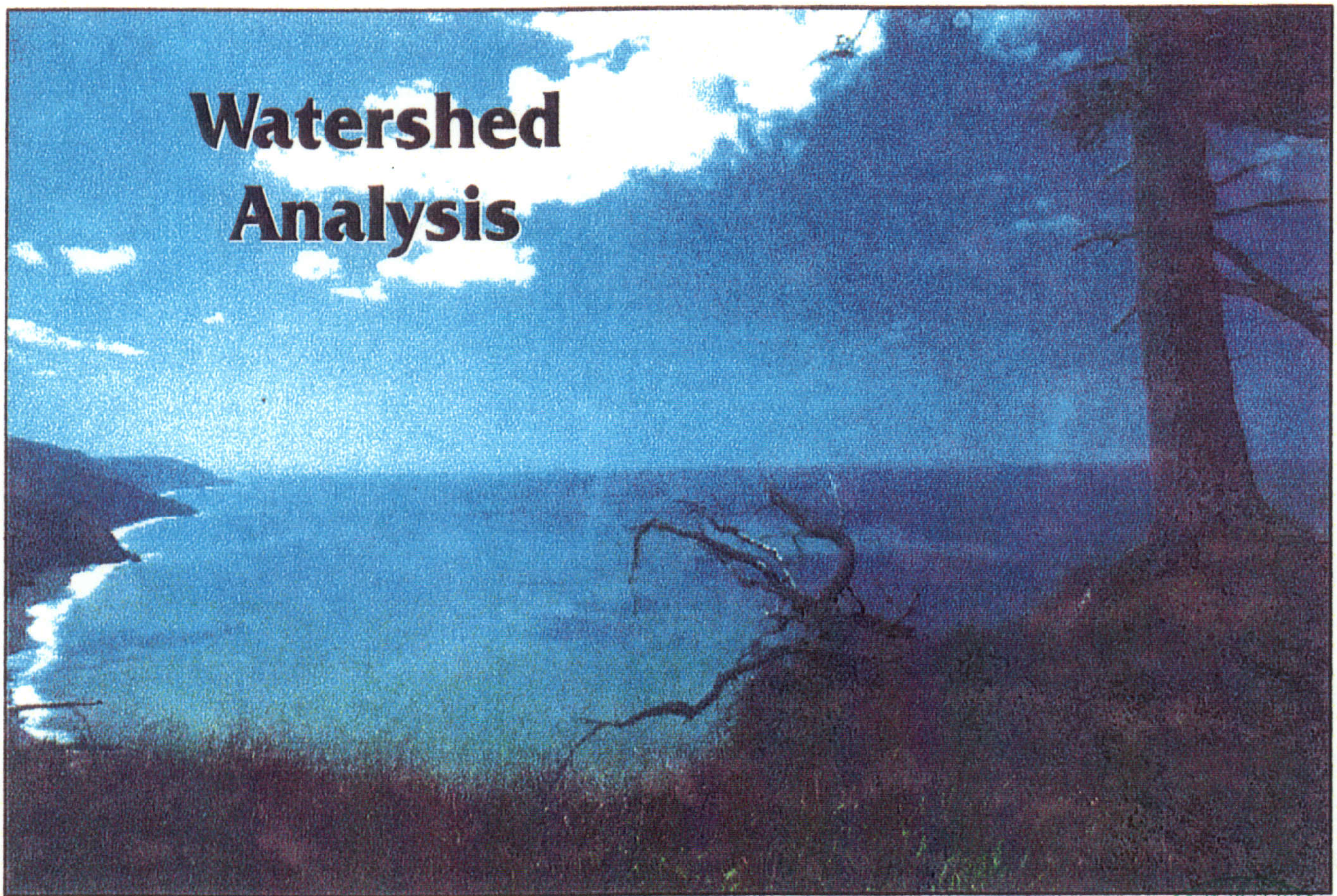
Hunter Creek



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I have read this analysis and find it meets the Standards and Guidelines for watershed analysis required by The Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. (April 1994).

SIGNED *William B. Blackwell, Jr* DATE *7/21/98*

for District Ranger
Gold Beach Ranger District
Siskiyou National Forest

Hunter Creek Watershed Analysis

Prepared for

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1.0 INTRODUCTION

The purpose of this analysis is to develop a scientifically based understanding of the processes and interactions occurring in the Hunter Creek watershed and to determine how past management activities have influenced near- and long-term resource conditions. Specific goals and objectives of the analysis are to:

- Gather and analyze information to guide future management activities.
- Provide management recommendations designed to attain/maintain Aquatic Conservation Strategy objectives and increase old growth habitats on the Late Successional Reserve (LSR) portion of federal lands.
- Develop an understanding of the role that multiple ownership plays in determining conditions in the Hunter Creek watershed.

1.1 ANALYSIS PROCESS

Documentation and analysis procedures follow the guidelines in the Federal Guide to Watershed Analysis. Issues and key questions, developed by the Forest Service with EA Engineering, Science, and Technology guide the content of this analysis. Key questions are designed to focus the assessment on the important questions, so that efforts are concentrated on the processes and conditions directly related to desired conditions and beneficial uses.

The Hunter Creek watershed was stratified by land ownership and four 6th field watersheds. For analysis purposes, the sixth field watersheds were subdivided into Watershed Analysis Areas (WAA's). Information used in the analysis consisted of Forest Service GIS maps and associated databases, aerial photography, field sampling, and interviews with various individuals. Private land owners and the Bureau of Land Management (BLM) were contacted regarding management direction and future actions. Considering the mixed ownership, amount and quality of data at the subwatershed level is highly variable. However, attempts are made to assess watershed conditions across all ownerships consistently.

An interdisciplinary core team consisting of a hydrologist, geologist, fisheries biologist, wildlife biologist, and silviculturalist conducted this analysis. Forest Service and other agency personnel, in addition to the public, provided key information and insights to the history and conditions in the Hunter Creek Watershed (Appendix A).

1.2 ANALYSIS OF ECOSYSTEM ELEMENTS

This analysis is grouped into three main categories: the Terrestrial Ecosystem, the Riparian Ecosystem, and the Aquatic Ecosystem. Social aspects and values are discussed in Chapter 2, Watershed Overview.

In a physically based model of the watershed, energy flow is initiated at the summit and proceeds downslope through the riparian zone, into the stream channel, and delivered to the next body of water. Therefore, the physical/biological analysis begins upslope, with the forest structure and associated biological communities. Next, the riparian zone serves as the interface between the upslope and aquatic environments. The final section focuses on the aquatic system and its ability to transport watershed products and support aquatic dependent species.

Key questions are organized sequentially, such that information contained in preceding questions are used in the analysis of the subsequent questions.

2.0 CULTURAL AND PHYSICAL FEATURES

2.1 MANAGEMENT ALLOCATION

The Hunter Creek watershed encompasses 28,404 acres. The watershed is located directly south of Gold Beach and drains directly into the Pacific Ocean (Figure 1). Lands administered by the forest products industry (South Coast Lumber, Menasha, Moore Mill and Lumber), BLM, Forest Service, and private citizens create a mosaic of ownership in the Hunter Creek watershed. Table 1 displays the ownership allocation acres. Table 2 displays the land management allocations. Distribution of ownership and land management allocations presented in Figure 2.

The Siskiyou Land and Resource Management Plan (Siskiyou LRMP 1989) as amended by the Record of Decision for Amendments to the Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD 1994) further allocated the Forest Service and Bureau of Land Management ownership into various management designations (Table 2, Figure 2). At the watershed scale, industrial forest land accounts for the largest management area with 14,732 acres. Within federal lands, Late Successional Reserves (part of the Northwest Coast LSR) account for the largest management area (6,311 acres) followed by matrix land designation (2,375 acres).

2.2 PHYSICAL SETTING

Hunter Creek is a moderate sized stream flowing into the Pacific Ocean in Township 37 South, Range 15 West, Section 12, Willamette Meridian, approximately two miles south of Gold Beach, Oregon. The National Forest boundary occurs approximately at river mile (RM) 12.0 from the mouth. Hunter Creek divides into three major branches: the main stem, North Fork Hunter Creek, and South Fork Hunter Creek. Other significant tributaries include Conn Creek, Little South Fork Hunter Creek, and Elko Creek.

A small estuary approximately of 0.7 miles in length is at the mouth of Hunter Creek. During low water flow periods sand accumulates at the mouth developing a sill and "bar-bound" conditions which restrict the daily mixing of fresh and salt water.

2.2.1 Bedrock Geology

The bedrock geology of the Hunter Creek watershed consists primarily of four units: Colebrooke Schist, Otter Point Formation, Dothan Formation and an ultramafic suite composed of serpentinites and peridotites (Figure 3). These units were created seaward, likely as trench fill sediments and subsequently accreted on to the North American Plate as the Pacific Plate was subducted beneath the North American Plate. The obducted crust forms a series of subparallel thrust plates that appear in map view as east to west trending out cropping ridges trending parallel to the coast. Typically the relative age of the rocks increases with depth. The watershed is divided by a north-south striking thrust fault located between the Otter Point Formation and the ultramafics, running from Section 36 of T36S, R14W to Section 36 of T37S, R14W.

TABLE 1: LAND OWNERSHIP IN HUNTER CREEK

Managers	Area (Acres)
Private	17,662
Forest Service	7,001
Bureau of Land Management	3,703
State of Oregon	38

TABLE 2: LAND MANAGEMENT ALLOCATIONS

Management Regime	Area (Acres)
Forest Products Industry	14,732
Late Successional Reserve	6,311
Small Private Ownership	2,931
Matrix	3,474
BLM General Forest	1,099
Riparian Reserve	649
Special Interest Site	144
Special Wildlife Site	77
Botanical Area	47
Oregon State Park	38
National Forest Land Allocation (numbers are not an addition to above)	
Matrix	2,735
Late Successional Reserve	2,422
Riparian Reserve	649
Special Wildlife Site	77
Special Interest Area	144
Botanical Area	47

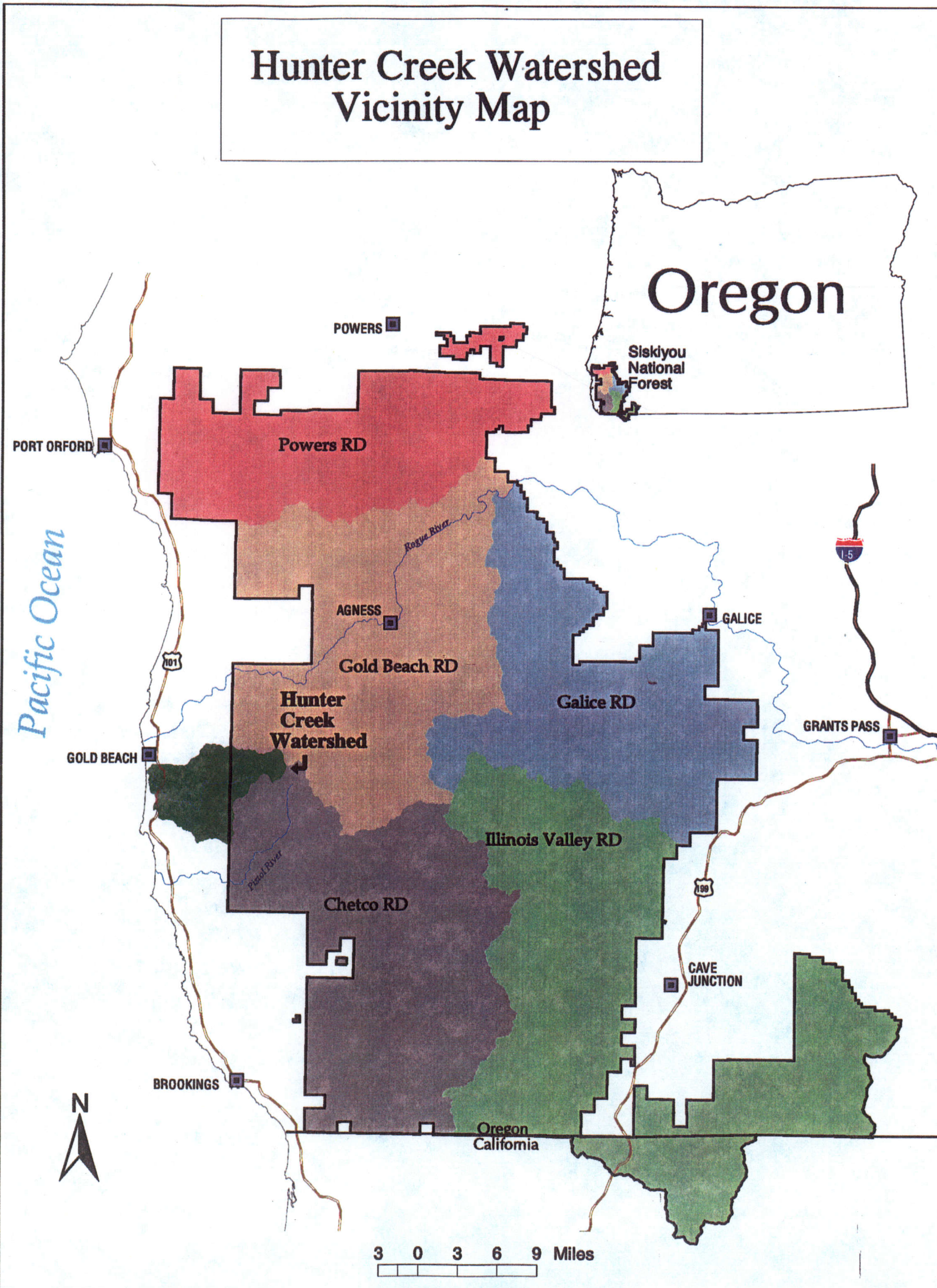

Hunter Creek Watershed
Vicinity Map
Oregon
Siskiyou
National
Forest
POWERS
PORT ORFORD
Powers RD
Pacific Ocean
Rogue River
AGNESS
GALICE
I-5
Gold Beach RD
Hunter
Creek
Watershed
Galice RD
101
GOLD BEACH
GRANTS PASS
Illinois Valley RD
Pistol River
199
Chetco RD
CAVE
JUNCTION
BROOKINGS
N
Oregon
California
3 0 3 6 9 Miles

Figure 1

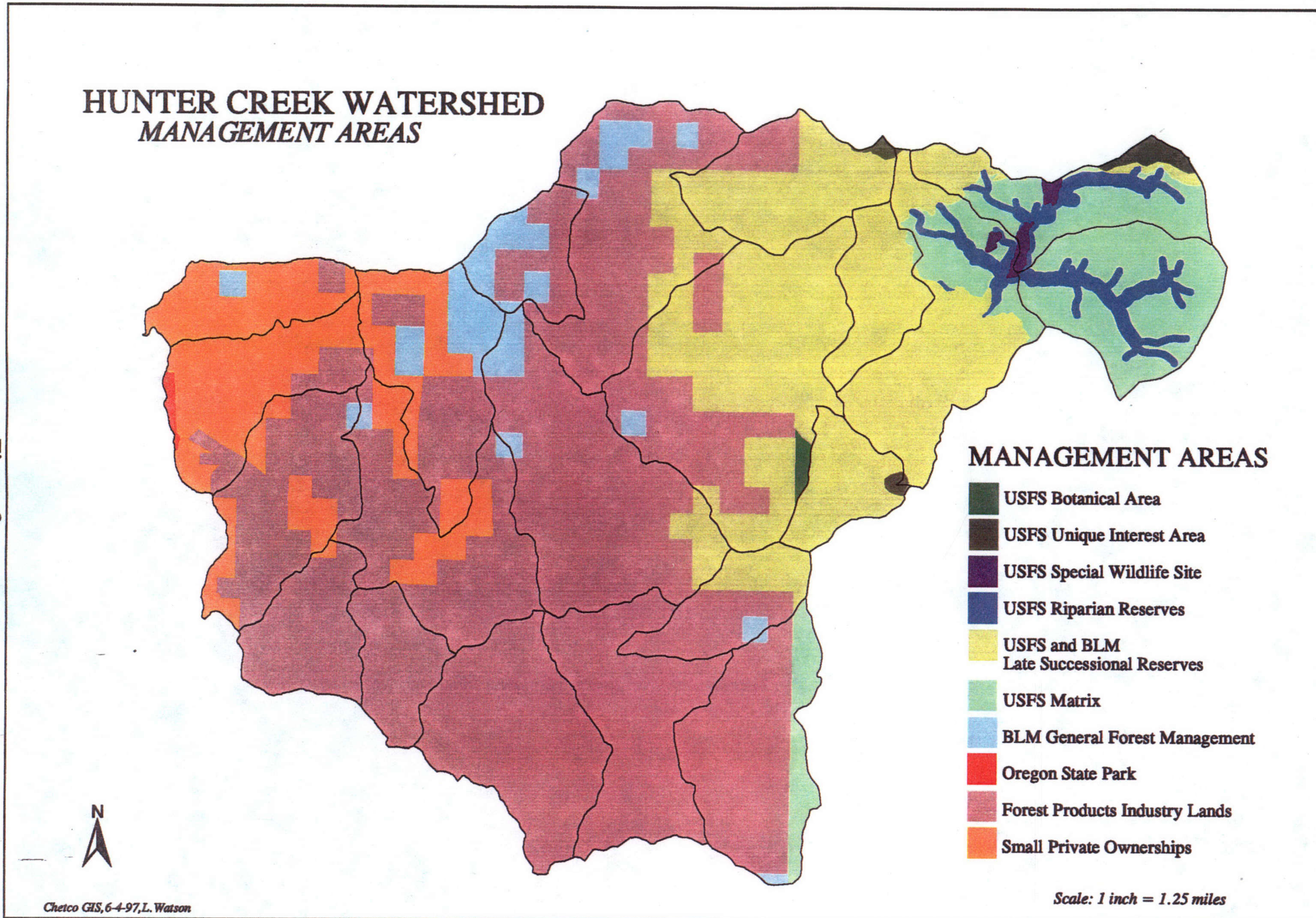

HUNTER CREEK WATERSHED
MANAGEMENT AREAS
MANAGEMENT AREAS
USFS Botanical Area
USFS Unique Interest Area
USFS Special Wildlife Site
USFS Riparian Reserves
USFS and BLM Late Successional Reserves
USFS Matrix
BLM General Forest Management
Oregon State Park
Forest Products Industry Lands
Small Private Ownerships
N
Scale: 1 inch = 1.25 miles
Chetco GIS, 6-4-97, L. Watson

Figure 2

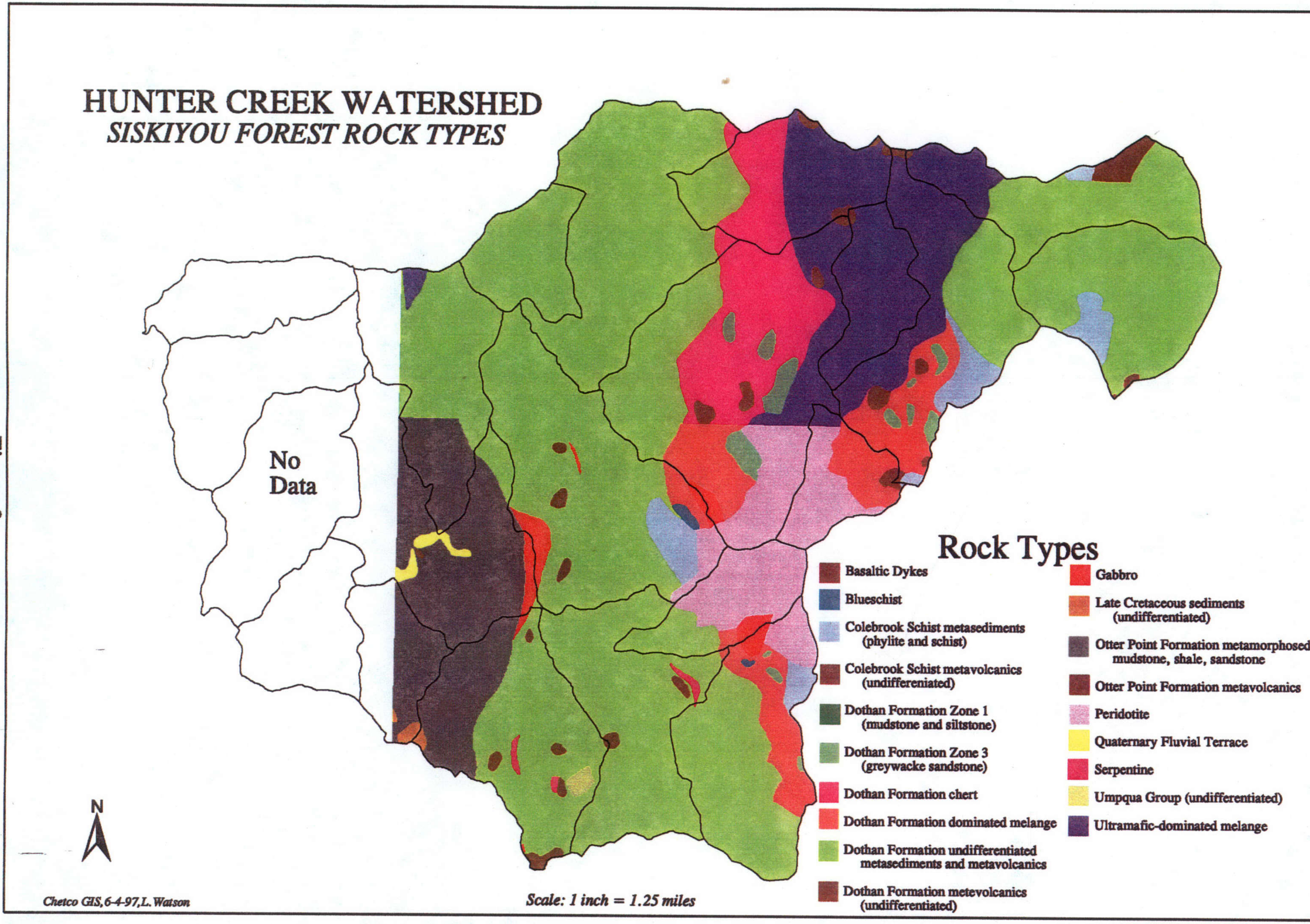

HUNTER CREEK WATERSHED
SISKIYOU FOREST ROCK TYPES
No Data
Rock Types
Basaltic Dykes
Blueschist
Colebrook Schist metasediments (phylite and schist)
Colebrook Schist metavolcanics (undiffereniated)
Dothan Formation Zone 1 (mudstone and siltstone)
Dothan Formation Zone 3 (greywacke sandstone)
Dothan Formation chert
Dothan Formation dominated melange
Dothan Formation undifferentiated metasediments and metavolcanics
Dothan Formation metevolcanics (undiffereniated)
Gabbro
Late Cretaceous sediments (undifferentiated)
Otter Point Formation metamorphosed mudstone, shale, sandstone
Otter Point Formation metavolcanics
Peridotite
Quaternary Fluvial Terrace
Serpentine
Umpqua Group (undifferentiated)
Ultramafic-dominated melange
N
Chetco GIS, 6-4-97, L. Watson
Scale: 1 inch = 1.25 miles

Figure 3

2.2.2 Lithologies

Stratigraphically, the youngest rocks in the watershed, the Dothan and Otter Point Formations are composed of greywacke, sandstone, mudstone, with inclusions of cherts and pillow basalts. The more resistant volcanic units often form the topographic highs within the watershed. The deepest gorges in the Hunter Creek watershed are incised into these units. These gorges trend parallel to the strike of the regional structure and appear to be related to either localized stratigraphic weaknesses in the units (i.e. more erosive layers), or to fracturing and faulting. Field investigations found the sedimentary units to be generally thinly bedded with high degree of fracturing.

The ultramafic rocks occur primarily as sheets within the Otter Point Formation and as soles to overriding thrust sheets, but also are present along vertical faults (Renoud 1976). They consist of peridotites and serpentinites. Ultramafic soils once disturbed, erode rapidly. However, ultramafic rocks weather to a saprolitic clay which is more erosion resistant. Because of the very low permeability of these clay soils, water tends to pond which results in higher mass movement potential. Another important aspect of the ultramafic units is the toxicity of these saprolitic soils to a majority of the plant species in the watershed. This leads to an open woodland vegetative structure where trees are generally sparse and stunted, or may be completely lacking in vegetation. The ultramafic rocks are a source of chromite, nickel, copper, and asbestos (Ramp 1975).

Colebrooke schist consists predominantly of tectonically metamorphosed sediments. Inclusions of metavolcanic greenstone are also present. The metavolcanics are very resistant to weathering, often forming bedrock promontories, such as Pyramid Rock and the buttes at Signal Buttes. The metasediments are much less resistant and constitute a higher risk of failure, particularly in the inner gorge areas of Hunter Creek.

2.2.3 Structure

The principle structural feature in the Hunter Creek watershed is a complex system of thrust faults in which relative displacement of individual thrust plates is in an east to southeasterly direction. The rocks were further deformed by a series of north/south trending high-angle faulting which sheared and altered the rocks into a melange of lithologies. These shear zones range in size from a few inches wide to the width of a valley, and appear to be a prime area for slope failures. Subsequent tectonic events have caused some folding in all units, with the exception of the unconsolidated Quaternary sediments. The structural fabric generally controls the landscape-scale topographic features, from deeply-incised stream channels to flat-lying ridge tops. Structure controls appear to dictate the extent of incision since there is little correlation between geologic units and extent of incision.

Geomorphology

Low angle implacement of the ultramafic thrust plates have formed broad plateaus in the upper watershed as a result of the. Massive landscape-scale landslides have occurred in the past, blocking and re-routing Hunter Creek. Several landslides exist on the south and east flanks of the Flycatcher Springs area. The upper basin is characterized by immature drainage patterns and terrace landforms. The topography on many of the hillsides exhibit a scalloped pattern indicative of landslide scarps. Lower in the basin, and particularly in the North Fork and the mainstem near the National Forest boundary, the creek is deeply incised, with steep canyon walls and associated inner-gorge slides. In the lower watershed, where gradients decrease, sediment delivered to the channel system are deposited creating an alluvial valley.

Hydrogeology

Groundwater is an important factor in determining slope stability in the Hunter Creek watershed. In areas where the serpentine has weathered to clay it presents an impervious boundary to the vertical migration of groundwater, creating local perched water tables. The Hunter Creek bogs are a good example of this occurrence. Localized perched water tables have also formed on the back side of ancient landslides.

The clay layer also has the effect of keeping the water at or near the surface, which increases the potential for overland flow. The groundwater can also play an important role in the initiation of mass wasting events, as in the example of the slump complex at MP 8.0 on FR 3680.

2.3 CULTURAL ELEMENT

Key Question: What are the past and present cultural uses of the watershed?

2.3.1 Prehistoric

The archaeological record points to continuous human occupation of southwest Oregon for at least the last 8,000 to 9,000 years. A Carbon-14 study of the Marial site (35CU84, Griffin, 1983) on the Rogue River yields several dates beginning at 8,560 Before Present (B.P.), establishing the antiquity of human life in this portion of southwest Oregon. Excavations carried out near the mouth of the Illinois River at the Tlegetlinten site (35CU59, Tisdale, 1986) unearthed materials from two later cultural periods; 6,000 and 2,000 years ago. Human adaptations in southwest Oregon appear to have evolved from a moderately mobile, hunting/gathering lifestyle to more sedentary, specialized economies.

Southwest Oregon was traditionally occupied by several different bands of Athabaskan Indians. Each band spoke a different dialect of the Athabaskan language and had its own name. The Tututni group of bands refers collectively to all of the Oregon Athabaskans of the seaboard.

The Tututni group occupying Hunter Creek was known as the Yahshutes band. In general, the Tututni (or Coast Rogues, as they are sometimes called) inhabited much of southwestern Oregon from the beaches to the upland forests. They occupied the region from the mouth of the Coquille River near Bandon, Oregon to northern California and extending up the major drainages like the Smith, Chetco, Pistol and Rogue Rivers. The bands were numerous and the locations diverse.

The general pattern of Tututni settlement indicates that large winter villages were established at meadows, along rivers and major streams. Houses constructed at village settlements were substantial, consisting of semi-subterranean structures with bark or plank walls with roofs measuring 12 to 16 square feet. These villages served as semi-permanent habitation spots, where foods collected throughout the year could be stored for use in the winter.

The Hunter Creek watershed was likely used as a dispersed hunting and gathering area. A winter village may have been located along the wider reaches of lower Hunter Creek. Hunter Creek itself would have likely been used for seasonal fishing opportunities. The ridge top location of current road 1703 was likely used as a travel corridor between the Rogue and Pistol Rivers.

Several prehistoric sites have been documented on federal lands within the Hunter Creek watershed. These sites have been primarily lithic scatters. One prehistoric camp has also been documented. Vision quest sites have also been documented in or near the watershed. Cultural surveys have not been conducted on private lands.

There is no evidence that local Indian groups presently use the watershed for traditional activities. Recognized tribes (Tolowa, Karuk, Coquille, and Siletz) have previously been queried about any traditional activities currently in practice in the Siskiyou National Forest. No current activities were disclosed.

2.3.2 Historic

Exploration /Settlement

The first historic encounters with the Hunter Creek watershed were by offshore Spanish explorers in the 1500s. Exploration by English, Russian, and French explorers came later. The earliest recorded contact between the coastal natives and Europeans is noted in the log of Captain George Vancouver in 1792.

Interest in fur resources led to a period of maritime fur trade, particularly strong between 1785 and 1820. Both Americans and Europeans gained much knowledge of the Pacific Northwest from these trade voyages. It was this knowledge of the area's bountiful natural resources that prompted land-based exploration.

The first real land exploration of southwest Oregon began with the Hudson Bay Company's fur trading expeditions in the 1820s. This British-based firm monopolized most of the fur trade in southwest Oregon. Forays by American traders like Jedediah Smith and Ewing Young were rare. With the exception of the bloody confrontation in 1828 between Jedediah Smith's group and the Lower Umpqua or Kalawatset Indians near Gardiner, relations between the land-based traders and the Indians were positive and peaceful.

The efforts of the land traders, as well as those of pioneer emigrants and natural history explorers, gradually publicized the area between 1820 and the early 1850s. Then, discovery of gold near Jacksonville in 1852 and near Bandon at Whiskey Run Beach in 1853 brought in thousands of miners. The discovery of gold near Gold Beach (then Ellensburg) followed. Thus started the first Euro-American settlement of the area.

Differences in culture, lifestyle, and economic subsistence between the native peoples and the newly arrived Euro-Americans inevitably led to conflicts. By the end of the Rogue Indian wars in 1856, the remaining population of aboriginal people had been moved to the Grande Ronde or Siletz Reservations. Some individuals escaped relocation or were allowed to return to their homelands, mainly because of intermarriage with the white settlers. However, some individuals returned to their homelands after the enactment of the Dawes Act, which opened up public domain allotments to Indian peoples. In 1938, 23 allotments existed in Curry County.

The restricted area of arable ground in the watershed (essentially just the valley bottom at the lower end of Hunter Creek) limited the amount of settlement in the watershed.

The Siskiyou National Forest was established on October 5, 1906. Early on, fire protection was one of the primary functions of the rangers. Fire lookouts were built and operated in the 1930s. In the Hunter Creek watershed, these included lookouts at Pyramid Rock, Signal Buttes, and Grizzly Mountain. None of these lookouts exist today.

Mining

The Hunter Creek area has seen mineral exploration and development at varying levels of intensity since the 1850s gold rush. Gold was mined in the 1850s mostly as placer deposits along the river terraces and beaches near the mouth of the creek. The 1930s saw exploration for nickel, as well as gold; the 1950s for nickel and chromite. Most of the physical evidence found today is from exploration, mainly trenches and test pits.

Mining activity in the watershed focused around two main areas: Signal Buttes, including the Starr or McKinley mine; and Red Flat, including the West mine. Current road 1703 (which began as an aboriginal trail) on the east side of the watershed served as a mining trail. Other trails in the watershed were created or used by miners. Several prospectors' or early settlers' cabins exist, or at one time existed, in the watershed.

Current mining claims in the watershed are on serpentine soils. Nickel is the only metallic resource that appears to have a potentially significant impact on the future economy of Curry

County (Ramp et al. 1977). If market conditions were to change, wide-scale nickel mining in the watershed is possible due to the vast extent of low-grade ore.

Approximately 10 rock quarries have operated in the watershed over the years. Two sand and gravel pits are currently being operated in the Hunter Creek alluvium. Curry County and the Siskiyou National Forest operate these pits.

Special Forest Products

Special forest products collected from the watershed include: mushrooms, boughs, ferns, shrubs, poles, cedar posts and bolts, Christmas trees, burls, beargrass and firewood. Much of this collection activity is recreational in nature.

Neither the Forest Service nor the BLM allow collection of Port-Orford-cedar boughs for personal use. This is due to past over harvest and as a measure to control the Spread of Port-Orford-cedar Root Rot.

Grazing

Since the 1800s, the area has a history of domestic livestock grazing (Dillingham 1995). Presently, about 1,132 acres in the northern part of the watershed is grazed in an area known as the Signal Buttes Range Allotment. The remaining 971 acres of this 2,103-acre allotment falls within the neighboring Quosatana and Jim Hunt Creek watersheds.

The Signal Buttes Range Allotment, formerly known as the Wildhorse-Quosatana Range Allotment, has been under Forest Service permit since 1924. The Signal Buttes (and Kimball Hill) portion was added in 1950. Sometime between 1965 and 1974 the allotment was vacated. In 1974, grazing resumed in the Signal Buttes area with 30 cow-calf pairs for the period June 15 - September 15. Grazing continued through 1994. Since 1995, one bull and 9 cow-calf pairs are allowed to graze yearlong, with the highest use taking place during spring, summer, and mild winters. This grazing permit is valid to the year 2005.

Streams exposed to grazing within the watershed's portion of this allotment amount to approximately 1.25 miles in the North Fork Hunter Creek subwatershed and 1.5 miles in the Hunter Creek subwatershed; all are perennial, non-fish bearing streams. Stream banks are well vegetated and stable (Dillingham 1995). There are no range improvement structures (including boundary fencing).

Cattle are also present in the lower watershed. Grazing occurs on private land, on pastures adjacent to Hunter Creek.

2.4 RECREATION

Key Question: What are the major recreation uses in the watershed?

The majority of National Forest lands in the Hunter Creek watershed is designated "roaded natural" in the Recreation Opportunity Spectrum (ROS) classification system. Roughly 1,800 acres in the National Forest's northwest corner of the watershed is designated "semi-primitive motorized" in the same ROS system. Table 3 gives an inventory of formal recreation sites and trails in the Hunter Creek watershed, both existing and proposed.

TABLE 3. DEVELOPED RECREATION SITES IN THE HUNTER CREEK WATERSHED, EXISTING AND PROPOSED

Recreation Site	Status	Ownership
Elko Campground	Existing	USFS
Quosatana Butte Trail (Non-system trail)	Existing	USFS
McKinley Mine Trail (Non-system trail)	Existing	USFS
North Fork Hunter Creek Trail	Existing	BLM
Hunter Creek Bog Viewing Area/Trail	Proposed	BLM

There are no developed recreation sites on private lands within the watershed.

Recreational activities in the watershed are conducted mostly by local citizens. The amount of each use is not known. However, the primary recreational use of the watershed is driving. This is especially true during the autumn hunting seasons.

The second most common use is camping. The heaviest camping use occurs during hunting season. During this time, camping is spread throughout the watershed at dispersed sites along Hunter Creek. Camping also occurs during the summer months, again at dispersed sites.

The undeveloped Coldiron Camp area receives the highest camping use in the watershed. The second most heavily used camping area is at Elko Campground, the only developed campground in the watershed. Elko receives most of its use during deer and elk hunting seasons and summer weekends; exact numbers are unknown. Other dispersed camping sites include Red Flat, sites along Hunter Creek, and the Signal Buttes area.

Another recreational use is botanical study and viewing. This occurs at the Hunter Creek Bog (BLM) and Red Flats Botanical Area (USFS). The Bureau of Land Management plans to improve this use by constructing a boardwalk. The existing parking area on the east side of the bog will be maintained at its current size.

Hiking in the watershed is moderately popular with local citizens. All of the existing trails listed in Table 3 receive varying degrees of use. Currently, none of the National Forest trails are maintained except for minor work by local hikers. Only the North Fork Hunter Creek trail is planned for maintenance (not improvement).

Swimming is a very popular recreational activity during the summer. There are several excellent swimming holes in the main stem of Hunter Creek near the end of the county road. This area is outside the fog zone and thus a popular area for locals.

All-terrain vehicle (ATV) use and four-wheeling in the open serpentine areas is another common recreational pastime in the watershed. However, this activity is a concern, as motorized vehicles are a known vector spreading Port-Orford-cedar root rot. There is also concern that this type of recreation could, in the future, negatively impact the watershed's sensitive plants.

Recreation is very limited on private lands due to locked gates. South Coast Lumber Company, for example, keeps almost all its roads gated and locked except during deer season.

Recreation trends shown in the 1994 Oregon State Outdoor Recreation Plan survey indicate that demand for dispersed recreation of various types is increasing. The dominant activities, listed in rank order, are sightseeing/pleasure driving (69 percent of households), swimming (59 percent), boat fishing (41 percent), tent camping (39 percent), and nature study and wildlife viewing (38 percent). Demand for recreational opportunities in Hunter Creek is expected to remain the same or gradually increase from current levels. The outdoor recreation plan also indicates that the demand for trails is increasing. Locally, there has been an increased interest in accessible trails, including equestrian, mountain bike and ATV trails, as well as day-use trails.

If roads are closed for fish and wildlife protection, Port-Orford-cedar protection, road-related watershed restoration, meadow protection, and other resource-related purposes, then current levels of road access in the watershed will decrease.

3.0 TERRESTRIAL ECOSYSTEM

Assessment of the terrestrial ecosystem begins with the historic and current vegetative structure in the watershed. This includes stand structure, old growth habitats, and special and unique habitats. Following the vegetation and habitat characterization, the assessment presents terrestrial species of concern, including information on occurrence. Habitat is discussed for each species and is based on the findings from the vegetation characterization analysis.

Although sources vary, data on vegetation and species is consistently assessed across all ownerships. Data sources include Pacific Meridian Resources (PMR), Forest Service supplied GIS and associated databases, aerial photography, and field sampling.

Limitations

PMR classifications should be verified before making any site-specific resource decisions. Classification discrepancies have been noted in vegetation stands located on ultramafic soils. Specifically, vegetation stands located on ultramafic soils in the early seral stage are classified as pioneer structural stage by PMR.

3.1 VEGETATIVE CHARACTERIZATION

Key Question: What is the structure and distribution of vegetation in the watershed?

The Hunter Creek watershed stretches from the Pacific Ocean to approximately 10 air miles inland. As such, the entire watershed is strongly influenced by the coastal climate. However, there are a variety of habitats in the watershed driven by the diversity of other physiographic conditions. Habitats include serpentine soils, rock and rock outcrops, productive riparian areas, and north and south-facing aspects.

Most of the lower end of the watershed, primarily in private ownership, consists of highly productive soil of sedimentary origin. These lands, heavily harvested of nearly all old growth timber in the 1950s and 60s, now support a mix of conifer and hardwood stands. Small amounts of agricultural and developed land exist in the lower watershed. Some residential development has taken place on the hills above lower Hunter Creek.

Federal lands occupy the eastern one-third of the watershed, including the headwaters of the mainstem and North Fork Hunter Creeks. National Forest lands have seen a moderate amount of timber harvesting; since 1955, 22 percent of these lands have had regeneration or thinning harvests.

Federal lands, in general, are a mix of productive forest lands and sparsely vegetated serpentine soils. These serpentinite soils occupy a wide block of land running south from Signal Buttes to the southern watershed boundary. The serpentine, or ultramafic derived soils, supports stands of widely spaced Jeffrey pine and Port-Orford-cedar; Jeffrey pine and Port-Orford-ceder are the climax species on ultramafic soils. Other pine species found on or near serpentine soils in the watershed include knobcone pine, western white pine, lodgepole pine, and sugar pine.

More productive sites in the watershed are stocked with Douglas-fir, western hemlock, western redcedar, grand fir, and red alder. Other species found in the watershed include incense cedar, Oregon myrtle, and tanoak; tanoak is common on dry, south-facing slopes.

At least three plant series occur on National Forest lands in the watershed: tanoak, tanoak/Douglas-fir, and Jeffrey pine. Plant series are not mapped for the balance of the watershed. However, it is likely that these three series, along with the Douglas-fir and western hemlock series, account for the entire watershed.

Currently, approximately three percent of the watershed is in late successional habitat. In 1940, approximately 37 percent was in late successional habitat. In comparison, the Regional Ecosystem Assessment Project Report - Southwest Oregon (USDA 1994) estimates that 45 - 75 percent late successional habitat across the landscape is needed for a fully functioning ecosystem.

Unique interest areas help characterize the diversity of vegetation within the watershed. Hunter Creek Bog (BLM) and the adjacent Red Flat Botanical Area (USFS) are a prime example of serpentine bogs. *Darlingtonia californica* (California pitcher plant) is the focal plant of the bog. Also included as unique interest areas are Pyramid Rock, Quosatana Butte, and Signal Buttes; all on National Forest lands. These unique interest areas are home to most of the 10 documented sensitive plant species in the watershed (see **Key Question: What is the status of T&E listed, sensitive, and indicator species in the watershed, what is their distribution, and what is the character of their habitat?**).

3.1.1 Reference Condition

Vegetation conditions in the 1940s represent reference conditions, as timber harvesting was not yet a significant disturbance factor in the watershed. Some timber harvest occurred in the late 1940s, although logging in earnest did not start until the 1950s. Prior to harvest activities, fire was the primary disturbance in the watershed.

Lightning fires have shaped the landscape over time. The fire return frequency for the Hunter Creek watershed is estimated to be at least 150 years. The strong marine influence in this watershed creates moisture conditions that are generally unfavorable for fire starts from lightning. When conditions are favorable, however, the resulting fires are intense and stand re-setting in nature. Additionally, during pre-historic and early historic times, American Indians and early white settlers likely used fire to enhance forage for game and to stimulate the growth of plants used as food and for manufacturing baskets.

Fire suppression since early this century has nearly eliminated the fire disturbance process from the watershed. It is likely that the 1940 forest stands originated with a fire. But, it is also likely that few, if any, of these stands had encountered even moderate intensity fire for many years prior to 1940. There are no significant fires recorded in the watershed during this century.

Clumpy windthrow and, especially, large scale windthrow is a natural disturbance which has shaped forested landscapes throughout the Pacific Northwest. Although data is not available to describe the historic distribution of windthrow, it is assumed that over the centuries windthrow has modified vegetation stands in Hunter Creek. Exploratory and extractive mining also had an influence, but mining in general, including fires started as a result of mining activities, likely had only a minor impact to the vegetative landscape.

Late-successional forest in 1940, by sixth field watersheds, is shown in Appendix B. The acreages were determined in two ways, depending on ownership. A 1938 Curry County inventory using aerial photographs established late-successional stands on National Forest lands. On all other lands, late-successional forest was interpreted from 1940 aerial photographs. Based on these sources, 37 percent of the watershed (10,375 acres) was in late-successional forest in 1940.

It should be noted that the 1938 inventory was probably done for timber purposes, not for structural characteristics. As such, there are limitations to its accuracy for late-successional assessment.

3.1.2 Current Conditions

Since the 1940s, timber harvest has supplanted fire and large scale windthrow events as the primary disturbance influence in the watershed. Timber harvesting started in the watershed in the late 1940s, with significant logging in the 1950s and 1960s. During that time, Agnew Timber Company (previous landowner to South Coast Lumber Company) heavily logged its ownership in the watershed.

Logging on National Forest lands within the Hunter Creek watershed reportedly started with the Hunter Creek Timber Sale in 1955. This sale included timber harvest in the nearby Lawson Creek watershed to the east. Overall, there were two periods of relatively heavy harvest in Hunter Creek: 1955 to 1964, and 1980 to 1989. Harvest levels on National Forest lands by half-decade periods are shown in Table 4. Some of this harvest occurred in what was General Forest that now is designated Late-Successional Reserve. This allocation occurred by the Record of Decision, Northwest Forest Plan in 1994.

Reforestation on private forest lands did not begin until the 1960s. Much of this early reforestation, often in the form of aerial seeding, was unsuccessful. In addition, vegetation control was poor to non-existent. As a result, much of the logged private lands grew back to red alder, tanoak, and other hardwoods. South Coast Lumber and other private landowners are now converting these hardwood stands back to conifers. This conifer reforestation appears is silviculturally intensive and appears successful.

TABLE 4. HARVEST ACRES BY HALF-DECADE PERIOD, NATIONAL FOREST LANDS.

Period	Clearcut (acres)	Other Harvest* (acres)	All Harvest % of National Forest Lands
1955 - 1959	289	0	4%
1960 - 1964	309	0	4%
1965 - 1969	17	0	<1%
1970 - 1974	92	23	2%
1975 - 1979	79	44	2%
1980 - 1984	178	107	4%
1985 - 1989	317	70	6%
1990 - 1994	0	0	0%
Total	**1281**	**244**	**22%**

* Includes partial removal, shelterwood and salvage harvest.

It should be noted that even though natural fire has been excluded from the watershed for most of this century, prescribed fire in support of reforestation efforts is fairly common. In fact, regeneration harvest areas on National Forest and BLM lands are routinely burned. Many of the recent hardwood conversion units on private lands have been burned as well.

Current structural stages were determined from the interpretation of 1992 aerial photos on non-USFS land and from the PMR analysis of 1988 Landsat satellite imagery (manually updated in 1992 to reflect harvest since 1988). Table 5 and Figure 4 show current structural stages and non-forest land for the Hunter Creek watershed as a whole. Appendix B- B.2 shows the structural stage breakout by Watershed Analysis Areas (WAAs).

3.1.3 Future Conditions

Current structural stages along with land ownership allocations were used to predict areas of late successional forest in the year 2040. It is estimated to be 210 acres (interior acres). It was assumed that management practices on private lands would not produce late successional forest. A similar assumption was made for BLM's Northern General Forest Management Area and National Forest matrix lands. For Late Successional Reserve (LSR) lands, any forest of

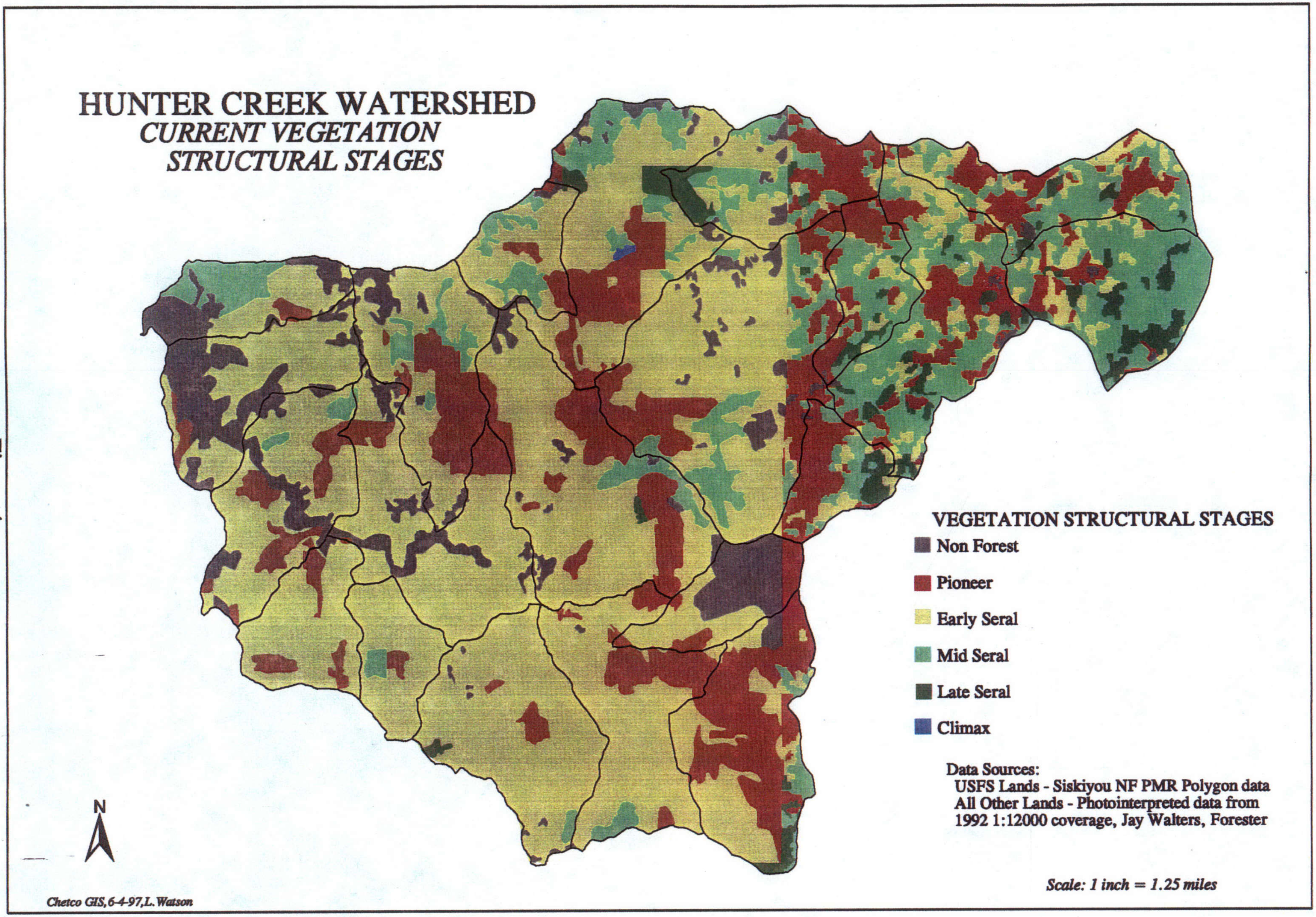

HUNTER CREEK WATERSHED
CURRENT VEGETATION
STRUCTURAL STAGES
VEGETATION STRUCTURAL STAGES
Non Forest
Pioneer
Early Seral
Mid Seral
Late Seral
Climax
Data Sources:
USFS Lands - Siskiyou NF PMR Polygon data
All Other Lands - Photointerpreted data from
1992 1:12000 coverage, Jay Walters, Forester
N
Scale: 1 inch = 1.25 miles
Chetco GIS, 6-4-97, L. Watson

Figure 4

mid-seral structural stage and greater is assumed to be late successional in the year 2040. These predictions do not account for any structure-enhancing treatments that may expedite late successional achievement.

A trend in state forest practices regulations is for increasing protection of riparian and aquatic resources. It is anticipated that streamside protection zones will be broadened in the future. Also, harvest unit size will likely be reduced in size and spatial distribution. Therefore, connectivity and late seral structure along stream corridors are expected to increase over the next 20 to 50 years.

TABLE 5. ACRES BY STRUCTURAL STAGE AND NON-FOREST CLASS IN 1992, ENTIRE WATERSHED.

Structural Stage/Non-Forest Class	Acres	% of Watershed
Water	10	<1%
Rock Outcrops / Rocky Soil	92	<1%
Meadows	469	2%
Shrub / Brush	798	3%
Developed (residential)	687	2%
Agriculture	192	1%
Pioneer	5696	20%
Early Seral	14,948	53%
Mid-Seral	4677	16%
Late Seral	809	3%
Climax	11	<1%
Total	**28,404**	**100%**

3.1.4 Sensitive Plants

Key Question: What is the status of T&E listed, sensitive, and indicator species in the watershed, what is their distribution, and what is the character of their habitat?

There are no federal threatened or endangered plant species identified in the watershed.

There are currently 10 documented sensitive plant species located in the watershed. For this analysis, sensitive plants include those on the USFS Region 6 Sensitive Plants listing and those on the BLM Special Status Plants: Bureau Sensitive Oregon Natural Heritage Program (ONHP List 1) and Bureau Assessment (ONHP List 2) lists. These 10 plants are shown in Table 6.

All but the *Sidalcea* and the *Trillium* are associated with serpentine soils. The *Sidalcea* grows in meadows and openings; *Trillium* occurs in moist coniferous forests.

Populations of these species are generally stable. The potential threats to these species include grazing, recreation, and meadow encroachment. Timber harvesting is not a threat, as these are serpentine associated species where timber harvesting is not planned.

Grazing on Signal Buttes, where some of these species occur, is not currently a major concern. The grazing allotment is small - 1 bull and 9 cow/calf pairs. Grazing is not expected to be a threat to these plants at the current use level. However, grazing could cause harm if direct grazing to these plants were to increase or if increased disturbance overall allowed alien plants to invade, crowding out the sensitive plants. Neither scenario is expected at this time.

TABLE 6. USFS SENSITIVE AND BLM SPECIAL STATUS (BUREAU SENSITIVE AND BUREAU ASSESSMENT LISTS) PLANT SPECIES DOCUMENTED TO OCCUR IN THE HUNTER CREEK WATERSHED

Scientific Name	Common Name	Occurrence
Allium bolanderi	Bolander's onion	BLM
Arctostaphylos hispidula	Howell's manzanita	BLM/USFS
Carex gigas	Siskiyou sedge	USFS
Gentiana setigera	Waldo (elegant) gentian	BLM
Hieracium bolanderi	Bolander's hawkweed	BLM/USFS
Poa piperi	Piper's bluegrass	BLM/USFS
Salix delnortensis	Del Norte willow	USFS
Sidalcea malvaeflora ssp. patula	coast checker mallow	BLM/private
Trillium angustipetalum	giant purple trillium	BLM

Note: The known locations of these species in the watershed have been mapped out. However, agreement with the Nature Conservancy precludes their location from being listed here.

Off-road vehicle recreation in the watershed has been known to harm some *Poa piperi* plants. In general, however, current recreation levels do not pose a threat to any of the sensitive plant species.

Meadow encroachment is not considered a threat to the core populations of sensitive plants in this watershed because vegetative establishment is slow on serpentinite soils which support these plants. One notable exception is the Pine Point area, where Douglas-fir seedlings are coming in under the Jeffrey pine overstory. This regeneration may create conditions too shady for *Arctostaphylos* and *Poa*.

There are at least six unusual plant species in the watershed. Unusual plants includes those listed by the USFS Gold Beach Ranger District and those on the BLM Special Status Plants, Bureau Tracking (ONHP list 3 and 4) lists. These six plants are shown in Table 7.

TABLE 7. USFS UNUSUAL AND BLM SPECIAL STATUS (BUREAU TRACKING LISTS) PLANT SPECIES DOCUMENTED TO OCCUR IN THE HUNTER CREEK WATERSHED

Scientific Name	Common Name	Occurrence
Aster brickelloides	brickellbush aster	USFS
Cypripedium californicum	California lady-slipper	USFS/BLM
Darlingtonia californica	California pitcher-plant	USFS/BLM
Lillium vollmeri	Vollmer's lilly	USFS
Myrica californica	wax myrtle	USFS/BLM
Pinus contorta var. murrayana	inland lodgepole pine	USFS

The *Myrica californica* is unusual in that Hunter Creek is one of two known locations supporting of this species on the Siskiyou National Forest. It is also unusually far inland for this section of the coast.

The *Quercus garryana* (Oregon white oak) savanna is a unique plant community located on BLM lands in the North Fork Hunter Creek subbasin. This community is unique because of its close proximity to the Pacific Ocean and relative rarity along the west side of the Siskiyou Mountains.

There are currently no known sites of "survey and manage" species (S & M species) in the Hunter Creek watershed. There are, however, eight such species documented in the adjacent Pistol River watershed.

3.2 WILDLIFE HABITAT CHARACTERIZATION

Key Question: What is the historic and existing late-successional habitat in the watershed?

Pioneer successional habitat is generally found in recent clearcuts from 1980 to present, in brush fields, meadows, and open woodlands located on ultramafic soils. Currently, 5,696 acres or 20 percent of the watershed area is in pioneer habitat condition.

Early to mid-seral stands typically have small diameter trees with a nearly closed to closed canopy; these include pole-sapling, and hardwood stands. Currently, 19,625 acres or 70 percent of the watershed area is in early and mid-seral habitat condition.

Only three percent of the watershed (820 acres) is in the late seral or climax structural stage. All but approximately 40 acres are located on federal lands.

Interior Old Growth

Interior forest habitat includes those portions of the late-successional and climax forest areas that are not influenced by "edge effect." Edge effect is the result of changes in microclimate and species composition which are caused by an increased exposure to sun and wind. Edge effect penetrates a forest edge for approximately two tree lengths, or about 400 feet into the forest interior (Harris 1984; Franklin and Forman 1987). The preliminary results of current research (Spies et. al. 1990) generally support this approximate distance.

Interior old growth late-successional habitat (late seral and climax seral stages) was analyzed using GIS seral stage data. Interior habitat was determined by buffering in from openings and lesser seral stage forests. For 1992 (current condition), buffers around mid-seral stands were 200 feet; buffers around pioneer, early seral and non-forest stands were 400 feet. Stands on ultramafic soils were excluded from late successional habitat, as these stands contain widely spaced trees and do not contain the same conditions typical of closed canopy late-successional habitat.

To determine interior old growth in 1940, an average buffer width of 300 feet (average of 200 and 400) was applied to all stands surrounding late successional habitat. Data describing seral stages adjacent to late successional habitat is not available. Therefore, applying buffer widths based on seral stage condition was not possible. Again, stands on ultramafic soils were excluded.

The same 300 foot buffers were made for the 2040 interior old growth assessment. This projection assumed that all stands in protected management regimes that are currently at least mid-seral in size would reach late successional condition by 2040.

Tables 8, 9, and 10 show the grouped distribution of interior old growth blocks in the years 1940, 1992, and 2040, respectively. Figures 5, 6 and 7 display the data.

Old-Growth Fragmentation and Connectivity

Old-growth forest habitat within the Hunter Creek watershed is highly fragmented. Table 11 shows how patch size and distance to an adjacent patch has changed dramatically since the 1940s. Fifty years ago, interior old growth habitats were contiguous with the mean closest distance to an adjacent patch of 0.26 miles (range 0.08 - 0.76 miles). The current condition shows a 71 percent loss of patch numbers (8 remaining of 28), and a reduction in mean patch size of 95 percent (from 226 acres to 11 acres). Currently, average distance to the closest adjacent patch is 0.65 miles (range 0.08 - 2.61 miles). This reduction in old-growth habitat may contribute to the absence of old-growth-associated animals like the marbled murrelet and spotted owl.

TABLE 8: HISTORIC DISTRIBUTION OF INTERIOR LATE-SUCCESSIONAL FOREST BLOCKS IN 1940

Block Size in Acres	Number of Blocks	Total Acres
1 - 25	14	113
26 - 50	4	121
51 - 100	2	165
101 - 300	2	230
301 - 500	2	936
501 - 700	0	0
701 - 900	1	892
>900	3	3874
Total	**28**	**6331**

TABLE 9: CURRENT DISTRIBUTION OF INTERIOR LATE-SUCCESSIONAL FOREST BLOCKS IN 1992.

Block Size in Acres	Number of Blocks	Total Acres
1 - 25	7	39
26 - 50	1	48
51 - 100	0	0
101 - 300	0	0
301 - 500	0	0
501 - 700	0	0
701 - 900	0	0
>900	0	0
Total	**8**	**87**

TABLE 10: FUTURE DISTRIBUTION OF INTERIOR LATE-SUCCESSIONAL FOREST BLOCKS IN 2040

Block Size in Acres	Number of Blocks	Total Acres
1 - 25	7	83
26 - 50	0	0
51 - 100	0	0
101 - 300	1	127
301 - 500	0	0
501 - 700	0	0
701 - 900	0	0
>900	0	0
Total	**8**	**210**

TABLE 11. PATCH SIZE (ACRES), AND CLOSEST DISTANCE (MILES) TO AN ADJACENT PATCH, OF INTERIOR OLD GROWTH WITHIN THE HUNTER CREEK WATERSHED

DECADE 1940		CURRENT DECADE		DECADE 2040	
SIZE	DISTANCE	SIZE	DISTANCE	SIZE	DISTANCE
1,570	0.19	47	0.72	127	0.15
1,281	0.23	20	0.08	23	0.61
1,023	0.08	8	0.15	20	0.98
892	0.49	8	2.61	18	0.61
476	0.27	2	0.72	13	0.76
460	0.19	1	0.08	4	0.27
129	0.27	1	0.19	4	0.27
101	0.15			1	0.15
92	0.27				
73	0.19				
32	0.34				
32	0.34				
30	0.23				
27	0.34				
24	0.19				
20	0.19				
13	0.30				
13	0.76				
9	0.08				
9	0.11				
8	0.08				
5	0.19				
4	0.30				
3	0.19				
2	0.23				
1	0.19				
1	0.27				
1	0.64				
Mean = 226	Mean = 0.26	Mean = 11	Mean = 0.65	Mean = 26	Mean = 0.47

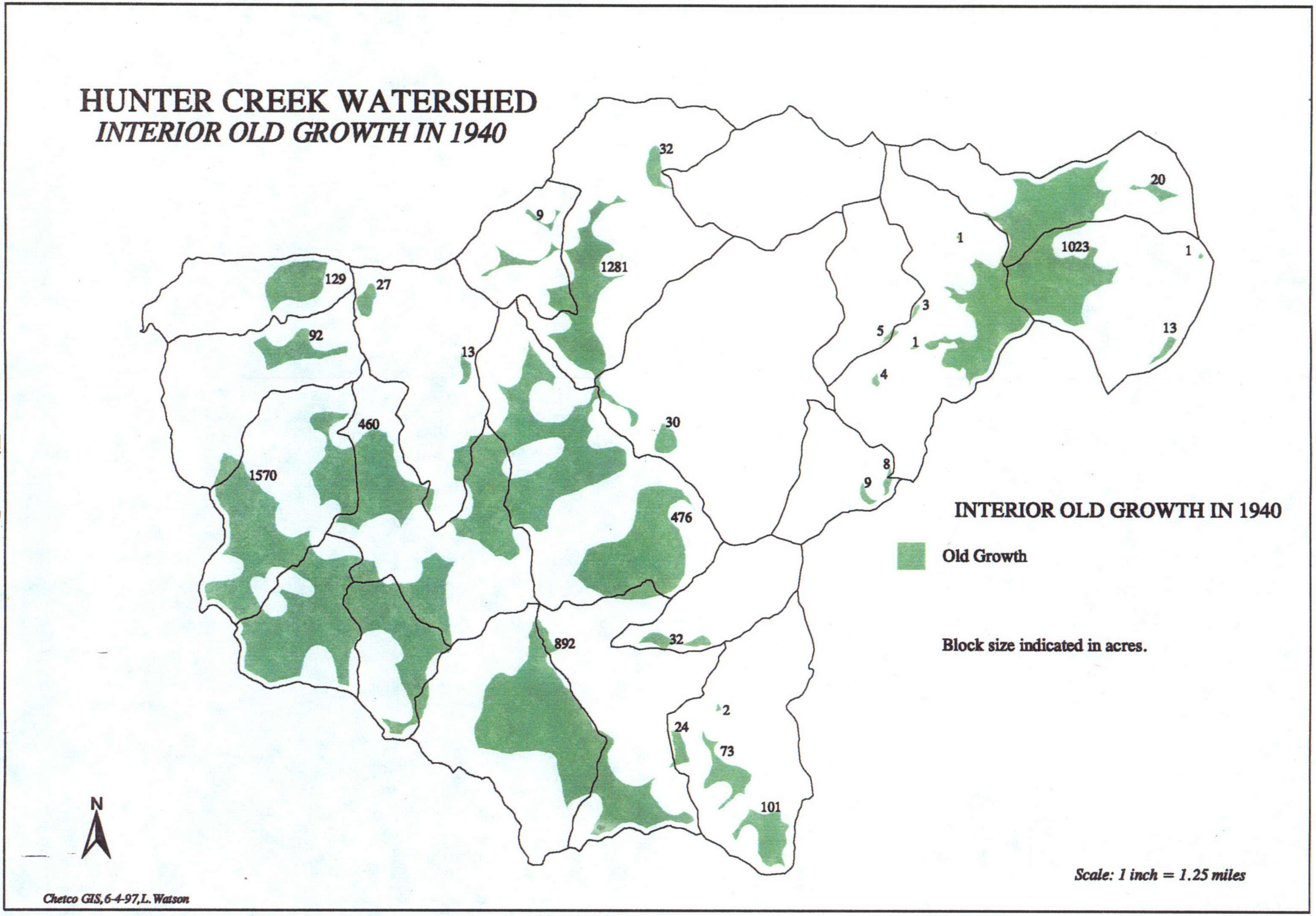

HUNTER CREEK WATERSHED
INTERIOR OLD GROWTH IN 1940
32
9
1281
129
27
92
13
460
1570
30
476
892
32
24
2
73
101
1
1023
1
20
3
5
1
4
13
8
9
INTERIOR OLD GROWTH IN 1940
Old Growth
Block size indicated in acres.
N
Scale: 1 inch = 1.25 miles
Chetco GIS, 6-4-97, L. Watson

Figure 5

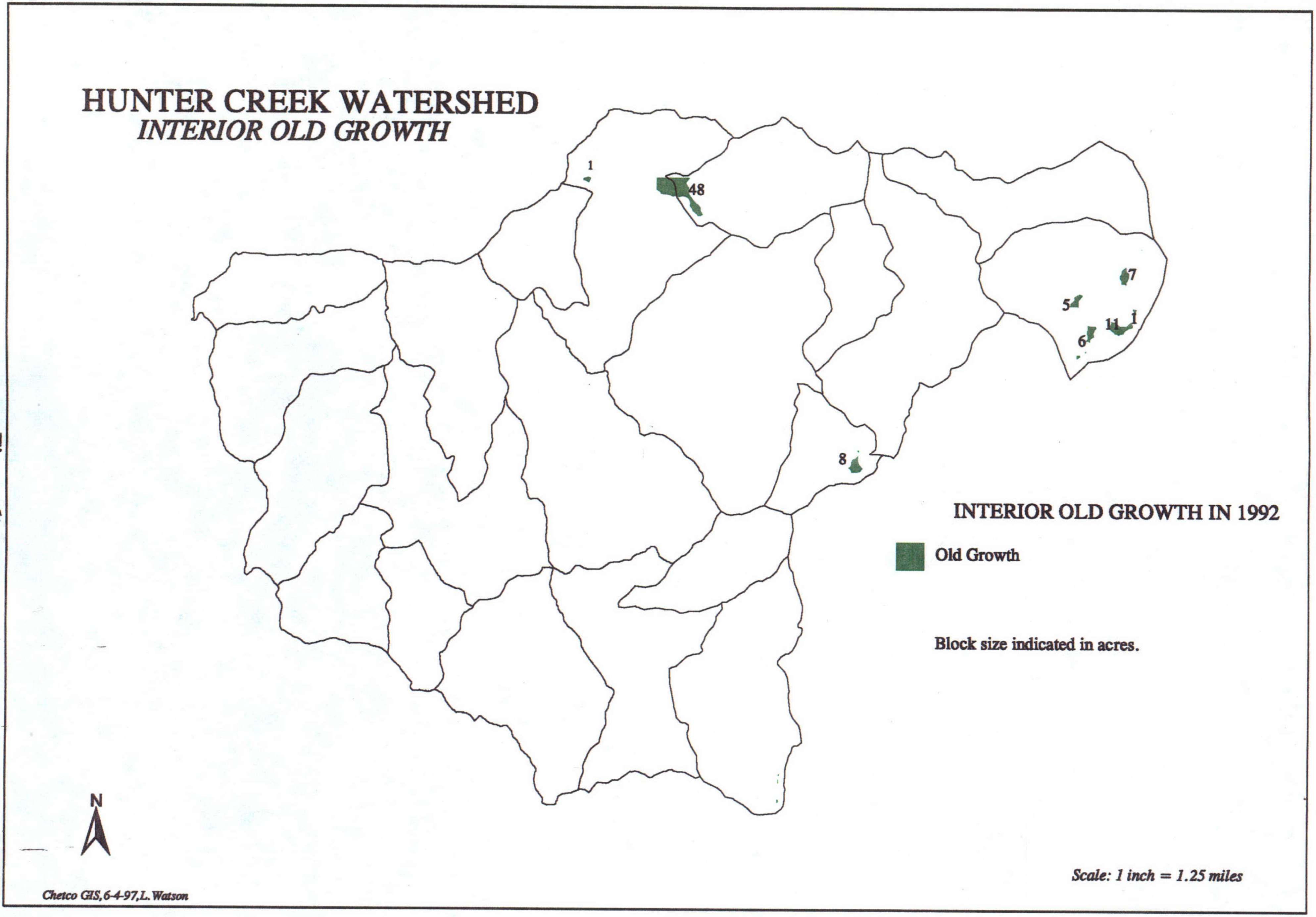

HUNTER CREEK WATERSHED
INTERIOR OLD GROWTH
1
48
7
5
11
1
6
8
INTERIOR OLD GROWTH IN 1992
Old Growth
Block size indicated in acres.
N
Scale: 1 inch = 1.25 miles
Chetco GIS, 6-4-97, L. Watson

Figure 6

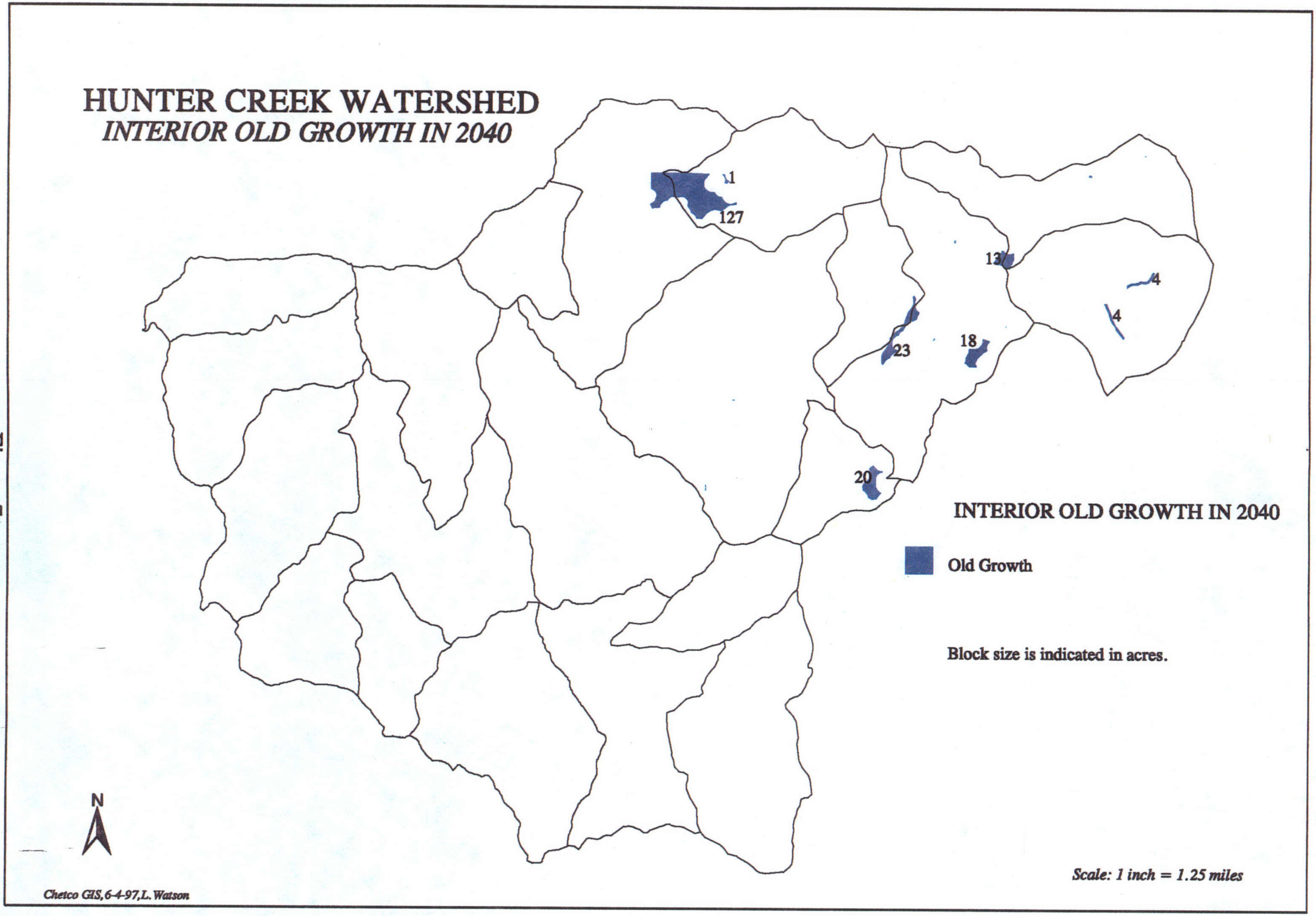

HUNTER CREEK WATERSHED
INTERIOR OLD GROWTH IN 2040
1
127
13
4
4
23
18
20
INTERIOR OLD GROWTH IN 2040
Old Growth
Block size is indicated in acres.
N
Scale: 1 inch = 1.25 miles
Chetco GIS, 6-4-97, L. Watson

Figure 7

3.2.1 Special and Unique Habitats

Key Question: What are the special and unique habitats in the watershed, and how are they changing?

Special and unique terrestrial habitats discussed in this analysis include (1) rock cliffs, outcrops, or talus slopes, (2) caves, (3) dry or moist meadows, and (4) old or mature coniferous forest (Brown 1985; Andelman & Stock 1994). Table 12 displays the type and amount of special wildlife sites located on National Forest land.

Rock cliffs, outcrops, or talus habitats are present in at least nine locations, but total less than 74 acres. This habitat is relatively unchanged since the 1940s, and is not expected to change in the future.

Only one cave is known in this watershed. This is located within the National Forest. The site is suspected to shelter bats, although a detailed survey has not been conducted to determine season of use (e.g. maternity colony, winter roost, or summer roost), or species and population occurrence. Disturbance from current human use is unknown but conditions are not expected to change in the near future.

Aerial photography from 1940, 1992, and 1996 indicates that at least one grassy area or meadow located on a private land ridge top of the watershed's north end may be experiencing tree encroachment, presumably from red alder and Douglas-fir. For the two large meadows on National Forest land, little change is evident between 1940 and 1996. However, Douglas-fir and incense cedar is encroaching into open, grassy Jeffrey pine stands in the northeast section of the watershed.

TABLE 12. ACRES OF SPECIAL WILDLIFE HABITATS ON NATIONAL FOREST LANDS WITHIN THE HUNTER CREEK WATERSHED.

DISPERSED LATE-SUCCESSIONAL FOREST	LAKE, POND, OR BOG	MEADOW	ROCK OUTCROP	WILDLIFE AREA
62	<1	54	69	95

3.3 SPECIES OF CONCERN

Key Question: What is the status of (species of concern) T & E listed, sensitive, and management indicator species in the watershed, what is their distribution, and what is the character of their habitat?

There are 70 terrestrial animal "species of concern" evaluated in this section. They include 4 federal or state listed (or proposed/candidate for listing), 22 state of Oregon sensitive, 9 President's plan survey & manage, 7 Regional Forester-designated sensitive, 9 Siskiyou N.F.

Land and Resource Management Plan (LRMP) indicators, and 19 neotropical migrant landbirds. State of Oregon sensitive species of concern are further divided into critical, vulnerable, peripheral, and undetermined. Appendix C.1 lists species, designations, and occurrence. Appendices (C.2-C.9) describes habitat associations and the amount of suitable habitat for those species within the watershed.

A species with more than one designation (for example, *state sensitive* and *neotropical migrant*) is discussed in detail only in the category where it first appears (e.g. *state sensitive* in the preceding example).

Evaluation of conditions for these species in the 1940s is difficult because of the diversity of habitats involved and lack of reliable forest stand conditions. However, it would be expected that forest-associated animals responded linearly to changes in habitat. Animal species associated with mature or old-growth forest have presumably declined in number and distribution, while edge species have presumably increased. Similarly, non-forest-associated animals have not changed significantly because these habitats have not changed.

3.3.1 Federal or State Listed Species

Appendix C.2 describes habitat associations and the amount of suitable habitat for federal or state listed (or candidate/proposed for listing) animal species within the watershed.

Endangered

The **peregrine falcon** has not been sighted in the watershed, although no specific inventories have been conducted. Aerial foraging for prey is possible anywhere, but cliff-nesting habitat is estimated from aerial photography occurs on less than 20 acres .

Threatened

Nesting surveys for the **marbled murrelet** have been conducted on BLM and Forest Service lands. These surveys have not documented nesting activity within the watershed since their startup in 1994 (Colin Dillingham personal communication; McCabe et al. 1995; Rodenkirk & Guetterman 1994). At another survey site on BLM land just outside the watershed's northern boundary, three detections were recorded in 1994 — including one visual of flight below the canopy that indicated occupied behavior. General surveys at this site in July 1991 recorded three murrelets to indicate presence. At the same site in 1995, three audio detections indicated presence only. One bird was sighted in early-January 1998 near the mouth of Hunter Creek, in WAA 06L01F.

Approximately 38 percent of existing suitable nesting habitat has been surveyed to protocol. About 546 acres of suitable nesting habitat on National Forest lands remain unsurveyed; 60

percent of unsurveyed habitat is in WAA 06M04F. Unsurveyed suitable nesting habitat on BLM land amounts to another 174 acres, and a small balance of 36 acres in private ownership.

In spite of specific surveys for the **spotted owl** within this watershed, there have not been sightings to indicate the presence of an activity center. However, the species have been reported just outside the watershed's southeast boundary. This indicates that dispersing adult and juvenile owls move through the watershed, but insufficient nesting/roosting/ foraging habitat remains for them to nest and reproduce. There are an estimated 3,766 acres of suitable nesting/roosting/foraging habitat, of which 56 percent is on the National Forest, 19 percent is on BLM, and the remaining 25 percent is in private holdings. Suitable nesting/roosting/foraging habitat was estimated from PMR stand types 15-19, 22, 25, 26, 28, 29, 31, 32, 34, and 39. Ultramafic (serpentine) areas within these PMR stand types were excluded.

The **wolverine** has not been reported within this watershed, but its presence is possible especially on the ridge lines forming the watershed boundary closest to the Kalmiopsis Wilderness less than 6 miles to the east.

3.3.2 State Sensitive

Appendix C.3 describes habitat associations and the amount of suitable habitat for state sensitive animal species within the watershed.

Critical

A **northern goshawk** has been observed on BLM land (John Guetterman personal communication). Nest locations have not been found, but breeding is suspected. Suitable habitat consists of stands in mid-seral, late-seral, or climax forest structures; there are 5,497 acres of suitable habitat in Hunter Creek.

One of only five known nesting location for **purple martin** in Curry County was documented in 1991 on BLM land in T37S, R14W, Section 23 (Colin Dillingham personal communication; John Toman personal communication). At this location, two (possibly four) pairs are using snags as nesting habitat. Seven individuals were sighted during the 1995 breeding season in T37S, R14W, Sections 10 & 13 (John Guetterman personal communication). These latter two locations indicate the possibility of additional nesting colonies. Suitable habitat consists of water availability and stands in pioneer forest structure. There are 5,684 acres of pioneer habitat in the Hunter Creek watershed, but an undetermined percent of this has suitable snag habitat.

Although no documentation exists for the **Lewis' woodpecker** in this watershed, it is suspected to occasionally winter within open forests of oak, pine, or hardwood-pine.

TABLE 13. ESTIMATED SUITABLE HABITAT FOR ***MARBLED MURRELET NESTING*** OR ***SPOTTED OWL NESTING/ROOSTING/FORAGING*** WITHIN THE HUNTER CREEK WATERSHED

SUBWATERSHED	AREA ACRES	MARBLED MURRELET USFS	MARBLED MURRELET BLM	MARBLED MURRELET OTHER	SPOTTED OWL USFS	SPOTTED OWL BLM	SPOTTED OWL OTHER
06L01F	774	0	0	0	0	43	192
06L02F	1,223	0	0	0	0	0	0
06L03F	1,415	0	0	0	0	12	38
06L04F	1,739	0	0	0	0	0	3
06L05F	2,372	0	0	13	0	17	115
06L06W	826	0	0	0	0	0	0
06L07W	620	0	0	0	0	0	36
06L08W	1,429	0	0	0	0	93	46
06L09W	1,708	0	0	16	0	0	37
Lower Hunter Creek	12,106	0	0	29	0	165	467
06M01F	3,001	4	0	0	0	44	170
06M02W	585	70	0	0	66	0	0
06M03W	669	44	0	0	40	0	0
06M04F	1,808	135	0	0	404	0	0
06M05W	1,395	231	0	0	1,047	0	0
06M06W	1,141	46	0	0	460	0	0
Hunter Creek	8,599	530	0	0	2,017	44	170
06N	2,022	0	75	18	0	236	176
06N01W	1,143	17	87	0	2	154	0
06N02W	653	0	0	2	0	93	65
N. Fk. Hunter Creek	3,818	17	162	20	2	483	241
06S	1,568	0	0	0	0	0	55
06S01W	709	0	0	0	0	0	0
06S02W	1,604	38	17	7	95	17	9
Big South Fork	3,881	38	17	7	95	17	64
TOTAL	28,404	585	179	55	2,114	709	942

The **white-headed woodpecker** is not suspected within the watershed. However, one unconfirmed sighting on BLM land approximately 20 years ago is in the BLM database (USDI Bureau of Land Management 1995b). This sighting, if reliable, represents the western-most occurrence in Oregon; the known range is east of Curry County (Marshall et al. 1996). If more than accidental within the watershed, it would likely be found in mature Jeffrey pine forest. Suitable habitat consists of forest stands in late-seral, or climax seral structure; there are 820 acres of suitable habitat in Hunter Creek. This habitat estimate may be high because stand structures included in this estimate incorporate moister plant series like Douglas-fir or western hemlock, which are not favored by the white-headed woodpecker.

Few specific surveys have been conducted for the **Townsend's big-eared bat**. However, a sighting of at least five individuals was reported in September 1991 at a cave within the National Forest boundary. Follow-up surveys failed to relocate them. In June 1976, one individual was reported at an abandoned cabin (Gold Beach Ranger District 1998). Suitable roosting habitat is estimated from the amount of rock identified which occurs in less than 1 percent of the watershed.

No sightings of the **fisher** are known. Suitable habitat consists of late-seral or climax forest stands; suitable habitat is estimated to be 820 acres.

Vulnerable

Sightings of the **Del Norte salamander** have been noted since 1993 (Gold Beach Ranger District 1998). Locations include the Big South Fork Hunter Creek watershed (WAA 06S02W = 2 sightings), and the Hunter Creek watershed (WAAs 06M02W = 1 sighting, 06M04F = 4 sightings, 06M05W = 6 sightings, and 06M06W = 1 sighting). Suitable habitat was estimated from the amount of rock identified in GIS, which accounts for less than 1 percent of the watershed. An additional but unquantified amount of suitable talus habitat is present under the forest canopy.

Although presence is expected, the **western bluebird** has not been reported.

The **pileated woodpecker** was documented on BLM and National Forest ownerships in the northern third of this watershed (USDI Bureau of Land Management 1995b; Gold Beach Ranger District 1998). Presently, there are 5,467 acres of suitable habitat of which 82 percent is in public ownership.

Guetterman (personal communication) and the Gold Beach Ranger District (1998) reported sightings of the **American marten** in the Big South Fork watershed (WAA 06S02W), and the Hunter Creek watershed (WAA 06M01F, 06M02W, 06M05W, and 06M06W). Currently, there are an estimated 5,467 acres of suitable habitat of which 82 percent is in public ownership.

There is one unconfirmed report of a **California mountain kingsnake** (John Toman personal communication). The location within the watershed is unspecified. Suitable habitat consists of forest stands in early-seral or mid-seral structure, and also shrublands.

Although the **sharptail snake** has not been found, it is suspected because of the wide range of suitable habitats found within the lower watershed; habitats include agriculture, grassland, shrubland, pioneer forest, or early-seral forest.

Peripheral or Rare

The only documented occurrence of the **California slender salamander's** is in WAA 06L01F of the Lower Hunter Creek subbasin (John Guetterman personal communication).

Cliff faces near waterfalls are optimal colonial nest sites for the **black swift**. Neither the species nor the suitable habitat have been observed in the watershed.

Undetermined

Sightings of the **clouded salamander** have been reported in the Lower Hunter Creek (WAA 06L05F) by John Guetterman (personal communication), and in WAAs 06M04F and 06M06W by the Gold Beach Ranger District (1998). It is apparently tolerant of forest openings and timber harvest if suitable logs or other woody moist debris are available. Suitable habitat consists of early-seral or mid-seral forest stands; estimated suitable habitat in the watershed is 19,625 acres.

The tree-cavity nesting **northern pygmy-owl** was documented in two Hunter Creek WAAs—06M01F in 1978, and 06M04F in 1991 (Gold Beach Ranger District 1998). It is suspected in conifer or coniferous/deciduous forests of late-seral or climax structure.

Few surveys for the **silver-haired bat, long-eared myotis, long-legged myotis**, or **Yuma myotis** have been conducted. Of these species only one, the long-legged myotis, has been documented. This species was tentatively identified near Elko Creek in 1995 (Gold Beach Ranger District 1998). Suitable habitat for the silver-haired bat and long-eared myotis is climax forest. For the long-legged myotis and Yuma myotis, approximately 820 acres of suitable habitat occur in Hunter Creek.

The **ringtail** is not documented in Hunter Creek, but it is associated with a wide variety of habitats found in Hunter Creek. Suitable habitat consists of agriculture, grassland, rock, shrubland, and forests of pioneer or early-seral structure, especially tanoak woodlands near rocky areas or streams.

The **western gray squirrel** is widely distributed and particularly associated with white oak, tanoak, or myrtle forest (John Toman personal communication). Suitable habitat consists of mid-seral, late-seral, or climax forest stands; estimated suitable habitat in Hunter Creek is 5,497 acres.

3.3.3 ROD's Survey & Manage

Appendix C.4 describes habitat associations and the amount of suitable habitat for species listed in the President's Forest Plan. Species considerations and requirements pertain to federal lands only.

Project Survey Required

Sighting of the **red tree vole** have not been recorded in Hunter Creek. Suitable habitat consists of mid-seral, late-seral, or climax forest stands. Over 50 percent of the area is suitable habitat.

The terrestrial snail **Oregon megomphix** (*Megomphix hemphilli*) is expected in moist conifer/hardwood forest slopes and terraces up to 3,000 foot elevation (Furnish et al. 1997). Bigleaf maple in the overstory, and an abundance of sword fern with rotten logs and stumps nearby, is favored. Forested plant associations described by Atzet et al. (1996) which potentially have suitable habitat include:

- Tanoak-Port-Orford-cedar/Salal (LIDE3-CHLA/GASH).
- Tanoak-Western hemlock/Evergreen huckleberry/Western sword-fern (LIDE3-TSHE/VAOV2/POMU-RIP).
- Western hemlock-Tanoak-California-laurel (TSHE-LIDE3-UMCA).
- Douglas-fir-Canyon live oak/Dwarf Oregongrape (PSME-QUCH2/BENE2).

Blue-grey tail-dropper (*Prophysaon coeruleum*), a slug, is found in open to moist conifer or conifer/hardwood forests at 500-3,000 foot elevation (Furnish et al. 1997). This condition includes many forested plant associations found in the watershed. In open or dry areas, it is usually located in micro sites with relatively abundant shading and moisture such as partially decayed logs, leaf or needle litter, and moss or moist plant communities.

Another slug, **papillose tail-dropper** (*Prophysaon dubium*), is strongly associated with hardwood logs and leaf litter in open, moist conifer or conifer/hardwood forests at 500-3,000 foot elevation (Furnish et al. 1997). This condition includes many forested plant associations found within the watershed.

3.3.4 Regional Forester Sensitive

Appendix C.5 describes habitat associations and the amount of suitable habitat for Regional Forester-designated sensitive animal species within the watershed. All species in this group are previously discussed.

3.3.5 Siskiyou N.F. Land & Resource Management Plan Indicators

Appendix C.6 describes habitat associations and the amount of suitable habitat for Siskiyou National Forest LRMP indicator animal species within the watershed. Species considerations and requirements pertain to National Forest Lands only.

An abundant and widespread population of **black-tailed deer** use the watershed yearlong (except in deep-snow winters). The entire watershed, except for areas labeled in GIS as water or rock, is considered suitable habitat.

While **Roosevelt elk** in Curry County were reported in great numbers by the first European settlers (Peterson & Powers 1977), the watershed's current population is unknown but estimated to be a few small groups (Colin Dillingham personal communication; USDI Bureau of Land Management 1995b). The entire watershed, except for areas labeled in GIS as water or rock, is considered suitable habitat.

Optimal elk cover, as estimated from PMR and other data, is relatively scarce and poorly distributed (Appendix C.7). Optimal thermal elk cover consists of vegetation stands with 70 percent Crown Closure (CC), that contain hiding cover and forage. Optimal cover was estimated from areas labeled in GIS as PMR structure codes 20-34. There are 731 acres of optimal cover in the watershed, of which 97 percent is located on National Forest or BLM ownership.

Regular thermal cover, with at least 70 percent canopy cover (providing fully neutral thermal microclimates) is found on 2,933 acres, of which 78 percent is in public ownership.

Elk hiding cover, defined as any vegetation capable of hiding 90 percent of a standing adult elk at 200 feet or less, is estimated to occur on 17,535 acres. It is presumed that watershed areas not labeled as (1) elk optimal thermal cover, (2) elk thermal cover, (3) elk hiding cover, (4) elk forage, or (5) labeled as "no data", "water", "rock", "developed", or "agriculture" is considered hiding cover.

Elk forage area is defined as vegetated structure with less than 60 percent combined canopy closure of tree and tall shrub (greater than 7 feet). Grass (463 acres) and pioneer forest (5,674 acres) structural stages were used to estimate forage acreage. The current distribution of forage in Hunter Creek is: 16 percent in the Lower Hunter Creek subbasin, 33 percent in the Big South Fork subbasin, and 24 percent along the mainstem and North Fork Hunter Creek subbasins.

1940 elk forage acres are estimated to be areas currently labeled by GIS as grass. Current pioneer forest is presumed to have been closed-canopy in reference conditions, providing little forage opportunity. In the absence of timber harvest, elk forage areas by 2040 will approach the acreage estimated in 1940. However, it is not anticipated that harvest activities will cease.

The density of roads open to public vehicles in this watershed averages 1.77 miles per square mile of area. Roads on forest product industry lands are gated and closed except for hunting season (5-6 weeks). According to Cole 1996, in a nearby study area, elk are affected by road density and avoid areas ≤150 meters from roads. Appendix C.8 displays the open road density, and associated area of elk avoidance for the Hunter Creek watershed. Subbasins with ≥40 percent of their area avoided by elk due to roads include 06L01F, 06L02F, and 06L03F on private land, plus 06M02F, 06M04F, 06M05F, and 06M06F on National Forest ownership.

The Oregon Department of Fish and Wildlife believes illegal harvest of elk in Hunter Creek is a concern (John Toman, Personal Communication 1997). Poaching, facilitated by roads open yearlong to public vehicles, is known to be a significant cause of elk mortality elsewhere in western Oregon (Cole 1996; Pope 1994; Stussey et al. 1994).

Woodpeckers excavate tree cavities for their own need and coincidentally benefit many other animals. Because they benefit other species, woodpeckers are considered a pivotal species group in this watershed. Snags and decayed live trees are the excavation platform for the woodpecker species. Of the seven woodpecker species likely to be found, the pileated woodpecker and white-headed woodpecker were discussed earlier in this section, and the downy woodpecker is considered in the riparian ecosystem section. The remaining four species are the **northern flicker** (documented in USDI Bureau of Land Management 1995b), **hairy woodpecker** (documented by USDI Bureau of Land Management 1995b, and by Dillingham 1997), **red-breasted sapsucker**, and **acorn woodpecker**.

Snags and decayed live trees are scarce on private land due to past harvesting. At that time, regulations did not protect snag density/size. Presently, informal observations indicate that these lands provide less than one snag per 10 acres (<0.1 per acre). It is estimated that wildlife trees on private lands average less than 15 inches dbh and, therefore, provide little woodpecker habitat. This current habitat situation provides less than 3 percent maximum woodpecker density; maximum woodpecker population density occurs when nest cavities are no longer limiting. Due to the current scarcity of large trees, cavity-user habitat is not expected for 20-40 years.

Secondary cavity-users like the western screech-owl, northern pygmy-owl (discussed elsewhere), and northern saw-whet owl are likely to be absent or in token numbers on private lands because of the species dependency on tree cavities. Current state regulations require two snags or live trees (≥11" dbh and ≥30' tall) per acre in harvest units ≥25 acres size. This requirement applies only if a site-variable threshold for remaining basal area is reached. Two wildlife trees per acre would equate to ≤54 percent maximum woodpecker density, but only if those trees were dead and most were >15-25 inches dbh. Current management rotations on private forest uplands is not expected to produce adequately-sized snags. However, riparian buffers along streams are expected to provide future snags.

On National Forest lands, approximately 1,523 acres were harvested prior to snag guidelines as specified in the 1989 Siskiyou National Forest LRMP. The guideline provides snags for 60 percent of the maximum woodpecker density (USDA Forest Service 1989d). It is estimated from field reconnaissance that those harvested acres do not meet this guideline. Harvest information on BLM ownership is unknown, but observations indicate the retention of snags is similar to National Forest lands.

Not considering snags, suitable habitat for the northern flicker was estimated to occur everywhere except areas labeled in GIS as water or rock. Primary suitable habitat for the red-breasted sapsucker, acorn woodpecker, and hairy woodpecker is considered late-seral or climax forest structure(Brown 1985).

3.3.6 Neotropical Migrant Landbirds

There are 122 species of neotropical migrant landbirds that breed in Oregon (Andelman & Stock 1994). Of these, 89 occur on the Siskiyou National Forest (Shea 1996). According to Breeding Bird Survey (BBS) data from Andelman & Stock (1994), twenty-two of the Siskiyou N.F. species show statistically significant long-term declines in Oregon. Another 2 species could be vulnerable due reduced habitat. Among these 24 species, 19 are found primarily in terrestrial habitats. They include:

Mourning dove
Olive-sided flycatcher
Rufous hummingbird
Dark-eyed junco
American kestrel
Western meadowlark
Band-tailed pigeon
Chipping sparrow
White-crowned sparrow
Violet-green swallow
Vaux's swift
Western tanager
Swainson's thrush
Varied thrush
Turkey vulture
Hermit warbler
Orange-crowned warbler
Townsend's warbler
Western wood-pewee

Twelve of these 19 species utilize mature/old growth forest habitat components, indicating the importance of late-seral structure. Three of the 12 species are dependent upon mature/old growth forest characteristics. It is assumed that coinciding with the loss of habitat there is an associated decline in bird populations. Appendix C.9 summarizes habitat associations and generalized management recommendations for neotropical migrant landbirds.

Four stations of a 30-station BBS are near Elko Camp. During observation years 1992-1997, brown-headed cowbirds were not recorded at these four points (Dillingham 1997). Similarly, none of the other 26 points in this BBS, albeit in a neighboring watershed, recorded cowbirds. These findings indicate that cowbird parasitism upon neotropical birds is not yet a problem within National Forest land. While similar data is lacking in the lower watershed, it is assumed that cowbirds are present in association with agriculture and animal husbandry.

Alder shrubland or alder/conifer forest is valuable habitat for neotropical migratory landbirds. This habitat condition is currently common on private lands logged as early as the 1950s. Conversion of alder stands to conifers is planned, diminishing existing habitat for neotropical bird species.

3.4 FOREST HEALTH - INSECTS, DISEASE AND NOXIOUS WEEDS

Key Question: What is the known status and risk of spread of disease in the watershed?

White pine blister rust, while a significant concern in the Lawson Creek watershed to the east, is not a problem in Hunter Creek. The lack of a blister rust in Hunter Creek may be due to a decreased frequency of summer fog. Swiss needle cast, while a significant problem on the north coast of Oregon, does not appear to be a concern in Hunter Creek. Insect pests are not currently an issue in Hunter Creek.

Port-Orford-cedar root rot (POC root rot) is the primary disease concern in the Hunter Creek watershed (Figure 8). This watershed has one of the highest incidences of POC root rot on the Gold Beach Ranger District. This disease is particularly well-established along the North Fork and main stem Hunter Creeks, as well as the Signal Buttes area. As Port-Orford-cedar is an ultramafic associate, most ultramafic sites tend to be infected with POC root rot.

POC root rot spores live in water and mud. Anything that attracts and carries mud or soil including, construction equipment, seedlings, boots, tires, and animals can spread the disease to uninfected drainages. Once in a drainage, any moving water along a road or in a stream can spread the disease downstream. Natural uphill spread of the disease is slow to non-existent.

Port-Orford-cedar is an important forest component of the watershed, particularly in ultramafic riparian areas where it is often the dominant tree species. It provides shade, large wood and vegetative diversity. It is especially valuable as riparian large wood because of its decay-resistance. POC will last far longer in streams than other species of the same size.

Several management strategies have been employed in an effort to stop or slow the spread of the disease. Some roads have been closed during the wet season when spores are easily spread. The Snow Camp tie-through is one such road. Road-side berms have been built near Pine Point and Hunter Creek bogs to keep water from leaving the road and infecting healthy trees.

In 1992 and 1993, all POC within 25 feet and less than eight inches in diameter were removed along road 3680 from Pine Point to Quosatana Butte. This work was accomplished with a Curry County corrections crew. In addition, the ditch lines along this segment of road were cleaned in 1997 (timber sale road maintenance), including the removal of all new seedlings established since the earlier cutting. This host tree removal is intended to break the POC root rot life cycle.

Seedlings from disease-resistant trees have also been planted as a way to halt the disease spread. Such seedlings have been planted at Pine Point and in the upper North Fork Hunter Creek drainage. The disease-resistant parents are located near Hunter Creek bog and along the upper half of the four-wheel drive road east of the bog.

NOTE: Additional information on the occurrence of POC disease in Hunter Creek is available at the Bureau of Land Management, Coos Bay. During the writing of this document, the BLM is conducting POC root rot surveys.

Key Question: What are the known locations and risk of spread of noxious weeds in the watershed?

Five noxious weed species currently inhabit the watershed. Most populations are currently restricted to disturbed areas including roadsides, disturbed woodlands, landings and streambeds. Noxious weed populations have likely increased along with new roads in the watershed. Brooms (*Cytissus* sp.) and gorse (*Ulex* sp.) are beginning to appear in the Hunter Creek watershed and their aggressive nature could threaten native plant communities.

Current known occurrences of broom on National Forest lands include road 3680 at Pine Point, the 1503/3680 road junction near Coldiron Camp, and on the access road to the Signal Buttes communications site less than a 1/4 mile from the summit. Broom is also a problem lower in the watershed on private lands.. Ground disturbance, including roads and development, provides an excellent seed bed for both Scotch and French broom. Gorse is documented only on road 3680-200 - Elko Creek Road.

Canada thistle, bull thistle, and tansy ragwort are well-established in the watershed. These species pose a lesser risk of spread because of their long occupancy on many of the watershed's disturbed sites. Biological controls, including a flea beetle and the cinnabar moth, have been established to keep tansy ragwort under control.

Italian thistle has not been found in the watershed, but does occur in the Pistol River watershed to the south. Yellow star thistle is also a potential problem, as it exists nearby in the Rogue River corridor.

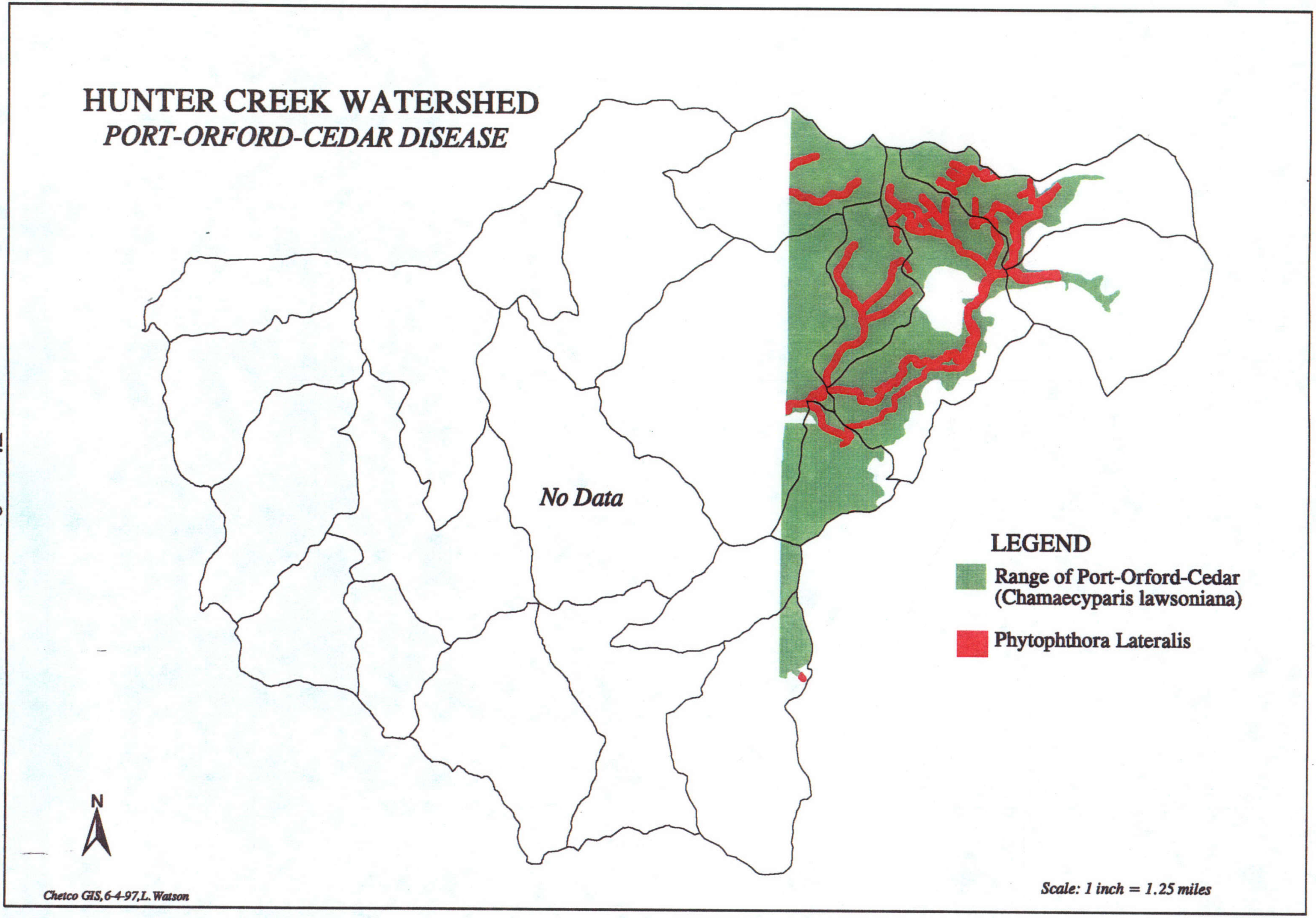

HUNTER CREEK WATERSHED
PORT-ORFORD-CEDAR DISEASE
No Data
LEGEND
Range of Port-Orford-Cedar (Chamaecyparis lawsoniana)
Phytophthora Lateralis
N
Chetco GIS, 6-4-97, L. Watson
Scale: 1 inch = 1.25 miles

Figure 8

4.0 AQUATIC ECOSYSTEM

This section describes the past and current conditions of the aquatic resource in Hunter Creek. The intent of this analysis is to establish linkages between current aquatic conditions and hillslope and riparian conditions. The assessment starts with the upslope processes of runoff and erosion. Next, riparian zone conditions and functions are assessed. The channel condition assessment synthesizes upslope and riparian zone conditions with channel processes. The data from these assessments are integrated to describe watershed function and characterize aquatic habitat. Following the characterization, beneficial uses of the stream system are identified. For the Hunter Creek watershed, fisheries resources are the focus of beneficial uses. Aquatic species of concern are also identified.

4.1 UPSLOPE ENVIRONMENT

4.1.1 Hydrology

Key Question: What are the dominant hydrologic characteristics in the watershed?

Current Conditions

Figures 9 and 10 display stream density and road density respectively. These figures and the associated numbers represent the drainage pattern of Hunter Creek.

Peak and Base Flow

Using the regional equation developed by Oregon Water Resource Research Institute (Andrus et al., 1989) a 25 year return interval was determined for each WAA (Figure 11) and each sixth field watershed (Table 14). The 25 year return interval is an instantaneous peak flow discharge expected to occur once every 25 years. The model is based on the United States Geological Survey's (USGS) gauging statistics from the Elko Creek streamflow station. Based on the statistics, a runoff coefficient of 250 cubic feet per second per square mile of drainage (CSM) was determined. Base flows were calculated using 0.5 CSM determined to be appropriate for the region (Lawson Creek Watershed Analysis 1997).

Note: Accuracy of peak flows diminishes from the WAA level to the sixth field level to the fifth field level (Hunter Creek). This is due to times of flow concentration. For example, the 25-year event of 10,783 cubic feet per second (cfs) calculated for the sixth field watershed 06L assumes that all individual WAA's in 06L contributed their peak discharge simultaneously. Generally, this does not occur and will result in an overestimation of peak flow. For this reason, a peak discharge was not calculated at the fifth field level.

TABLE 14: PEAK AND BASE FLOW ESTIMATION

Subwatershed	Watershed Analysis Area*	Acreage	Area Sq Mi	5 Yr RI** Peak Discharge (CFS)	Baseflow (CFS)
	Lower Hunter Creek				
06L01F	Turner Creek	774	1.2	689	0.6
06L02F	Taylor Creek	1223	1.9	1089	1.0
06L03F		1415	2.2	1260	1.1
06L04F		1739	2.7	1549	1.4
06L05F		2372	3.7	2113	1.9
06L06W	Crossen Creek	826	1.3	736	0.6
06L07W		620	1.0	552	0.5
06L08W	Conn Creek	1429	2.2	1273	1.1
06L09W		1708	2.7	1521	1.3
		WAA TOTAL		**10782**	**9**
	Upper Hunter Creek				
06M01F		3001	4.7	2673	2.3
06M02W		585	0.9	521	0.5
06M03W		669	1.0	596	0.5
06M04F		1808	2.8	1610	1.4
06M05W	Elko Creek	1395	2.2	1242	1.1
06M06W		1141	1.8	1016	0.9
		WAA TOTAL		**7658**	**7**
06N01W	N. F. Hunter	1143	1.8	1018	0.9
06N02W		653	1.0	582	0.5
06N		2022	3.2	1801	1.6
		WAA TOTAL		**3400**	**3**
	South Fork Hunter				
06S	Little South Fork	1568	2.5	1397	1.2
06S01W		709	1.1	631	0.6
06S02W	Big South Fork	1604	2.5	1429	1.3
		WAA TOTAL		**3457**	**3**

* Blanks indicate an unnamed tributary

** Return Interval

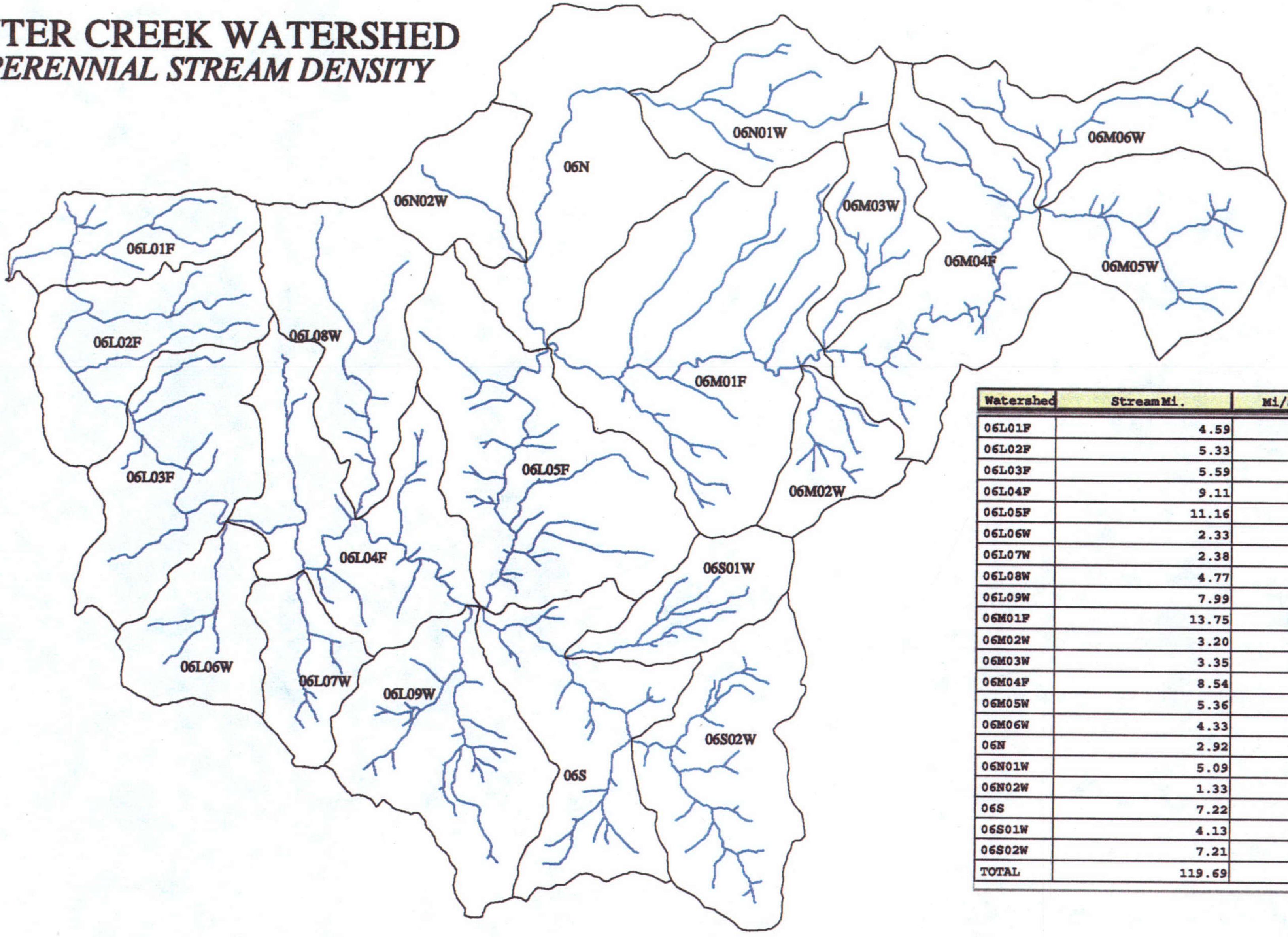
<u>Cumulative Effects</u>

Fifteen percent, or 4,195, acres of the Hunter Creek Watershed is in the Transient Snow Zone (TSZ). The remainder of the watershed lies in a rain dominated hydrologic regime. Table 15 displays past harvest activity in the transient snow zone. (Data is for Forest Service lands only).

Tables 16 and 17 display the Equivalent Clearcut Acres (ECA) for each WAA. ECA acres are based on vegetation units and road acres (data includes all ownerships). Please refer to Appendix D for a description of the ECA method and the calculations involved in determining total unrecovered acres. Table 16 displays the data by WAA and then totaled by sixth field watershed; results at the sixth field level are in bold. Table 17 is a ranking of WAAs, from the least recovered to the greatest. WAA's in National Forest lands are in bold. Road acres were calculated using an unvegetated road prism width of 25 feet.

Figure 9

HUNTER CREEK WATERSHED
PERENNIAL STREAM DENSITY



Watershed	Stream Mi.	Mi/Sq Mi
06L01F	4.59	3.81
06L02F	5.33	2.80
06L03F	5.59	2.53
06L04F	9.11	3.36
06L05F	11.16	3.01
06L06W	2.33	1.80
06L07W	2.38	2.46
06L08W	4.77	2.14
06L09W	7.99	2.99
06M01F	13.75	2.93
06M02W	3.20	3.50
06M03W	3.35	3.21
06M04F	8.54	3.02
06M05W	5.36	2.46
06M06W	4.33	2.43
06N	2.92	0.92
06N01W	5.09	2.85
06N02W	1.33	1.30
06S	7.22	2.95
06S01W	4.13	3.73
06S02W	7.21	2.88
TOTAL	119.69	2.70

Scale: 1 inch = 1.25 miles

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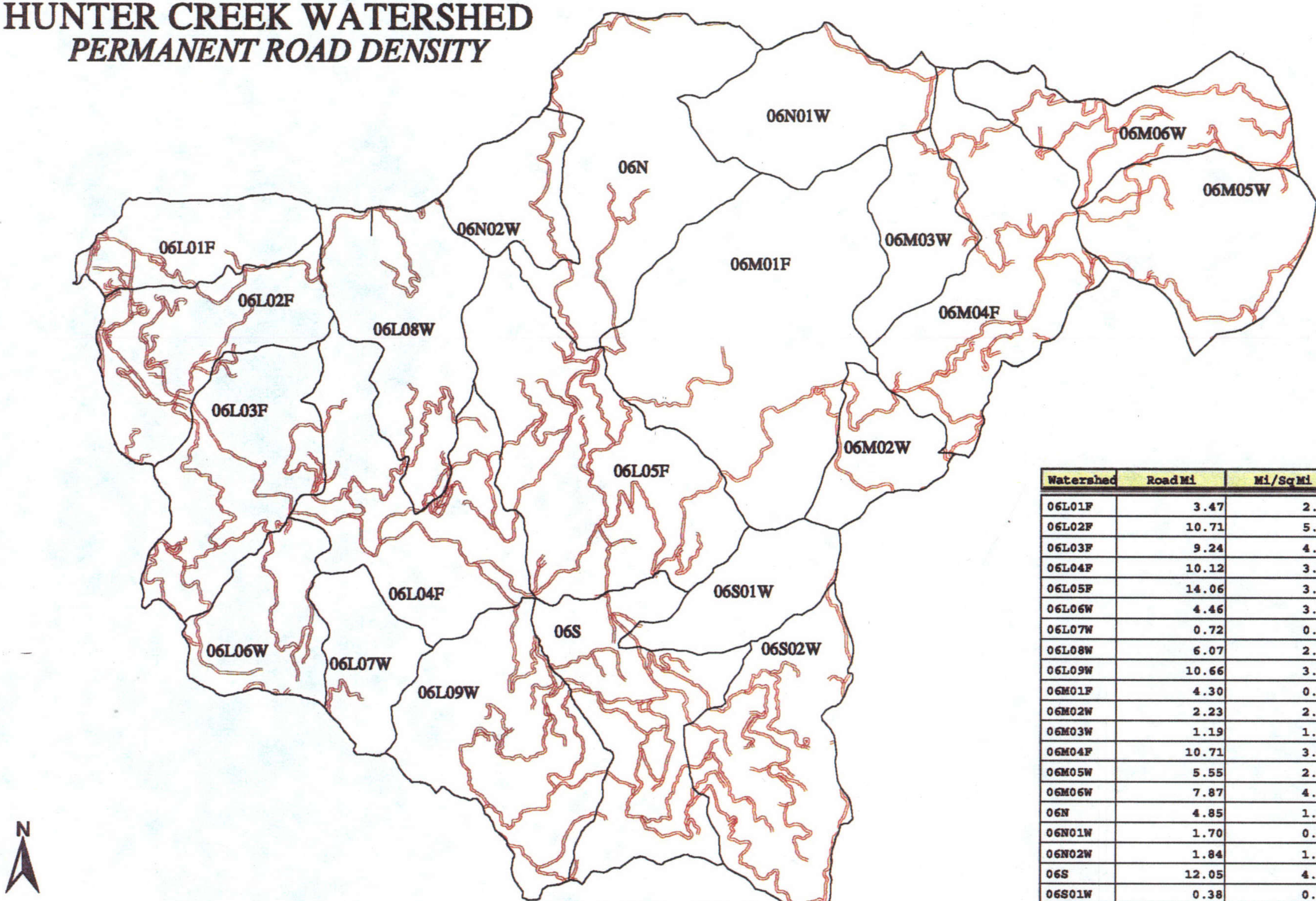
HUNTER CREEK WATERSHED
PERMANENT ROAD DENSITY



Scale: 1 inch = 1.25 miles

Watershed	Road Mi	Mi/Sq Mi
06L01F	3.47	2.87
06L02F	10.71	5.61
06L03F	9.24	4.18
06L04F	10.12	3.73
06L05F	14.06	3.80
06L06W	4.46	3.46
06L07W	0.72	0.74
06L08W	6.07	2.72
06L09W	10.66	3.99
06M01F	4.30	0.92
06M02W	2.23	2.44
06M03W	1.19	1.14
06M04F	10.71	3.79
06M05W	5.55	2.55
06M06W	7.87	4.42
06N	4.85	1.54
06N01W	1.70	0.95
06N02W	1.84	1.80
06S	12.05	4.92
06S01W	0.38	0.34
06S02W	13.58	5.42
TOTAL	135.81	2.92

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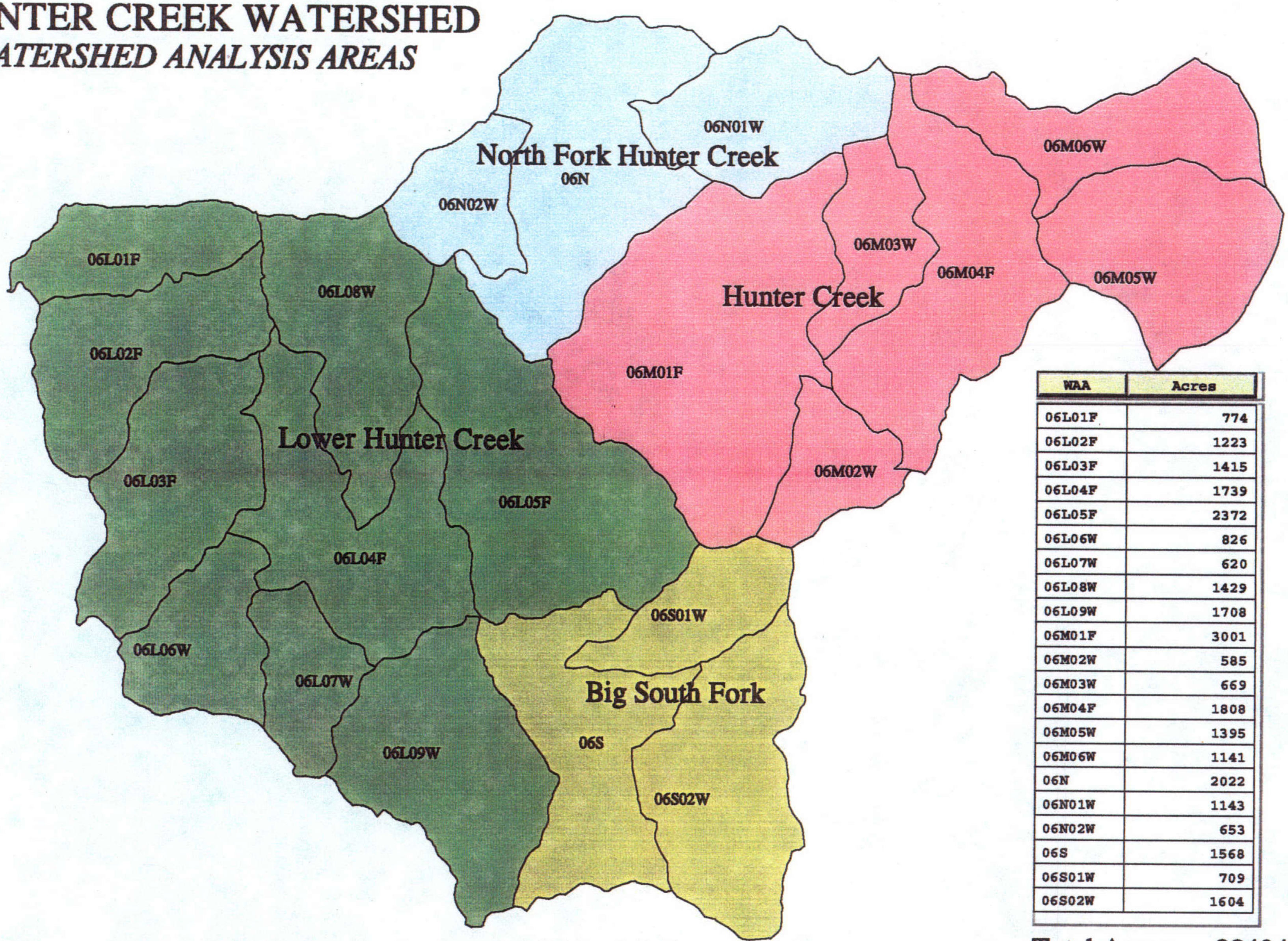
Figure 10

HUNTER CREEK WATERSHED
WATERSHED ANALYSIS AREAS



WAA	Acres
06L01F	774
06L02F	1223
06L03F	1415
06L04F	1739
06L05F	2372
06L06W	826
06L07W	620
06L08W	1429
06L09W	1708
06M01F	3001
06M02W	585
06M03W	669
06M04F	1808
06M05W	1395
06M06W	1141
06N	2022
06N01W	1143
06N02W	653
06S	1568
06S01W	709
06S02W	1604

Total Acres 28404

Scale: 1 inch = 1.25 miles

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Figure 11

TABLE 15: FOREST SERVICE ACTIVITY IN THE TRANSIENT SNOW ZONE

WAU	Acres Harvested in TSZ	Percent of TSZ Harvested
06M01F	0	0
06M02W	3	3
06M03W	18	4
06M04F	107	17
06M05W	143	13
06M06W	350	40
06N01W	0	0
06S01W	0	0
06S02W	0	0

TABLE 16: ROADS AND VEGETATIVE RECOVERY

WAU	WAU Area (acres)	Unrecovered Acres	Road Acres	Total Unrecovered Acres	% Watershed Unrecovered
06L01F	774	109.6	11	120	16
06L02F	1223	456.4	32	489	40
06L03F	1415	352.2	28	380	27
06L04F	1739	228.8	31	259	15
06L05F	2372	316.2	43	359	15
06L06W	826	81.2	14	95	11
06L07W	620	14.4	2	17	3
06L08W	1429	232	18	250	18
06L09W	1708	33	32	65	4
06L Total	**12106**	**1823.8**	**211**	**2034**	**17**
06M01F	3001	349.2	13	362	12
06M02W	585	156	7	163	28
06M03W	669	134.4	4	138	21
06M04F	1808	273.6	32	306	17
06M05W	1395	79.2	17	96	7
06M06W	1141	193.8	24	218	19
06M Total	**8599**	**1186.2**	**97**	**1283**	**15**
06N	2022	266.4	15	281	14
06N01W	1143	180.6	5	186	16
06N02W	653	49.8	6	55	8
06N Total	**3818**	**496.8**	**25**	**522**	**14**
06S	1568	189	37	226	14
06S01W	709	71.4	1	73	10
06S02W	1604	504	41	545	34
06S Total	**3881**	**764.4**	**79**	**843**	**22**
Grand Total	**28404**	**4271.2**		**4683**	**16**

TABLE 17: RANKING OF WAA'S BY UNRECOVERED ACRES

WAA	WAA Area (Acres)	Vegetative Unrecovered Acres	Roads Acres	Total Unrecovered Acres	% Watershed Unrecovered
06L02F	1223	456.4	32	489	40
06S02W	1604	504	41	545	34
06M02W	**585**	**156**	**7**	**163**	**28**
06L03F	1415	352.2	28	380	27
06M03W	**669**	**134.4**	**4**	**138**	**21**
06M06W	**1141**	**193.8**	**24**	**218**	**19**
06L08W	1429	232	18	250	18
06M04F	**1808**	**273.6**	**32**	**306**	**17**
06N01W	1143	180.6	5	186	16
06L01F	774	109.6	11	120	16
06L05F	2372	316.2	43	359	15
06L04F	1739	228.8	31	259	15
06S	1568	189	37	226	14
06N	2022	266.4	15	281	14
06M01F	**3001**	**349.2**	**13**	**362**	**12**
06L06W	826	81.2	14	95	11
06S01W	709	71.4	1	73	10
06N02W	653	49.8	6	55	8
06M05W	**1395**	**79.2**	**17**	**96**	**7**
06L09W	1708	33	32	65	4
06L07W	620	14.4	2	17	3

Interpretation

Alterations to the hydrograph are a function of management activities interacting with watershed characteristics. In Hunter Creek, three variables were identified as the dominant inherent characteristics determining runoff response: rain dominated hydrologic regime; presence of clay soils; and quick revegetation rates.

In a rain dominated hydrologic regime, soil moisture recharge begins in fall and becomes complete through the winter season. As soil saturation increases, a greater percent of precipitation is available for runoff. Timber harvesting reduces evapotranspiration increasing antecedent soil moisture; thus soil moisture recharge occurs earlier in the year. Keppeler et al. (1990) states, "Soil on logged watersheds has a relatively high moisture content at the onset of the rainy season, requiring less rainfall to recharge soil moisture levels, thus allowing more precipitation to become available for runoff." According to Jones et al. (1996), "Clear cutting apparently suppresses transpiration losses from soil depths greater than 1 meter." Correspondingly, the studies found the largest relative increases in runoff occurred early in the wet season.

Clay soils, weathered from ultramafic rock, reduce deep infiltration rates because of their low permeability. As a result, a greater percentage of precipitation is available for runoff.

The revegetation process in Hunter Creek is rapid, excluding areas of ultramafic soils. This is primarily due to the moisture availability throughout the year. Consequently, herbs, brush, and hardwoods quickly vegetate openings in the canopy, reducing recovery time. However, these species have a shallow root system and do not affect soil moisture content greater than one meter, referenced by Jones et al.

Based on vegetation distribution and road mileage, the National Forest lands which currently have the highest probability for alterations in the flow regime are WAA's 06M02W, 06M03W, 06M06W, and 06M04F. Of the four WAA's, 06M06W rates the most sensitive to hydrologic disturbances due to the percentage harvested (40) in the TSZ. Although WAA 06M03W rates susceptible to alteration in the flow regime, aerial photograph analysis indicates ultramafic soils are responsible for the pioneer structural stage. Since pioneer structural stage represents reference condition, this watershed is considered recovered.

WAAs with a high ECA attributed to harvest management are likely to experience alterations in runoff early in the wet season, during the first storms of the year. This can be attributed to quicker recharge of the soil profile. As the wet season progresses, more and more of the watershed becomes saturated, increasing translatory flow (flow through the soil profile). As more of the watershed contributes to flow generation, the percent increase in runoff from harvested units and road beds becomes proportionately smaller. WAAs with a high ECA attributed to development and agriculture (06L02F, 06L03F) are likely to experience alterations in quick flow processes. Specifically, compacted surfaces decrease the lag time or the difference between rainfall initiation and runoff generation. This is attributed to increased water conveyance efficiency to the channel.

Field observations made in the North Fork and Upper Hunter subbasins indicated inside ditch lines intercepted more water from vegetation units in the pioneer structure stage than the more mature vegetation stages. This supports the "quicker recharge" process inferred above.

Increases in peak flows are more likely to occur in the smaller events (<2 yr Return Interval) than in larger, less frequent events. Harr et al. (1975), found that with increasing storm size differences between cut and uncut watersheds became less significant, responding nearly alike hydrologically. Efficiency of flow over compacted surfaces is masked by the more efficient translatory flow from the entire watershed (Wright et al., 1990). Wright further states, "for larger storms, interception would be less significant because the canopy quickly reaches water holding capacity."

4.1.2 Erosion and Sediment

Key Question: What erosion processes are dominant within the watershed?

Methods

Geology, soils, and slope are investigated to characterize the watershed. Combined with the runoff and vegetation patterns discussed in previous assessments, they represent the dominant variables influencing erosion in reference conditions. To qualify management related erosion, management activities were tracked through time and effects noted. Data sources for the determination included aerial photographs, past research, field reconnaissance, and maps provided by the U. S. Geologic Service, State of Oregon, and the U.S. Forest Service.

Reference Conditions

Natural Sources of Erosion and Sedimentation

Historically, the sediment input of the watershed was dominated by mass movements with minor contributions from surface erosion and ravel. Constantly sloughing inner-gorge side walls of the North Fork and the mainstem coupled with large slower-moving landscape-scale earthflows, such as the Otter Point formation, represented the largest natural sources of sediment input. To a lesser degree, surficial erosion from exposed ultramafic soils contributes to the historic sediment regime. The channel response to the sedimentation was the formation of point bars and floodplain deposits in the lower four miles of river, creating an alluvial valley (see Channel Morphology).

Several of the landscape-scale failures have been studied and at least one is fairly well documented (slump complex at MP 8.0 of FR 3680). Two studies have shown this failure to be related to a massive pre-historical movement, across which the road was built. Sag ponds, large tilted trees, and abundant tension cracks reveal that the slide is still active. Rainfall and groundwater response show a very "flashy" system where groundwater levels respond very quickly to rainfall. A graph of slide movement, based on extensometer data, shows that the slide responds rapidly to infiltration of surface water which would indicate that pore pressure is the determining factor in movement. Cross-sections of the site show that the bedrock, which is composed of serpentinites, has a low permeability which ponds water on its surface creating a failure plane.

One of the greatest chronic natural sediment sources in the watershed is the inner-gorge slides. As documented on the earliest air photo flights, a series of slides has been caused by over steepening of the hillslopes composed of peridotite. This was observed in both the mainstem Hunter Creek and the North Fork of Hunter Creek.

Shallow rapid mass wasting processes such as debris flows and shallow landslides were not a significant hillslope process in Hunter Creek. Resource areas identified as sensitive to debris flows are located primarily on concave slopes; these slopes tend to be collection areas for both sediment and water. Sediment and organic material accrete in these concave features through colluvial processes. When precipitation intensity is sufficient, the sediment can become saturated and develop into a fluid composed of water and sediment. The additional weight of the water increases shear force while saturation decreases friction, or shear resistance, between the top-soil and the underlying bedrock. Slides initiate as the shear force acting on the sediment body increases beyond the shear resistance.

Considering that saturation is a mechanism for debris flow initiation, it is assumed that large infrequent rainstorm events could trigger shallow rapid landsliding. However, aerial photographs following the 1964 and 1974 events displayed very few occurrences of shallow landslides or debris flows. Additionally, shallow landslides or debris flows resulting from the 1996 flood in Hunter Creek were not observed during field surveys conducted in December 1997.

Because shear force is a function of gravity and the angle of repose, it is speculated that the shallow relief of the basin minimized rapid mass wasting events.

Current Conditions

Although data is not available which indicates the quantity of increased erosion, investigations conclude that vegetation manipulation and road building has increased surficial erosion. Most notable is the use of tractor logging. Logging removed vegetation, increasing runoff (see hydrology assessment), and skid trails concentrated and routed the water down the hillslopes into the creek. In other instances, the use of log and fill stream crossings (referred to as "Humbolt" crossings) led to elevated sedimentation rates. The crossings failed as they destabilized or were subjected to peak flows.

Surface erosion from road cuts and fillslopes is occurring throughout the watershed. Field surveys identified roads as the mechanism for channeling and gully formation (see Appendix E - Road Condition Report). A notable example is the alterations to the drainage pattern in the Signal Buttes area where the roads are becoming seasonal drainages into upper Hunter Creek.

Road related failures are also common in the watershed. Forest Road 1703 crossing of the Little South Fork of Hunter Creek is an example of road fill failures entering the creek. Another example is located in SE Section 1, T37S, R14W; the road is failing into a small tributary. Sediment and debris from raveling cut banks and eroding ditch lines are blocking culverts and causing surface flows to be routed down the road bed. On other sections of road with blocked culverts, inner ditches are eroding to a depth of one to two feet, undermining the road. Culvert blockage and ditch scour are particularly frequent below recent harvest units. It is speculated that the ditches are intercepting increased subsurface flow (see hydrology), as well as organic debris.

Increased sedimentation was identified from bare ground surfaces and skid trails following logging activity, but the mass failures which have been known to occur five to seven years following harvest were not observed. Aerial photo review following the storms of 1955, 1964, and 1974 showed very low occurrences of hillslope failures in past harvest units. Recent field sampling in areas with the highest road densities and the largest scale harvest units showed very little signs of mass failure following the storm of 1996. This is probably due in part to the high rate of revegetation, and to the nature of the vegetation. For example, tan oak is a vigorous stump-sprouting tree (the root wad stays intact). This improves slope stability. Additionally, first and second order stream channels running through harvest units and crossed by multiple roads were stable and intact, supporting the watershed's low sensitivity to shallow landslides and debris flows.

The increase in surficial erosion has likely led to increased sedimentation during high intensity storms. However, cumulative sediment input over a longer time scale (>5 years) is relatively small compared to the natural sediment input from large landslides and the inner gorge slides.

4.2 RIPARIAN ENVIRONMENT

Key Question: What are the riparian processes in the watershed?

Methods

Based on the interim buffer widths recommended in the ROD, riparian zones on federal land consisting of 300 feet on either side of fish-bearing streams and 150 feet on non fish-bearing streams were assessed (Figure 12) as part of this watershed analysis. Based on buffer widths listed by the Oregon State Forest practices, riparian zones consisting of 100 feet and 50 feet on either side of fish and non-fish bearing streams, respectively, were assessed. In total, 2,229 acres of streamside vegetation were analyzed. GIS, aerial photo interpretation, and field observations were used to characterize the vegetative conditions.

Streams buffered and discussed were derived from USGS 7.5 minute quadrangles. Channels delineated on these quadrangles are considered perennial streams.

The identified functions of the riparian zone were split into physical and biological. Data characterizing the physical structure and associated functions is presented first. Following the physical description, riparian habitat dependent species are discussed.

4.2.1 Physical Characterization

Intermittent Streams

The ROD defines intermittent channels as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. The category of intermittent channels can be further classified into ephemeral and intermittent channels. Intermittent channels flow seasonally where both groundwater and surface runoff contribute to stream flow. Ephemeral channels also flow seasonally but only during periods of heavy precipitation.

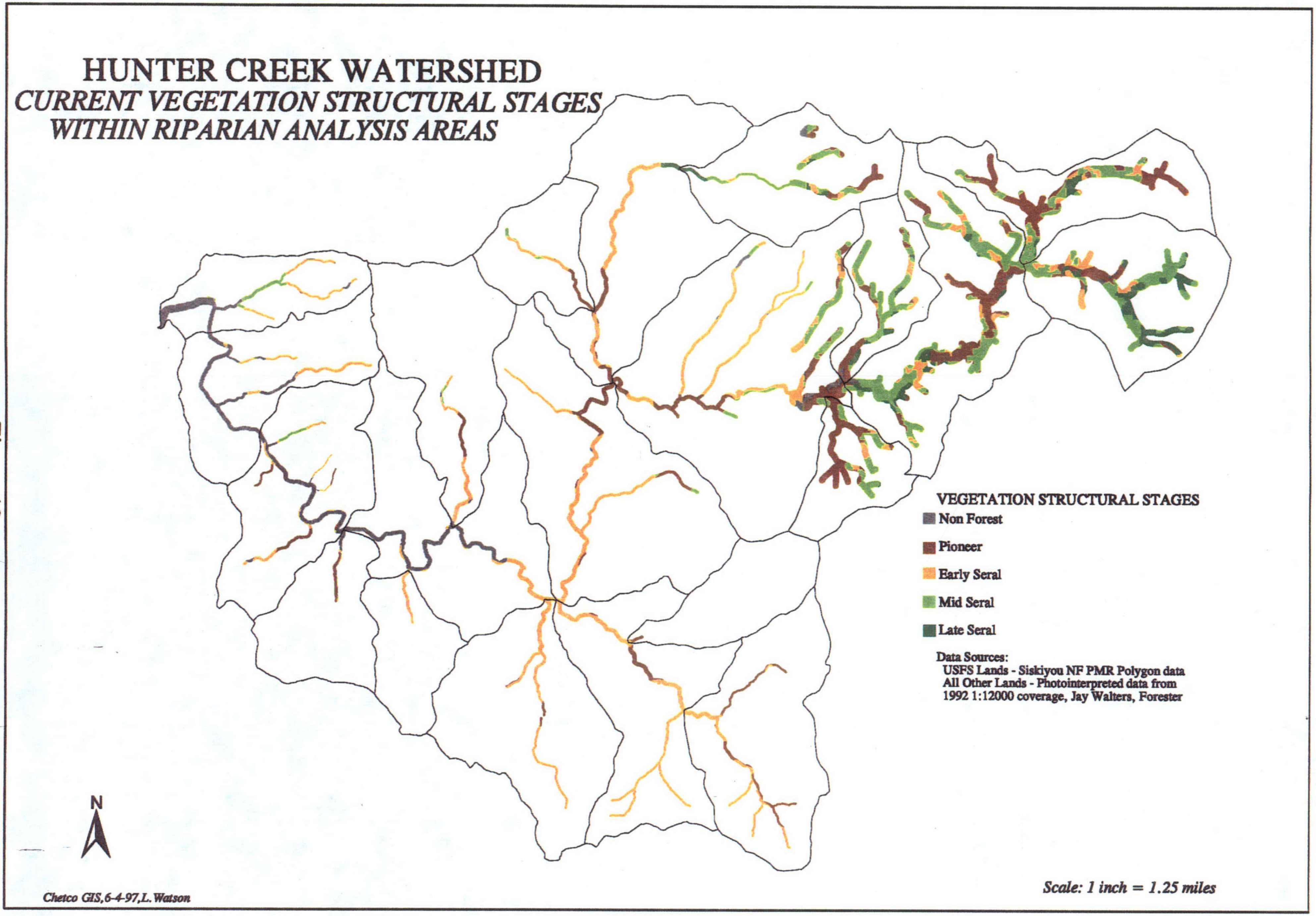

HUNTER CREEK WATERSHED
CURRENT VEGETATION STRUCTURAL STAGES
WITHIN RIPARIAN ANALYSIS AREAS
VEGETATION STRUCTURAL STAGES
Non Forest
Pioneer
Early Seral
Mid Seral
Late Seral
Data Sources:
USFS Lands - Siskiyou NF PMR Polygon data
All Other Lands - Photointerpreted data from
1992 1:12000 coverage, Jay Walters, Forester
N
Scale: 1 inch = 1.25 miles
Chetco GIS,6-4-97,L.Watson

Figure 12

Duration of flow in intermittent channels is greater than ephemeral channels. Correspondingly, biological diversity is generally higher. Intermittent channels provide moist microclimates for amphibian species seeking shelter and nest sites, and for terrestrial species seeking thermal refuge and travel corridors. Physically, intermittent channels act as a conveyance system, delivering sediment, nutrients, and large wood to perennial fish bearing streams.

Similar to intermittent channels, ephemeral drainages store nutrients, sediment, and large wood. However, delivery of these products downstream is less frequent, requiring large storm events to produce sufficient precipitation to mobilize the material. Ephemeral channels maintain a lower moisture content and support a reduced vegetation diversity compared to intermittent channels. As a result, they provide little habitat value for amphibians or thermal refuge for terrestrial species.

Riparian zones play a major role in regulating nutrient and energy flow in low-order streams. Leaf litter and wood originating from riparian vegetation enters the lotic system and affects associated microbial and benthic macroinvertebrate communities that consume and process this organic material. This material typically constitutes the energy base in low-order forested streams (Wipfli 1997).

Perennial Streams

Perennial stream and adjacent riparian areas are generally the most biologically diverse locations in the watershed. Terrestrial species utilize the dense riparian vegetation as a travel and dispersal corridor. The grasses, shrubs, and hardwoods within the riparian zone provide an important food source for both terrestrial and aquatic species. Due to a relatively high moisture content and a multiple canopy of hardwoods and conifers, these riparian areas provide thermal refuge in times of heat and drought. The streamside vegetation also provides a microclimate for riparian dependent species such as salamanders and frogs.

Riparian zones are crucial to protecting aquatic habitat. Large conifers supply wood to the channel needed to create pools and hiding cover. Tree crowns of hardwoods and conifers provide stream shade and their roots stabilize channel banks.

Reference Conditions

River valley morphology for nearly all channel segments in the Hunter Creek watershed is classified as confined. Confinement limited floodplain development. Consequently, riparian species (willows, sedges etc.) that depend on fine fluvial sediment deposits for establishment were few and limited to the stream margins. Based on 1940 aerial photographs and field visits to undisturbed riparian zones in Upper Elko Creek and a tributary to upper Hunter Creek in section 5, riparian zones were dominated by conifer species which provided a full canopy. Many of these stands had an understory component of hardwood species. Due to a dominant component of conifers and a full canopy reducing solar radiation input, stream side shade and large woody debris (LWD) recruitment potential were high.

The inner gorge area along the mainstem, near Pine Point, had a reduced conifer and vegetative component. Low productivity soil of peridotites along the inner gorge of Hunter Creek, supported a minimal canopy cover (<30 percent) with an open understory. One reach of the inner gorge is void of vegetation due to constant erosion. In the lower reach of Hunter Creek, confluence of Conn Creek to the mouth, the unconfined nature of the valley bottom allowed floodwater to spread across the valley floor. This process created new deposits, scoured old deposits, and fluctuated the water table. As a result, the landscape was dynamic, and correspondingly, supported a variety of vegetation consisting of grasses, shrubs, hardwoods, and conifers. Streamside canopy was open and large wood recruitment was low.

Current Conditions

The physical functions of the riparian areas are: (1) stabilize stream banks via root mass, (2) provide a canopy to reduce solar radiation input, and (3) supply LWD to the channel system.

Table 18 displays the amount of streamside vegetation in the non-forest (rock, grass, brush, residential) and pioneer vegetation structural stage at the WAA level. Data includes streamside vegetation across all ownerships. The final column represents the percent of the WAA with streamside vegetation in non-forest and pioneer structure. WAA's with a higher percentage of these classes are more susceptible to elevated stream temperatures due to the absence of canopy closure. They are also likely to maintain a low level of instream wood due to a reduced presence of large tree structure.

Table 18 ranks the WAAs by riparian zones from the highest percent of non-forest and pioneer structural stage to the lowest. WAA's in bold represent National Forest lands. Appendix F provides the breakdown of all vegetation classes in the riparian zone by WAA.

<u>Bank Stability</u>

Other than the naturally unstable inner gorge areas of the mainstem and the North Fork, and the naturally migrating reach of the lower watershed, channel banks are stable. Although 50 percent of the streamside vegetation across the entire watershed is classified as pioneer and non-forest, field inspections indicated very little bank erosion. Channel reaches with the most recent harvest activity coincide with the most inherently stable banks. Channel banks in the North and Big South Fork of Hunter Creek are composed of large cobble and small boulder. Bank stability in these reaches is not dependent on vegetation and associated root mass. Therefore, banks are not sensitive to vegetation disturbances. This is supported by the fact that in 1996 the channels experienced a very large flow event which resulted in minor bank erosion.

In the Upper Hunter Creek subbasin (Upper Hunter and Elko Creeks) a mixture of sediment sizes, including fluvial deposits, comprise the channel banks. Due to inclusions of fine grained previously deposited sediments, these areas are considered susceptible to erosion. Review of 1969 aerial photographs documented bank erosion and channel widening following the 1964 storm event. All identified widened areas coincided with recent harvest activity (harvesting occurring within 10 years of the flood event). Currently, the previously disturbed streambanks in the Upper Hunter subbasin are stable with a mixture of hardwood and conifer species.

TABLE 18: STREAMSIDE VEGETATION IN NON-FOREST AND PIONEER STRUCTURAL STAGE

WAA	Riparian Acres	Acres in NF and P*	Percent of WAA in NF and P
06L06W	11	11	100
06S01W	4	4	100
06L03F	75	58	77
06L04F	82	60	73
06L02F	75	53	71
06L01F	71	43	61
06M02W	120	72	60
06M06W	220	110	50
06S02W	57	24	42
06M01F	253	94	37
06N02W	23	8	35
06M04F	402	137	34
06N01W	84	28	33
06L08W	30	9	30
06L05F	109	32	29
06M03W	129	37	29
06N	68	17	25
06S	76	11	14
06M05W	250	36	14
06L09W	47	3	6
06L07W	8	0	0
06M06W	0	110	0

* NF= Non-forest structure; P= Pioneer vegetation structure

Canopy Cover

The ability of streamside vegetation to prevent increases in water temperature is directly related to the canopy cover provided by the vegetation. As canopy cover increases, solar radiation input decreases. Vegetation structure less than early seral (pioneer and non-forest) has little canopy cover value. In Hunter Creek, early seral stage is often associated with large alders, which fill in the canopy and provide shade. Table 18 displays the WAA's and associated level of streamside vegetation in the non-forest and pioneer stage.

A reduction in the streamside canopy cover has occurred as a result of past management activities. Past harvest units in the riparian zones have created openings in the canopy. Additional canopy openings were created by stream widening during the 1964 flood event (see effects of storm events in aquatic environment). However, aerial photographs following harvest activity and stream widening indicated that canopy openings did not persist for long periods (approximately 17 years) as hardwoods were quick to revegetate, providing canopy cover.

Water temperature data has been collected by the Forest Service (1993-1997) in the upper reaches of Hunter Creek down to the Forest Service boundary. In 1995, the Lower Rogue Watershed Council monitored the water temperature at the mouth of North Fork and Big South Fork Hunter Creek and on the mainstem at High Bridge. Along the mainstem Hunter Creek on Forest Service lands, the 7-day maximum temperatures ranged from 58-64°F in the upper basin to 72-74°F at the Forest Service boundary. This represents a stream distance of approximately three miles. The increase in temperature can be attributed to the inner gorge area where constant raveling and landslides have prevented the establishment of riparian vegetation, exposing the entire water surface width to solar radiation input. This change in temperature, from above the canyon to below, is considered a natural phenomenon. At High Bridge 71°F was recorded. Water temperatures for the two largest tributaries, the North and Big South Forks, had a 7-day maximum temperature of 65°F and 63°F, respectively.

In 1973, the Oregon Department of Fish and Wildlife (ODFW) recorded water temperature of 72°F near the Highway 101 bridge. Although the temperatures were recorded 25 years ago, a significant change in temperature is not expected. The lower three to four miles of Hunter Creek is unconfined with riparian vegetation in the non-forest or early seral vegetation structure. The unconfined morphology and associated immature vegetation combined with residential and pasture development provides little canopy cover.

Large Wood Recruitment

The potential for large wood recruitment is considered high in stands maintaining mid- and late seral vegetation structure. On National Forest lands, past harvest in WAA's 06M02W, 06M06W, and 06M04F decreased the high large wood recruitment potential to 31 percent, 40 percent, and 53 percent respectively. In comparison, WAA's 06M03W and 06M05W, which had a reduced level of harvest activity, maintain 80 percent and 72 percent, respectively. Field inspection of channels in WAA's with low recruitment potential indicated a very low presence of LWD (see channel morphology assessment).

WAA 06M01F is also rated low, with mid and late seral stands comprising 19 percent of the riparian area. In this WAA, however, minimal development of mid to late seral stands is due to the presence of ultramafic soils.

4.2.2 Riparian and Aquatic Animal Species of Concern

There are 18 riparian animal "species of concern" considered in this section. They include 2 federal or state listed (or proposed/candidate for listing), 8 state sensitive, 4 Regional Forester-designated sensitive, 4 Siskiyou LRMP plan indicators, and 5 neotropical migrant land birds experiencing significant long-term decline. Appendix C.2 lists species designations and occurrence. In this document, a species with more than one designation (for example, *state sensitive* and *neotropical migrant*) is discussed only in the category where it first appears from the above hierarchy (e.g. *state sensitive* in the preceding example).

Federal or State Listed

The **Aleutian Canada goose** has not been documented in the watershed, nor is it probable except in pastures or waters on private lands at the mouth of Hunter Creek. Increasing human development will probably cause future goose avoidance.

The **Bald eagle** is not known to nest or roost here, but there have been a few sightings in lower Hunter Creek and near Hunter Creek Bog (Gold Beach Ranger District 1998). The lack of use in the watershed by the bald eagle may be due to limited foraging area, consisting of the mouth of Hunter Creek upstream to approximately Conn Creek. This segment is developed with residences and other concentrated human activity that disturb eagles. Additionally, larger trees favored by the eagle are limited. National Forest lands are at least 3 miles beyond this upstream foraging area, and many times farther than the half-mile or less from water for a typical nest location.

State Sensitive

Critical

The **southern torrent salamander** was documented in T37S, R14W, Section 13 (Guetterman 1997). Its distribution within the watershed is probably wider, considering that there are many miles of cold water streamside habitat with rock, gravel, or sphagnum in the splash zone.

Vulnerable

The **foothill yellow-legged frog** was documented in T37S, R14W, Section 15 (Toman 1997), and in T37S, R14W, Section 14 (Guetterman 1997). It also is suspected to habitate throughout the area in perennial, slow-moving streams with rocky bottoms and vegetated streambanks.

The only evidence of the **tailed frog** was a sighting in 1992 (Gold Beach Ranger District 1998). Because of this species preference for pristine, cold, tumbling water streams, Elko Creek provides particularly good habitat. Habitat conditions are unlikely to change in the future, unless recreation use at Elko Camp increases dramatically.

The **western toad** has not been documented in the area, but may occur in any near surface water habitat which is necessary for breeding. It is tolerant of human presence and vegetative manipulation. However, ultraviolet radiation has been identified as a controlling factor.

Undetermined

The **red-legged frog** has been reported in the Lower Hunter Creek (T37S, R14W, Section 18) by Toman (1997) and in subwatershed 06L01F by the Gold Beach Ranger District (1998). The frog has also been documented by the Gold Beach Ranger District (1998) within the North Fork Hunter Creek WAA 06N01W, and Upper Hunter Creek WAA's 06M01F, 06M03W, 06M04F, 06M05W, and 06M06W.

Shallow-gradient reaches of lower Hunter Creek, plus ponds or lakes, provide wintering habitat for the **bufflehead**, but they migrate north to nest.

Alder stands in riparian areas seem to be the preferred habitat for the **white-footed vole**. This species has not been documented in the watershed, but is suspected. It apparently benefits from timber harvest that creates early successional stages (and supports alder). Species distribution is expected to be widespread on private ownerships and on streambanks of the upper watershed.

National Forest Land & Resource Management Plan Indicators

The **osprey** is not known to nest in Hunter Creek, but the Gold Beach Ranger District (1998) has reported a single-bird sighting in WAAs 06S (July 1993), 06M04F (June 1980), and 06M06W (August 1988).

Neotropical Migrant Landbirds

There are 122 species of neotropical migrant landbirds that breed in Oregon (Andelman and Stock 1994). Of these, 89 occur on the Siskiyou National Forest (Shea 1996). Twenty-two (27 percent) of these Siskiyou N.F. species show significant long-term declines in Oregon according to Breeding Bird Survey (BBS) data, and another three species (3 percent) could be vulnerable due to reduced habitat. Eighteen of the 25 species utilize riparian habitat. Such a high proportion of riparian species illustrates the critical value of this habitat. Appendix C.9 summarizes habitat associations.

It is assumed, but not verified, that cowbirds occur in the riparian areas of the lower watershed in association with agriculture and animal husbandry.

Alder dominated riparian habitats are valuable habitat for 19 (70 percent) of the 27 species in decline or vulnerable. This habitat condition is especially common on private lands logged in the 1940s or 50s, where alder has matured to provide a dense, tall, deciduous canopy with stems of up to an estimated 16 inches dbh. This habitat is favored by birds such as the American goldfinch, Swainson's thrush and Orange-crowned warbler. Conversion of alder stands to conifers is extensively planned on industrial forest lands, which could diminish existing habitat for these three neotropical bird species and others.

Aquatic Animal Species of Concern

The **western pond turtle** is documented from the lower reaches of Hunter Creek in T37S, R14W, Section 18 (Toman 1997). Since it favors standing or slow-moving water, its distribution is probably limited to Hunter Creek from Conn Creek downstream. This stream reach is in private ownership.

The **horned grebe** is not documented within the watershed, but if present is likely to be found only near the mouth of Hunter Creek during winter. Increased human development on private land will probably preclude its occurrence in the future.

4.3 AQUATIC ENVIRONMENT

The aquatic environment is divided into physical and biological components. Data characterizing the physical processes and associated structure of the channel environment are presented first. Following the physical description, characterization of salmonid use is discussed.

4.3.1 Physical Characterization

Key Question: What are the basic morphological characteristics of stream valleys and channels and the sediment transport and deposition processes in the watershed?

Methods

In determining changes to channel morphology from past land activity, stream channels were stratified based on two criteria. The first criteria stratified the channels based on riparian zone condition; harvested or not harvested. The second criteria stratified the channels based on sediment transport capacities. This classification is based on "Channel Classification, Prediction of Channel Response, and Assessment of Channel Condition"(Montgomery and Buffington, 1993). Each channel type is discussed. Methods vary slightly between reaches and will be discussed individually.

Figure 13 displays the distribution of source, transport, and response reaches in the watershed. In summary:

- **Source Reach** —These are high gradient, sediment storage reaches likely to experience debris flows. Slope range is >30 percent.

- **Transport Reach**—These have high sediment transport capacities, and channel geometry alterations from increased sediment load is not probable, as sediment is quickly transported downstream. Slope range is 3 to 30 percent.

- **Response Reach**—These are low gradient, typically unconfined, reaches. Response reaches are considered most susceptible to changes in sediment and/or flow changes due to the low transport capacity. Sediment delivered to the channel system from source reaches is mobilized through the transport reach and deposits in the response reach. The slope range is < 3 percent.

In assessing channel conditions and establishing relationships between channel conditions and types, several stream channels were investigated and are noted below.

Source Reaches

Channels designated as source are generally first and second order channels, according to the Strahler method. They are also colluvial hollows. Source reaches are generally located in the upper most reaches of the watershed. Source reach channels are considered vulnerable to scouring events such as debris flows and shallow landslides.

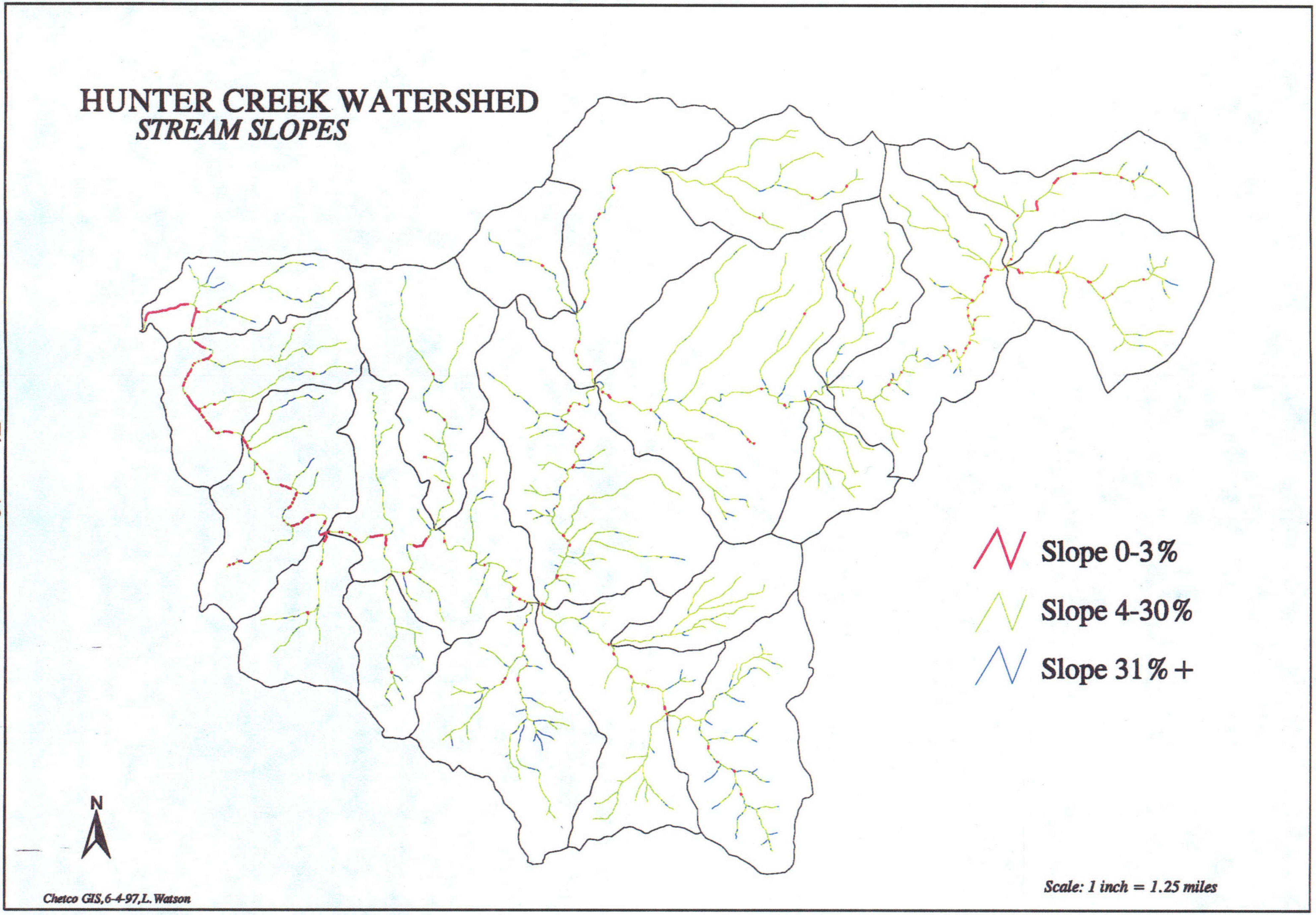
Most source reaches are not identified on maps, but several reaches were identified in the field. Source reaches were examined in forested and harvested units in the Upper Hunter, North and South Fork subwatersheds. Specifically, channels were investigated to determine the level of scouring which may occur as a result of flow concentrations due to road runoff or vegetation removal.

Field observations indicated these reaches are stable. In both harvested units and fully vegetated stands, there was very little evidence of scouring, suggesting the source reaches in Hunter Creek are not highly susceptible to shallow landslides or debris flows. This is particularly true since field investigations followed the 1996 flood. Given the magnitude and infrequency of such an event, it is assumed that if these channels were susceptible to mass wasting, a greater number of failures would have been observed. Similarly, 1969 aerial photos, which follow the 1964 flood event, indicate very few first and second order channels failing.

Transport Reaches

Except for the first few river miles, the Hunter Creek channel system is dominated by sediment transport processes. Channels in the Upper Hunter (including Elko), Middle Hunter, North Fork, and South Fork subbasins were visited to evaluate conditions. Site visits included reaches running through past harvest units, ranging from the 1950's to the 1980's.

Figure 13



HUNTER CREEK WATERSHED
STREAM SLOPES
Slope 0-3%
Slope 4-30%
Slope 31%+
N
Scale: 1 inch = 1.25 miles
Chetco GIS,6-4-97,L. Watson

Upper Hunter Subbasin

Current Conditions—Stream gradients in upper Hunter Creek fall within the transport reach classification with inclusions of response reaches. Field verification indicated that a mixture of sediment sizes are depositing throughout the reaches, representing a response reach. Specifically, these are confined response reaches. Confinement limits the lateral adjustments to increasing sediment loads; adjustments such as multiple channel formation or "braiding" are unlikely. As a result, responses to disturbances occur along the longitudinal profile.

Lacking geologic structure and sinuosity, the confined response channels in Upper Hunter Creek rely on the input of large roughness elements such as Large Wood Debris (LWD) or boulders to converge and diverge flows. Convergence and divergence of flows scour pools and form bars, respectively. Currently, the channel system is void of large roughness elements. Wood removal from the stream channels occurred in this basin (Personal Communication, 1997. Vanleer). Additionally, past harvest in the riparian zone reduced the potential for large wood recruitment. Consequently, the combination of wood removal and harvest activities reduced instream roughness elements. Currently, sediment grains and a few mid-channel bars provide the majority of energy dissipation.

The geomorphology of upper Hunter and Elko creeks is characteristic of a plane bed morphology. Montgomery and Buffington (1995) state, "plane-bed channels lack free form bars, have subdued cross-section topography, and consist primarily of riffles." This is the condition observed in the field. Longitudinal profiles lack vertical fluctuations with very little bedform roughness. Runs and riffles dominate the habitat types; pool habitat comprises approximately 10 percent of the channel area. Additionally, due to the lack of complexity, the channel is rated poor for pool formation and instream cover.

Effects of Storm Events—Aerial photography sequencing indicates channel widening following the 1964 flood event. In all cases, channel widening was commensurate with streamside harvest; each of the areas with widened channels was harvested in the late 1950's or early 1960's. Reaches in Lower Elko Creek, mainstem Hunter Creek in Sections 4 and 8, and an unnamed tributary running southeast through Section 5 all experienced channel widening. Widening appeared to be related to the scouring of young vegetation as opposed to an increase in sediment loads. Otherwise, the stream channels had nearly a full canopy of stream side vegetation. Currently, these reaches have a full canopy dominated by alder species with a fir subdominant component.

The storm of 1996 had little effect on the channels in the Upper Hunter Creek subbasin. Fine sediment deposition was observed along the stream margins. Significant scouring (>20 percent of the channel) was not observed, with the riparian zone maintaining a full vegetative component.

Reference Conditions— To present reference conditions for upper Hunter Creek, physically based conclusions are necessary. A comparison to undisturbed channels was not possible due to the fact that all channel segments have been subjected to past disturbances. The physically based analysis focuses on processes active in forming the current plane-bed morphology. Montgomery et al. (1993), describes processes as "plane-bed channels respond to increased flows by bed coarsening, creating turbulence; an increase in sediment can cause significant aggradation; removal of LWD can change a pool-riffle morphology to a plane-bed morphology."

In confined response reaches, valley bottom morphology prevents the widening of the channel as a response to an increase in sediment loads. Rather, zone of active sediment transport increases. In the channels observed in the Upper Hunter Creek, the active zone of sediment transport is the entire channel. This creates an unstable channel environment where the channel bed becomes mobile through a wider range of flows. Without large wood or other structural elements, local hydraulics acting to scour pools and create depositional environments are absent. Therefore, prior to harvest and wood removal channels in the Upper Hunter Creek WAA probably had a pool-riffle morphology shaped and maintained by the presence of large wood.

Middle Hunter Creek

Current Conditions—The Middle Hunter Reach runs from the SE 1/4 Section 8, T 37S, R 13W to the low gradient reach of the lower watershed in SW Section 22, T 37, R 14W. In this reach, bedrock geology controls channel processes and conditions.

The presence of bedrock throughout the reach creates geologic sinuosity. The bedrock also provides hydraulic controls. Sinuosity shifts the thalweg laterally, causing changes in the velocity profile. Gravel bars are developing in eddies and back water areas. Bedrock protruding into the active channel constricts flow width, creating deep backwater pools.

As with upper Hunter Creek, very little wood was observed. However, unlike Upper Hunter Creek, LWD does not play a significant role in the channel forming process. Specifically, in the middle reach, flow obstruction and complexity is provided by bedrock.

In Section 18, the channel runs through a steep inner gorge composed of peridotite. Numerous gullies and slides are directly delivering sediment into the channel environment. This inner gorge represents the single largest source of sediment into the Hunter Creek stream system. However, the flow velocities are competent in transporting the sediment downstream to the alluvial reach of the lower watershed.

Reference Conditions—Based on the geomorphology and the dominant role of bedrock in this reach, it is speculated that reference conditions are very similar to current conditions. There are localized channel disturbances from campsites and old roads. However, these perturbations are isolated and do not represent changes to channel functions or conditions.

Big South Fork and North Fork Hunter Creeks

Current Conditions—The Big South Fork and North Fork were lumped together based on similarities in channel morphology and sediment transport capacities. These subbasins have the highest relief in the Hunter Creek watershed. Correspondingly, they have very high transport capacities.

The Big South Fork has the highest road density in the watershed. Aerial photographs and field visits reveal that much of the watershed has been harvested.

Based on past activities in the basin, and the relation between land management activities and accelerated erosion, hillslope erosion has likely increased. However, stream channel conditions in the Big South Fork subbasin do not indicate an elevated sediment load. The geomorphology is characterized by high gradient riffles and cascades. Channel substrate is composed of large cobbles and small boulders.

Similar to the channels in the upper basin, large wood is essentially absent from the system. In a high gradient system such as the South Fork, the presence of LWD functions to provide future wood delivery to the mainstem. The function of large wood to scour pools is minimal due to the armoring of the bed with cobbles and boulders.

Channel conditions in the North Fork are very similar to those in the South Fork. High gradient riffles and cascades characterize the geomorphology; large cobbles to small boulders compose the channel bed and banks.

Harvesting and road building in the North Fork are assumed to have increased sediment into the channel. Also, stream bank failures up to 30-50 feet tall were noted in Section 2. As evident from the absence of sediment accumulation, stream power in the North Fork is competent in transporting the current sediment input.

Much of the streamside vegetation has been removed from the lower reach. The volume of LWD is low. However, the mechanism for the low volumes of LWD is uncertain and could be a combination of stream power and management activities. The energy gradient observed in the North Fork has the capacity to transport wood of all sizes during large storm events.

Reference Conditions—Typically, the function of the high gradient streams found in both the South and North Forks is to transport sediment and wood to the mainstem of Hunter Creek. Currently, channels in the North and South Fork lack wood debris and sediment. Although the relative contribution of management activities versus stream power shaping this condition is not known, it is assumed that in the absence of road building and harvest, wood delivery to the South and North Forks would be higher.

Response Reaches

The lower three to four miles of Hunter Creek represents the largest contiguous response reach. Lower Hunter Creek is an unconfined, alluvial valley consisting of point bars, side channels, and an extensive floodplain. As this reach has the lowest gradient in the watershed, the probability for sediment deposition is greatest. Additionally, bank material is composed of fluvial deposits, or sediment previously transported by the channel. A combination of low transport capacity with banks composed of fine material, makes this reach highly susceptible to changes from alterations in sediment and/or water supplies.

Reference Conditions—Inspection of 1940 photographs displays an open alluvial valley. The valley bottom consists of the wetted width with bare soil (depositions) extending 2-4 channel widths. This zone delineated the active channel. Outside the active channel, side channels and grass flats are evident. The extent of the grass flats and side channels delineated the floodplain.

The response reach in the Lower Hunter Creek was dynamic, in terms of vertical and lateral adjustments to annual sediment and flow volumes. The unconfined nature of the valley allowed for channel migration and overbank flooding. During infrequent flood events water overtops its banks and spreads across the floodplain. Depending on local conditions, sediment was deposited and stored in the floodplain or generated by the scour of a new channel. Commensurate with the physical changes occurring across the floodplain, vegetation composition was dynamic. A mixture of pioneer, early seral, and mid-seral structures developed; the stage and age being dependent on the frequency and magnitude of inundation.

Channel forming processes were consistent with a pool-riffle sequence. In a low gradient pool-riffle system, pools are rhythmically spaced about five to seven channel widths (Leopold et, al., 1964). The key to bar and pool formation is lateral migration of the thalweg. Bars forming on the inside create roughness pushing the thalweg to the alternate bank, scouring a pool. This sequencing provides significant form roughness, acting to reduce flow energy.

Current Conditions—Currently, channel processes have been altered. Road building and floodplain reclamation are the dominant mechanisms. Channel banks have been stabilized to prevent erosion. Floodplains were drained to support agriculture and development. Consequently, the channel straightened, increasing stream flow velocities. This has led to an increase in shear stress and sediment transport capacity.

From field visits, and interviews, it is evident that the channel has degraded. Preventing bank erosion and restricting floodwater from accessing the floodplain significantly reduced the energy dissipating capability of the channel. As a result, energy dissipation is occurring along the channel bed.

As the stream downcuts, it undermines the toe of the bank. Additionally, as the water recedes from a high flow event pore pressure pulls on the bank. Consequently, channel banks are collapsing. In a natural setting scenario, the sediment from the banks would be deposited in the form of point bars. The process of eroding banks and forming point bars is an attempt to reestablish grade through sinuosity. Currently, scouring of channel banks and depositing on the alternate bank forming pool-riffle sequences is not a significant process. Bank armoring and channel straightening are artificially maintaining stream grade, perpetuating bank erosion and land losses.

Summary and Conclusions

From a watershed perspective, the conveyance rate of watershed products (water and sediment) has increased through the channel network. In the Upper Hunter Creek subbasin, removal of wood has reduced the process of flow convergence and divergence, creating a uniform bed profile. As a result, average stream flow velocity increased. Since stream power, or the ability to do work, is proportionate to velocity, stream power has also increased. Beschta and Platts (1986) state, "Channels that are steep, straight with hydraulically smooth banks and beds, uniform in cross section...will have relatively high unit stream power." Consequently, rate of water and sediment transport has increased. However, mid-channel bars continue to develop and scour annually, indicating that degradation from increased stream power is not occurring.

The middle reaches of Hunter Creek have changed little from reference conditions. Bedrock continues to be the dominant characteristic determining sinuosity, pool formation, and bank stability. One of the most significant sediment sources in the watershed are the inner gorge slides of the middle reaches. Both the influence of bedrock on channel form and the sediment input from the inner gorge slides remain unchanged from reference conditions.

In the lower watershed, armoring of the stream banks and reclaiming the floodplain led to channel straightening, or decreased sinuosity. "Meandering is one means whereby a river can adjust its rate of energy loss and transport ability" (Knighton 1984). The greater the sinuosity, the lower the channel slope relative to the valley slope. Associated with straightening is a reduction in bedform roughness; point bars and pool formations have been reduced. Flows which historically accessed the floodplain are now contained in the channel banks, resulting in bed and bank scour. For fish habitat, increased bed mobility translates to unstable gravels. Additionally, the primary pool forming processes (development of pools on the opposing bank of point bars) have decreased.

4.3.2 Biological Characterization

Key Question: What is the physical and biotic characterization of fish habitat?

Hunter Creek is an important, fish-producing watershed on Oregon's south coast. Populations of sensitive anadromous fish are dependent upon the quality of the watershed and, subsequently, the quality of the water produced within the watershed.

Methods

Data on stream classification, miles of streams, and watershed characteristics were obtained from the National Forest. ODFW provided data on physical stream surveys, fish populations, and special studies. Historic data was obtained from conversations with several individuals who have lived or worked in the Hunter Creek area for many years.

Anadromous fish populations typically receive the most emphasis from public agencies. Hence, the majority of fish-related data pertains to anadromous species. Data on non-anadromous species is collected primarily during physical stream surveys. Also, information on other aquatic species of concern are presented.

Habitat Characterization

Table 19 lists the miles of stream class in the Hunter Creek watershed. As with most coastal streams, the upper section of the watershed is typified by steep hills and confined valley profiles. This characterizes habitat in the North and South Forks of Hunter Creek. In these reaches, the stream has a high gradient with little or no spawning gravel. Pools are minimal, limited to small plunge pools. Woody debris from past logging activities or slides frequently accumulates in narrow canyons or behind large boulders. Fish production is minimal, however, resident cutthroat trout are usually found through the limit of perennial stream flow.

Lower stream gradients within National Forest Land (Upper Hunter and Elko creeks), allow for increased spawning gravel deposition, and pool formation. However, a reduction in LWD (see channel assessment) has resulted in a simplified channel form which supports low habitat complexity. Currently, the habitat is dominated by shallow, low gradient riffles and runs. Additionally, the lack of instream structure has increased sediment conveyance, presenting spawning gravel stability concerns.

Middle Hunter Creek currently provides good habitats. The habitat is geologically controlled providing sinuosity and backwater areas. Both create large pool habitat. Geologic nick points also provide stable locations for spawning gravel. These nick points are a fixed structure in the system and, therefore, will not respond to changes in water or sediment inputs. This habitat condition was observed from Section 8 on National Forest lands to Section 14 upstream of the confluence with the North Fork Hunter Creek.

The lower watershed, approximately RM 0.7 to RM 10.75, exhibits a low gradient, meandering stream, frequently with vertical streambanks. Decreased stream velocities through this section cause gravel and silt to deposit. Fair-to-good amounts of spawning gravel are available for fall chinook and winter steelhead (Table 20). Deep pools are forming upstream of geologic bedrock controls.

The concern for the lower reach is the reduction in sinuosity and floodplain function. Straightening the river restricted lateral adjustment and, hence, formation of lateral scour pools. Channelization and reduction in floodplain function increased water and sediment conveyance. This will act to fill in pools and mobilize potential spawning gravel sites.

Most tributary streams have a limited amount of low gradient stream near the mouth. At these locations gravel is deposited and available to spawning fish

TABLE 19: PERENNIAL STREAM CLASSIFICATION AND MILES WITHIN THE HUNTER CREEK WATERSHED.

	CLASS 1	CLASS 2	CLASS 3	UNCLASS	TOTAL
Hunter Creek mainstem - below USFS boundary	11.95	0.00	0.00	0.00	11.95
- above USFS boundary	2.05	2.69	0.58	0.00	5.32
Hunter Creek tributaries - below USFS boundary	0.00	0.45	12.60	17.75	30.80
- above USFS boundary	0.00	1.27	11.32	0.00	12.59
Crosson Creek	0.00	0.00	0.00	2.26	2.26
Conn Creek	0.57	1.19	0.90	2.10	4.76
South Fork Hunter Creek	0.52	0.86	5.51	0.00	6.89
Big South Fork Hunter Creek	0.88	2.62	10.22	0.00	13.72
North Fork Hunter Creek	0.75	1.00	2.95	3.60	8.30
Elko Creek	0.00	2.05	2.93	0.00	4.98
TOTAL	16.72	12.13	47.01	25.71	101.57

TABLE 20: AMOUNT (SQUARE-YARDS) AND QUALITY OF ANADROMOUS FISH SPAWNING GRAVEL ESTIMATED FROM SURVEYS OF THE HUNTER CREEK DRAINAGE IN 1971.

	GOOD	MARGINAL	TOTAL
Hunter Creek - below barriers	16,046	7,544	23,590
- above barriers	597	1,063	1,660
Conn Creek	0	25	25
Little South Fork Hunter Creek	15	35	50
South Fork Hunter Creek	0	65	65
North Fork Hunter Creek	430	550	980
TOTAL	**17,088**	**9,282**	**26,370**

A 1971 physical and biological stream survey of the Hunter Creek watershed by the Oregon Game Commission (OGC) indicated there were 16,046 square yards of good spawning gravel and 7,544 square yards of marginal spawning gravel for chinook and steelhead. There were also 597 square yards of good gravel and 1,063 square yards of marginal gravel above anadromous fish barriers. Tributary streams also contained 445 square yards of good gravel and 1,063 square yards of marginal gravel accessible to anadromous fish (Oregon Game Commission - 1971).

Due to a lack of current information, it is uncertain how present spawning gravel conditions compare to 1971 conditions.

A 1996 National Forest document reports the seven day average maximum stream temperature near the forest boundary was 74.4°F. The seven-day average maximum temperature in the upper reaches was 62.7°F. (USFS - 1996). Water temperatures increased through the inner gorge where vegetation is sparse. A 1973 ODFW Hunter Creek estuary study recorded water temperatures within the estuary near the old Highway 101 bridge from May 15, 1973 to September 18, 1973. The maximum high temperature recorded during this period was 72°F with a weekly average of 70.5°F.

According to the Siskiyou National Forest LRMP, optimal water temperatures for salmonids range between 45°F and 59°F. Temperatures ranging from 59 to 69°F are considered sub-optimum. At temperatures ranging from 69 to 75°F, it is suspected that growth ceases. Summer low flow temperatures fall into the 69 to 75°F category for a majority of the channel length.

Tidal influence at the mouth of the stream provides an area where fresh and salt water mix during the daily ebb and flow of the tide. The Hunter Creek estuary is typical of the Klamath Geologic Province, in that during low summer flows the entrance becomes "bar bound". However, enough mixing does occur through the year to provide rich biota typical of an estuary. Tidal influence occurs from RM 0.0 to about RM 0.7. Large numbers of salmonids and non-game species use the estuary for feeding and rearing.

Historic Fish Distribution

Considerable fish population and fish habitat data have been collected over the years by the ODFW. National Forest and BLM have data relative to their lands. A collation of available agency data, conversations with knowledgeable individuals and personal experience provided the data for this section.

Records of fish distribution prior to approximately 1950 are not available. Human access to much of the upper watershed was limited to foot travel. Roads allowing ready access for fish surveys, had not been constructed. Apparently little effort was made to quantify fish populations.

It can be reasonably assumed that anadromous salmonids used all accessible streams where habitat was available for spawning and rearing. Resident cutthroat trout were likely found above barriers upstream, extending to the limits of perennial stream flow.

The mainstem Hunter Creek stream mileage (RM) as reported in various reports varies considerably. For example, an ODFW 1971 stream survey report lists the fall chinook barrier at RM 8.25 and a winter steelhead barrier at RM 10.75 (ODFW - 1971). The National Forest lists the upward limit of anadromous fish passage at RM 13.1 (USFS - 1996). Another National Forest stream survey report designated the forest boundary at RM 10.0. For the purpose of this report, the ODFW stream mileages will be used. Stream miles reported by ODFW begin at the mouth.

Hunter Creek historically has the reputation for producing large adult fall chinook and winter steelhead. Some of the largest steelhead on the south coast have been caught or observed spawning within the system.

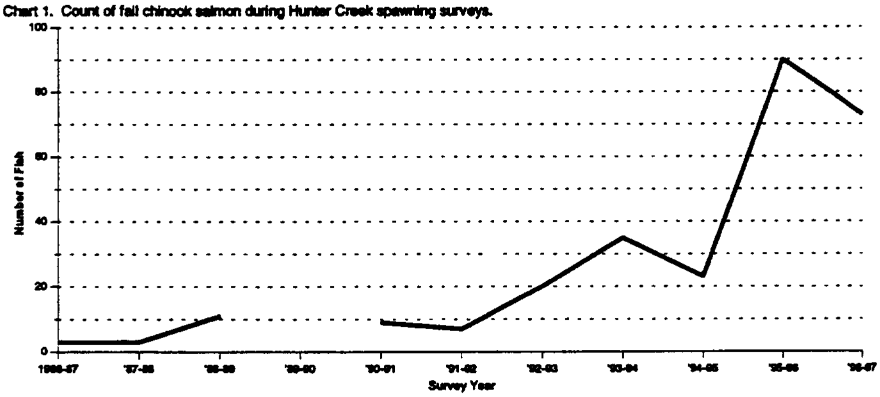
It is probable that chum salmon used the system at one time, as chum salmon typically spawn in tributaries close to the mouth of the river or estuary.

Present Fish Distribution

A series of waterfalls and chutes 6 to 12 feet in height at RM 8 - 10 create a barrier to anadromous fish. Steelhead migrated one or two miles further upstream than chinook. National Forest lands have very little anadromous fish production.

Fall chinook salmon currently use mainstem Hunter Creek up to the natural stream barriers located near the National Forest boundary (Figure 14). An estimated 600 to 800 adult chinook annually enter the system to spawn (Personal Communication, ODFW). Annual standard spawning ground surveys indicate that the numbers of fall chinook using the Hunter Creek system has increased dramatically since about 1991-92 (Chart 1).

Chart 1. Count of fall chinook salmon during Hunter Creek spawning surveys.



Winter steelhead use the mainstem Hunter Creek up to the barrier and the lower portions of tributary streams where suitable spawning and rearing habitat are available. A few steelhead apparently negotiate the mainstem barrier during certain high water stages. No quantitative population data is collected on spawning steelhead due to the length of their spawning season and the difficulty of observing spawning adult fish.

While numbers of chinook and steelhead may not yet be optimum, the population of adults entering the system has increased. Currently, a limited no-bag-limit sport angling season currently is in effect for winter steelhead in the lower mainstem Hunter Creek; a limited fall chinook sport fishery is being contemplated. The majority of the recreational angling is conducted from the bank. Boat angling is severely limited by the size of stream and depth of water.

A remnant run of coho salmon may still be present in Hunter Creek. However, coho have not been observed since the 1993 spawning season when one adult coho was caught in a seine being used to capture spawning chinook (personal comm. - ODFW). Coho prefer spawning in small tributary streams or backwater areas such as side channels. Habitat of this nature has decreased as a result of floodplain reclamation.

Coho salmon are in severe jeopardy along the entire Oregon coast. While all of the reasons are not understood, the general feeling is that reduced spawning and rearing habitat in combination with ocean conditions are the reasons for this serious decline. Coho are currently listed as a threatened species by the federal government.

A limited run of sea-run cutthroat trout enter Hunter Creek each fall to spawn. Historic runs were not quantified but were apparently never of much significance.

Chum salmon have not been observed for many years.

Resident cutthroat trout occupy most all available habitat. These resident trout are found primarily in the upper stream reaches, above anadromous spawning areas. Some resident cutthroat do descend the streams and enter the sea-run cutthroat population. It is expected that cutthroat populations have declined with habitat degradation.

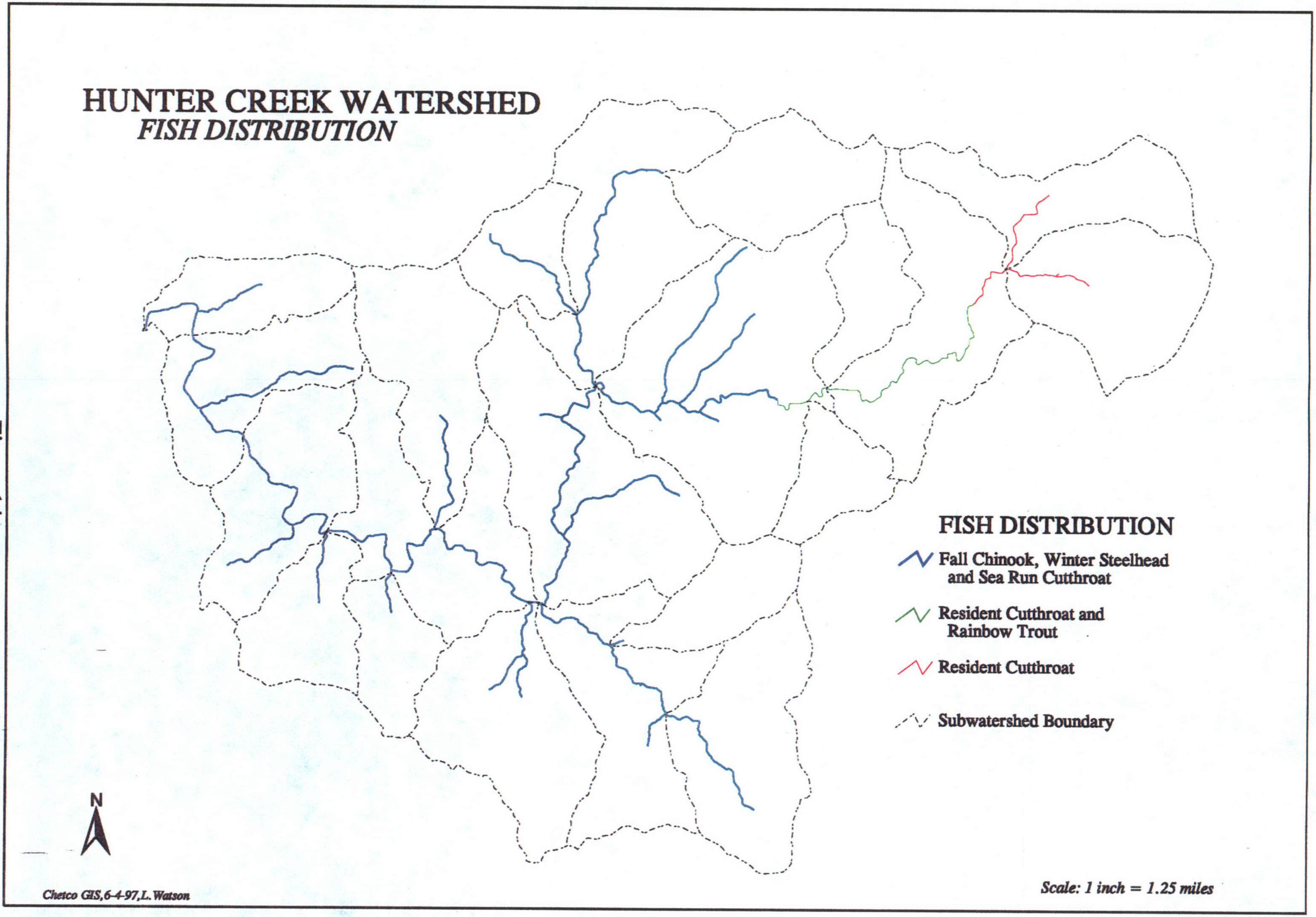

HUNTER CREEK WATERSHED
FISH DISTRIBUTION
FISH DISTRIBUTION
Fall Chinook, Winter Steelhead and Sea Run Cutthroat
Resident Cutthroat and Rainbow Trout
Resident Cutthroat
Subwatershed Boundary
N
Chetco GIS, 6-4-97, L. Watson
Scale: 1 inch = 1.25 miles

Figure 14

5.0 MANAGEMENT OPPORTUNITIES AND RECOMMENDATIONS

5.1 INTRODUCTION

This section identifies management opportunities, restoration opportunities, and information needs to improve future terrestrial and aquatic conditions in the Hunter Creek watershed. Guidelines for management options on Federal Lands are adapted from Late Successional Reserve Assessments and the Aquatic Conservation Strategy Objectives.

5.2 TERRESTRIAL ECOSYSTEM

5.2.1 Silviculture Opportunities

The following recommendations identify silvicultural treatment opportunities intended to:
1) Accelerate the growth and development of early and/or mid-seral stands into late seral forest structure. 2) Increase block size and connectivity of future late successional habitat.

Below are opportunities identified during the watershed analysis, however, these do not represent the only opportunities. Additional areas and prescriptions may be identified by the agencies and landowners during the project level planning process.

Late-Successional Reserve Allocation

There are 6,311 acres allocated to Late Successional Reserves.

BLM land: Commercial thinning in the mid-seral stand to the south of the existing BLM late seral block located in WAA 06N01W will increase the size of the current late seral stand. Pre-commercial thinning in surrounding early seral stands will also expedite the development of a large late seral habitat block. Given the fragmentation of late seral stands by pioneer and early seral vegetation stands and the limited productivity of ultramafic soils, this is the best opportunity in the northern portion of the watershed to create a contiguous late successional habitat block.

National Forest land: To increase the size of the existing late seral habitat identified in the eastern portion of WAA 06M02W, near Pyramid Rock, commercial thinning in adjacent mid-seral stands is recommended.

Development of contiguous late successional structure can be accelerated by the use of silvicultural treatments in managed stands between the late seral forest stands near Pyramid Rock northeast to the LSR boundary (western edge of Elko Creek drainage). Figure 15, "1940 vegetation structure" displays a contiguous block of late successional habitat from Elko Creek along the watershed boundary to Pyramid Rock. Harvest activity in 1955-1964 and 1975-1984 has fragmented this contiguous block. Treating these past harvested units will expedite the return of late successional habitat connectivity. Specifically, commercial thinning in the 1955-1964 managed stands and pre-commercial thinning in the 1975-1984 managed stands is recommended.

Matrix Land Allocation

There are 2,375 acres allocated to National Forest matrix lands. Project level planning is necessary to establish specific prescriptions and areas of timber management in the matrix land allocation. However, the team identified commercial thinning opportunities in stands managed between 1955 and 1964. These units are located in the lower, or western half, of Elko Creek (Figure 15 "current vegetation structure").

Silviculture planning efforts should coordinate prescriptions in matrix lands with thinning activities in the LSR and riparian zones (see riparian ecosystem recommendations) to optimize landscape diversity.

5.2.2 Wildlife Enhancement Opportunities

Throughout the watershed there is a lack of adequately sized snags for woodpeckers and other cavity using species. Managing for snags and erecting nest or roost boxes will improve short and long term habitat conditions for cavity associated wildlife.

In the northwest end of the watershed, Douglas-fir and incense cedar are encroaching into open, grassy Jeffrey pine stands. There is an opportunity to reduce the encroaching vegetation by the use of prescribed fire or by slashing and girdling.

Roads

Appendix E lists road segments and conditions.

Throughout the forest, road closure/obliteration will reduce fragmentation thereby increasing connectivity of terrestrial habitat. However, the greatest impact of roads on wildlife resources, particularly elk, is the level of open road density. Based on road densities leading to elk avoidance areas, WAAs 06M-02W, 04F, 05W, 06W were identified as high priority areas for reducing road access. These subbasins are located on National Forest land. Currently, South Coast Lumber Company keeps gates locked on several of their roads, restricting access into the North and South Forks of Hunter Creek.

Information needs

PMR vegetation classification should be field verified at the project planning level. This will more accurately identify old-growth and late-successional forest where species of concern such as marbled murrelet, spotted owl, and others could be found.

Sharp (1994) referenced the existence of Breeding Bird Survey route #025 - Wedderburn, Oregon. Data from this route should be located to supplement bird species occurrence and trend information for the west side of the watershed.

Complete marbled murrelet surveys in the watershed (Figure 16).

Hunter Creek Watershed
Comparison of 1940 and 1992 Vegetation Structural Stages

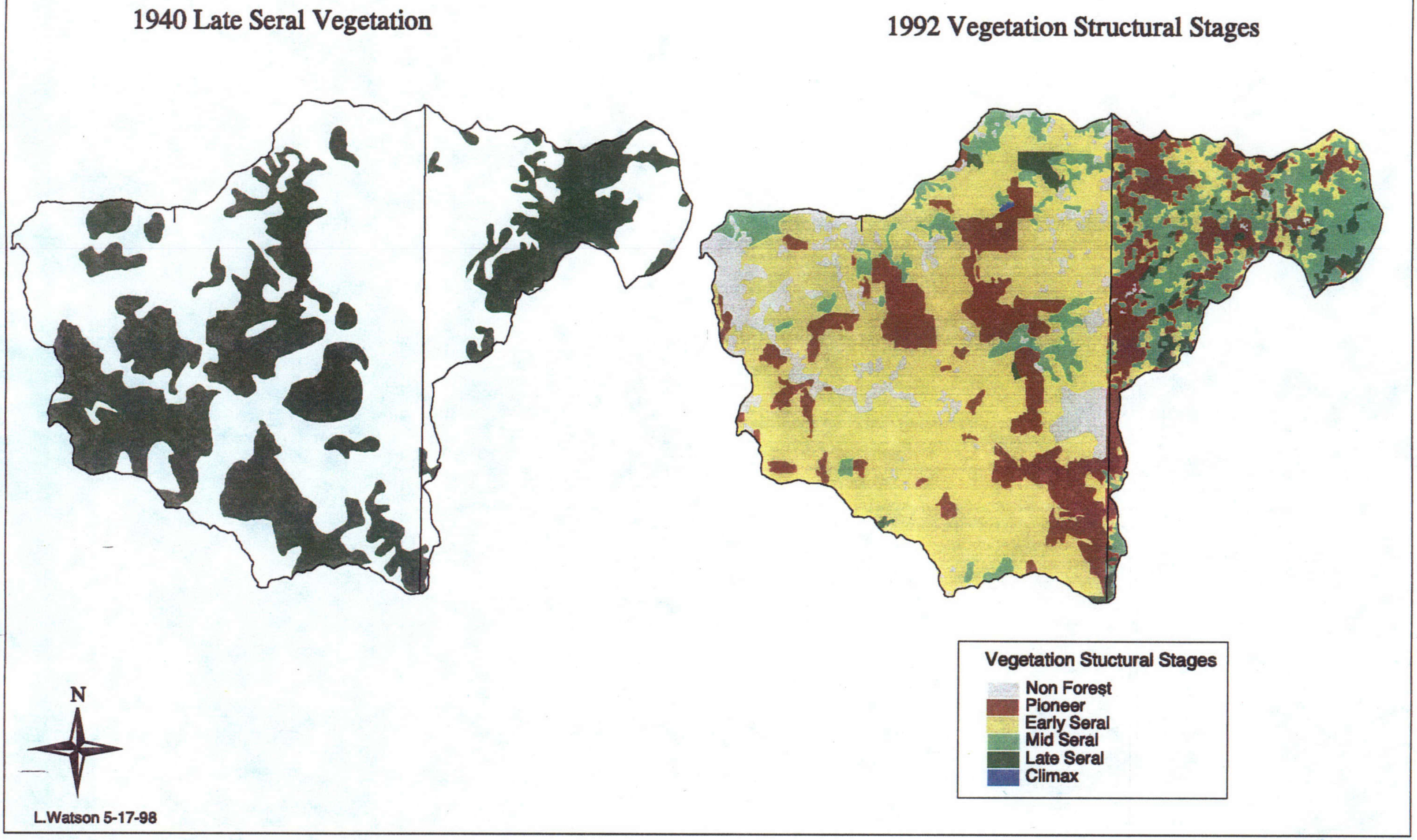


Figure 15

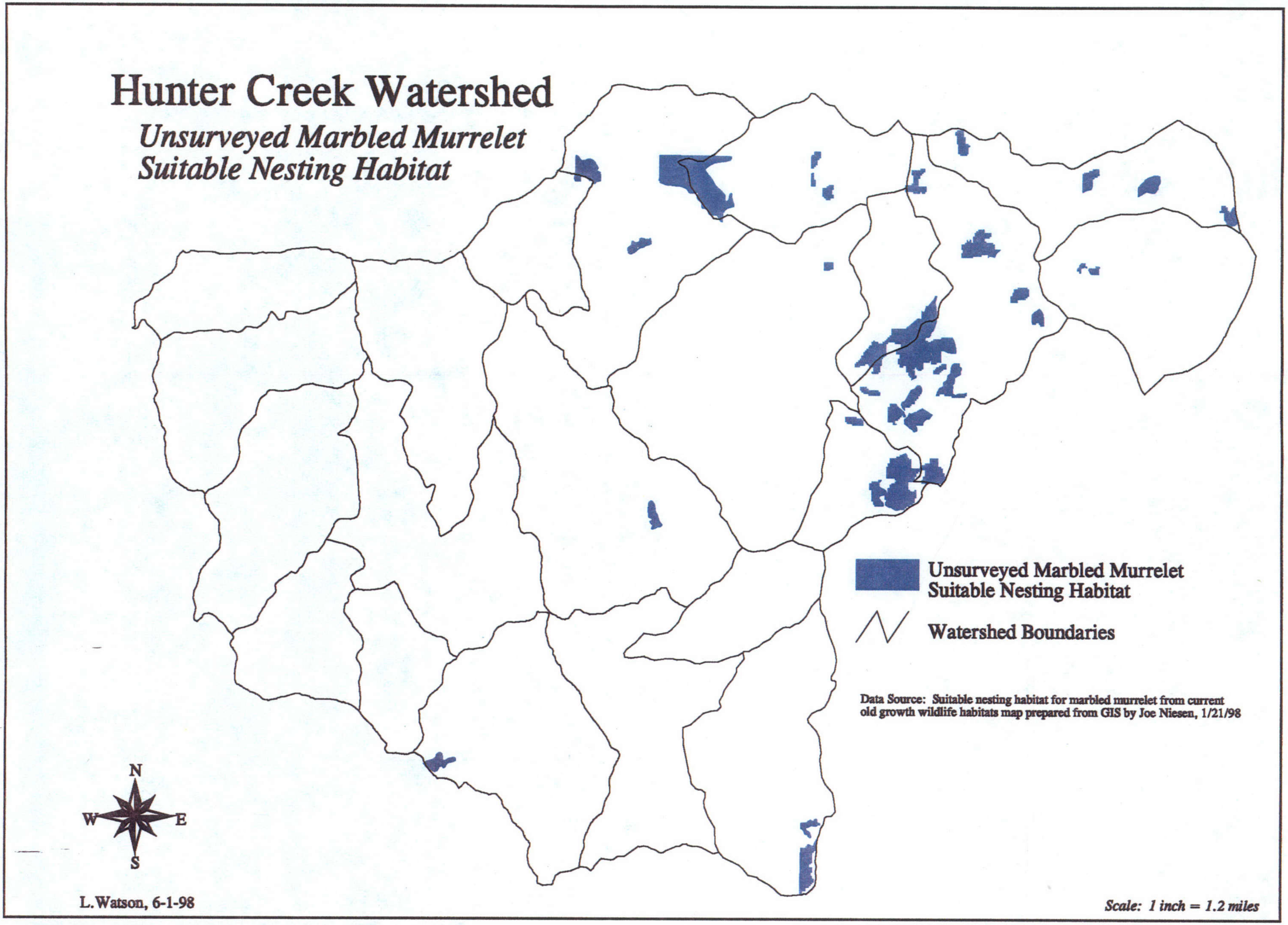

Hunter Creek Watershed
Unsurveyed Marbled Murrelet
Suitable Nesting Habitat
Unsurveyed Marbled Murrelet
Suitable Nesting Habitat
Watershed Boundaries
Data Source: Suitable nesting habitat for marbled murrelet from current
old growth wildlife habitats map prepared from GIS by Joe Niesen, 1/21/98
N
W
E
S
L.Watson, 6-1-98
Scale: 1 inch = 1.2 miles

Figure 16

5.2.3 Forest Health

POC root rot disease

Decommissioning the following roads is recommended to reduce the risk of spreading POC root rot disease:

- Road 195 in WAAs 06M03W and 06N01W
- 4WD road which connects Hunter Bog to road 1703 in WAA 06M02W
- 4WD road just north of Hunter Creek Bog from road 3680 heading downslope toward the mainstem of Hunter Creek (note: this action is recommended in the BLM's "Hunter Creek Bog and North Fork Hunter Creek Areas of Critical Environmental Concern")

Currently, several risk reducing practices are in place. These practices include using only "clean" water sources for road watering, washing contractors' vehicles, restricting the off-site movement of material from infected rock sources, and limiting ground disturbing operations to the dry season. Continuing these practices is recommended.

Noxious weeds

The most effective approach to controlling noxious weeds is a long term strategy that eliminates known seed beds. Not only is it important to eliminate existing plants, but also to monitor every two years to prevent reestablishment.

Treatment opportunities include cutting, pulling, burning, and chemical treatments. Control methods include closing roads, washing construction machinery, and using "clean" fill material. South Coast Lumber Company, Oregon Department of Transportation and Curry County have cooperated with the National Forest to administer control activities along their roads.

Control methods are limited for thistles and tansy because of their wide distribution, although the flea beatle is an option for controlling tansy. Seeding disturbed areas with native vegetation will reduce opportunities for weeds to become established or re-established.

Information needs

Continue to monitor areas adjacent to known locations of POC root rot disease, particularly in creeks downstream of the 3680 road from Pine Point to Quosatana Butte. Evaluate the presence of disease spores in active rock pits.

For noxious weed control, survey disturbed areas to detect new populations before they become well established. Prompt eradication of these populations will greatly reduce the potential for establishment of noxious weed beds.

Apply for grants, including those offered by the National Fish and Wildlife Foundation, which are available to fund noxious weed control on both federal and private lands.

5.3 RIPARIAN ECOSYSTEM

The team recommends following the guidelines listed in the ROD for riparian reserve boundaries until adjustments are made through site specific project planning analysis. In addition to the ROD

- Two site potential trees (340 foot slope distance) for fish-bearing perennial streams.
- One site potential tree (170 foot slope distance) for perennial, non fish-bearing and intermittent streams.
- In addition to the ROD's standards and guidelines, the team recommends applying a 25 foot (slope distance) buffer to small drainage features, such as ephemeral swales, that do not meet the ROD criteria of a definable channel with evidence of annual scour or deposition. Although riparian vegetation is lacking in these areas, maintaining unimpeded water flow during high runoff periods is important for hydrologic function.

Locations of ephemeral and most intermittent drainages are not mapped and will need to be identified during project planning.

5.3.1 Opportunities in Riparian Reserves

The biggest concern within the riparian zone is the lack of large tree structure. The lack of large tree structure does not, and is not expected to for the next 50 years, provide adequate large wood recruitment into the channel environment. Lack of large tree structure has also reduced habitat connectivity and species diversity. The ROD describes acceptable management opportunities within riparian reserves, stating "Apply silvicultural practices for Riparian Reserves to control stocking, reestablish managed stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives."

In WAAs 06M06W and 06M04F (upper Hunter Creek) and 06M05W (Elko Creek), riparian reserves lack large tree development and, correspondingly, in-channel large woody debris is lacking. These conditions prevent the attainment of ACS objectives # 3, 8, and 9— Physical integrity of the channel environment; structural diversity of plant communities; and habitat to support a well-distributed population of species.

To improve riparian functions, pre-commercial thinning in pioneer and early seral structural stands (see figure 12) is recommended. The intent is to expedite the development of large tree structure through silvicultural treatments. Because alder is desirable for invertebrate fish food production, silviculture treatments within 50 feet of the channel should maintain a mixture of hardwoods and conifers.

Commercial thinning in riparian reserves in conjunction with thinning opportunities, discussed in the terrestrial section, will increase the effectiveness of the LSR. Specifically, expediting the development of large tree structure will create corridors from the LSR allocation in Hunter Creek to late seral blocks to the northeast.

In developing management guidelines within riparian reserves, the following site characteristics should be considered during project level planning.

- Sensitivity of hillslope to erosion and mass wasting. Identify hillslope angle of repose, soil erodibility and productivity characteristics, and local drainage characteristics, i.e. convex or concave slope orientation.
- Potential fluvial erosion. Identify the location of the management activity relative to the high flow stage (5-25 year return interval).
- Instream beneficial uses and their sensitivity to disturbance. Identify the location and timing of beneficial uses.
- Habitat for riparian dependent species. Identify habitat characteristics at project site and along the entire riparian corridor.
- Streamside canopy for shade and micro habitat
- Large wood recruitment

5.4 AQUATIC ECOSYSTEM

This section describes management recommendations intended to improve aquatic conditions. Recommendations focus on surface runoff and channel hydraulics.

To improve hydrologic function, focus road decommissioning/obliteration in hydrologically sensitive areas. Identified hydrologically sensitive areas are the first 6 WAA's listed in table 17. Combining past harvest activity with road mileage, these locations have the highest probability of an altered flow regime. Target road densities to the range of 2-3 miles of road per square mile of watershed area. High priority locations are roads or sections of roads that increase the drainage network. Such locations are typically long sections of road without culvert relief that drain into existing channels, or areas where a series of roads cross the same drainage. Roads immediately downslope of harvested areas may require a "tighter" spacing of culverts due to increased interception of subsurface flow and logging debris.

Road 3680 crossing of Upper Hunter Creek is suspected to prevent fish passage. The hydraulic drop and flow velocity through the culvert restricts migration of aquatic species. Redesign of the road crossing is needed to facility aquatic connectivity above and below the road crossing.

Channel hydraulics have been simplified. Both Upper Hunter and Elko Creeks lack instream structure. Additionally, large wood debris recruitment potential from the riparian zone is rated low for the next several decades. Therefore, to improve aquatic habitat, in-channel placement of large native materials is recommended. Large substrate, (greater than 36 inches) vortex weirs will converge flows necessary to scour the channel bottom, creating pool habitat and channel complexity. Where appropriate, falling trees into the channel environment from adjacent riparian areas is a cost effective means to increase instream LWD. Unless a specific objective is identified, anchored placement of wood debris in not recommended.

In the lower watershed, from the mouth of Hunter Creek to just below the confluence of York Creek, the channel has been straightened and the floodplain reclaimed. Additionally, banks have been armored to protect property and roads. As a result, the ability of the system to dissipate energy during high runoff periods has been greatly reduced. The dynamics of lateral scour and fill, creating sinuosity, has also been reduced.

Allowing flood water to access the floodplain and reestablish sinuosity will improve quality pool and spawning habitat. Scouring on the outside bends will create pools and depositions on the opposite bank will increase spawning gravel stability. Stream bottom scour and bank failures associated with pore pressure will be reduced. An alternative approach would be to create side channels designed to convey flood water. Side channels would act as an overflow channel, reducing stream power in the thalweg channel. This would also provide velocity refugia and backwater habitat for anadromous fish species.

Information Needs

Prior to in-channel project implementation, site specific hydraulic analysis would be required to properly plan and design structures. The feasibility of allowing the stream channel to meander in the lower watershed needs to be addressed. This action would result in the loss of land on the scour side and an accretion of land on the deposition side. Similarly, the feasibility of providing an overflow channel needs to be addressed. The length of this channel will likely exceed a half mile with a width two-thirds of the main stem.

5.5 RECREATION

ATV use should be managed to limit the spread of POC root rot disease (BLM is planning to close Hunter Creek Bog and North Fork Hunter Creek Area of Critical Environmental Concern (ACEC) to motorized vehicle use).

Two opportunities exist to convert poorly maintained roads into recreational trails. They include:

- Road up Pyramid Rock with additional trail construction to the top of the rock
- Road to the top of Signal Buttes (note: It will be necessary to allow for vehicular traffic for maintenance of electronic equipment)

This action will reduce resource damage from poorly maintained roads and provide a hiking experiences to vista points.

5.6 COORDINATION OPPORTUNITIES

Terrestrial

In the North Fork Hunter Creek (WAA 06N01W) LSR allocation, there is an opportunity to coordinate silvicultural thinning prescriptions between the FS and BLM. Currently, there are two small blocks of late seral habitat—one on BLM and the other on National Forest land. Ultramafic soils in the North Fork prevents the development of a contiguous late seral vegetation stand. However, thinning in adjacent early and mid-seral stands represents the best opportunity to increase late successional habitat in the northern portion of the watershed.

Coordination between BLM, FS and South Coast Lumber regarding POC root rot will be the most effective means to limit the spread of the disease. Communication of disease location and control efforts will produce a watershed understanding of the progress of POC root rot.

The only documented locations of the Purple Martin in Curry county are in sections 10, 13, and 23 of T37, R14. Coordination between ODFW and South Coast Lumber will help ensure awareness and protection of this unique wildlife resource. Additionally, coordination between ODFW and South Coast Lumber Company regarding snags and placement of nest/roost boxes will improve woodpecker and cavity user habitat conditions.

Aquatic

The team recommends a watershed scale assessment of culvert function at road-stream crossings. Current information on susceptibility of road failure and fish barrier concerns is limited. An opportunity exists to work through the South Coast Watershed Council (SCWC) to provide crews to inventory road-stream crossings. Another identified opportunity with SCWC includes coordination with private landowners along the floodplain in the lower watershed and ODFW to survey for the presence of western pond turtle nesting sites. This coordination will help facilitate protection of critical habitat.

In the lower reach of Hunter Creek, ODFW has conducted stream bottom scour studies to determine the level of channel scour during high flow events. However, insufficient data points are available to present conclusions. Considering the alteration of floodplain function in the lower watershed, annual scour has likely increased which represents spawning gravel stability concerns. It is recommended that ODFW continue with the channel scour study to determine the effects of bed mobilization on spawning success.

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Appendix A

List of People Contacted

List of people consulted:

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Jerry Wilks	Forest Service
David Pivorunas	Forest Service
Lee Webb	Forest Service
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Dale Stewart	BLM
John Toman	ODFW
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Jennifer Dwyer	Lower Rogue Watershed Council
Harry Hoogesteger	
and other private landowners	South Coast Watershed Council

Appendix B

B.1 Late Successional Forest 1940

B.2 Vegetation Structural Stands by WAA

B.1 Late Successional Forest 1940

Watershed Analysis Area	Late Successional Forest(acres)	% of WAA
06L01F	204	26%
06L02F	243	20%
06L03F	858	62%
06L04F	1012	58%
06L05F	1428	60%
06L06W	715	87%
06L07W	439	71%
06L08W	244	17%
06L09W	841	49%
Lower Hunter Creek	5984	49%
06M01F	135	4%
06M02W	82	14%
06M03W	49	7%
06M04F	965	53%
06M05W	538	39%
06M06W	630	55%
Hunter Creek	2399	28%
06N	584	29%
06N01W	66	6%
06N02W	260	40%
North Fork Hunter Creek	910	[illegible]
06S	488	31%
06S01W	94	13%
06S02W	499	31%
Big South Fork	1081	[illegible]
Total	**10,375**	**37%**

B.2 Current Forest Structural Stages

Watershed Analysis Area	Non-Forest/No Data (acres)	Pioneer (acres)	Early Seral (acres)	Mid Seral (acres)	Late Seral (acres)	Climax (acres)
06L01F	246	32	261	235	0	0
06L02F	489	45	689	0	0	0
06L03F	217	242	905	50	0	0
06L04F	236	159	1340	4	0	0
06L05F	106	528	1598	128	13	0
06L06W	11	117	697	0	0	0
06L07W	0	25	558	36	0	0
06L08W	149	385	755	139	0	0
06L09W	19	55	1588	21	16	0
Lower Hunter Cr.	1473	1588	8391	613	29	0
06M01F	195	584	1725	491	4	0
06M02W	3	283	94	135	70	0
06M03W	2	225	91	306	44	0
06M04F	22	461	332	858	135	0
06M05W	10	141	197	816	231	0
06M06W	14	324	246	512	46	0
Hunter Creek	246	2018	2685	3118	530	0
06N	81	445	1081	322	81	11
06N01W	65	302	358	314	105	0
06N02W	16	83	396	155	2	0
N. F. Hunter Cr.	162	830	1835	791	188	11
06S	4	316	1193	55	0	0
06S01W	330	120	259	0	0	0
06S02W	37	825	579	100	62	0
Big South Fork	371	1261	2031	155	62	0
Total	**2253**	**5697**	**14,942**	**4677**	**809**	**11**

Appendix C

C.1 Species of Concern Designation and Occurrence

C.2 Suitable Habitat and Availability for Federal and State Listed Species

C.3 Suitable Habitat and Availability for State Sensitive Species

C.4 Suitable Habitat and Availability for Presidents Forest Plan Species

C.5 Suitable Habitat and Availability for Regional Forester's Designated Species

C.6 Suitable Habitat and Availability for Siskiyou N.F LRMP Indicator Species

C.7 Elk Thermal Cover

C.8 Elk Avoidance Areas

C.9 Summary of habitat associations for Neotropical Migratory Landbirds

C.1

Animal species of concern within the Hunter Creek watershed.

SPECIES	FEDERAL STATUS 1/ LE	L T	C>	STATE STATUS 2/ LE	LT	SC	SV	SP	SU	3/ SV	4/ R6	5/ MI	6/ N C	7/ O C
Kingfisher, Belted *Ceryle alcyon*														●
Martin, Purple *Progne subis*						●								●
Meadowlark, Western *Sturnella neglecta*														○
Murrelet, Marbled *Brachyramphus marmoratus*		●												●
Osprey *Pandion haliaetus*												●		●
Owl, Spotted *Strix occidentalis*		●										●		○
Pigeon, Band-tailed *Columba fasciata*														●
Pygmy-Owl, Northern *Glaucidium gnoma*														●
Sapsucker, Red-breasted *Sphyrapicus ruber*												●		●
Sparrow, Chipping *Spizella passerina*														●
Sparrow, White-crowned *Zonotrichia leucophrys*														●
Swallow, Barn *Hirundo rustica*														●
Swallow, Violet-green *Tachycineta thalassina*														●
Swift, Black *Cypseloides niger*								●						○
Swift, Vaux's *Chaetura vauxi*														○
Tanager, Western *Piranga rubra*														●
Thrush, Swainson's *Catharus ustulatus*														●
Thrush, Varied *Ixoreus naevius*														○
Vulture, Turkey *Cathartes aura*														●
Warbler, Hermit *Dendroica occidentalis*														●
Warbler, Orange-crowned *Vermivora celata*														●
Warbler, Townsend's *Dendroica townsendi*														○
Warbler, Wilson's *Wilsonia pusilla*														●
Wood-Pewee, Western *Contopus sordidulus*														○
Woodpecker, Acorn *Melanerpes formicivorus*												●		○

C.1
Animal species of concern within the Hunter Creek watershed.

SPECIES	FEDERAL STATUS 1/ LE	L T	C>	STATE STATUS 2/ LE	LT	SC	SV	SP	SU	3/ SV	4/ R6	5/ MI	6/ N C	7/ O C
Woodpecker, Downy *Picoides pubescens*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Woodpecker, Hairy *Picoides villosus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Woodpecker, Lewis's *Melanerpes lewis*	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]	○
Woodpecker, Pileated *Dryocopus pileatus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Woodpecker, White-headed *Picoides albolarvatus*	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	●	[redacted]	●	[redacted]	○
FISH														
Salmon, Chinook (fall) *Onchorynchus tshawytscha*	[redacted]	●	[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]	●	[redacted]	●
Salmon, Coho *Onchorynchus kisutch*	[redacted]	●	[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]	●
Steelhead, Klamath Mountains *Onchorynchus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Trout, Cutthroat (resident) *Onchorynchus clarki clarki*	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]	●	[redacted]	●
MAMMALS														
Bat, Silver-haired *Lasionycteris noctivagans*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	○
Bat, Townsend's Big-eared *Plecotus townsendii*	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]	●
Deer, Black-tailed *Odocoileus hemionus columbianus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Elk *Cervus elaphus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Fisher *Martes pennanti*	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]	○
Marten, American *Martes americana*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Myotis, Long-eared *Myotis evotis*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	○
Myotis, Long-legged *Myotis volans*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	
Myotis, Yuma *Myotis yumanensis*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Ringtail *Bassariscus astutus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Shrew, Fog *Sorex sonomae*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Squirrel, Western Gray *Sciurus griseus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Vole, Red Tree *Phenacomys longicaudus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	○
Vole, White-footed *Phenacomys albipes*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○

C.1

Animal species of concern within the Hunter Creek watershed.

SPECIES	FEDERAL STATUS 1/ LE	LT	C>	STATE STATUS 2/ LE	LT	SC	SV	SP	SU	3/ SV	4/ R6	5/ MI	6/ NC	7/ OC
Wolverine *Gulo gulo*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
MOLLUSKS														
Megomphix, Oregon *Megomphix hemphilli*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	○
Tail-dropper, Blue-grey *Prophysaon coeruleum*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	○
Tail-dropper, Papillose *Prophysaon dubium*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	○
REPTILES														
Kingsnake, California Mountain *Lampropeltis zonata*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Snake, Sharptail *Contia tenuis*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Turtle, Western Pond *Clemmys marmorata*	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]	●

1/ Federal designations by the U.S. Fish & Wildlife Service or National Marine Fisheries Service (Oregon Natural Heritage Program 1995):
LE = Listed as Endangered
LT = Listed asThreatened
C> = Candidate for listing or Species of Concern classification when the next Candidate Notice of Review is published.

2/ State designations by the Oregon Department of Fish & Wildlife (Oregon Natural Heritage Program 1995):
LE = Listed as Endangered
LT = Listed asThreatened
SC = Sensitive - Critical. (Listing as endangered or threatened is pending, or may be appropriate if immediate conservation actions are not taken.)
SV = Sensitive - Vulnerable. (Listing as endangered or threatened is not imminent, and can be avoided through continued or expanded use of adequate protective measures and monitoring.)
SP = Sensitive - Peripheral or Naturally Rare. (Oregon populations are on the edge of the species range, or are historically few in number because of naturally-limiting factors.)
SU = Sensitive - Undetermined. (Status is unclear, so scientific study is required before a judgement can be made.)

3/ SEIS survey & manage species (USDA Forest Service and USDI Bureau of Land Management 1994)

4/ Regional Forester-designated sensitive species (USDA Forest Service 1989; Williams 1997)

5/ Siskiyou N.F. Land & Resource Plan-designated management indicator species (USDA Forest Service 1989)

6/ Neotropical migrant landbirds of management, research, or monitoring concern (Andelman & Stock 1994)

7/ Occurrence within the Hunter Creek watershed.
● = Documented
○ = Suspected

C.1
Animal species of concern within the Hunter Creek watershed.

SPECIES	FEDERAL STATUS 1/ LE	L T	C>	STATE STATUS 2/ LE	LT	SC	SV	SP	SU	3/ SV	4/ R6	5/ MI	6/ N C	7/ O C
AMPHIBIANS														
Frog, Foothill Yellow-legged ***Rana boylei***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Frog, Red-legged ***Rana aurora***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Frog, Tailed ***Ascaphus truei***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Salamander, California Slender ***Batrachoseps attenuatus***	[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]	●
Salamander, Clouded ***Aneides ferreus***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Salamander, Del Norte ***Plethodon elongatus***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]	●
Salamander, Southern Torrent ***Rhyacotriton variegatus***	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]	●
Toad, Western ***Bufo boreas***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
BIRDS														
Bluebird, Western ***Sialia mexicana***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Bufflehead ***Bucephala albeola***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Dove, Mourning ***Zenaida macroura***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Eagle, Bald ***Haliaeetus leucocephalus***	[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Falcon, Peregrine ***Falco peregrinus***	[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Flicker, Northern ***Colaptes auratus***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]	●
Flycatcher, Olive-sided ***Contopus cooperi***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Goldfinch, American ***Carduelis tristis***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Goose, Aleutian Canada ***Branta canadensis leucopareia***	[redacted]	●	[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Goshawk, Northern ***Accipiter gentilis***	[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]		[redacted]	●
Grebe, Horned ***Podiceps auritus***	[redacted]		[redacted]		[redacted]		[redacted]	●	[redacted]		[redacted]		[redacted]	○
Hummingbird, Rufous ***Selasphorus rufus***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Junco, Dark-eyed ***Junco hyemalis***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●
Kestrel, American ***Falco sparverius***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	○
Killdeer ***Charadrius vociferus***	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●

C.2

Primary habitat associations and acres of estimated suitable habitat for *federal or state listed animal species* of concern within the Hunter Creek watershed.

	NONFOREST 1/					FOREST 2/					SUITABLE	%
SPECIES	A	G	R	S	W	PI	ES	MS	LS	CX	HABITAT	AREA
BIRDS												
Eagle, Bald *Haliaeetus leucocephalus*	■		■		■		■		■	●	14	<1
Falcon, Peregrine *Falco peregrinus*	■		■		■		■		■		<20	<1
Goose, Aleutian Canada *Branta canadensis leucopareia*	■		■		■		■		■		202	<1
Murrelet, Marbled *Brachyramphus marmoratus*	■		■		■		■		■	●	819	3
Owl, Spotted *Strix occidentalis*	■		■		■		■		■	●	3,765	13
MAMMALS												
Wolverine *Gulo gulo*	■	●	■		■		■	●	■	●	6,016	21

1/ **Nonforest Habitats:**

A = Agriculture
G = Grass
R = Rock
S = Shrub
W = Water

2/ **Forest Habitats:**

CX = Climax
ES = Early-seral
LS = Late-seral
MS = Mid-seral
PI = Pioneer

C.3

Primary habitat associations and acres of estimated suitable habitat for *state sensitive animal species* of concern within the Hunter Creek watershed.

SPECIES	NONFOREST 1/ A	G	R	S	W	FOREST 2/ PI	ES	MS	LS	CX	SUITABLE HABITAT	% AREA
AMPHIBIANS												
Frog, Foothill Yellow-legged *Rana boylei*	■		■		■		■		■		2,228	8
Frog, Red-legged *Rana aurora*	■		■		■		■		■		2,228	8
Frog, Tailed *Ascaphus truei*	■		■		■		■		■		2,228	8
Salamander, California Slender *Batrachoseps attenuatus*	■		■		■		■	●	■	●	20,418	72
Salamander, Clouded *Aneides ferreus*	■		■		■		■	●	■		19,614	69
Salamander, Del Norte *Plethodon elongatus*	■		■		■		■		■		74	<1
Salamander, Southern Torrent *Rhyacotriton variegatus*	■		■		■		■		■		2,228	8
Toad, Western *Bufo boreas*	■		■		■		■	●	■		19,624	69
BIRDS												
Bluebird, Western *Sialia mexicana*	■	●	■	●	■	●	■		■		22,032	78
Bufflehead *Bucephala albeola*	■		■		■		■		■		10	<1
Goshawk, Northern *Accipiter gentilis*	■		■		■		■	●	■	●	5,479	19
Martin, Purple *Progne subis*	■		■		■	●	■		■		5,684	20
Pygmy-Owl, Northern *Glaucidium gnoma*	■		■		■		■		■	●	804	3
Swift, Black *Cypseloides niger*	■		■		■		■		■		<20	<1
Woodpecker, Lewis's *Melanerpes lewis*	■		■		■		■		■	●	804	3
Woodpecker, Pileated *Dryocopus pileatus*	■		■		■		■	●	■	●	5,467	19
Woodpecker, White-headed *Picoides albolarvatus*	■		■		■		■		■	●	804	3
MAMMALS												
Bat, Silver-haired *Lasionycteris noctivagans*	■		■		■		■		■	●	11	<1
Bat, Townsend's Big-eared *Plecotus townsendii*	■		■		■		■		■		74	<1
Fisher *Martes pennanti*	■		■		■		■		■	●	804	3
Marten, American *Martes americana*	■		■		■		■	●	■	●	5,467	19
Myotis, Fringed *Myotis thysanodes*	■		■		■		■		■		74	<1
Myotis, Long-eared *Myotis evotis*	■		■		■		■		■	●	11	<1
Myotis, Long-legged *Myotis volans*	■		■		■		■		■	●	804	3

Primary habitat associations and acres of estimated suitable habitat for *state sensitive animal species* of concern within the Hunter Creek watershed.

	NONFOREST 1/					FOREST 2/					SUITABLE	%
SPECIES	**A**	**G**	**R**	**S**	**W**	**PI**	**ES**	**MS**	**LS**	**CX**	**HABITAT**	**AREA**
Myotis, Yuma *Myotis yumanensis*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	•	804	3
Ringtail *Bassariscus astutus*	[redacted]	•	[redacted]	•	[redacted]	•	[redacted]		[redacted]		22,106	78
Shrew, Fog *Sorex sonomae*	[redacted]	•	[redacted]		[redacted]		[redacted]		[redacted]	•	2,228	8
Squirrel, Western Gray *Sciurus griseus*	[redacted]		[redacted]		[redacted]		[redacted]	•	[redacted]	•	5,479	19
Vole, White-footed *Phenacomys albipes*	[redacted]		[redacted]		[redacted]		[redacted]	•	[redacted]		1,211	4
REPTILES												
Kingsnake, California Mountain *Lampropeltis zonata*	[redacted]		[redacted]	•	[redacted]		[redacted]	•	[redacted]		20,378	72
Snake, Sharptail *Contia tenuis*	[redacted]	•	[redacted]	•	[redacted]	•	[redacted]		[redacted]		22,032	78
Turtle, Western Pond *Clemmys marmorata*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		10	<1

1/ Nonforest Habitats:

A = Agriculture
G = Grass
R = Rock
S = Shrub
W = Water

2/ Forest Habitats:

CX = Climax
ES = Early-seral
LS = Late-seral
MS = Mid-seral
PI = Pioneer

C.4

Primary habitat associations and acres of estimated suitable habitat for *President's plan survey & manage animal species* of concern within the Hunter Creek watershed.

SPECIES	NONFOREST 1/ A	G	R	S	W	FOREST 2/ PI	ES	MS	LS	CX	SUITABLE HABITAT	% AREA
AMPHIBIANS												
Salamander, Del Norte *Plethodon elongatus*	■		■		■		■		■		74	<1
BIRDS												
Woodpecker, White-headed *Picoides albolarvatus*	■		■		■		■		■	●	804	3
MAMMALS												
Bat, Silver-haired *Lasionycteris noctivagans*	■		■		■		■		■	●	11	<1
Myotis, Long-eared *Myotis evotis*	■		■		■		■		■	●	11	<1
Myotis, Long-legged *Myotis volans*	■		■		■		■		■	●	804	3
Vole, Red Tree *Phenacomys longicaudus*	■		■		■		■	●	■	●	5,479	19
MOLLUSKS												
Megomphix, Oregon *Megomphix hemphilli*	■		■		■		■	●	■	●	?	
Tail-dropper, Blue-grey *Prophysaon coeruleum*	■		■		■		■	●	■	●	?	
Tail-dropper, Papillose *Prophysaon dubium*	■		■		■		■	●	■	●	?	

1/ **Nonforest Habitats:**

A = Agriculture
G = Grass
R = Rock
S = Shrub
W = Water

2/ **Forest Habitats:**

CX = Climax
ES = Early-seral
LS = Late-seral
MS = Mid-seral
PI = Pioneer

C.5

Primary habitat associations and acres of estimated suitable habitat for *Regional Forester-designated sensitive animal species* of concern within the Hunter Creek watershed.

	NONFOREST 1/					FOREST 2/					SUITABLE	%
SPECIES	**A**	**G**	**R**	**S**	**W**	**PI**	**ES**	**MS**	**LS**	**CX**	**HABITAT**	**AREA**
AMPHIBIANS												
Frog, Red-legged *Rana aurora*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		2,228	8
Salamander, Del Norte *Plethodon elongatus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		74	<1
BIRDS												
Eagle, Bald *Haliaeetus leucocephalus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	14	<1
Falcon, Peregrine *Falco peregrinus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		<20	<1
Goose, Aleutian Canada *Branta canadensis leucopareia*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		202	<1
Murrelet, Marbled *Brachyramphus marmoratus*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	819	3
Owl, Spotted *Strix occidentalis*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	3,765	13
MAMMALS												
Bat, Townsend's Big-eared *Plecotus townsendii*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		74	<1
Vole, White-footed *Phenacomys albipes*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	●	804	3
Wolverine *Gulo gulo*	[redacted]	●	[redacted]		[redacted]		[redacted]	●	[redacted]	●	6,016	21
REPTILES												
Kingsnake, California Mountain *Lampropeltis zonata*	[redacted]		[redacted]	●	[redacted]		[redacted]	●	[redacted]		20,378	72
Kingsnake, Common *Lampropeltis getulus*	[redacted]	●	[redacted]	●	[redacted]	●	[redacted]		[redacted]		22,032	78
Turtle, Western Pond *Clemmys marmorata*	[redacted]		[redacted]		[redacted]		[redacted]		[redacted]		10	<1

1/ **Nonforest Habitats:**

A = Agriculture
G = Grass
R = Rock
S = Shrub
W = Water

2/ **Forest Habitats:**

CX = Climax
ES = Early-seral
LS = Late-seral
MS = Mid-seral
PI = Pioneer

C.6

Primary habitat associations and acres of estimated suitable habitat for Siskiyou N.F. Land & Resource Management Plan indicator animal species of concern within the Hunter Creek watershed.

SPECIES	NONFOREST 1/					FOREST 2/					SUITABLE	%
	A	G	R	S	W	PI	ES	MS	LS	CX	HABITAT	AREA
BIRDS												
Eagle, Bald *Haliaeetus leucocephalus*										●	14	<1
Flicker, Northern *Colaptes auratus*		●		●		●		●		●	28,256	100
Osprey *Pandion haliaetus*								●		●	14	<1
Owl, Spotted *Strix occidentalis*										●	3,765	13
Sapsucker, Red-breasted *Sphyrapicus ruber*										●	804	3
Woodpecker, Acorn *Melanerpes formicivorus*										●	804	3
Woodpecker, Downy *Picoides pubescens*										●	155	<1
Woodpecker, Hairy *Picoides villosus*										●	804	3
Woodpecker, Pileated *Dryocopus pileatus*								●		●	5,467	19
Woodpecker, White-headed *Picoides albolarvatus*										●	804	3
MAMMALS												
Deer, Black-tailed *Odocoileus hemionus columbianus*		●		●		●		●		●	28,256	100
Elk *Cervus elaphus*		●		●		●		●		●	28,256	100
Marten, American *Martes americana*								●		●	5,467	19

1/ **Nonforest Habitats:**

A = Agriculture
G = Grass
R = Rock
S = Shrub
W = Water

2/ **Forest Habitats:**

CX = Climax
ES = Early-seral
LS = Late-seral
MS = Mid-seral
PI = Pioneer

C.7

Current acres of *elk cover and forage* within the Hunter Creek watershed.

SUBWATERSHED	AREA ACRES	OPTIMAL THERMAL COVER	THERMAL COVER	HIDING COVER	FORAGE
06L01F	774	0	0	621	62
06L02F	1,223	0	0	696	95
06L03F	1,415	0	0	965	242
06L04F	1,739	0	0	1,344	253
06L05F	2,372	0	128	1,662	550
06L06W	826	0	0	698	117
06L07W	620	0	36	559	25
06L08W	1,429	0	137	816	464
06L09W	1,708	16	21	1,596	73
Lower Hunter Creek	12,106	16	322	8,957	1,881
06M01F	3,001	4	321	1,983	659
06M02W	585	70	67	164	260
06M03W	669	44	76	322	225
06M04F	1,808	91	411	814	457
06M05W	1,395	226	712	307	132
06M06W	1,141	38	329	436	324
Hunter Creek	8,599	473	1,916	4,026	2,057
06N	2,022	81	245	1,178	514
06N01W	1,143	105	168	553	314
06N02W	653	2	155	401	95
N Fk Hunter Creek	3,818	188	568	2,132	923
06S	1,568	0	55	1,193	317
06S01W	709	0	0	590	119
06S02W	1,604	54	72	637	840
Big South Fork	3,881	54	127	2,420	1,276
TOTAL	28,404	731	2,933	17,535	6,137

C.8

Open road density **and associated** ***elk avoidance area*** **within the Hunter Creek watershed.**

SUBWATERSHED	AREA ACRES	OPEN ROAD MILES 2/	OPEN ROAD MILES/SQ. MILE	ACRES OF ELK AVOIDANCE 1/	% AREA ACRES
06L01F	774	3.47	2.87	414	53
06L02F	1,223	10.45	5.47	1,223	100
06L03F	1,415	5.23	2.37	624	44
06L04F	1,739	3.41	1.26	407	23
06L05F	2,372	4.75	1.28	567	24
06L06W	826	1.84	1.43	220	27
06L07W	620	0.71	0.73	85	14
06L08W	1,429	2.80	1.25	334	23
06L09W	1,708	2.71	1.02	323	19
Lower Hunter Creek	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
06M01F	3,001	2.38	0.51	284	9
06M02W	585	2.23	2.44	266	45
06M03W	669	1.19	1.14	142	21
06M04F	1,808	10.72	3.79	1,279	71
06M05W	1,395	5.55	2.55	662	47
06M06W	1,141	7.88	4.42	928	81
Hunter Creek	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
06N	2,022	1.56	0.49	186	9
06N01W	1,143	1.70	0.95	203	18
06N02W	653	0.01	0.01	1	0
[illegible] Hunter Creek	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
06S	1,568	3.12	1.27	372	24
06S01W	709	0.19	0.17	23	3
06S02W	1,604	4.55	1.81	543	34
[illegible] South Fork	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	28,404	76.45	1.77	9,086	32

1/ Avoidance zone of 150 meters on each side of open roads, from Cole 1996.
2/ Includes roads open all year

C.9

Primary habitats and management recommendations for *neotropical migratory landbirds* of management or research concern within the Hunter Creek watershed. 1/

SPECIES	CM	CP	CS	MM	MP	MS	ES	FW	RP	MD	CL	MANAGEMENT 3/
	HABITATS 2/											
Dove, Mourning *Zenaida macroura*			●			●			●			Thin forest stands (particularly drier plant series) to increase tree spacing and encourage seed-producing, low-growing vegetation.
Flycatcher, Olive-sided *Contopus borealis*	●	●		●	●	●						Use selective tree harvest rather than clearcut. Retain snags for perching.
Goldfinch, American *Carduelis tristis*									●			Maintain open forest canopy and deciduous trees or tall shrubs near water. Discourage presence of brown-headed cowbird via control of livestock.
Hummingbird, Rufous *Selasphorus rufus*	●	●	●	●	●	●			●	●		Encourage wildflowers as hummingbird food source by keeping meadows free of tree invasion, and by including desirable native flowers in erosion control seedings.
Junco, Dark-eyed *Junco hyemalis*	●	●	●	●	●	●			●			Maintain open coniferous forest with shrubby understory. Retain logging slash.
Kestrel, American *Falco sparverius*									●	●		Retain snags — especially with existing cavities — in forest openings for primary cavity excavators, or introduce and maintain nest boxes. Minimize pesticide use.
Killdeer *Charadrius vociferus*							●	●	●	●		Provide areas of bare ground or very short plant stubble in riparian habitat or upland areas near standing water.
Kingfisher, Belted *Ceryle alcyon*							●	●	●			Protect vertical banks of friable soil within 1 mile of fish-bearing streams as prospective nest sites.
Meadowlark, Western *Sturnella neglecta*										●		Maintain natural openings with short grass stubble (e.g. grassland & meadow).

C.9

Primary habitats and management recommendations for *neotropical migratory landbirds* of management or research concern within the Hunter Creek watershed. 1/

SPECIES	CM	CP	CS	MM	MP	MS	ES	FW	RP	MD	CL	MANAGEMENT 3/
					HABITATS 2/							
Pigeon, Band-tailed *Columba fasciata*		●		●		●						Protect known nest sites or mineral deposits from exploitation, noise, and human presence during occupancy. Encourage nut- or berry-producing plant species such as elderberry, chokecherry, hazelnut, salmonberry, tanoak, or madrone.
Sparrow, Chipping *Spizella passerina*		●		●						●		Maintain open forest uplands or deciduous tree riparian areas with shrub understory.
Sparrow, White-crowned *Zonotrichia leucophrys*										●		Maintain open forest uplands or deciduous tree riparian areas with shrub understory.
Swallow, Barn *Hirundo rustica*												Minimize human disturbance and maintain mud sources at rocky cliffs, bridges, or buildings already used as colonial nest sites. Retrofit bridges and buildings with structure that increases nest-building surfaces.
Swallow, Violet-green *Tachycineta thalassina*		●		●				●				Retain snags with existing cavities in open forest or forest clearings, and provide/maintain nest boxes in snag-deficient but otherwise suitable habitat.
Swift, Vaux's *Chaetura vauxi*				●								Retain large, broken, hollow snags or live trees for nesting or roosting.
Tanager, Western *Piranga rubra*		●		●								--
Thrush, Swainson's *Catharus ustulatus*		●		●		●						Maintain mature or old growth forest conditions — especially with shrubs — or moist, shrubby, riparian habitats with willow or alder. May be sensitive to habitat fragmentation and minimum patch size.
Thrush, Varied *Ixoreus naevius*		●		●								Maintain dense forest canopy with herbaceous ground cover.

C.9

Primary habitats and management recommendations for *neotropical migratory landbirds* of management or research concern within the Hunter Creek watershed. 1/

SPECIES	CM	CP	CS	MM	MP	MS	ES	FW	RP	MD	CL	MANAGEMENT 3/
	HABITATS 2/											
Vulture, Turkey *Cathartes aura*		●		●		●		●		●		Provide protection from disturbance around known nesting or communal roosting sites.
Warbler, Hermit *Dendroica occidentalis*				●								Maintain open coniferous forest with scattered large trees.
Warbler, Orange-crowned *Vermivora celata*						●						Maintain mesic, deciduous shrub thickets — especially on north aspects — avoiding closed overhead forest canopy. May be sensitive to habitat fragmentation and patch size.
Warbler, Townsend's *Dendroica townsendii*												Maintain multiple-canopy, mature and old growth fir or mixed conifer forest.
Warbler, Wilson's *Wilsonia pusilla*		●		●		●						Discourage presence of brown-headed cowbird via control of livestock or minimal openings in overhead canopy.
Wood-Pewee, Western *Contopus sordidulus*		●										Maintain open forest canopy. Sensitive to forest fragmentation and patch size.

1/ Designation from Andelman & Stock 1994.

2/ Habitat associations from Andelman & Stock 1994:

- CL = Cliff or rock outcrop.
- CM = Mature or old growth coniferous forest (closed canopy stand >100 years of age).
- CP = Sapling or pole-sized coniferous forest (closed canopy stand <100 years of age).
- CS = Unstocked clearcut, seedling stand, or shrubby opening within coniferous forest or potentially-forested area.
- ES = Estuary or mudflat where fresh water meets ocean.
- FW = Freshwater (shrubby or other-vegetated bog, marsh, or similar wetland associated with standing water).
- MD = Wet or dry meadow.
- MM = Mature or old growth mixed conifer and mixed evergreen forest (closed canopy stand >100 years of age).
- MP = Sapling or pole-sized mixed conifer and mixed evergreen forest (closed canopy stand <100 years of age).
- MS = Unstocked clearcut, seedling stand, or shrubby opening within mixed conifer and mixed evergreen forest or potentially-forested area.
- RP = Riparian woodland, shrubland, or other-vegetated area associated with moving (occasionally standing) water.

3/ Management recommendations from Dobkin 1994, Marshall et al. 1996, and Sharp 1992.

Appendix D

Hydrology Method

Method

The Hunter Creek Watershed was divided into four 6th field watersheds (Big South Fork, North Fork, Upper Hunter, and Lower Hunter). These four were further divided into 21 hydrologic units or Watershed Analysis Areas (WAAs). Each WAA is investigated for the potential of flow alteration, following the module outlined below. The units are then combined into the subbasins for determination of potential flow alteration at the 6th field level.

Cumulative Effects Analysis

In developing a conceptual model and forming assumptions for factors leading to changes in flow regime, research conducted in western Oregon and northern California (e.g., Harr et al. 1979; Harr 1975; Harr et al. 1975; Keppeler et al. 1990; Wright et al. 1990; Jones et al. 1996; Wemple et al. 1996) was used. A summary of the key findings is described below:

- Storms produced higher peak discharges and increased volume when 25–30 percent of drainage is in clear-cut condition.
- Mean daily peak flows increased.
- Number of low flow days decreased
- Loss of transpiration accounted for 2/3 of the change in flow with 1/3 from loss of interception.
- Road network increased drainage density altering flow routing efficiency.
- Elevated peak flows decreased rapidly after year 6, but remained altered for 20-30 years.

Using this background data, a hydrologic module was developed.

The net effect of a decrease in evapotranspiration, canopy interception, and road development was assumed to be most influential in altering quick flow and peak discharge. The fundamental concepts underlying these assumptions are: loss of transpiration allows quicker recharge of soil, reduction in canopy closure will reduce interception, and the presence of roads add to the drainage network. "Net effect" was chosen because all three factors are simultaneously involved. Consequently, determining the relative contribution of any one variable is not significant.

Equivalent Clearcut Method (ECA)

The assumptions focus the cumulative effects analysis on road densities and recovery rates of harvested units. Recovered in this analysis is considered to be "hydrologically recovered."

Harvest units are hydrologically recovered when re-establishment of leaf area is sufficient to return transpiration rates to pre-harvest levels and canopy closure is sufficient to provide interception. The leaf area index is the ideal variable to quantify to express recovery; however, considering the mixed ownership and availability of data, vegetation structure was used as a surrogate. Vegetation structure information coverage is consistent across all ownerships.

To standardize the data and facilitate comparisons among watersheds, hydrologic recovery is expressed in terms of ECA. ECA is determined from vegetation structure data. Roads and areas of compaction are considered unrecovered in the recovery model as these conditions persist for long periods of time.

The vegetative recovery period for the Hunter Creek watershed geographic area is considered to be 25 years. Temporally, the maximum increase in streamflow response generally occurs the first five years following harvest. Keppeler et al. (1990), found increased water yields diminished with revegetation, with annual flows returning to pretreatment levels within four-to-five years. Jones et al. (1996), found increases in average peak discharge declined significantly after year six.

The module examines the two dominant time periods of timber harvest in the Hunter Creek Watershed, 1955 to 1965 and from 1980 to 1995. The former group has developed into early seral stage and is considered recovered. Aerial photographs of Hunter Creek indicate as stands develop from pioneer to early seral stage they move into the 70-100 percent canopy closure class (CCc). Stand age of this transition is estimated at 20-25 years old. The latter group is classified as pioneer structural stage. Given the age range of cuts in the 1980 to 1995 group, a mean age of eight years is assumed.

A percent recovery coefficient is assigned to the six vegetative categories:

Vegetation Type	Recovery Coefficient
Non forest (rock, water, grass)	1.00
Agriculture	0.00
Development (Including roads)	0.00
Pioneer	0.4
Early seral	1.00
Mid seral	1.00
Late seral	1.00

Non-forest is considered fully recovered as this group is assumed unchanged from reference conditions. Agriculture and development received a zero recovery value as the soil runoff coefficients have increased due to compaction, creating an impervious surface layer. As previously mentioned, age eight is assumed to be the mean age of vegetation within the pioneer class. At age 8, a 40 percent recovery value is assigned. Even though from an age perspective, recovery is approximately 30 percent, due to the exponential nature of recovery early in the regrowth process, a slightly higher recovery value is awarded.

Limitations

It is recognized that in certain watersheds, ultramafic soils are responsible for the pioneer vegetation condition. Many of these same areas have also been harvested. Therefore, it is difficult to determine the relative contribution between natural versus management factors responsible for the early vegetation development. In WAA's where ultramafic soils are responsible for the pioneer vegetation structure ECA acres are overestimated; this stage represents reference conditions. However, these areas are identified with aerial photographs and are noted in the interpretation text.

The following analysis is not intended to quantify the magnitude of change in stream flow from management activities. Rather, it is a tool to translate past and present research into management considerations. Specifically, the analysis is designed to give a picture of the potential effects given the magnitude of disturbances within the watershed.

In assigning the same recovery values to each vegetative stand, the WAA ECA results are relative. The analysis is designed to compare vegetative recovery between watersheds and not to give an absolute number; the results are intended to highlight hydrologically sensitive areas.

Appendix E

Road Conditions

HUNTER CREEK WATERSHED ROAD LIST — USFS LANDS

System Road #	Length Miles	Open/ Closed	Maint. Level	Road Condition	Road Surface	Notes
3680	9.00	open	3	3-L	Aggregate	From end of county road to Jct w/ 3313
This road annually has major slide problems in Section 23, T.37S., R.14W.						
3680-190	3.04	open	2	3-L	Aggregate	High erosion hazard for 300 feet along Hunter Creek
3680-191	0.22	open	2	3-L	Aggregate	
3680-192	0.08	open	2	2-L	Aggregate	
3680-193	0.78	closed	1	2-L	Aggregate	
3680-195	2.30	open	2	5-M	Aggregate	FS plans to close for POC
3680-196	0.13	closed	2	5-M	Aggregate	
3680-197	0.10	open	1	2-L	Aggregate	Not in TMS
3680-200	1.40	open	2	3-M	Aggregate	Road is close to Elko Creek.
This road has a limited strength bridge and has road runoff problems near the end.						
3680-202	0.40	open	2	2-L	Aggregate	
3680-204	0.47	open	2	4-L	Aggregate	
3680-205	0.56	open	1	4-L	Natural	
3680-207	0.17	open	1	3-L	Natural	
3680-210	1.06	open	2	3-L	Aggregate	
3680-220	1.34 0.50	closed	2 1	2-L 5-L	Aggregate Natural	Needs waterbars & blocked at end Naturally decommisioning, needs waterbars
3680-230	0.67	open	2	3-M	Aggregate	Close to creek for first few stations
3680-270	0.75	open	2	2-L	Aggregate	
3680-280	1.18	open	2	3-L	Aggregate	In need of minor repair, channeling in roads Many spurs off of this road - all are grassed over ok
3680-281	0.28	open	2	2-L	Aggregate	
3680-282	0.26	open	2	3-L	Aggregate	In need of minor maintenance to prevent water from channeling in the road
3680-4WD1	0.70	open	1	3-L	Aggregate	In SESW of Section 8 Good waterbars
3680-4WD2	0.70	closed	1	3-L	Aggregate	In NENW of Section 7 Culvert has been removed, has healed well
3680-spur 1	0.10	open	1	4-M	Aggregate	In SESW of Section 8 Runs down to Hunter Creek
3680-spur 2	0.30 0.20	open open	1 1	2-L 2-L	Aggregate Natural	In SESE of Section 23, road natu Great view point
3680-spur 3	0.10	open	2	2-L	Aggregate	Road to Pine Point picnic area
1503	3.40	open	3	3-L	Aggregate	3680 to 1503-070
1503-spur 1	0.20	open	1	3-L	Aggregate	Culvert for 1503 draining water onto spur
4WD-1	1.20	open	1	4-L		Ties Road 1703 to Road 3680 Some serious ruts & drainage problems
4WD-2	0.70	closed	1	5-M	Natural	Road to Family Fued claim, in poor shape - recommend fixing drainage problem and closing
1703	6.00	open	2	4-H	Aggregate	County road to boundry Some sloughing into creek-few potential problem areas
1703-118	0.20	open	1	1-L	Aggregate	
1703-189	0.20	closed	1	2-L	Aggregate	
1703-195	0.30	open	1	4-L	Natural	Road to pyramid rock Opportunity to close and turn into trail
1703-401	0.10	closed	1	2-L	Aggregate	Road in good shape except minor errosion in the ditch
1703-spur 1	0.10	open	1	4-L	Natural	Road to West mine
1703-spur 2	1.00	open	1	3-L	Natural	Red Flat - primitive road in good shape Many 4X4 roads in this area in good condition
1703-spur 3	0.20	open	1	4-L	Natural	In NWNW Section 16 Needs waterbars, could close
1703-spur 4	0.20	3-L	1	3-L	Aggregate	In SWSW Section 9
Total roads	40.59					

Road Condition Codes:

The numeral specifies erosion problem
- 1 = No erosion problems occuring
- 2 = Minor erosion occuring
- 3 = Moderate erosion occuring
- 4 = Substantial erosion occuring
- 5 = Major erosion occuring

The letter specifies the risk potential of significant sedimentation reaching a str
- L = Low Risk
- M = Moderate Risk
- H = High Risk

Appendix F

Vegetation Structure in Riparian Zones

[illegible]	Structure	Total Acres	Acres in NF and Pioneer	% Pioneer and NF
06L01F	NF	43	43	
	ES	18		
	MS	10		
	P	0		
06L01F Total		**71**	**43**	**61**
06L02F	NF	53	53	
	ES	22		
06L02F Total		**75**	**53**	**71**
06L03F	NF	45	58	
	ES	14		
	MS	3		
	P	13		
06L03F Total		**75**	**58**	**77**
06L04F	NF	60	60	
	ES	22		
	P	0		
06L04F Total		**82**	**60**	**73**
06L05F	NF	0	32	
	ES	76		
	MS	1		
	P	32		
06L05F Total		**109**	**32**	**29**
06L06W	NF	3	11	
	ES	0		
	P	8		
06L06W Total		**11**	**11**	**100**
06L07W	ES	8		
06L07W Total		**8**	**0**	**0**
06L08W	NF	1	9	
	ES	20		
	MS	1		
	P	8		
06L08W Total		**30**	**9**	**30**
06L09W	ES	44	3	

[illegible]	Structure	[illegible]	[illegible] NF and Plunger	[illegible] and NF
	P	3		
06L09W Total		**47**	**3**	**6**
06M01F	NF	14	94	
	ES	109		
	MS	50		
	P	80		
06M01F Total		**253**	**94**	**37**
06M02W	ES	10	72	
	LS	0		
	MS	38		
	P	72		
06M02W Total		**120**	**72**	**60**
06M03W	NF	2	37	
	ES	11		
	LS	13		
	MS	68		
	P	35		
06M03W Total		**129**	**37**	**29**
06M04F	NF	4	137	
	ES	50		
	LS	32		
	MS	183		
	P	133		
06M04F Total		**402**	**137**	**34**
06M05W	NF	1	36	
	ES	36		
	LS	78		
	MS	100		
	P	35		
06M05W Total		**250**	**36**	**14**
06M06W	NF	0	110	
	ES	20		
	LS	14		
	MS	76		
	P	110		
06M06W Total		**220**	**110**	**50**

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
06N	ES	47	17	
	LS	4		
	P	17		
06N Total		**68**	**17**	**25**
06N01W	NF	3	28	
	ES	8		
	LS	9		
	MS	39		
	P	25		
06N01W Total		**84**	**28**	**33**
06N02W	ES	11	8	
	MS	4		
	P	8		
06N02W Total		**23**	**8**	**35**
06S	ES	65	11	
	MS	0		
	P	11		
06S Total		**76**	**11**	**14**
06S01W	ES	0	4	
	P	4		
06S01W Total		**4**	**4**	**100**
06S02W	ES	33	24	
	LS	0		
	P	24		
06S02W Total		**57**	**24**	**42**
Grand Total		**2194**	**847**	**39**