Drift Creek (Alsea)
Watershed Analysis

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Siuslaw National Forest

This assessment was done in cooperation with the Bureau of Land Management, Salem District and the Siuslaw National Forest

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CHAPTER 1 CHARACTERIZATION

SETTING

Two miles east of Waldport, cradled within the Oregon Coast Range, lays the Drift Creek Watershed (Map 1). The close proximity and influence of the Pacific Ocean are reflected in the watersheds mild maritime climate. Summers are relatively warm and dry while winters are wet and mild. Most of the 80-90 inches of precipitation occurs as rainfall with some snowfall accumulation on Table Mountain.

This major tributary to the Alsea River contains 11 sub-watersheds and is approximately 43,160 acres in size (Map 2). Oval in shape, it lies in a southwest to northeast direction. Tyee Sandstone is the major formation that underlies the watershed. One other geologic unit is exposed in the watershed, an igneous intrusive sill at Table Mountain classified as a porphyritic nepheline syenite. Relatively resistant to erosion, this intrusion has resulted in Table Mountain being a dominate landform feature of the watershed.

Elevations range from a few feet above sea level to 2820 feet. Typical of the Tyee Sandstone formations, the watershed has short steep slopes, and high drainage densities with a dendritic pattern. Flood plains are narrow in the middle and lower portions of Drift Creek, while the northern portion has a relatively wide and well-developed flood plain.

Euro-American settlement in Drift Creek, which began in the 1890's and peaked around 1910, displaced the native Alsea people who claimed Drift Creek as part of their lands for about 3,000 years. Current residents live around the confluence's of Nettle, Gopher and Drift Creeks as well as the lower Drift Creek area adjacent to county road 702. While the native people and early European settlers depended on the watershed for subsistence, today's resident's primarily live there for the rural atmosphere. Daily commuting to work and school in other communities are common.

Coho salmon, winter steelhead, cutthroat trout, sculpins, dace, spring and fall chinook salmon have all been documented in the watershed. A variety of factors have contributed to significant declines in the wild fish populations of the watershed. These include settlement, past logging, road construction, hatchery management, ocean conditions and fish harvest levels. The American Fisheries Society identified spring chinook, coho, chum and winter steelhead as being at risk of extinction or of special concern (Nehlsen et al. 1991). The National Marine Fisheries Service has proposed coho salmon and steelhead for listing under the Endangered Species Act (ESA).

Approximately the eastern two thirds of the watershed lies within the Western Hemlock Zone (Map 3). The distribution and age class of the Douglas-fir dominated stands, reflect the disturbance history over the last 150 years. This includes both natural and human caused events such as wildfire, wind, homesteading and logging. Given enough time (400+ years) between major disturbances, western hemlock should eventually dominate most sites. The western one third of the watershed lies within the Sitka Spruce Zone.

Conifer recruitment along valley bottoms and stream courses has been retarded by the frequent disturbance history. Hardwoods, primarily red alder, currently dominate these sites.

There are 200 species of terrestrial vertebrates within the watershed. The US Fish and Wildlife Service listed two species, the northern spotted owl and marbled murrelet, as threatened under the Endangered Species Act. The loss of mature and old growth forest, along with fragmentation of the remaining suitable habitat is the primary limiting factor for these species.

LAND OWNERSHIP AND ALLOCATIONS

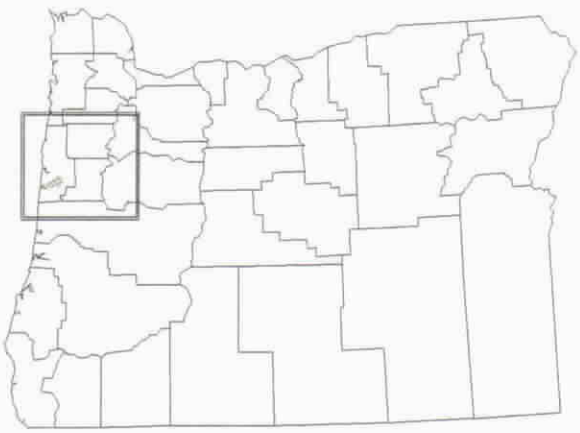
Federal ownership (68%) dominates the watershed (Map 4); however large corporations (Georgia-Pacific, Willamette Industries and Simpson Timber) own a significant portion (26%) of the lands in the watershed. Individual landowners or the State of Oregon owns the remaining land base.

Portions of the Drift Creek Watershed provide a unique legacy of intact, mature stands and remnant old growth forest. The establishment of the Flynn Creek Research Natural Area (1976), and the Drift Creek Wilderness (1984) provided the initial protection of natural systems within the watershed. Compared to the sub-alpine and alpine wilderness areas of the Cascades, visitors to the Drift Creek Wilderness experience a riverine temperate rain forest. Drift Creek is the largest Key Watershed in the Alsea basin as well as one of the larger ones within the Coast Range Province. It also contains the second largest mature landscape cell found within LSR RO268. The elements of wilderness, RNA, Key Watershed and LSR combine to make Drift Creek one of the cornerstone watersheds for the protection and restoration of aquatic and terrestrial resources in the Coast Range Province. Map 5 displays the primary land allocations for federal lands within the watershed that includes:

- Wilderness (5798 acres)
- Late-Successional Reserves (21959 acres)
- Riparian Reserves (22,147 acres)
- Matrix (544 acres)

The US Fish and Wildlife Service designated critical habitat for the northern spotted owl and the marbled murrelet. Approximately 55% of the federal land base has been designated as critical habitat for the northern spotted owl while over 75% of federal land is designated as critical habitat for the marbled murrelet (Map 6). The Drift Creek Wilderness provides additional protection of habitat for both species.

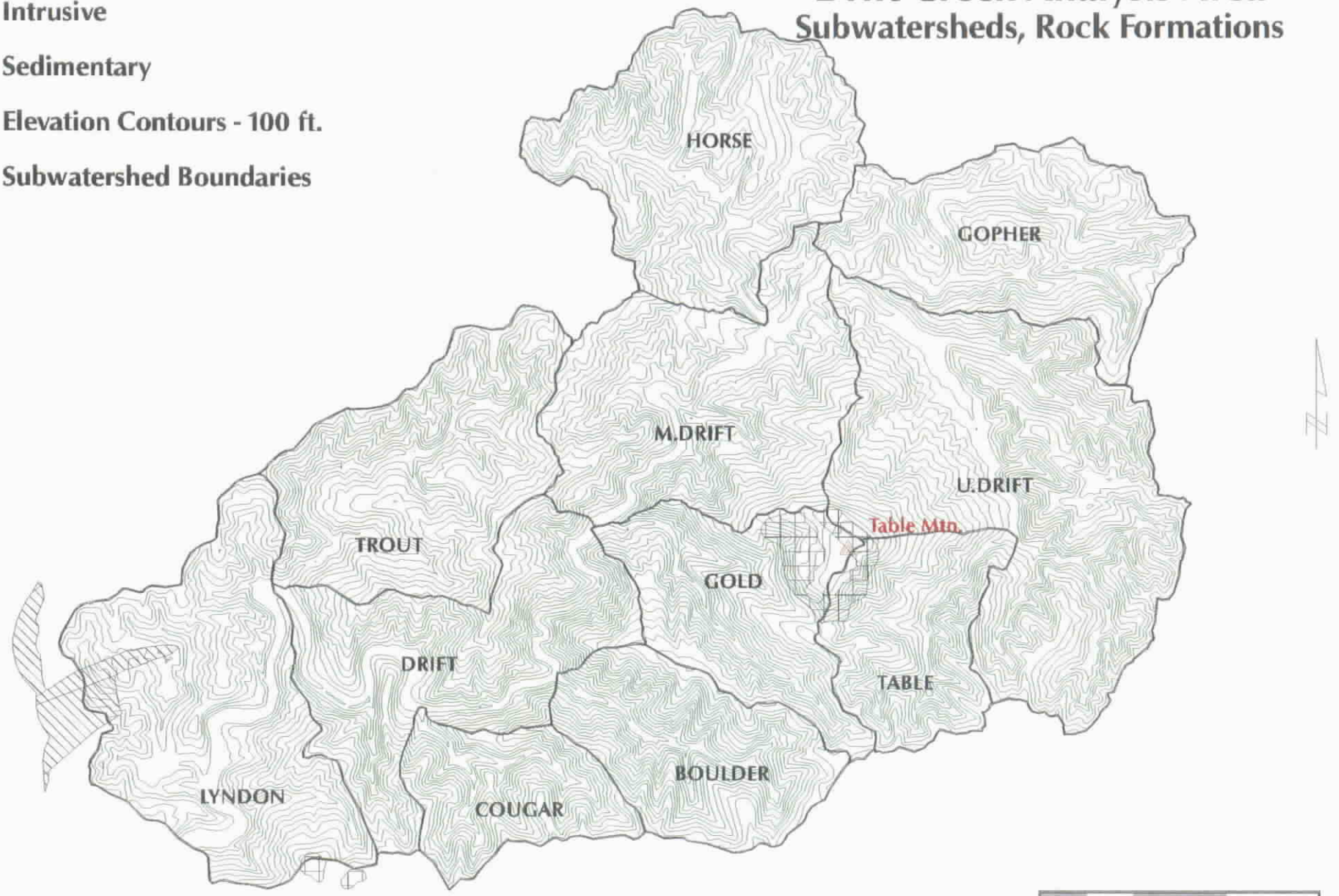
Drift Creek Watershed - Oregon Coast Range



Oregon

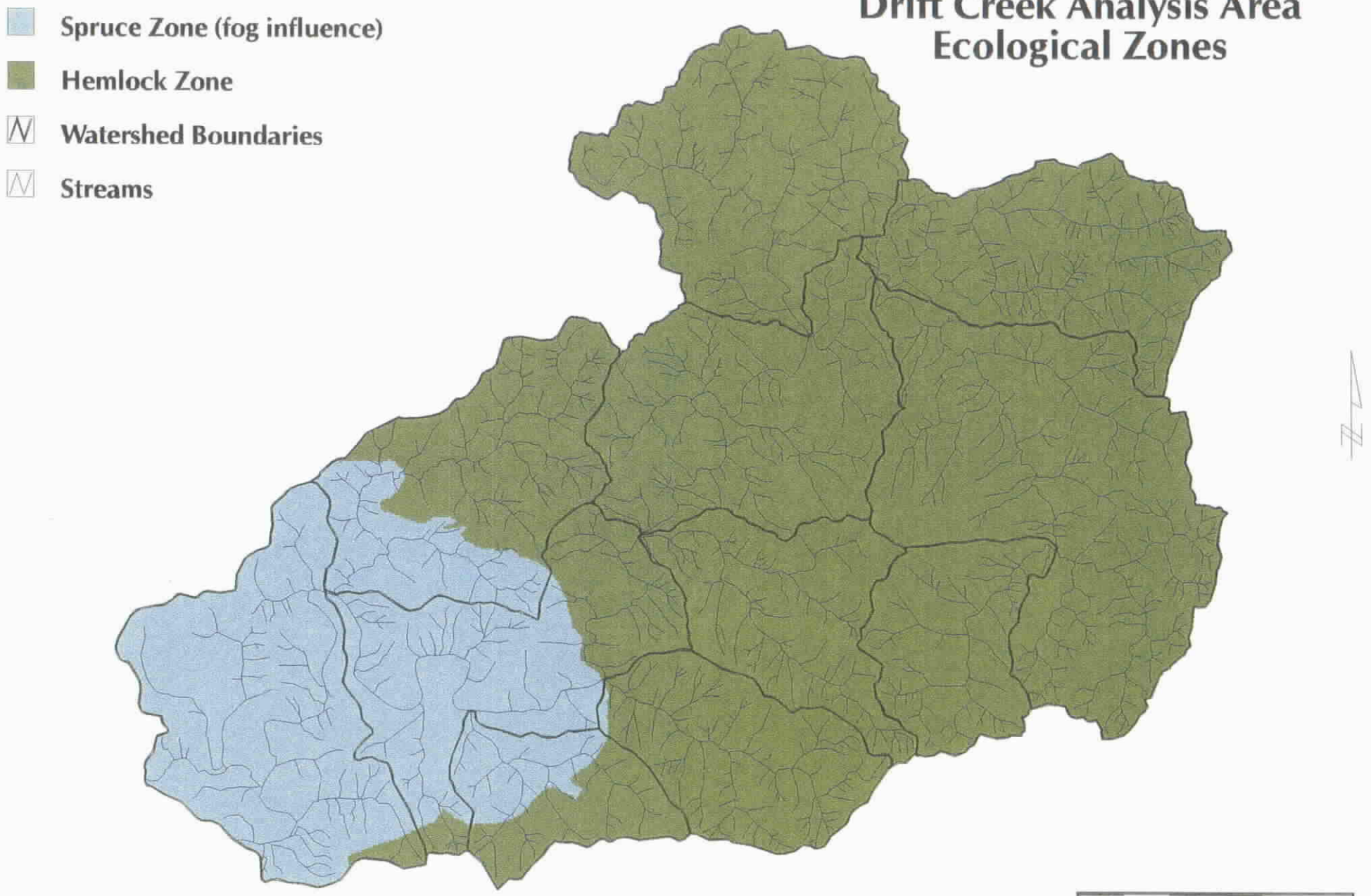
Map 1

Drift Creek Analysis Area
Subwatersheds, Rock Formations



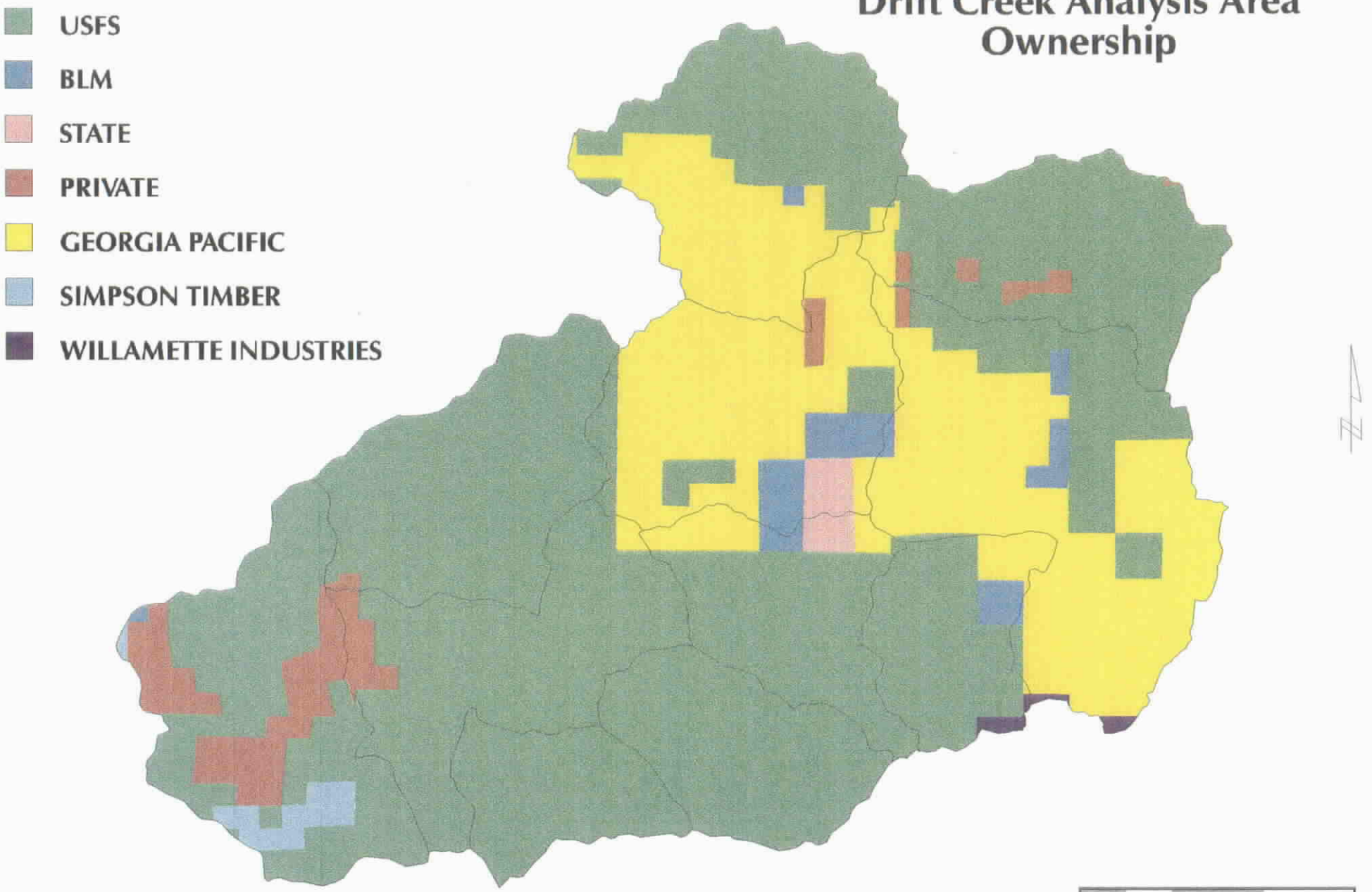
Map 2

Drift Creek Analysis Area
Ecological Zones



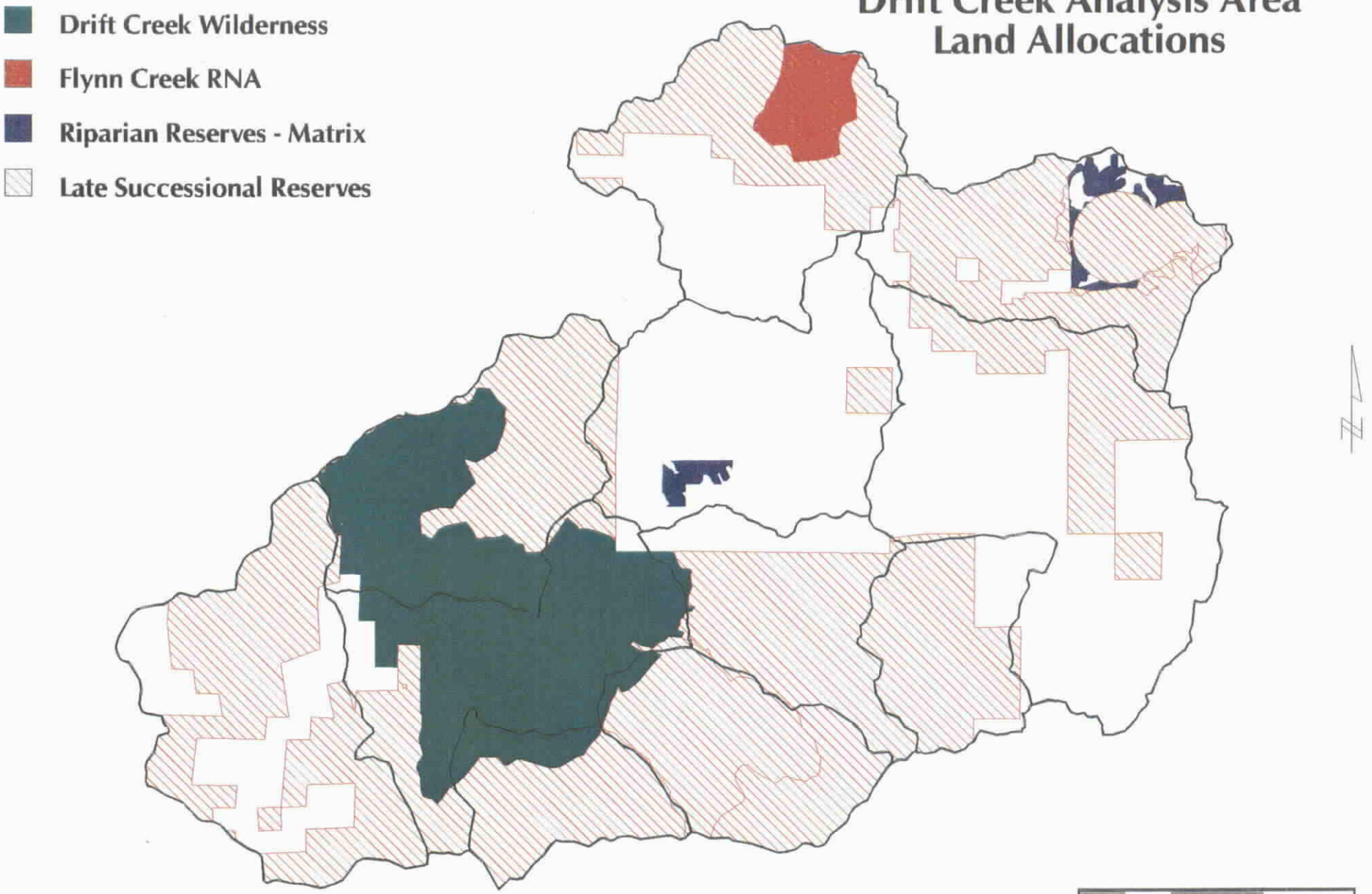
Map 3

Drift Creek Analysis Area Ownership



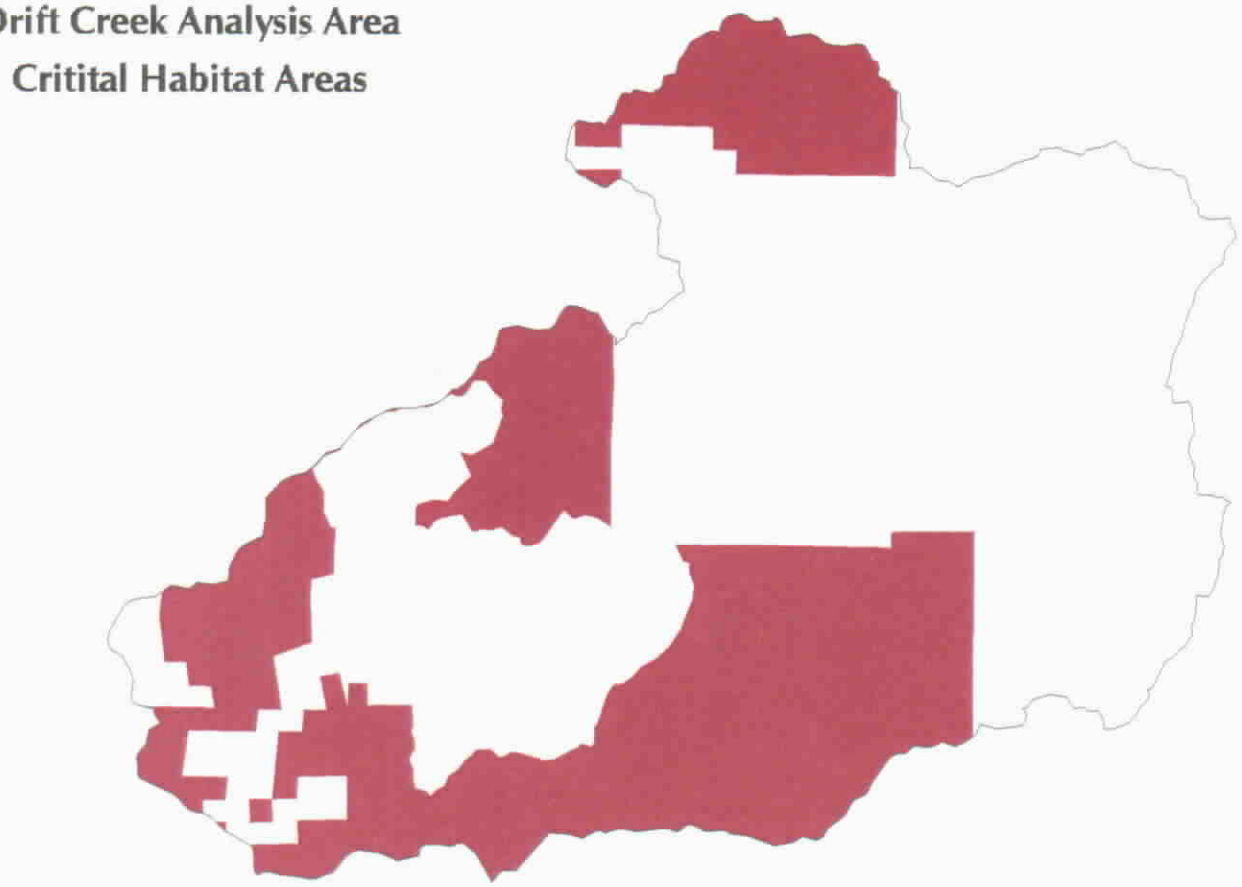
Map 4

Drift Creek Analysis Area
Land Allocations



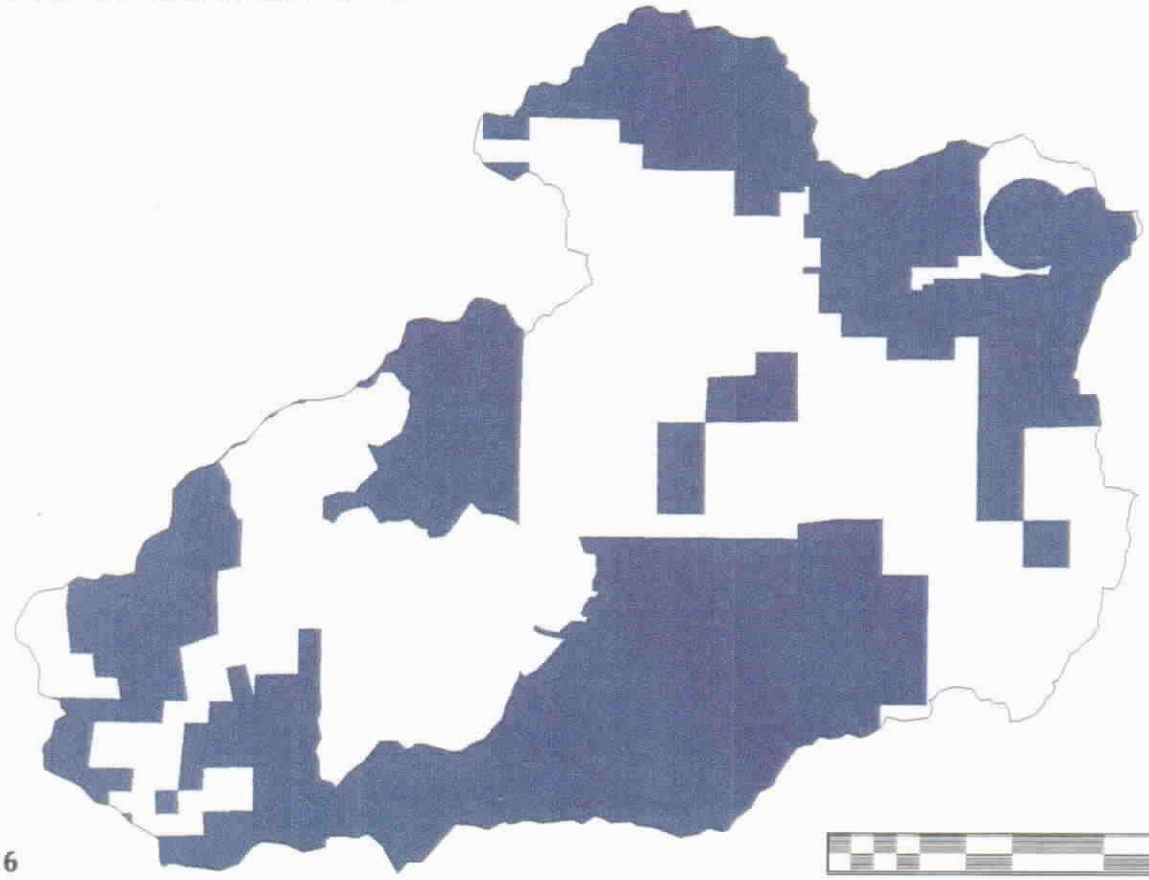
Map 5

Drift Creek Analysis Area
Critital Habitat Areas



Northern Spotted Owl Critical Habitat

Marbled Murrelet Critical Habitat



Map 6

0 1 2 3 4 5

MILES

CHAPTER 2 ISSUES AND KEY QUESTIONS

Management direction for federal lands within the Drift Creek Watershed has been established by the Northwest Forest Plan or through Congressional Reservation of the Drift Creek Wilderness. The ability of federal lands to meet current management objectives are influenced by societies past and current dependence on the watershed. Issues and key questions were developed to help focus the analysis on potential conflicts between natural processes and management activities that influence the function of the aquatic or terrestrial ecosystems. On federal lands within Drift Creek this primarily relates to the function of late successional and old growth forest ecosystems, including the aquatic environment.

ISSUE 1: HOW HAVE CHANGES IN HUMAN VALUES AND EXPECTATIONS ASSOCIATED WITH DRIFT CREEK INFLUENCED NATURAL PROCESSES?

The landforms and associated processes found in Drift Creek influence the effect human activities have on the landscape. Current and future dependence on the landscape influences the opportunity for federal agencies to meet aquatic and terrestrial management objectives. This includes meeting economic, social and recreational needs. Management of private lands can accelerate or retard the development and function of habitat on federal lands.

Key questions developed for this issue include:

- How have landslides and debris flows been affected by management activities?
- What landforms, including geology and disturbance process, affect the human, aquatic and terrestrial components of Drift Creek?
- What fluvial processes (including sediment routing) have been altered by management activities?
- How has the management of large woody debris changed aquatic function?
- What is the settlement pattern and social linkages within Drift Creek?
- What has been the past and future timber management activities in the watershed?
- What level of access can be expected in the future and how might the influence of the road system on natural resources be reduced?
- Do opportunities exist to improve the wilderness experience levels of users?
- What recreational activities dominate in the watershed and what changes are expected in the future?
- What opportunities exist to facilitate the exchange of information between the research and management communities?

ISSUE 2: WHAT IS THE CONDITION OF THE AQUATIC ENVIRONMENT? WHAT OPPORTUNITIES EXIST TO PROTECT PROPERLY FUNCTIONING AREAS AND RESTORE DEGRADED STREAM AND RIPARIAN AREAS?

Existing literature, including supporting documentation for the proposed listing of coho and steelhead, adequately document the status of anadromous salmonid runs on the Oregon Coast. Designated as a key watershed, Drift Creek serves as one of the cornerstone watersheds associated with the protection and restoration of anadromous stocks and other aquatic species. Results of research and stream surveys, summarized in reports such as Watershed Protection and Restoration in the Mid-Coast Range (USDA 193) and the Assessment of Federal Lands in and Adjacent to the Oregon Coast Province (USDA 1995), document that most streams on the Forest are deficient in large woody debris, and that riparian areas lack large conifer trees. Along with having a high stream density, areas with significant timber harvest activities have a high road density. Recent surveys indicate in-stream temperatures exceed state water quality standards. Industrial landowners, environmental groups as well as local, state and federal agencies have shown interest in restoring anadromous salmonid runs.

Key questions developed for this issue include:

- Where are the potential productive stream reaches in the basin?
- What is the current distribution of salmonids in the watershed?
- How is the influence from past management activities reflected in current aquatic habitat conditions and processes?
- What trends may influence changes to aquatic conditions?
- What barriers exist in the restoration of aquatic function and process in the watershed?
- What are the priority areas for additional protection and the initiation of restoration efforts?

ISSUE 3: WHAT IS THE CONDITION OF THE TERRESTRIAL ENVIRONMENT? WHAT OPPORTUNITIES EXIST TO PROTECT OR RESTORE THE FUNCTION OF MATURE AND LATE SUCCESSIONAL FOREST CONDITIONS ON FEDERAL LANDS?

Private ownership encompasses about half of the Oregon Coast Province. Only a small percentage of this land provides late-successional forest habitat. About 75% of the federal lands within the watershed are designated as Late-Successional Reserve. Forest managers want to know what barriers are limiting the function of existing stands of mature and late successional forest as well as what actions can be implemented to reduce the affects of those barriers. In addition, managers want to know what barriers limit the development of late-successional forest structure within the managed stands and what opportunities exist to reduce those barriers.

Key questions developed for this issue include:

- What were the historic disturbance processes and how have they changed?
- How have the vegetative pattern and seral stages changed through time?
- What are the quantity, distribution and suitability of mature forest habitat in the watershed?
- What is the general status of proposed and listed species as well as other species of interest?
- What barriers exist to achieving late seral stages within the LSR and Riparian Reserve?
- What seral stages can be expected through time on industrial lands?
- What opportunities and priorities exist to accelerate the long term protection and restoration of late seral conditions within the watershed on federal lands?

CHAPTER 3 HISTORIC CONDITIONS AND PROCESSES

This chapter describes the physical, social and biological resources associated with the watershed. It provides a general description of the relationships and changes that have occurred between these resources through time. The watershed analysis is tiered to the larger-scale analysis conducted for the Federal Lands Assessment (USDA 1995) and the Late-Successional Reserve Assessment for the Oregon Coast Province-Southern Portions (USDA 1996). These assessments provided some province and LSR-wide ecological strata that are helpful in placing the watershed in context of larger strata such as soil-climate zones, fire regime blocks, landtype associations and plant association groups.

Todays current conditions reflect the values and uses associated with Drift Creek prior to 1990. Issuance of the Interagency Scientific Committee's report "A Conservation Strategy for The Northern Spotted Owl" (Thomas et al. 1990) resulted in significant changes in management direction on federal lands. Consequently, it was felt that recognizing the historic human component through the end of the 1980's was a reasonable expectation for this section.

PHYSICAL ENVIRONMENT

Geology

Geology and climate interactions create the physical elements of ecosystems. In the Oregon Coast Range, the temperate marine climate rapidly weathers the soft sedimentary and hard volcanic rocks to form soils famous for their fertility. Loose, permeable soils and high rainfall rates result in numerous landslides, the dominant landforming process in this physiographic province. The result is an erosion-sculpted landscape of steep slopes and high stream density. Streams carry landslide-delivered sediments and organic material toward the ocean, creating complex channel conditions essential for fish and wildlife habitat.

Lithology

Tyee Formation — The Drift Creek-Alsea Watershed is largely underlain by the Tyee Formation, which is a thick sequence of rhythmically bedded medium-to-fine-grained sandstone and micaceous carbonaceous siltstone. Approximately half of the Formation's estimated 5,000 foot thickness is exposed between the top of Table Mountain and the mouth of Drift Creek.

Weathering quickly (hundreds of years) turns the Tyee Sandstone into fine-grained, well-drained soils. Shallow-rapid landslides are common on steep slopes; larger earthflows occasionally develop on low-angle slopes in thick soils. Boulders, cobbles, and gravels of this rock type break down in streams in tens to hundreds of years, depending on the rate of bedload movement. These larger sediment sizes are generally found in the supply

reaches, or near where they entered the stream if they were deposited by debris flows in side channels.

Igneous Intrusives — A large igneous body intruding the Tyee Formation at Table Mountain is classified as a nepheline syenite (Map 2). While it has the appearance of a granite or diorite, it is chemically distinguished by the absence of quartz. This intrusive is more resistant to erosion than the softer Tyee Sandstone around it, which explains its exposure as a prominent ridge. Gravels, cobbles, and boulders of this material are slow to weather and breakdown. As a result, stream sediments in the upper portions of Gold Creek, Table Creek, and the west half of South Fork of Drift Creek has a higher coarse particle size fraction than other subbasins.

Small igneous dikes--basalts and gabbros-- intrude the Tyee Formation in the Drift Creek Watershed, and are probably age-equivalent to the larger Table Mountain intrusive. They are mapped on the ridges and in the stream channels, perhaps because they are most easily visible in those locations. These small features are likely to influence local geomorphology and stream channel conditions. Their resistance to erosion may help hold ridges higher than ridges without dikes, and may act as local controls of stream gradient or channel confinement. They are also good sources of durable sediments in streams.

Recent Sedimentary Units — Unconsolidated sedimentary units are found locally in the Watershed (Map 2). There is a mapped occurrence of alluvium (river sediments) in the middle and lower portions of Drift Creek. Several large-scale landslide deposits (presently inactive) occur in the Drift Creek drainage (see Map 7). Groundwater flow patterns on and around these deposits will likely not follow surface topographic features, which is the case on adjacent terrain. Older river terrace deposits on lower Drift Creek, below the mouth of Cougar Creek, indicated earlier stages of stream valley development in the Coast Range.

Structure

The Tyee Formation's sedimentary strata exhibit a general eastward dip of about 19 degrees from horizontal in the central Coast Range; the result of regional uplift driven by Continental Drift. The (relatively) flat-lying massive sandstone strata strongly influence the development of the low stream gradients typical of much of the Drift Creek drainage and the Alsea Basin.

Two long northeast-trending faults, one trending northwest, and several shorter faults, have been mapped in the Watershed. There is no record of historic earthquake activity or movement along these faults. Several folding features are mapped in the Peavine Ridge-Table Mountain area and north. Neither the faults nor the folds appear to significantly influence landforms or the frequency of landslide occurrences in their vicinity.

Geomorphology

Landforms in the Oregon Coast Range are the result of landslides and erosion (hillslope processes), and streamflow (fluvial processes), moving sediments from the slopes to the

valleys and, eventually, out to the ocean. The rate at which these processes shape the landscape is dependent on climate, particularly rainfall levels, and the physical properties of the soils and rocks in the area.

Most landslides in the Coast Range occur in small, unchanneled valleys, sometimes called 'headwalls,' upslope from the inception of streamflow. An unchanneled valley typically consists of a hollow (concave out contours) bounded on either side by ridges (convex out contours), often with small sideslopes between ridge and hollow.

A channel is a feature with defined banks and an eroded substrate. Channels typically begin between 30 and 100 meters downslope from the ridge in the Tyee Sandstones of the Coast Range. Above this channel head, the source area for the channel is usually an unchanneled valley. The convergent topography of an unchanneled valley causes soil moving downslope (dry ravel and tree-topple root throw are the dominant soil movement mechanisms) to collect in the hollows, forming progressively thicker deposits.

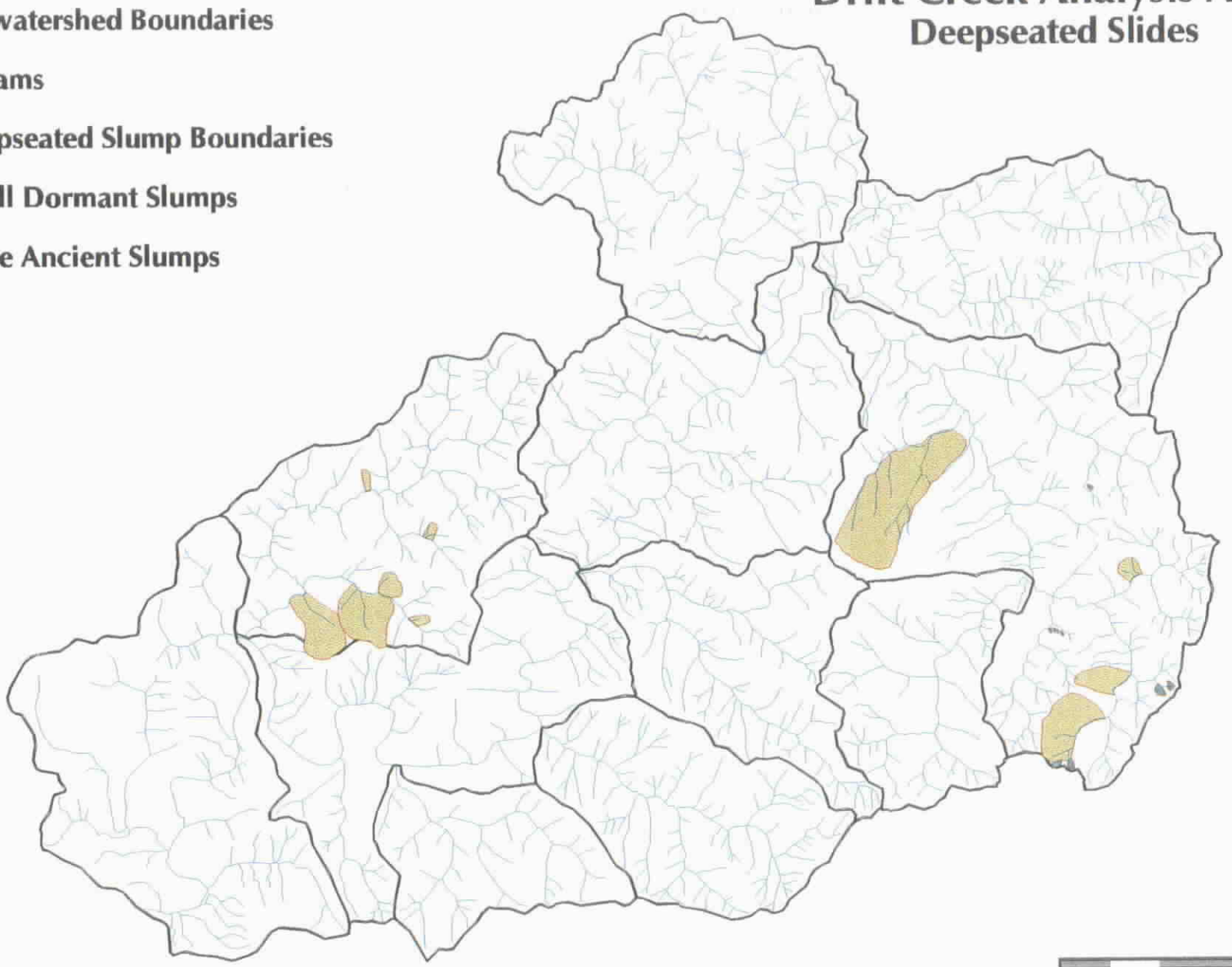
This convergent topography also concentrates rainfall runoff toward the valley or hollow axis, causing high pore water pressures in the colluvial (transported) soils during storms. High pore water pressures reduce soil shear strength, which can cause landslides to occur. Thus, most shallow landslides in the Coast Range occur in hollows at the heads of channels (Dietrich, 1989).

Disturbance Processes

Landslides
Shallow-rapid landslides, occurring as described above, are called debris avalanches or debris slides (Vames, 1980). These debris avalanches and debris slides usually initiate in stream channels with gradients steeper than about 60% (Sessions and others, 1987). Montgomery and Dietrich (1988) show a clear inverse relationship between the size of unchanneled valleys or hollows and the local slope angle at the channel head. For the Coast Range, most hollows are between about 600 to 10,000 square meters in area, with gradients ranging from 100 percent for the former, to about 30 percent for the latter.

Debris Flows
When shallow-rapid landslides occur in the heads of channels, gravity acts to move the slide material rapidly down channels as debris flows. Debris flows incorporate the soil, rock, vegetation and large woody debris (LWD) from the stream banks, often growing to many times the volume of the initiating landslide. This channel scouring generally occurs where gradients are greater than 8-10%. The distance debris flows will move downstream is generally a function of channel gradient and the angle at which the channel enters the next higher stream order. For example, where a tributary channel enters the main channel at oblique angles, debris flow material will deposit, sometimes damming the main channel. Cougar and Boulder Creeks are the Drift Creek tributaries that best exhibit this characteristic. Where the angle of stream incidence is acute (up to about 60%), debris

Drift Creek Analysis Area
Deepseated Slides



Map 7

flows will move down the main channel until the gradient is less than 10% (Benda and Dunne, 1987).

Deep-Seated Slides

Slumps and earthflows, also called deep-seated landslides, occasionally occur in the analysis area (see Map 7). They are generally slow-moving features ten to fifty feet thick, and may involve areas from less than one acre up to several hundred acres. Landslides of this type are generally active during high precipitation periods. These features may be reactivated by road construction and large-scale timber harvest. When the toe of a deep-seated landslide reaches a stream channel, erosion during peak flow periods can create a chronic source of sediment.

Flooding

Flooding, due to heavy rains and occasional rain-on-snow events, occurs about once in two years, usually in the late fall and winter. Large floods occur less frequently and result in more significant channel and riparian vegetation changes. In adjacent Coast Range drainages major events occurred in 1964, 1974, and 1996.

Sediment Routing

Sediment and large woody debris (LWD) reaches the stream system through hillslope processes (landslides) becoming debris flows. Following deposition, sediments move rapidly down channels with steep gradients (>20%), i.e. the steeper sections of 'source' reaches, usually within a year or two. Stream gradients between 20% and 8% i.e. the less steep sections of 'source' reaches, generally store sediments between flood events with a two to ten-year return interval. Where gradients are less than 8%, in 'transport' reaches, sediments are generally in storage for more than ten years. Reaches with gradients less than 4%, in moderately confined and unconfined channels, provide conditions for long-term (hundreds to thousands of years) sediment storage. The distribution of stream gradients is reflected in Map 7A.

Source areas -- expect debris torrents, mass wasting

Transport reaches -- mostly 4-8% gradient range, narrow/mod confined areas -- keeps sediment moving, short term storage of sediment, wood

Storage -- less than 4% gradient moderately confined to unconfined channels.

Sediments move in suspension, and as bedload. Research on another Coast Range drainage, Rock Creek, indicates that 60% of erosion and landslide materials leave the stream system as suspended sediment--clays and fine silts. Viewed another way, only 40% of mass wasting products are available to become bedload and spawning gravels. (Dietrich and Dunne, 1978).

In watersheds underlain by the Tyee Sandstone, the percentage of substrate fines can range from 20 to 30 percent, and the percentage of cobbles and boulders are generally low. In reaches where gravels and cobbles are absent, LWD becomes a critical channel roughness component. Finer sediments are stored behind debris jams and in beaver ponds,

and streamflow velocity is reduced. While the role of LWD in sediment retention is well understood, its importance in reducing stream velocity is seldom considered.

Where large volumes of sediment and LWD are stored in stream channels, stream velocity during peak flow periods is reduced. Under those conditions, streams interact with their banks and flood plains, resulting in increased channel complexity and reduced flood levels. Where flow velocity is reduced, more water remains in storage as groundwater, particularly in the riparian areas of moderately confined and unconfined channels. High groundwater levels mean higher stream flows during low precipitation periods, such as in the summer. Higher flow during the summer can help keep stream temperatures low. Thus, LWD as a channel roughness component, particularly in the middle and upper reaches of Coast Range streams, is critical to reestablishing and maintaining fully functioning fish habitat and healthy fish populations.

Soils

Soil productivity in this watershed is largely determined by soil organic matter levels and soil nitrogen levels (availability of trace minerals is also important). Soil organic matter levels are fairly constant over time except in areas with surface soil disturbance. Ridgetop soils (>1,750 feet) tend to have lower organic matter levels than at lower elevations. Soil nitrogen levels are maintained by additions through precipitation, nitrogen fixing plants, and decomposition of organic matter in soil. Soil nitrogen levels are likely to decline after severe fires, or after complete removal of trees, ground cover, and duff at intervals less than 90 years. Soil nitrogen levels in soils on ridgetops are naturally low; and topsoil disturbance or wildfire further reduces these levels.

Soil compaction, except for a few trails from humans and animals, was probably minimal prior to 1900. Soil displacement occurred in the form of natural levels of landsliding, windthrow, wildfires, surface erosion, and other factors.

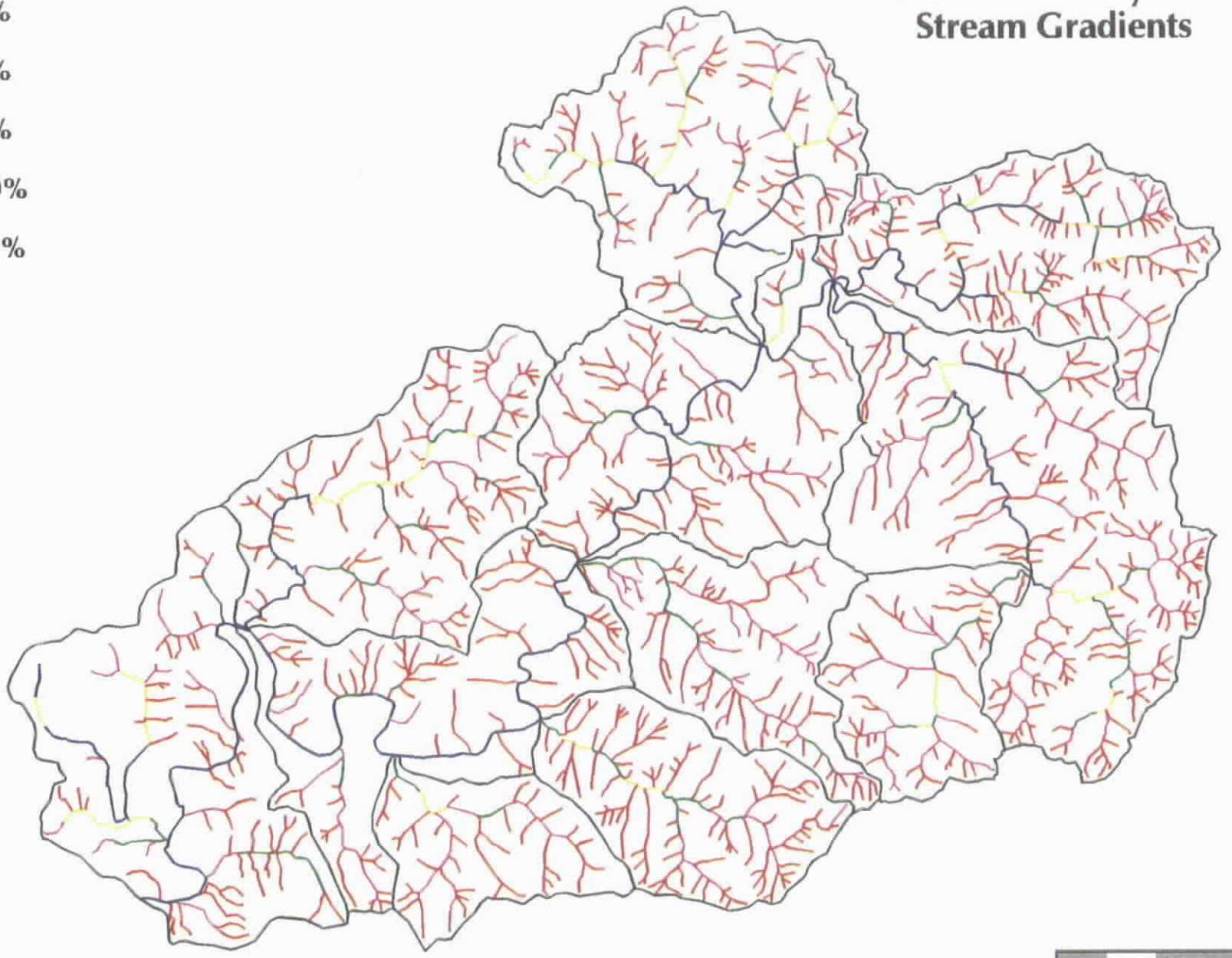
HUMAN ENVIRONMENT

Alsi People

Human occupation of the central Oregon coast dates back at least 3,000 years. This is relatively recent compared to 10,000 years documented at other sites in Oregon. Evidence of earlier occupation may have been lost through a rise in post glacial sea levels or alluvium deposits from flooded river valleys (Beckman, 1982).

Oregon's rugged coastal topography influenced the development of numerous, localized aboriginal cultures centered on river valleys. Contacts between coastal and valley interior cultures were likely sporadic and infrequent. Considering artifacts from limited excavations it is believed the occupancy and lifestyles of the various coastal cultures at the time of Euro-American contact were similar to their pre-historic predecessors.

Drift Creek Analysis Area
Stream Gradients



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MILES

Map 7A

The Alsi-Yaquina people occupied the Drift Creek watershed as part of their traditional tribal lands. The probable extent of their territory was from Tenmile Creek in northern Lane County, north to Beaver Creek and east to the crest of the coast range. To support additional Euro-American settlement, the Federal government utilized an 1855 treaty to take native lands from the Alsi-Yaquina people. Ratification of this treaty never occurred.

Ethnographic research did not occur until the 1890's, well after the 1855 Executive Order that forced the relocation of the Alsi and Yaquina to the Siletz Reservation. By this time, only fading memories and secondhand accounts provided the description of lifestyles and land. The Alsi and Yaquina were nestled between the Northwest coastal culture of Southeast Alaska and Washington and the Klamath culture to the south. The influence of these cultures, made the Alsi and Yaquina people anthropologically unique (Beckman 1982).

By all accounts the Alsi people were never numerous. Villages, composed of kin-groups, operated in relatively isolated enclaves. With no records of identified permanent village sites, the main villages probably developed around Alsea Bay and along the Alsea River. A 1939 source (Drucker, 1939) mentions twenty villages but did not identify a geographical location.

The aquatic and terrestrial ecosystems provided the Alsi with a rich and sustaining environment. Fall and winters were spent in permanent villages around Alsea Bay and Alsea River, possibly as far inland as tidewater. These located to facilitate the harvest of salmon, steelhead and eels. To easily exploit the marine resources of shellfish, fish and marine mammals, most tribal members would migrate to summer camps in the spring. Others would make inland excursions to gather traditional plants as well as hunt for deer and elk to supplement their diet. It would be during this period that hunting parties would venture into Drift Creek via boat and foot.

With shellfish and fish predominating their diet, the incentive to perpetuate early serial conditions for deer or elk was not as nearly as important to the Alsi as it was to their interior valley relatives. Evidence suggests that the majority of the coast range fires resulted from the spread of fires ignited by inhabitants of the Willamette Valleys.

European Contact

First European contact occurred around 1770, changing Alsi society forever. By the 1850's, the Alsi lost control of their tribal lands to the encroaching Euro-american settlers, placing much of it into the Coastal Reservation. Traditional practices were discouraged, while European practices of agriculture and livestock grazing was introduced. Ten years later, under pressure from entrepreneurs to develop a rail line to Yaquina Bay, and open more land for settlement by Euro-Americans, the Coastal Reservation was terminated.

Homesteading

Euro-American settlement in the Alsea valley began between 1852 and 1855. Additional interest in claiming land was spurred by passage of the Homestead Act of 1862. The generally rugged topography and dense vegetation challenged even the most ardent agriculturist. The more attractive agricultural lands close to Alsea Bay were claimed first. Later settlers migrated farther inland in search of land, which tended to be more marginal. Locations of arable land and the proximity to growing towns strongly influenced the location of claims within Drift Creek.

Settlers found a relatively open landscape within the watershed, a legacy from the fires of 1849-1850 and 1890's. The transportation system was primitive. Roads and trails followed valley bottoms and open ridge tops. Taking advantage of existing conditions, the settlers depended on subsistence agriculture to prove their homestead claims. Harvested trees were primarily milled for local use rather than being transported to commercial markets in Toledo or Waldport. It is likely some homestead claims of the early 1900's were filed to exploit chittam bark and abandoned after the bark was removed (Potter, 1917). Settlers frequently set fires in the spring or late fall to keep fields and grazing lands clear of fast growing shrubs and ferns. The vegetation pattern associated with the peak settlement period is not well documented. Map 10 reflects the vegetation patterns associated with settlement after many of the homesteads were abandoned. Fishing, hunting, berry gathering, along with the harvest of forest products such as cascara bark, and greenery for floral markets helped to supplement both their income and diets. Angora sheep were raised for wool in the upper watershed.

Topographic features, such as the narrow valley of Drift Creek between Boulder and Gold Creek, helped divide the watershed into an upper and lower community. The Meadow-Gopher-Nettle Creek areas established close ties with Harlan and conducted necessary business in Toledo (EST 1866). Joining several bachelors in the upper community, the Watkins family filed one of the first homestead claims in 1886. The most extensive community developed around the Glen post office that operated between January 1884 and June 1912. It is believed, as many as 30 families resided in the upper watershed during the peak period of 1885 and 1905. The Horlins were one of the first to file a homestead claim in the lower drainage in 1883.

Proving up on a homestead claim was a difficult proposition at best. In the Gopher Creek area, there were 90 homestead entries recorded but only 37 developed into patented lands. In Lyndon Creek, about 18 homestead claims resulted in the land being patented. Attempts to develop a homestead claim occurred as late as 1920, although, by the 1930's the trend was abandonment, relinquishment and the selling of claims. The original homesteaders were starting to retire to the larger coastal communities. The New Deal implemented a resettlement program, purchasing marginal agricultural lands, relocating families and providing retraining opportunities to those who showed interested. Many of the original homesteads were added to the Siuslaw National forest or acquired by logging companies. World War II became a time marker between the end of one era and the start up of new period.

Intensive Forestry

The maturing of timber, consolidation of land ownership, and the demand for wood fiber, combined to change the landscape within Drift Creek. Large scale commercial timber harvest commenced in the years between 1954 and 1959.

Private Industry
Georgia-Pacific acquired significant land holdings within the basin in 1956, purchasing land primarily from Oregon Mesabi (International Paper) and Rex Clemens. Starting in the northwest corner of their ownership they harvested large tracks to support mill operation in Toledo. By the late 1970's the majority of their land base had been converted from 110-120 year old second growth timber to plantations. Reflecting the common practice of the period, the company owned its own equipment and operated its own work crews. Private companies and individuals were contracted to harvest and transport the timber, towards the end of this period.

Federal Management
The Forest Service began significant timber harvest activities in the 1960's. Prior to this period, watershed protection was the primary management objective. The increase in harvest activities mirrored the increased national demand for timber. Intensive timber management became the primary management objective. Timber harvest within the watershed on federal lands averaged 250 acres per year between the mid-1960's and 1980. During the early 1980's timber recession harvest dropped to 90-100 acres per year but by 1990 the average harvest had returned to a 210 acre per year average.

Timber was sold to a variety of purchasers supplying mills in and out of Lincoln County. Lincoln County received 25% of the timber receipts returned to the general treasury for support of county services such as public education and road services. Each sale generated sufficient funds to support reforestation activities and infuse 1-2 million dollars into the general treasury.

Plantations were aggressively managed to ensure they became established and wood fiber production was maximized. To facilitate plantation establishment, unmerchantable material was yarded from the units, and logging slash burned. Protection from animal damage and release from vegetative competition were common practices. Douglas-fir was generally the dominate seedling planted especially in earlier plantations. Later plantations included a more diverse mix of seedlings, especially in the Sitka Spruce Zone. In the southwest portion of the watershed, large units were harvested to convert hardwood dominated stands into conifer plantations.

The harvest of greenery for floral arrangements and firewood was generally viewed as a minor activity, when compared to the large scale of timber operations in the area. Free permits were easily available. Cull log decks and trees fallen across the road system, were common sources of firewood.

Roads

Prior to timber harvest the road system was realtively limited. One of the longer term routes was up the Gopher Creek Drainage. The road system grew significantly to provide access into the forest and facilitate timber harvest. The road system developed to support the harvest of timber tells a major story about the intensity, location and timing of activities. Map 8 depicts the NFS road system development between 1955 and 1970. During the peak period the NFS system averaged three miles of road for every square mile of watershed.

Mineral Development

Opportunity for mineral development has been a relatively minor. Both load and placer claims have been filed for nepheline syenite in the Table Mountain area. Nepheline syenite is used primarily in industrial products such as paint, roofing as well as in ceramics. The Oil and Gas exploration leases issued in the 1980's, expired due to the poor economics of well development.

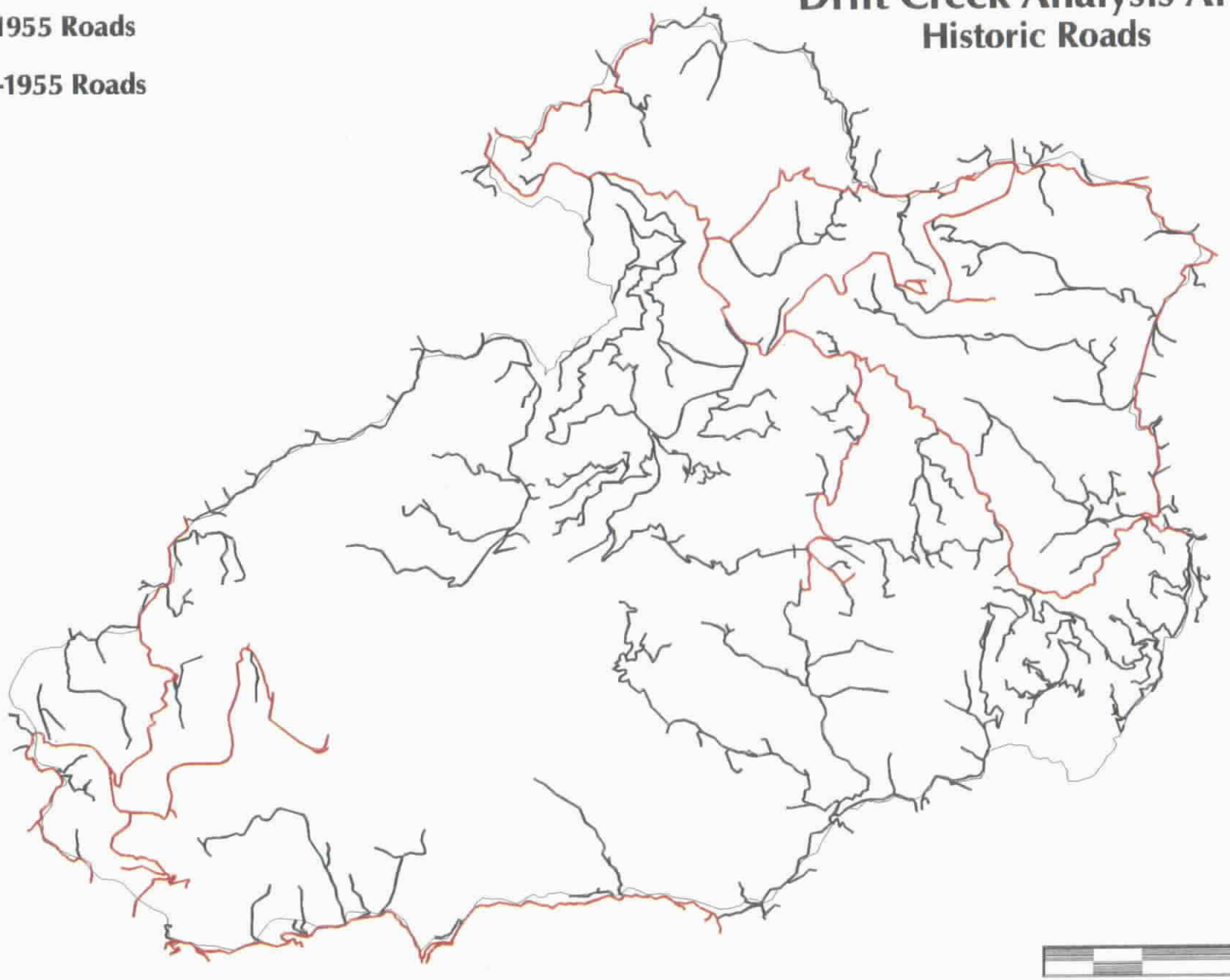
Recreation

As access into the forest improved, recreation activities associated with an intensive road system increased. Visitors to the watershed experienced a highly modified environment, and were likely to encounter other users. Recreation centered on hunting for deer and elk during the general rifle seasons. Fishing for resident trout, steelhead and coho salmon was the second most common activity. As Off Highway Vehicles (OHV) became more popular, impacts on meadow areas, hill slopes, roads and other users increased, especially in the upper basin areas. Equestrian use was associated with the limited trail system that served the Drift Creek Roadless Area. Horses were prohibited from the wilderness after its establishment in 1984. Unlike many wilderness areas the visitor to Drift Creek is limited to a semi-primitive non-motorized recreation experience. This is primarily due to the amount of noise associated with activities and roads in the surrounding areas. Visitors to most wilderness areas encounter a primitive experience. Except for potential fire restrictions, both federal and industrial forest lands were generally open to the public.

Research

Research opportunities abound with the watersheds close proximity to Oregon State University and the Pacific Northwest Forest Science Laboratory in Corvallis. The Alsea Watershed Study (Morning, 1975) was one of the first long term, comprehensive efforts to document the effects of logging and road construction on aquatic resources. Other projects range from utilitarian, such as evaluating timber harvest methods, to understanding ecosystem function.

Drift Creek Analysis Area
Historic Roads



Map 8

AQUATIC ENVIRONMENT

Geology, landform, fluvial (stream) processes disturbance history, the routing of coarse woody material and riparian vegetation directly influence aquatic habitat conditions. Conditions within the watershed are dynamic, reflecting the influxes of sediment or wood from episodic events such as fires or landslides. Some studies indicate the highest level of diversity in major tributaries occurs during the mid-seral stages following major fires. These same studies indicate the lowest levels occurred during the early and late seral stages. At any given time, portions of the watershed served as a refugia from major disturbances elsewhere in the system.

Productive Areas and Fish Distribution

In the Oregon Coast Range, including Drift Creek, stream reaches with wide valleys and low gradients are assumed to produce a disproportionately high amount of salmon. Map 9 displays those reaches with the greatest potential to produce anadromous species. Historic species distribution is presumed to be similar to recently documented distribution (Schwartz, 1991). However population numbers during any given period were higher than recently recorded (Buckman, 1996). Natural populations likely had extended run periods and diverse life history types. Streams were well connected to their flood plains, providing rearing habitat during peak flows, including the increased flows following major fire events. A larger, more complex tidal estuary provided additional hiding and rearing habitat for juveniles. Spring Chinook salmon could find summer holding habitat.

Habitat Conditions

Coarse woody debris has a strong influence on aquatic habitat development in Drift Creek. The historic quantities vary with the age of the stands. It is speculated that for the current aged stands, tributaries may have averaged more than the 40-80 pieces of large wood per-mile currently found in undisturbed basins. The wood often accumulated on riparian vegetation and at constrained points of the stream, creating large debris complexes. While these complexes sometimes formed temporary barriers they more frequently resulted in the collection of gravels for spawning or provided rearing habitat for smolts and fry.

Stream temperatures directly reflected the climatic conditions, channel morphology and seral stages within the watershed. The majority of solar heating occurred in the tributaries and upper main stem following the loss of vegetation to fires. Undisturbed tributaries, tributary plumes and deep pools served as thermal refugia during these periods.

Interrupted Disturbance Process

Natural change in habitat conditions was closely linked to natural fluvial process including the recruitment and decay of coarse woody debris. While major disturbances caused significant changes their influence was often transitory. During transition periods other adjacent watersheds served as refugee.

Homestead settlement initiated significant human influence on aquatic stream processes. The clearing of flood plains to develop pastures, removed key sources of large wood. Debris jams which flooded agricultural fields were removed, resulting in the loss of in-stream spawning and rearing habitat along with the loss of high flow rearing habitat on flood plains. Management activities that removed large wood further simplified the stream channel. These activities included channel clearing associated with timber harvest, road maintenance, and the removal of perceived barriers to fish migration. Considering practices in other basins it is speculated streams were channeled to prevent the flooding of fields. Estuary areas were terraced to protect them from tidal influences and winter flooding. Unlike most natural disturbances, these disturbances were often chronic, and adjacent watersheds often were in similar condition.

TERRESTRIAL ENVIRONMENT

Disturbance Process

The Late Successional Reserve Assessment details the disturbance history and pattern for Drift Creek. (USDA, 1996). Drift Creek is predominately in the Central Interior Alsea soil climate and disturbance regime blocks. The Coastal Fog Zone influences the western and southern edges of the watershed. In summary, stand replacing fire and windstorms that occur at infrequent (200-300 year) intervals dominate the natural disturbance pattern in the watershed. They range in size from large (1000+ acre) to jumbo size (10,000+ acre) events. The last major event within the watershed occurred around 1849 to 1850. Between major events, small scale disturbances from insect outbreaks, disease and windstorms helped to provide some patches within the watershed.

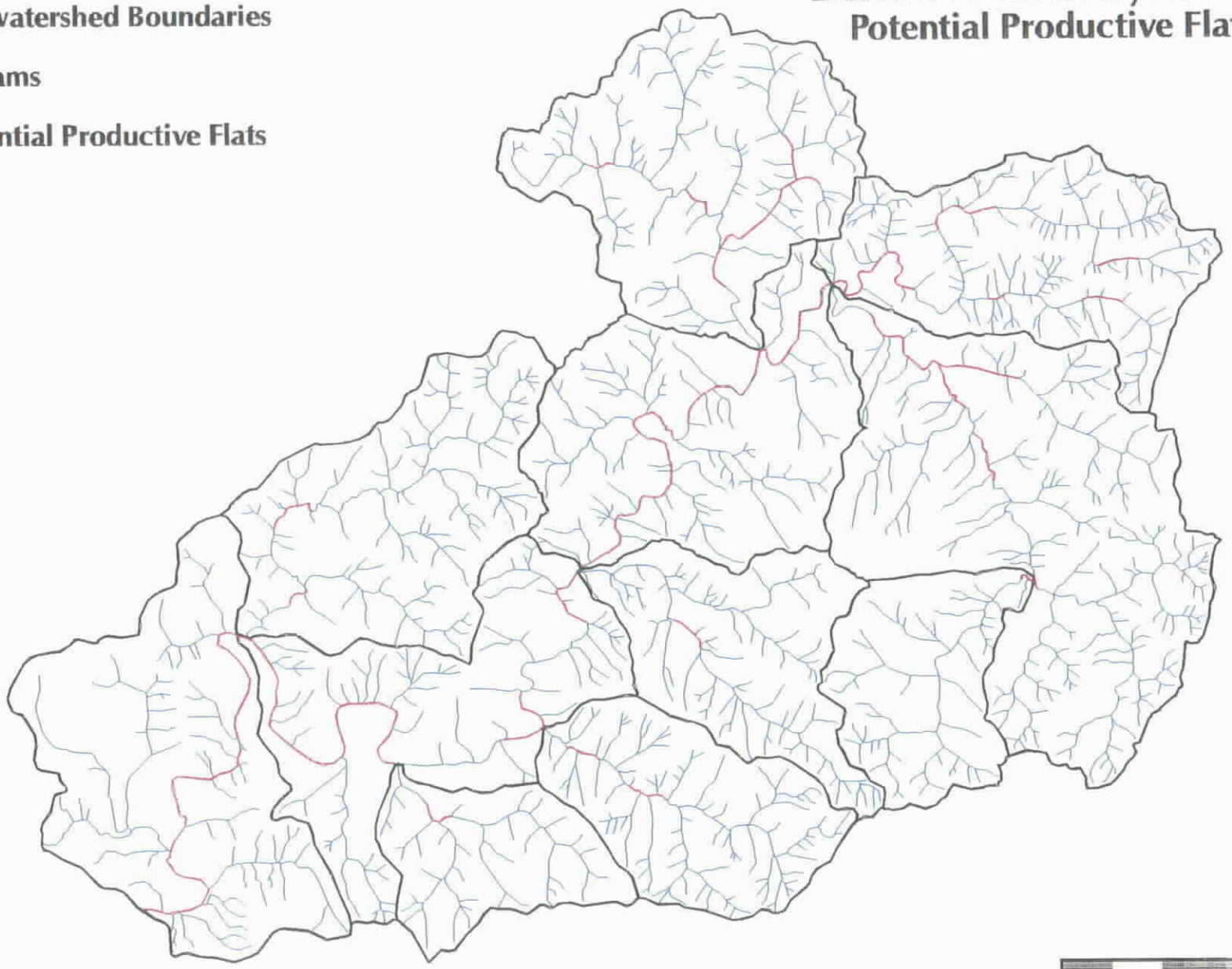
Between major events, mature seral classes dominated the landscape for long time periods. A variety of stands developed old growth characteristics during these extended periods. Edge effect was associated with areas of minor disturbance. After a major event, early (<10 years) to late seral age classes (50-100 years) lasted a relatively short period of time. The edge between different seral classes was limited to the few residual islands left from a previous stand.

Historic Conditions -- Pre-1955

Plant and animal species evolved and adapted to a forest environment that experienced infrequent change. Species that favor early seral stages and edge habitat were limited to frequently disturbed sites along river drainages and scattered small forest openings. These types of habitats however, were fairly numerous in the oak-savannas of the Willamette Valley. Species associated with late seral forest habitats were numerous. Early explorers documented stable populations of elk and deer within the Coast Range prior to the 1850 fire (ODFW, 1992) and were an important trade and food item for the early settlers.

Drift Creek Analysis Area
Potential Productive Flats

- Subwatershed Boundaries
- Streams
- Potential Productive Flats



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MILES

Map 9

Figure 1. Structure and Composition of the Mature Condition of Late-Successional Stands by Sub-Series Environments. Information is expressed in number per acre

	Hemlock- Dry (120 plots)					Hemlock- Moist (73 plots)					Hemlock- Wet (95 plots)				
Species	Small	Med.	Large	Giant	Total	Small	Med.	Large	Giant	Total	Small	Med.	Large	Giant	Total
Bigleaf maple	3				3	3				3	4	1			5
Red alder	8				8	7	1			8	15	2			18
Sitka spruce						1	1			2					
Douglas-fir	34	22	9	2	67	16	15	13	3	46	7	8	8	2	25
Western redcedar	4	1			5	4	1			5	6	1			7
Western hemlock	13	3	1		17	11	5	1		17	5	2	1		8
Total Live Trees	62	25	10	2	99	42	22	14	3	81	38	15	9	2	63
Hard conifer snags	10	1			11	6	1			8	3	1	1		5
Soft conifer snags	3	2	2		7	2	2	2	1	7	2	1	3	1	7
Hard log		2	1		3	8	3	1		12	26	7	2	1	35
Soft log	6	3	2		11	3	3	3	1	9	36	10	3	1	51
	Spruce- Dry (13 plots)					Spruce- Moist (45 plots)					Spruce- Wet (32 plots)				
Red alder	4				4	10	1			11	11	1			12
Sitka spruce	6	5	4		15	11	10	6	1	28	13	6	3	1	23
Douglas-fir	10	14	12	1	37	10	7	4	1	21	14	10	7		30
Western redcedar	1				1	2				2	2	1	1		3
Western hemlock	25	10	3		38	24	12	4		40	4	3	2		8
Total Live Trees	46	29	19	1	95	58	30	13	2	102	43	21	12	1	76
Hard conifer snags	5	1	1		6	9	2			11	7	1			8
Soft conifer snags	3		1	1	5	2	1	1		4		1	2		3
Hard log	7	3	1		11	10	4	2		16	9	3	2	1	15
Soft log	6	3	5	1	15	5	3	3	1	11	4	3	3	1	11

Data Sources: 1987 Vegetation Resource Survey- 194 plots.
1984 Siuslaw Ecoplot Intensive Survey- 184 plots.

Size classes: Small= 9.0-20.9 inches dbh
Medium= 21.0-31.9 inches dbh
Large= 32.0-47.9 inches dbh
Giant- 48.0+ inches dbh

Logs= pieces greater than 20 feet long.

Figure 1 describes the characteristics of mature stands within the Oregon Coast Range. The information provides a reference point for historical conditions of the mature seral stages in the Western Hemlock and Sitka Spruce Zones.

Considering the accounts of early explorers and the fire history of the area, it is generally accepted the watershed was primarily late-successional forests in the early 1800's. Openings were confined to the higher elevations, such as the tops of Mary's Peak and Grass Mountain, as well as the coastal strip and river valleys, where flood events and wetlands kept the forests from encroaching. Conifer stands remained in late-successional conditions for long periods between major disturbance events.

The large 1850 fire initiated new stand development in the interior of the Coast Range, including the majority of Drift Creek. The more remote stands within the watershed developed with little influence from settlement activities. In the Upper Drift and Gopher Creek areas, agricultural burning associated with settlement retarded stand development. Historical panorama photos taken at lookouts and oblique angles reflect the influence burning had on stand development.

Changes in vegetation patch types and distribution within the Drift Creek analysis area prior to intensive logging are reflected in Maps 10 and 11. The maps provide a general visual picture of the changes in patch sizes and distribution on the landscape. These maps were created from data collected by county and early Forest Service surveyors. Vegetation typing (especially areas typed as mature conifer or hardwood stands) and accuracy levels vary greatly between maps and thus cannot be used for data comparison purposes.

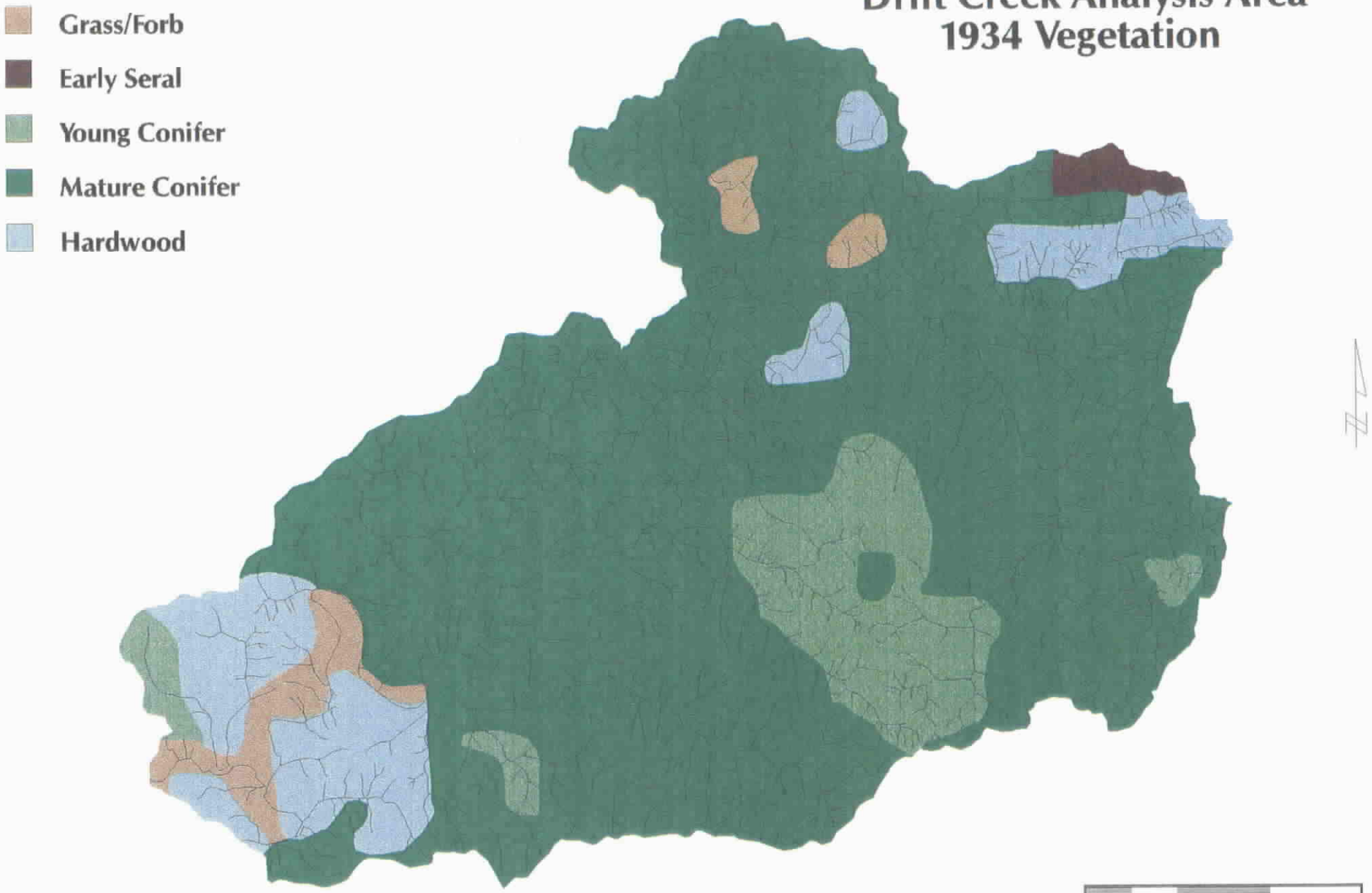
Historic Conditions -- Post 1955

Associated with the increased harvest activities of the 1950's a change in the mix of seral stages and patch size distribution occurred. On industrial lands, many adjacent managed stands are essentially the same age (25-40 yrs) and therefore combine to make a relatively large block (1000 acres) of mid-seral age forest. On Federal lands clear cuts were relatively small disturbance patterns (<100 acres) evenly distributed across the landscape. As described earlier, plantations were managed for wood fiber production, consequently they are not as diverse as natural stands of a similar age class. Generally, plantation establishment of clear cuts was relatively easy. Growth rates are rapid, averaging 30 inches per year, while mortality is extremely low. Nepheline syenite at Table Mountain and vegetative competition in the Sitka Spruce zone do cause some difficulties establishing plantations in those areas.

Vertebrate Species

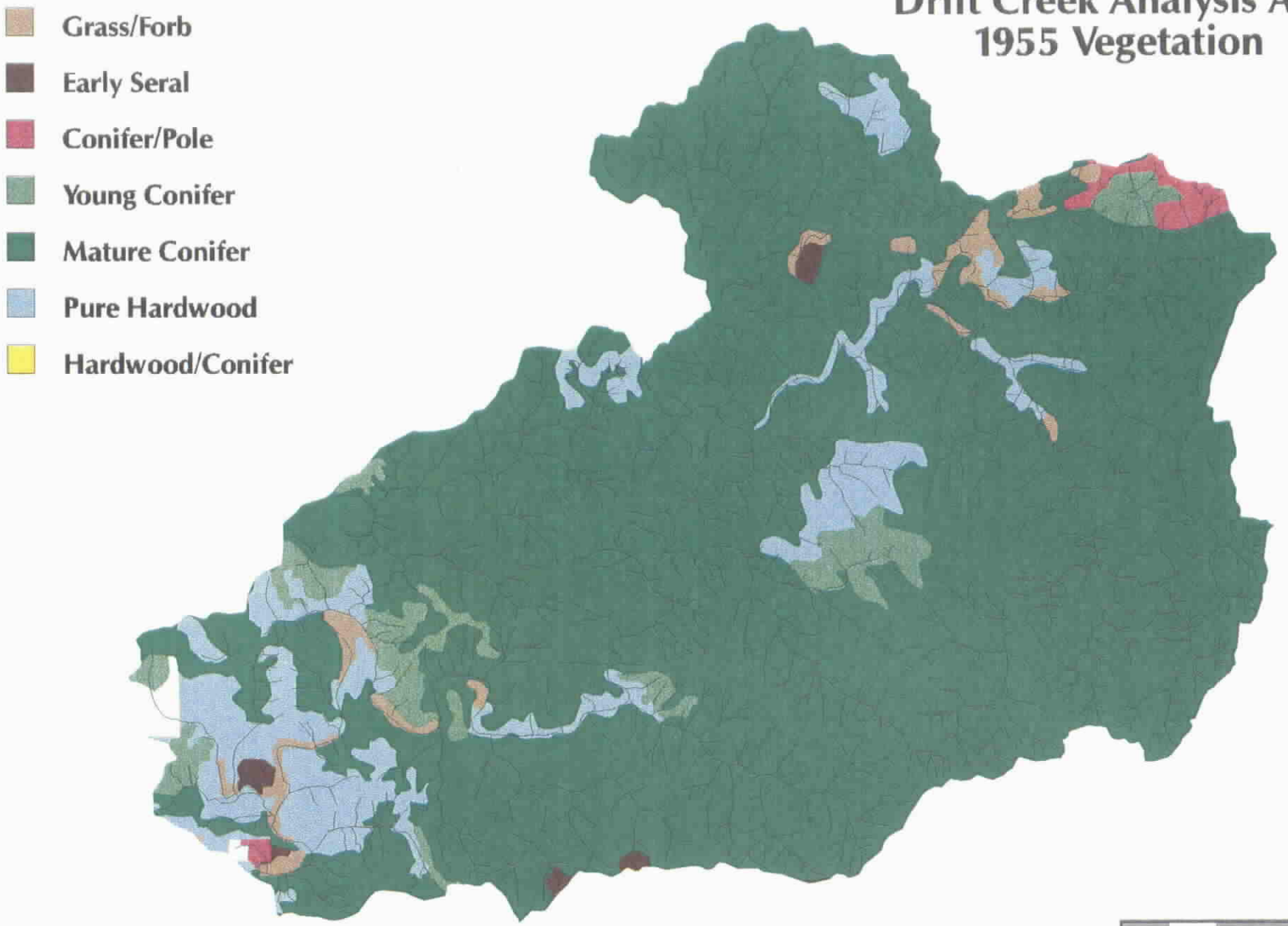
The shift in vegetation patterns and the acceleration of disturbance regimes on the landscape has dramatically altered the amount, distribution and quality of the terrestrial and aquatic habitats. Species that once had adjacent refugia to escape to after major

Drift Creek Analysis Area
1934 Vegetation



Map 10

Drift Creek Analysis Area
1955 Vegetation



Map 11

disturbance events, are now restricted to smaller habitat patches and are competing for limited resources. The edge effect of forest fragmentation reduces the amount of interior forest habitat available to mature and old growth dependant species. The risk of predation and competition with edge associated and non-native species increased with the additional edge habitat within the watershed. Forest fragmentation has had a direct negative effect on the survival and reproductive success of spotted owls, marbled murrelets and neotropical migratory songbirds. Chapter 4 describes the current distribution of seral stages and patch sizes within the watershed.

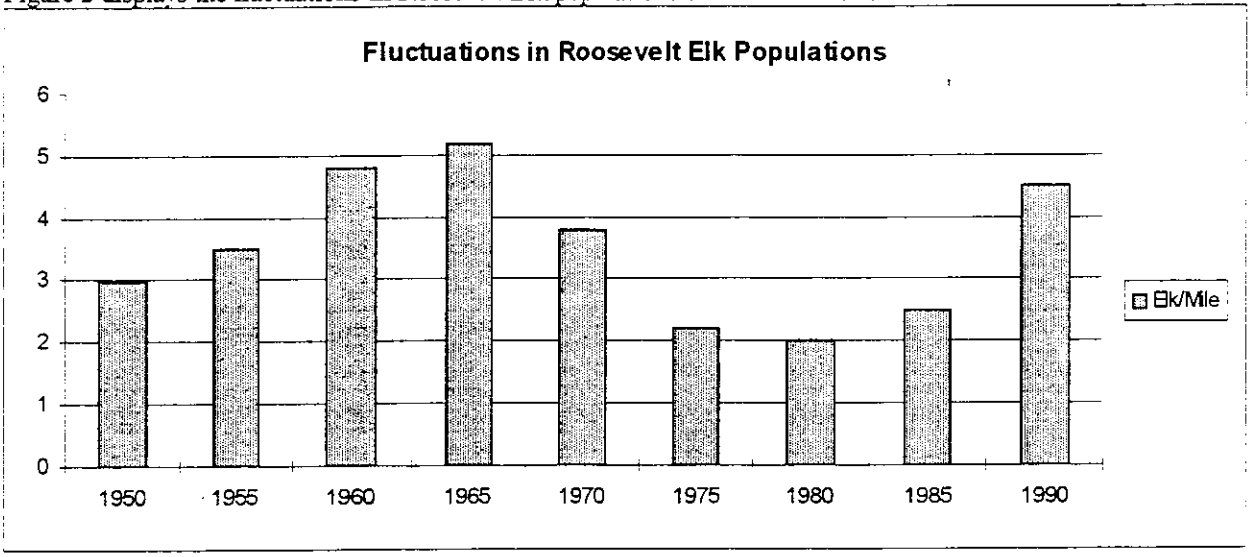
There are no known special habitats, such as caves or cliffs, within the analysis area. The quarry at the top of Table Mountain does have rock outcroppings, but this site is not considered to be suitable habitat for plants or animals that may be associated with cliffs or outcrops. Wetlands associated with beaver ponds were historically abundant in the upper basin. The quantity of habitat fluctuated closely with beaver populations.

A historical bald eagle nest site is located near the top of Table Mountain. Although this site has been inactive for a number of years, adult bald eagles have been observed along the confluence of Nettle Creek and Drift Creek. An alternate nest site may be in the area. Observations of this pair indicate they may have been foraging as far away as the coast, a distance of 11 miles. Although the Drift Creek drainage has a high potential to support bald eagles, the overall habitat suitability rating was considered to be moderate due to low fish stocks and unstable year-round runs.

Though common when settlers first arrived in the Coast Range, the Roosevelt elk was nearly extirpated in Oregon by market and subsistence hunting between 1850 and 1900. Market hunting was outlawed in 1899 and a combination of transplant efforts and state-wide hunting moratoriums between 1909 to 1938 allowed populations to slowly increase again. Populations peaked in the mid-'60's and declined sharply again through the '70's. The lowest populations occurred in the late 1970's and early 1980's (Oregon's Elk Management Plan, 1992).

The following chart (Figure 2) shows the changes in populations of Roosevelt elk in Western Oregon. This information is from the Oregon Elk Management Plan (July 1992, p. 5).

Figure 2 displays the fluctuations in Roosevelt Elk populations between 1950 and 1990



Ironically, the decline in elk populations coincides with high timber harvest levels on federal and private lands. The increase in road densities and hunter access are considered to be the primary limiting factor for the population during the 1970's and 1980's. Changes in public road access and meadow management helped to increase herd numbers.

Botanical Species

The known botanical resources in the watershed include vascular plants that are on the Regional Forester's Sensitive Species list, as well as selected mosses and lichens that are part of a multi-forest air monitoring program.

Vascular Plants

Prior to the 1990 vascular plant surveys were usually limited to areas affected by proposed ground disturbing activities. Survey strategies focused on species listed on the Regional Foresters sensitive species list. Within the watershed the primary habitat surveyed was associated with loose flowered bluegrass (*Poa laxiflora*). Previous surveys did not reveal other habitats potentially associated with other sensitive species.

Non-Vascular Plants

Suitable habitat for many non-vascular plants, especially fungi, is found within the watershed. Few surveys have been conducted for non-vascular plants although many species associated with mature forest conditions have been gathered for personal and commercial use in the watershed.

Non-Native Species

Forest fragmentation and maintenance of early seral conditions encourage the spread of non-native and invasive plant species, such as Himalayan blackberry, Scotch broom, tansy ragwort and many of the European pasture grasses. The long settlement history in the upper and lower reaches of the drainage resulted in non-native plants becoming well established. The change in vegetation patterns is also beneficial to non-native and non-indigenous wildlife species that were uncommon or absent in this region. Competition and parasitism by European starlings, brown-headed cowbirds and English sparrows, along with predation by feral cats and opossums occur within the watershed.

CHAPTER 4 CURRENT CONDITIONS

This chapter describes the watershed as it currently exists. The current conditions found in the watershed reflect the human influence on the landscape, ranging from intensive forestry, rural living and attempts to protect shrinking resources.

PHYSICAL ENVIRONMENT

Geology

Current lithology and structure (faults and folds) elements are unchanged from historic conditions.

Geomorphology

Slope stability analyses methods and predictive models cannot predict exactly where or when a landslide will occur. We can, however, identify areas in a watershed where landslides are most likely to occur. Stability analysis can provide us with the probability of a landslide occurrence under assumed storm intensities and soil strength conditions. We know that landslides in the Coast Range usually occur on slopes steeper than 60 percent in hollows or unchanneled valleys, based on landslide inventory information. Those factors have been used to model landslide susceptibility.

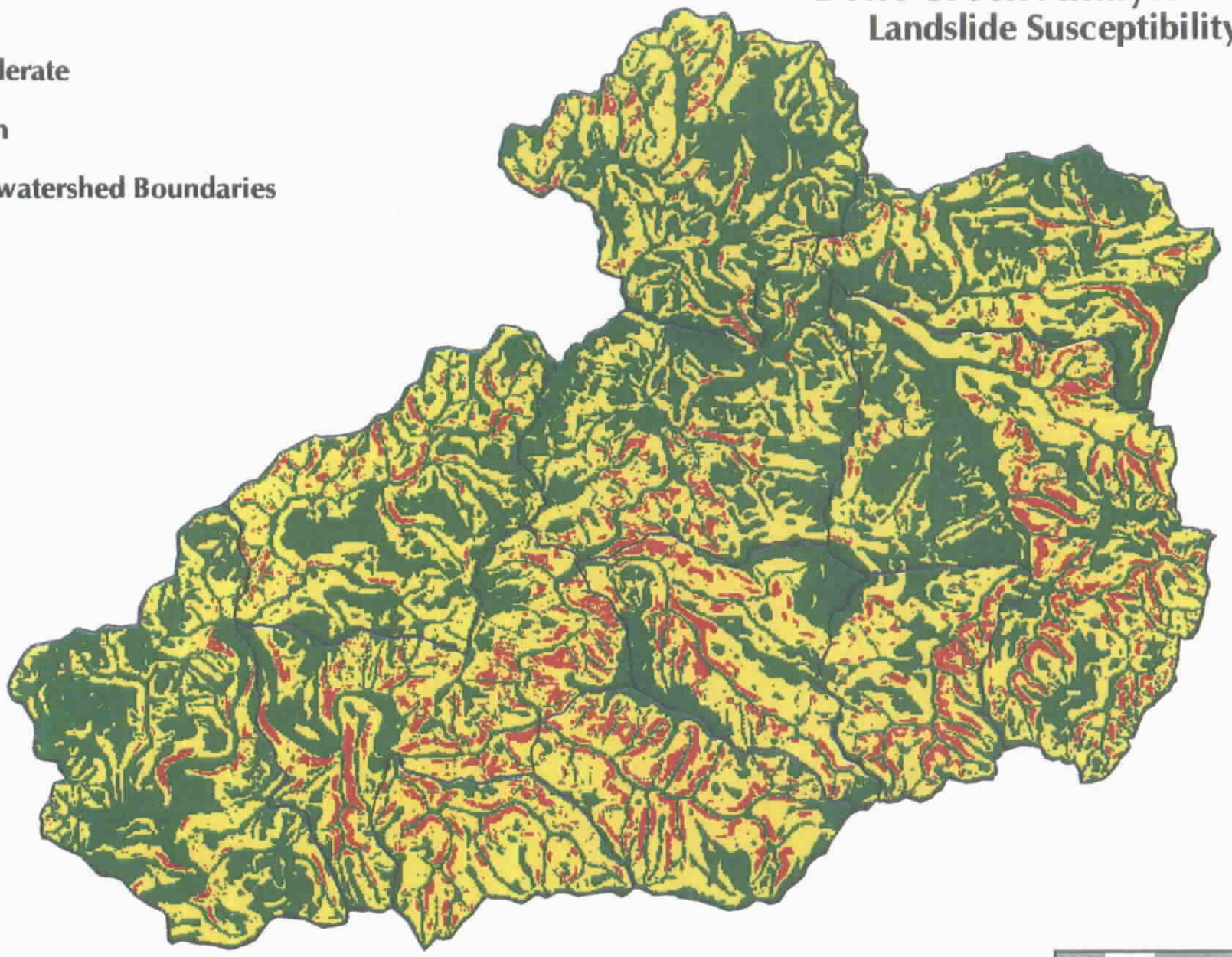
Landslide Susceptibility Model
Shaw and Johnson (1995) describe a method for using digital elevation data in standard ArcInfo analysis routines to model the association between particular landforms and landslide occurrence. The model differentiates convex, planar, and concave landforms in both the horizontal and vertical planes. When those landforms are further classified by slope gradient classes, the result is a display of areas with equal landslide susceptibility. The following illustrates how slope forms have been rated for landslide susceptibility based on slope class.

Slope form	Slope gradient (percent)		
	A (<35)	B (35-65)	C (>65)
convex	low	low	moderate
planar	low	moderate	high
concave	moderate	high	high

Shallow-rapid Landslide Susceptibility Matrix

The Landslide Susceptibility Map (Map 12) results were compared with an inventory of actual landslide locations to measure the reliability of its predictions. The inventory was done by stereoscopic interpretation of aerial photos taken between 1962 and 1989. Approximately 53 percent of all landslides occurred on moderate landslide susceptibility lands, and 27 percent of inventoried slides occurred on lands rated as high landslide

Drift Creek Analysis Area
Landslide Susceptibility



Map 12

susceptibility. When interpreting these results, note that all of the inventoried landslides are associated with either roads or timber harvest units; no slides were identified in unmanaged areas. Unpublished studies in western Oregon have determined that up to 50 percent of slides occurring in unmanaged parts of the study areas was not observed by aerial photo interpreters. The Landslide Susceptibility Map is not necessarily an accurate predictor of landslide occurrence under special site conditions. These include conditions created by roads or timber harvest, which can significantly change groundwater availability, and even affect soil mechanical properties and permeability.

The Landslide Susceptibility Map provides a generalized view of where landslides are most likely to occur under natural conditions. It will focus field-based mapping and analysis of landform, slope, soil mechanical properties, and groundwater availability during planning for future management activities.

Landslide-Erosion Rates

Landslides, as previously discussed, are a natural landforming process. The rate at which landslides occur under natural conditions is, however, difficult to determine. We assume that landslides occur at some low level under forested conditions, and at a higher level in response to disturbances such as wildfire and high intensity storms. Reliable occurrence rates after major natural disturbances have not been made because it is impractical to inventory landslides more than fifty years old and tie them to a particular storm or fire.

Most watershed and landscape-scale landslide inventories are done by interpreting aerial photographs. Since air photos have only been available since the early 1940's, the period of record is relatively short. Timber harvest and road construction have been increasing since the 1950's further reducing the 'sample base' of undisturbed land. It is also difficult to see the ground through the tree canopy on air photos, so the inventoried number of naturally occurring slides is always thought to be lower than actual numbers. Some researchers have estimated that the actual number of naturally occurring landslides is 50 percent higher than inventory figures. Some inventories do not identify natural landslide occurrences.

Photo-interpreted landslide inventories for the Drift Creek-Alsea watershed identify very small numbers of naturally occurring slides over the last 30+ years. These inventories suggest that management-related slide occurrence rates are between 5 to 9 times greater than natural rates. Map 13 displays known slides associated with roads and harvest units. While the rate of management-related increase may not be based on realistic natural occurrence rates, as discussed above, we can safely say that the rate of landslide occurrence increases after land management activity. This conclusion is supported by numerous published studies done from the late 1970's to present.

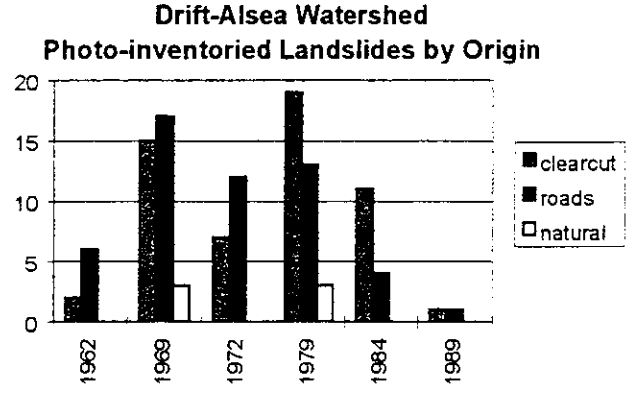


Figure 3

Figure 3 illustrates the landslide inventory results. It indicates an apparent downward trend in the number of road-related landslides from the late 1960's, while the number of harvest-related slides has stayed in the same range during that period. The number of landslides found after the major storm and flood events of 1964 and 1974 (see results for 1969 and 1979) increased over numbers from the previous inventory periods.

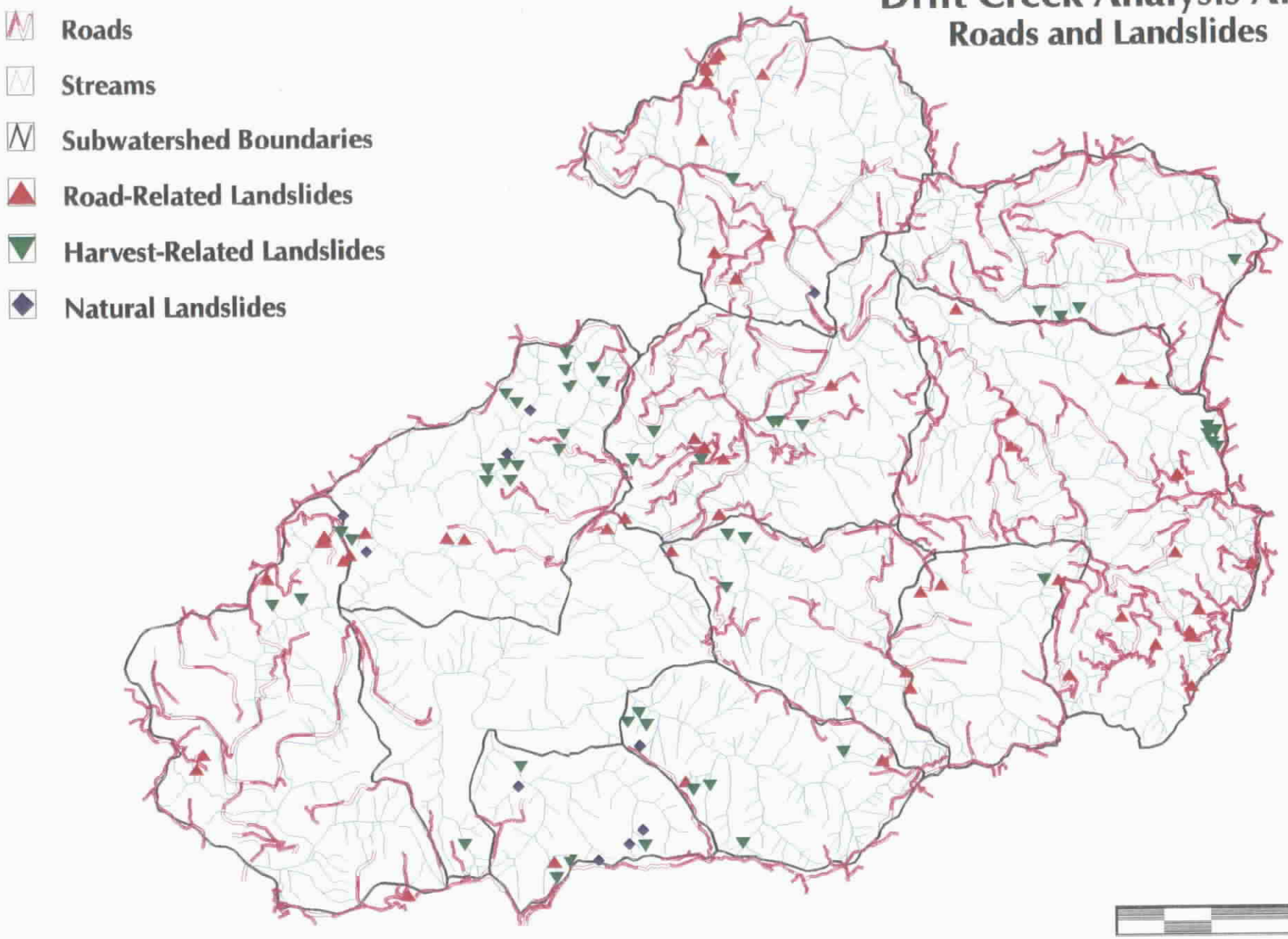
It is tempting to conclude that the reduction in the number of road-related landslides is the result of improved road location and construction practices implemented in the mid 1970's. Further analysis of this data together with studies of the effects of the 1996 storm should be done before we feel comfortable with that conclusion. A decline in harvest-related landslides is expected to occur with the associated decline in harvest activities on federal lands, and with the maturation of managed stands. It is not expected that landslide levels would return to natural rates for several decades, however. With intensive management on industrial lands expected to continue, landslide rates there are expected to be higher than background levels, especially on the moderate to high susceptibility slopes.

Sediment Routing

Landslides and their resultant debris flow (debris torrents) in the 'source' and 'transport' reaches are the primary delivery mechanism for CWD and sediment in the Coast Range. Management-related landslides have been blamed for increased sediment bedloads in northwest streams and the (apparently) resultant loss of pools and/or fish habitat diversity. While that cause-and-effect relationship does clearly exist in many streams, it cannot be demonstrated to exist in every stream.

Under natural conditions, Tyee sandstone streams are expected to have higher amounts of fine sediment than streams originating from harder rock sources such as Yachats Basalt. The increased rate of landslide occurrence, caused by management activities, has raised the volume of fine sediments delivered to Drift Creek streams above those relatively high natural background levels. Still, in general, the Drift Creek Watershed does not have an excessive sediment load. The lack of CWD in the stream channels limit's sediment retention as bedload. Figure 6 displays the distribution of large wood within the system. The high percentage of bedrock substrate in the mainstream of the upper basin

Drift Creek Analysis Area
Roads and Landslides



Map 13

demonstrates this lack of sediment retention. Streams will continue to remain disconnected from terraces and coarse sediment sources.

The Forest Service has decommissioned 10 miles of roads in the watershed since 1990. The removal of culverts has resulted in more natural channel functions at these sites. Where roads are located on slopes (not on ridge-tops), they will continue to influence hydrologic processes as well as slow and store debris from slope failures. Sections of the road system will constrain stream channels and in some places substantially alter fluvial processes. The most impacted section lies on the Gopher Creek Road (County Road 609) just upstream of Cape Horn Creek. Channel constraints also occur along Horse, Meadow, Flynn and upper and lower Drift Creek.

HUMAN ENVIRONMENT

The utilitarian landscape in the upper and lower Drift Creek reflects the economic dependence on the land by residents and landowners. Most of the relatively broad valley bottoms, able to support agriculture, are privately owned and maintained as pasture. The high percentage of managed stands (43% of the land base) reflects the commodity production on federal and private forest lands.

Native American Use and Consultation

In 1996 the Siuslaw National Forest signed a Memorandum of Understanding (MOU) with the Confederated Tribes of Siletz Indians of Oregon. The MOU addresses consultation on natural resources and cultural heritage issues within aboriginal lands. The Forest is currently working with Tribal members to identify and manage traditional fiber and medicinal plant resources within the Forest. The forest also works with the Tribe on identification and protection of cultural resources during project planning. Descendants of the Alsi are members of the Confederated Tribes.

Current Settlement

About a dozen families live within the watershed. There is a relatively even split in numbers between the upper and lower portions. Families in the upper basin have close community ties with Harlan and Burnt Ridge. County Roads 609 and 617 serve as a primary connector between the upper basin and the Harlan community. Base income is derived from outside the watershed, with some commuting to Corvallis on a regular basis. The lower basin is more closely associated with Waldport, Seal Rock and Newport. Agricultural activities are as much a social component as an economic supplement to their income.

A small 10 head cow-calf operation is authorized to graze the Gopher Creek Allotment under a Term Grazing Permit. Under terms of the permit, the permittee's livestock may utilize 110 AUM's during the year long grazing season. Grazing on the lower Drift Creek

is authorized through a 10 acre pasture permit. The pasture is grazed in association with the adjacent 105 acre private parcel. In Both cases the majority of grazing occurs along the meadows adjacent to the primary stream channels.

Intensive Forestry

Private Industry
Current and planned harvest activities on private land reflect objectives for high wood fiber production. Georgia Pacific commercially thins theirs stands between 25-30 years of age. The clear cut harvest of the residual stands is planned between 45 and 50 years of age. Considering current age classes, GP expects their final harvest to start in the northwest portion of their property, beginning in eight to ten years. The management plans for the other companies are unknown at this time. Harvest practices are guided by the state forest practices act.

Federal Management
The Siuslaw NF has only sold three sales since 1990, including salvage, commercial thinning, and clearcut regeneration harvests. Two sales (Wheelock 403 and Randall Salado) were sold under the 318 Rider. Four units of Wheelock 403 and one unit of Randall Salado remains un-harvested. The future of these sales was uncertain for several years due to the jeopardy opinion issued by the US Fish and Wildlife Service in May 1994. Through agreements with the purchasers, these sales will not be harvested. The timber volume within the Wheelock units are likely to be replaced by sales on another Forest. Natural and managed stands 40-65 years of age within Drift Creek may provide replacement volume for the Randall Salado sale. A further reflection on the radical change in Federal harvest activities is the low level of managed stands established since 1990. Only 575 acres have been planted, 75% in 1990 alone, with no acres being planted since 1992.

There are approximately 6100 acres of plantations managed by the Siuslaw within the watershed. Generally the plantations meet past objectives established which emphasized wood fiber production. The age class distribution is heavily weighted to those stands currently or rapidly approaching 30 years of age. Within seven years over 50% of the managed stands will be at least thirty years of age. Until recently, the growth and stocking denstiy of these stands followed the anticipated growth models for these stands. As with most plantations of this age, stocking levels are higher than found in natural stands of similar age while species and structural diversity within the stands are much lower. Generally this age group is at a junction for future development. Considering current objectives, these high density stands can develop at a slower rate than natural stands. A second option would be to thin the stands to stocking levels more consistent with natural stand development or accelerate them above natural development.

An additional 1900 acres of plantations are in the 10-20 year age class. Many of these stands are located in one of the original Habitat Conservation Areas, as well as subsequent conservation or reserve designations. Consequently traditional precommercial thinning

treatments were deferred during the debate over appropriate management direction for these land allocations occurred.

Since the initiation of this analysis, Swiss needle cast (SNC) has emerged as a potentially significant problem for Douglas-fir within the Coast Range. Initially considered an impact on Douglas-fir grown outside its natural range, SNC now appears to be present in many Douglas-fir stands on the Siuslaw. This fungal infection is currently causing severe defoliation and increment loss in scattered plantations all along the Oregon coast. There is a perception that the disease is getting worse on inland areas as well.

Although considerable variation of infection severity is apparent, the corresponding impact on growth is largely unknown. Severely infected trees, exhibit distinctively aberrant foliage quantity, color and size. Growth loss is quite apparent in severely impacted plantations, but may be more subtle in other areas. Within the pacific Northwest, height growth of SNC-infected stands has been estimated at 50-70% of normal, corresponding to as much as a 30% volume growth loss.

Infections may be particularly critical in young plantations (5-30 years of age) due to limited silvicultural options and economic opportunities for corrective action. Research to date has shown that fungicides are not a promising operation treatment. Additions of nitrogen, phosphorus, macro and micro-nutrient mixtures are being evaluated, but preliminary results are not promising. Favoring species other than douglas-fir during thinning, or interplanting spruce, hemlock or cedar in high hazard areas is probably the best option at the present time.

Preliminary analysis of some of the stands in this watershed indicates that annual growth has declined dramatically in the past five years due to very limited production of spring wood. If this condition prevails for long periods of time, mortality would likely increase and growth targets would have to be revised downward.

Map 14 displays the matrix lands within the watershed. With less than 4% of the federal land base managed under the standards and guidelines for matrix lands, future potential sale quantities are limited. After accounting for un-mapped managed late successional reserves and riparian reserves, there are 544 acres of matrix under federal management. Within this matrix base, there are approximately ten stands of mature conifer that could be considered for future harvest under the NWFP. The combined size of these stands is 60 acres, which is less than 0.01% of the total mature or old growth found on Federal lands within the basin. Considering current legislations, it is likely that Randall-Salado or Wheelock 403 will not be clear cut harvested. Consequently, clear cut harvesting on federal lands within the watershed is not likely to be seen in the near future. With harvest levels expected to remain low on federal lands, there will be little influence on local jobs by Federal timber sales.

With reduced harvest on Federal lands, significant reductions in the quantity of firewood have also occurred. Firewood has been made available when trees have fallen across the

primary or secondary road system or in conjunction with road maintenance activities. There are currently nine greenery leases in the basin on federal lands. As the road system degrades the amount of area accessible to the leases is expected to be reduced. The current value of these leases is approximately $10,000.

Roads

Map 15 displays the current road system used to support residential access, recreation and timber harvest, including many of the roads found on private land. The highest road densities (Figure 4) occur in those subwatersheds that have a high percentage of private land. On private lands, only minor amounts of road construction are expected in the future to support timber harvest. The heaviest use of the road system occurs during the general deer and elk hunting seasons. Prior to the ATM Plan, the Forest Service often maintained part of the county road system through formal and informal agreements. Since completion of the ATM Plan the Forest is re-evaluating those agreements for consistency with priorities set in the plan.

Georgia-Pacific is in the process of upgrading culverts to meet a 50-year flood event in areas where commercial thinning is planned. Remaining areas would be upgraded at the time of final harvest. With increased vandalism (trees being cut, garbage being dumped) many roads on private land are being closed to general forest travel. Georgia Pacific expects to keep the 1000, 1060, 1080 1040 and 1042 roads open to the public unless they are harvesting in the area.

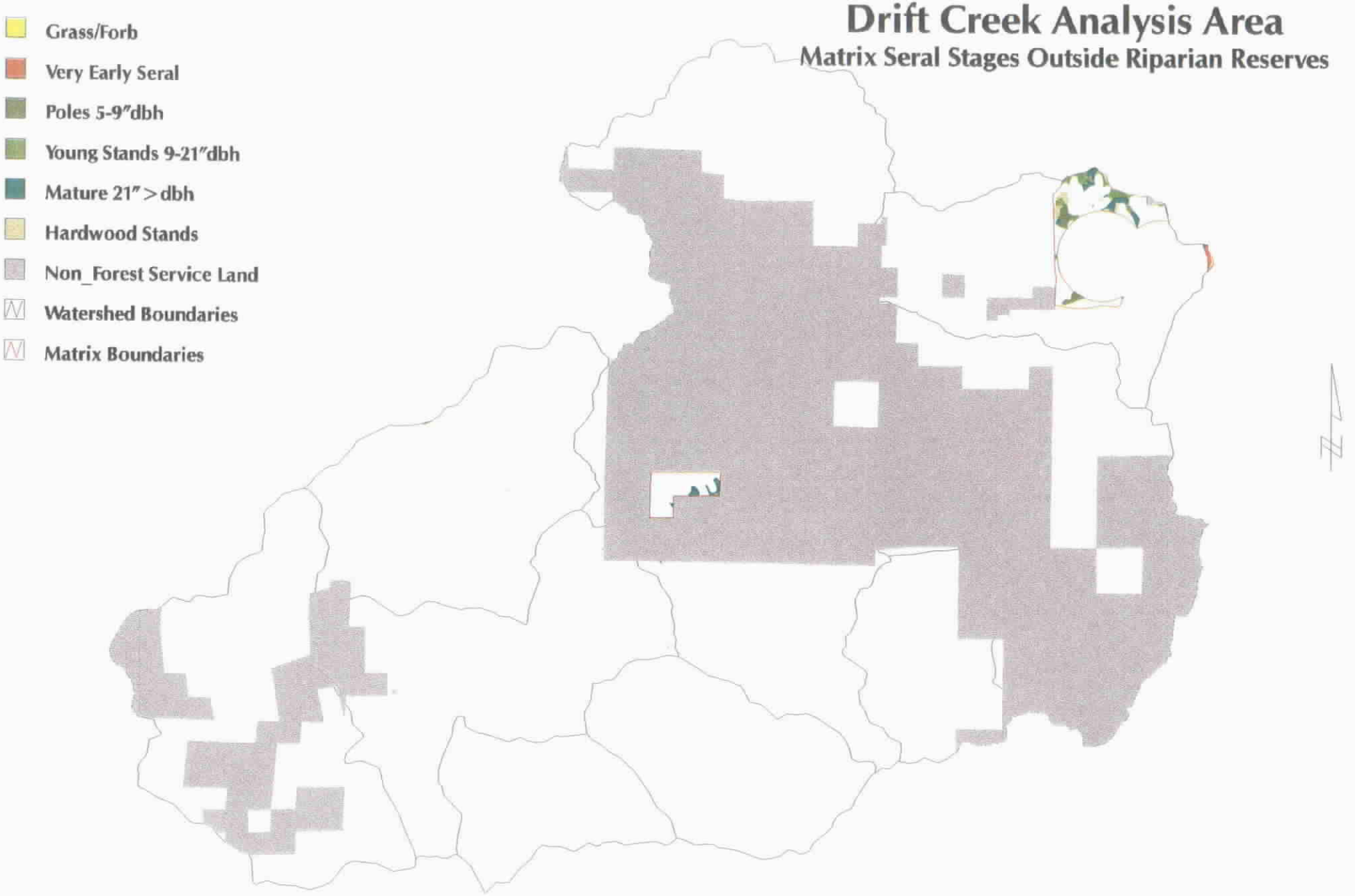
		Density
Subwatershed	Total Miles	(mi/sq mi)
Boulder	5.8	1.35
Cougar	2.38	0.83
Drift	5.65	0.86
Gold	11.1	2.55
Gopher	20.8	3.57
Horse	23.37	3.17
Lyndon	22.85	2.92
Middle Drift	28	3.86
Table	6.9	2
Trout2	8.9	1.38
Upper Drift	45.78	4.13

Figure 4-- Road Density within the Drift Creek Watershed

Figure 4 reflects the miles of road that influence the hydrologic function of this watershed, including roads that have been decommissioned. The data base primarily contains Forest System roads and the main roads on private land. Unfortunately many of the small collector roads on private land and temporary operator spurs on federal land are not reflected in the data base. Therefore road densities are higher than shown in Figure 4 especially in the Upper Drift and Middle Drift areas..

Drift Creek Analysis Area

Matrix Seral Stages Outside Riparian Reserves



Map 14

The forest has decommissioned 10 miles of road within the watershed since 1990. An additional 0.5 miles of road were decommissioned in a cooperative effort with Georgia-Pacific. The decommission process included the removal of culverts across live stream crossings and the water-barring of the remaining road bed. These roads were some of the first decommissioned on the forest and were chosen based on aquatic and road maintenance issues.

In 1994 the Siuslaw NF adopted an Access and Travel Management (ATM) plan to guide future road management priorities for its road system. The 43 miles of road identified as primary and secondary (Map 15) will be maintained to the standards identified in the ATM plan. Approximately 25 miles are county maintained. During preparation of the ATM plan, it was anticipated available road maintenance dollars would be allocated primarily to maintain the primary and secondary road system. It was expected the benefitting project (such as recreation, fisheries, timber or wildlife) would need to allocate funds to help maintain those roads required to meet project objectives. The remaining 70 miles of Forest System Roads within the watershed falls within this category.

Drivers on secondary roads can expect to experience increased brush encroachment, more potholes and reduced travel speeds. With limited or no maintenance planned for project maintained roads, some drainages are expected to fail resulting in washouts and slides. Vehicle passage on these roads will decline as they grow in and road beds fail.

Minerals

Over the last several years, development of the existing load and placer claims have been proposed. However proponents have failed to file either a Notice of Intent or Operating Plan. Private rock quarries on Table Mountain continue to be used as an aggregate source for road maintenance as has the Forest Service quarry.

Recreation

Values associated with environments untrammeled by humans, and relatively intact forests are reflected in the management of the Drift Creek Wilderness and associated wild area. The Drift Creek Wilderness is valued for primitive camping opportunities and the chance to hike within a largely intact coastal rainforest. Use is relatively light, less than 1000 visitors per year. Factors contributing to its low usage include: 1) relatively small size, 2) accessibility, 3) visitor experience and 4) low public awareness. A wilderness implementation plan was prepared in 1994. The primary actions related to maintaining wilderness values include meeting the needs of the wilderness user, education and information. At current funding levels, lack of trail maintenance, trailhead parking, trailhead signing and adjacent road use will continue to affect visitor experience. Day trips will continue to be the primary means of meeting the wilderness experience.

Drift Creek continues to provide water-related activities although fishing opportunities have declined. Boaters troll the tidewater areas of the lower reaches while bank fishing is

still common in other portions of the watershed. Willammette Valley based kayakers have discovered early season opportunities along the main stem of Drift Creek. Their primary run starts above the wilderness and end in the tidewater area.

With limited equestrian opportunities within Lincoln County, individuals and groups have requested opportunities to ride their horses within a forested environment. The Lincoln County Mounted Sheriffs Posse has specifically requested the evaluation of horse use within the Drift Creek Wilderness.

Research

The Flynn Creek RNA was proposed for establishment in the mid 1970's. Although the Siuslaw Forest Plan allocated the area for RNA designation, formal establishment has been slow in developing. The environmental assessment to establish the RNA is under preparation.

Research within the watershed has taken on a new vigor. As part of the Coastal Landscape Analysis and Modeling Study (CLAMS), portions of the Alsea watershed study are being revisited. Scientists from the Pacific Northwest Research Station and the College of Forestry at Oregon State University are the principal investigators for the project. It's goal is to develop and evaluate concepts and tools to understand patterns and dynamics of provincial ecosystems and to analyze the aggregate ecological, economic and social consequences of forest policies for different owners at the provincial scale. With a broad set of interrelated tasks required to support this study, a number of research activities within Drift Creek are under way. Efforts have been made to improve the integration of research objectives and plans with forest management priorities and activities. The Forest lacks a compendium of past research within the watershed.

AQUATIC ENVIRONMENT

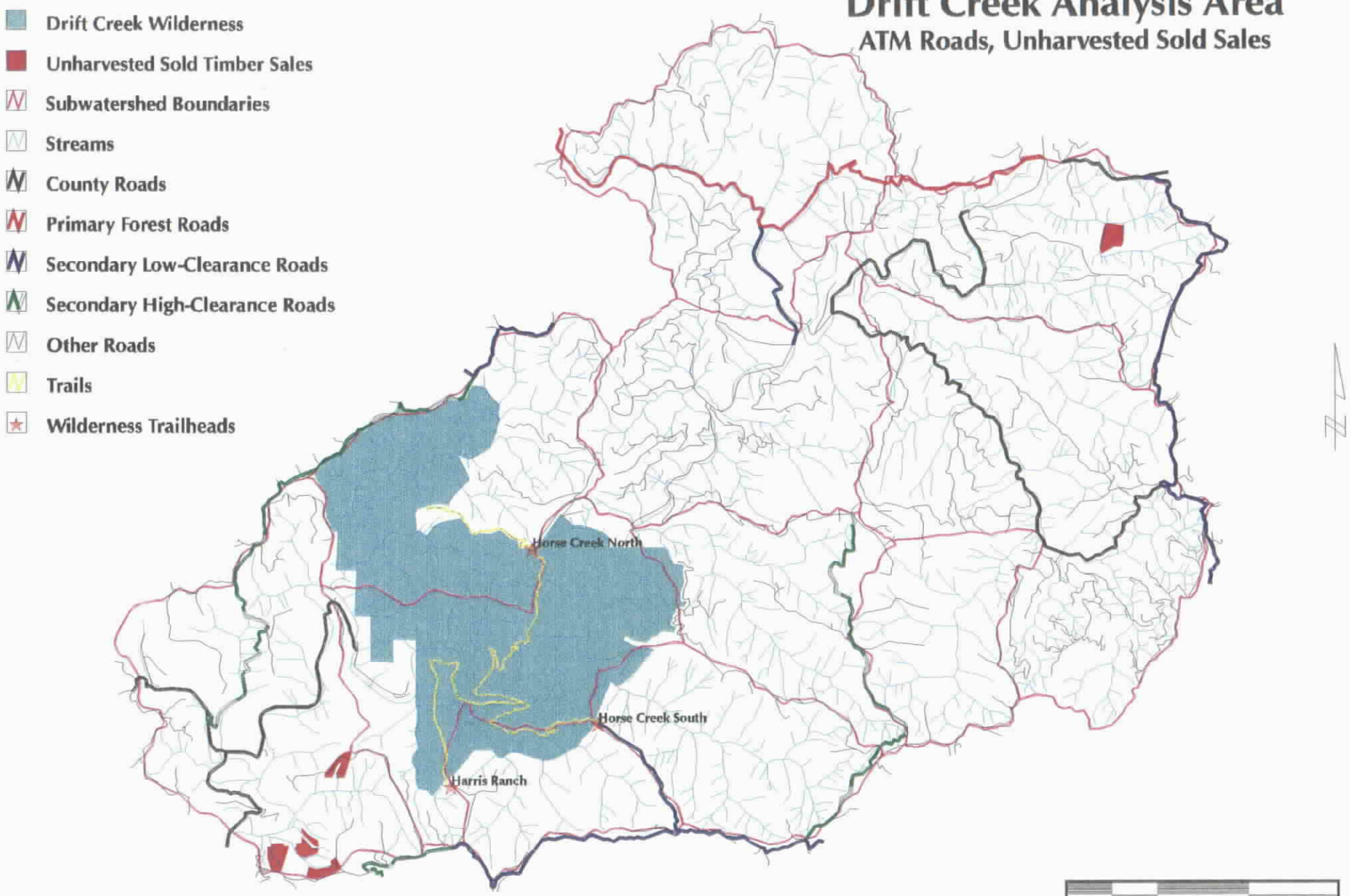
The current abundance of salmonid species reflect a number of factors. These include: habitat quality, ocean conditions, fish harvest and the influence of hatchery stock on life histories. The watershed contains spring and fall chinook salmon, coho salmon, winter steelhead, cutthroat trout, sculpins, dace, freshwater mussels and pacific lamprey. It also appears to contain suitable habitat for chum salmon, although none have been documented.

Population and Distribution

The 1996 ODF&W Northwest Region Fish Management Review (unpublished), describes the status of salmonid stocks within the Alsea Basin, including Drift Creek. Except for fall chinook, salmonid populations are at or near historically low levels. Drift Creek fall chinook are considered healthy (Huntington et al. 1996). Current research indicates poor ocean conditions and over-winter habitat as primary limiting factors on native salmonid

Drift Creek Analysis Area

ATM Roads, Unharvested Sold Sales



Map 15

production. Secondary factors may include competition with hatchery stocks and predation during smolt emigration.

Basin wide surveys conducted by Schwartz (1991) found chinook juveniles most abundant in the lower mainstream below Gold Creek, whereas coho was most abundant above Table Mountain Creek. Steelhead and cutthroat trout juveniles were relatively evenly distributed throughout the mainstream, although 1+ fish were slightly more abundant in the upper reaches. Schwartz found the lower reaches of Drift Creek had the largest increases in fish abundance when populations increased.

Habitat

Pool habitat comprised about 30-60% of the total habitat area in the mainstream of Drift Creek (Schwartz 1991). Those tributaries with the largest amount of total and deep pool habitat (Fig. 5) are strongly influenced by beavers. Summer stream survey data indicates beaver dams formed more than 20% of the pool habitat in Gopher, Traxel, Nettle, Flynn, Bear and Lyndon Creeks. Flynn and Gopher Creeks have greater than 50% of their pools formed by beavers. Beaver dam pools provide high quality summer and winter habitat for juvenile salmonids, particularly coho salmon and cutthroat trout.

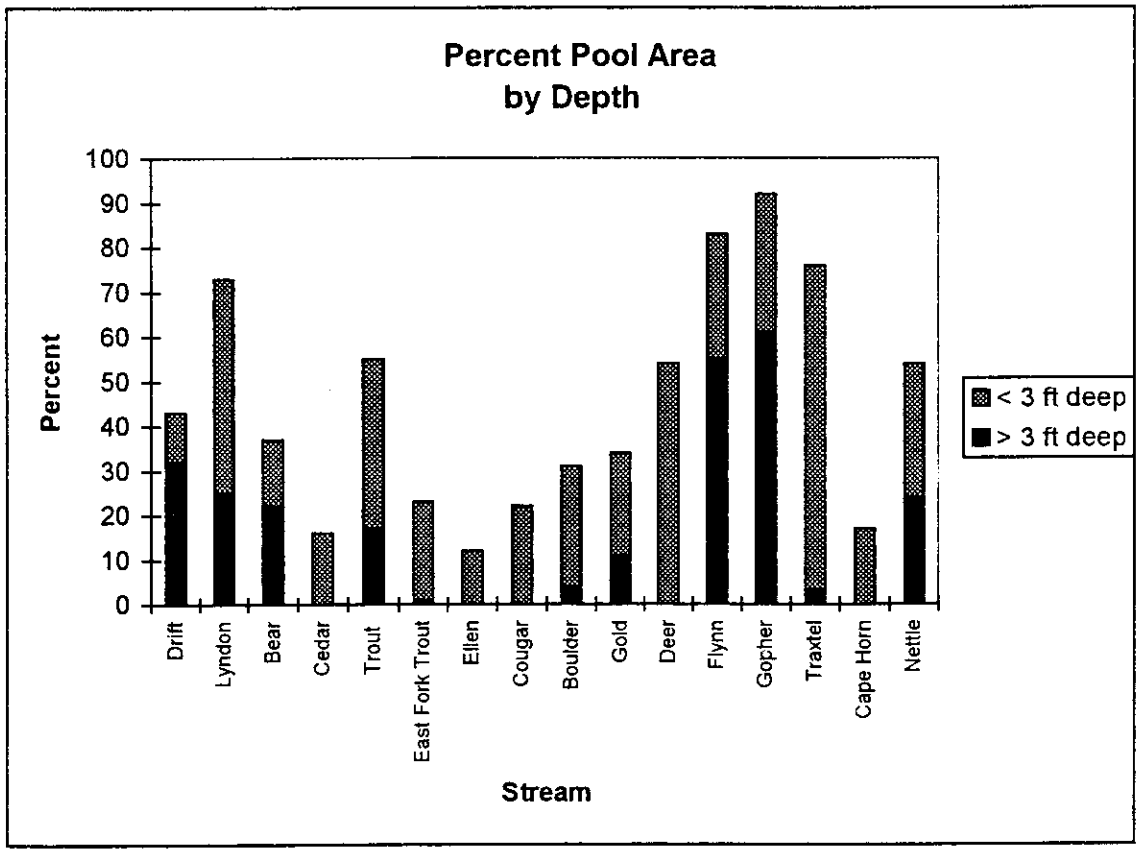


Figure 5 compares the amount of pool area to the depth for each sub-watershed.

The distribution of coarse wood within the watershed is displayed in Figure 6. The least disturbed subwatersheds, such as Trout, Cougar and Boulder have 40-70 pieces of large wood (>24"DBH, and 50' long) per mile. Most other streams with survey data are close to this range except for main stem Drift, Gopher, Nettle, Deer and Flynn Creeks. Nettle, Deer and Flynn Creek contain less then 10 pieces per mile. The main stem of Drift Creek and the lower 2.5 miles of Gopher Creek contain less than one piece per mile. These are far below less impacted systems which contain in excess of 40-80 pieces per mile.

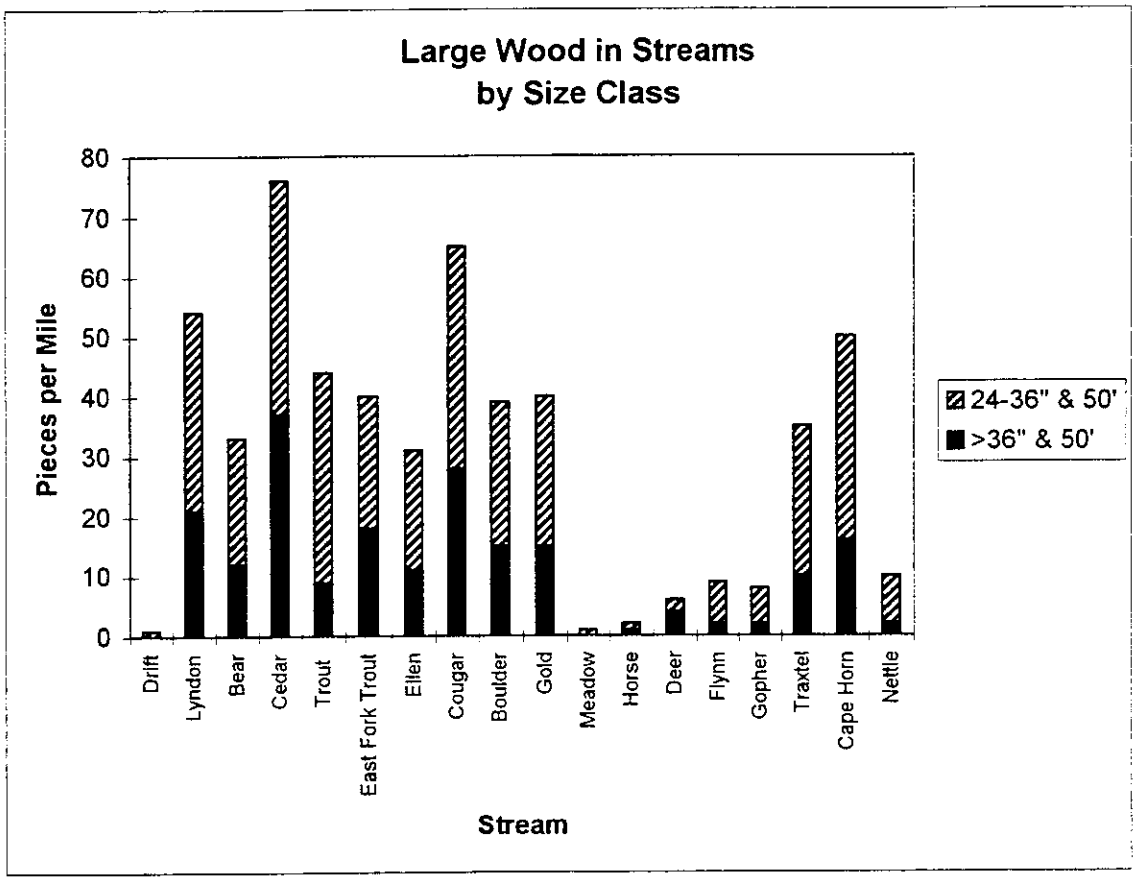


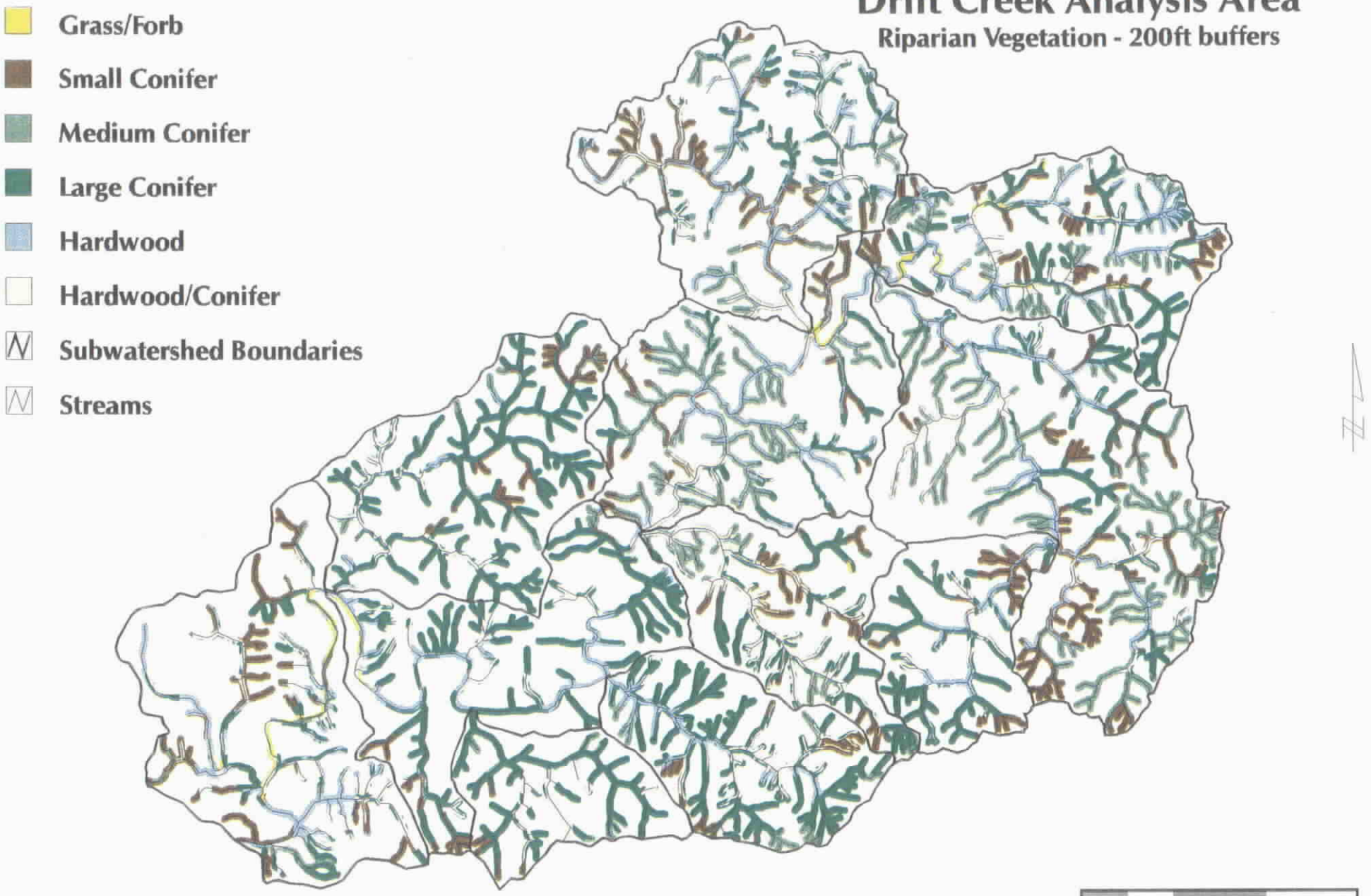
Figure 6 displays the distribution of wood within Drift Creek by subwatershed.

Stream restoration efforts have included the placement of CWD within stream channels since the late 1980's. Early efforts focused on recruiting spawning gravels and pool creation. Structures were engineered and built using logs and root wads. Later efforts placed long logs within the stream and banks. It was expected stream dynamics would configure log placement. Overall the amount of material added within the system was a minor amount compared to the levels expected at this point of natural succession.

The natural recruitment opportunity for coarse wood depends on the seral stage in the riparian area and the size of conifers adjacent to channels. The least disturbed areas remain the greatest opportunity for the natural recruitment of large conifers. Map 16 displays the current seral stages within 200 feet of streams. Figures 7 & 8 display the mature and large conifers found within 200 feet of streams by subwatershed.

Drift Creek Analysis Area

Riparian Vegetation - 200ft buffers



Map 16

The least disturbed riparian areas along small streams (third order and smaller), are found in portions of Boulder, Cougar, Trout, Table and Drift Creek. Within these subwatersheds, approximately 20-30% of the headwater stream miles have had large conifers removed through timber harvest. Large conifers currently comprise about 60-70% of the riparian vegetation within 200 feet of these channels.

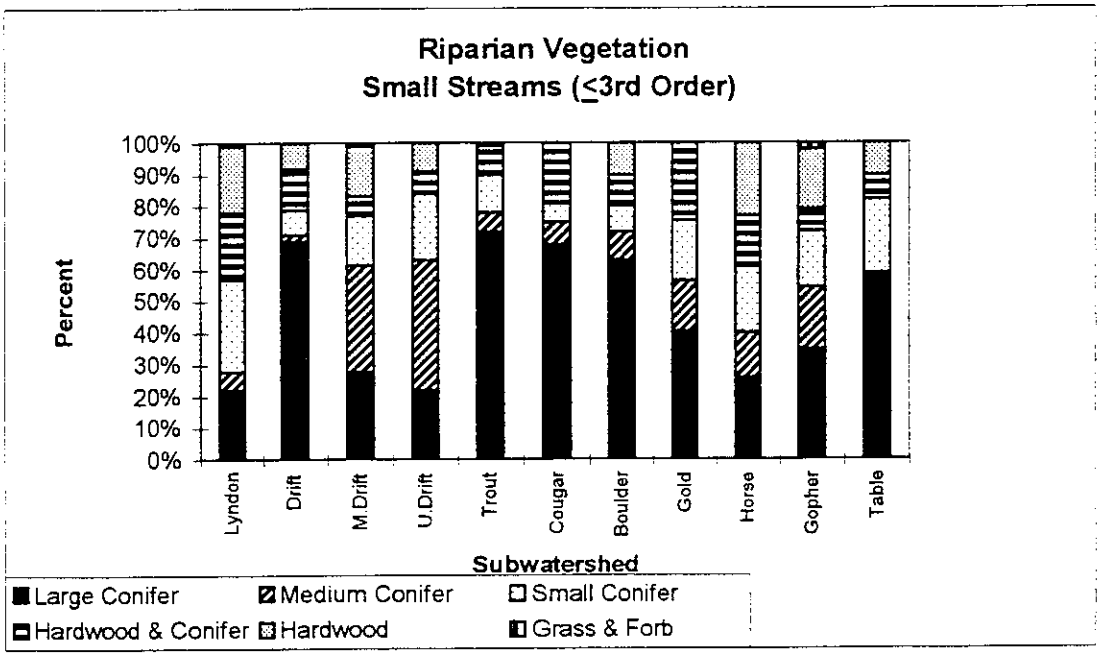


Figure 7 Riparian Vegetation on third order streams and smaller.

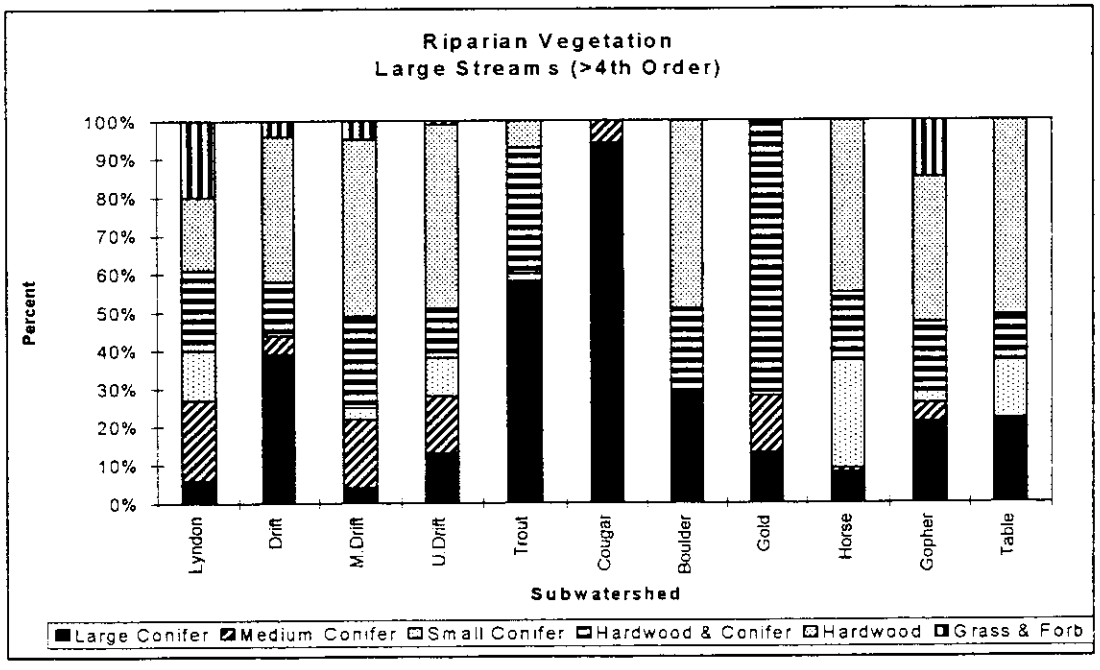


Figure 8 Riparian Vegetation on streams 4th order and larger.

On larger streams (4th order and larger), the least disturbed riparian areas are found in Trout, Cougar and Boulder subwatersheds. All three contain abundant large conifers on the lower slopes adjacent to stream channels as well as mixed stands of conifers, hardwoods and shrubs.

Along the main stem of Drift Creek, the least disturbed riparian area is between the western wilderness boundary and Gold Creek. Large conifers are abundant on the lower slopes adjacent to the stream with mixed stands on terraces and the floodplain. Large conifers appear more abundant on the valley floor along Drift Creek than along it's tributaries.

Unfortunately these conditions appear to be the exception on larger streams. In over half of the subwatersheds settlement and timber harvest activities impacted over 80% of the larger stream miles. The most extensive impacts occurred in the Middle and Upper Drift watersheds. The large conifer stands in these areas compose only 5-10% of the vegetation. Large conifer stands compose only 20-40% of the vegetation on smaller streams. This is far below the 50% level observed on larger least streams with the least disturbance. It is also below the 80% levels seen on smaller streams. The rate of natural conifer recruitment depends on the eventual decay of the hardwood stands, the occurrence of site disturbance events (such as timber harvest, floods or debris torrents) and competition with shrub species.

In response to current conditions, the Forest initiated a program to increase the conifer in riparian areas. Since 1990, riparian areas of federal lands have been planted with conifers, primarily in Upper Drift Creek, Gopher Creek and Gold Creek. The management objective has been to establish a conifer component without eliminating the existing hardwoods. The management activities required to ensure the survival of conifer seedlings under these conditions has evolved over the last six years. Early plantings have basically failed while more recent efforts are showing signs of success.

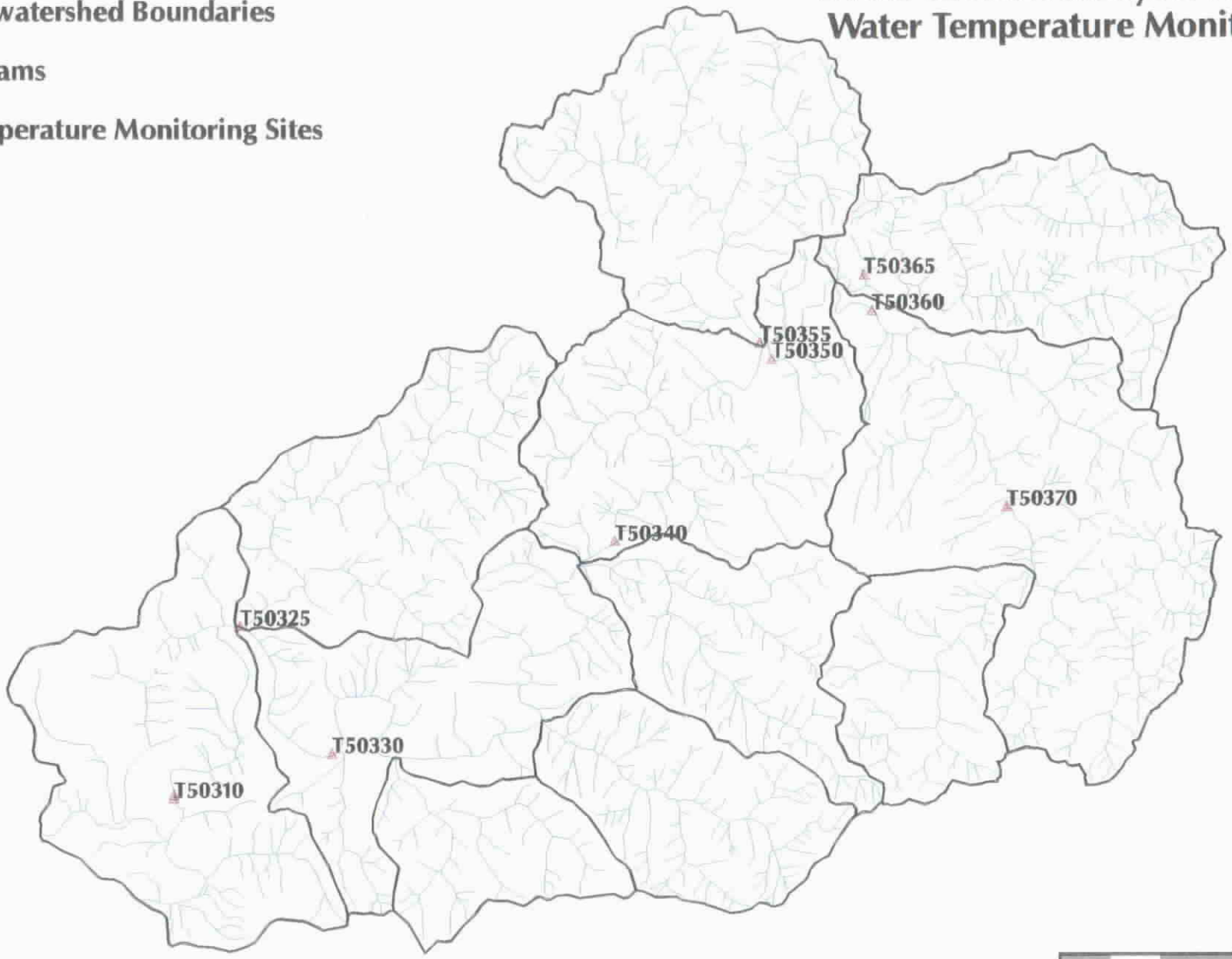
The opportunity to develop and recruit large conifers on industrial lands are guided by the basal area requirements of the State Forest Practices Act. Landowners have the choice of how the basal area requirements can be meet (e.g., retention of large numbers of younger and smaller conifers versus a few older and larger conifers). The implication is large conifers may not be recruited on private land if the former strategy is chosen.

Water Quality

Shading from riparian vegetation affects stream temperatures. The effects of temperature on aquatic related species is well described in the 1992-1994 Triennial Water Quality Standards Review (DEQ, 1995). The maximum preferred temperature for rearing juvenile salmonid is less than 59°F (Brett, 1952). Recent temperature sampling at nine locations (Map 17), as well as at other locations in the coast range, indicate water temperatures exceed preferred levels for maximum salmonid production.

Drift Creek Analysis Area
Water Temperature Monitors

- Subwatershed Boundaries
- Streams
- Temperature Monitoring Sites



0 1/2 1 2 3

MILES

Map 17

The greatest amount of heating on the mainstream of Drift Creek occurs along Drift Creek meadows between Nettle and Gopher Creeks. Maximum temperatures on the lower 22 miles of Drift Creek exceeded the Oregon Water Quality Standard of 64°F in both 1994 and 1995. This temperature was exceeded on individual days as well as part of consecutive seven day averages. Gopher Creek also exceeded this standard at its confluence with Drift Creek. Exceeding the State standards may lead to listing as an impaired waterbody under Section 303D of the Federal Clean Water Act. Specific impacts of warm water on Drift Creek stocks have not been studied.

Salmonids in warm streams have been observed to migrate into cool water areas such as deep pools, tributary plumes, and tributaries to avoid exceedingly high stream temperatures. Tributaries with relatively cool water, such as Trout Creek, provide important refugia for salmonids during the warmest months. It is believed that current shading on smaller streams appears adequate to keep temperatures lower than the mainstream, however information is lacking to effectively describe temperature regimes for these streams.

The mainstream appears to have three factors contributing to increased solar heating: 1)The current riparian vegetation does not appear tall enough to provide adequate shade across the wider channels. 2)The large amount of bed rock serves as a heat sump during daylight hours, slowing the cooling process during the evening period. 3)The bedrock reaches also lack the subsurface inter-gravel flow and deep pools as a source of cooler water. Changes in these conditions would be expected to occur as the percentage of large conifers increases in the riparian areas and CWD is eventually recruited into the system. The recruitment of CWD may be retarded as conflicts associated with flooding of private property, road management or recreational activities such as kayaking cause the removal of newly recruited wood.

TERRESTRIAL ENVIRONMENT

The Drift Creek watershed supports seasonal and resident populations of over 200 terrestrial vertebrate species (LSR Assessment, USDA 1996). It is one of the few drainages in the Oregon Coast Range that still contains remnant stands of late-successional forest, most of it in the Drift Creek Wilderness and the adjacent 'Undeveloped Area'(MA 11). Human activities may have changed the quantity but not the diversity of vegetation within the watershed. Wildlife species diversity follows this transition as well. Shorebirds, seals and other coastal species are common near the mouth of Drift Creek while the upper drainage serves as over-wintering or resting habitat for migratory species following the Willamette Valley flyway.

Seral Stage Distribution and Patterns

The mixture of ownership and land management patterns has resulted in the mosaic of vegetation types and patch sizes we see on the landscape today. The seral classification

map (Map 18) shows the relationships of the habitat types with each other. The seral stage composition is portrayed in Figure 9.

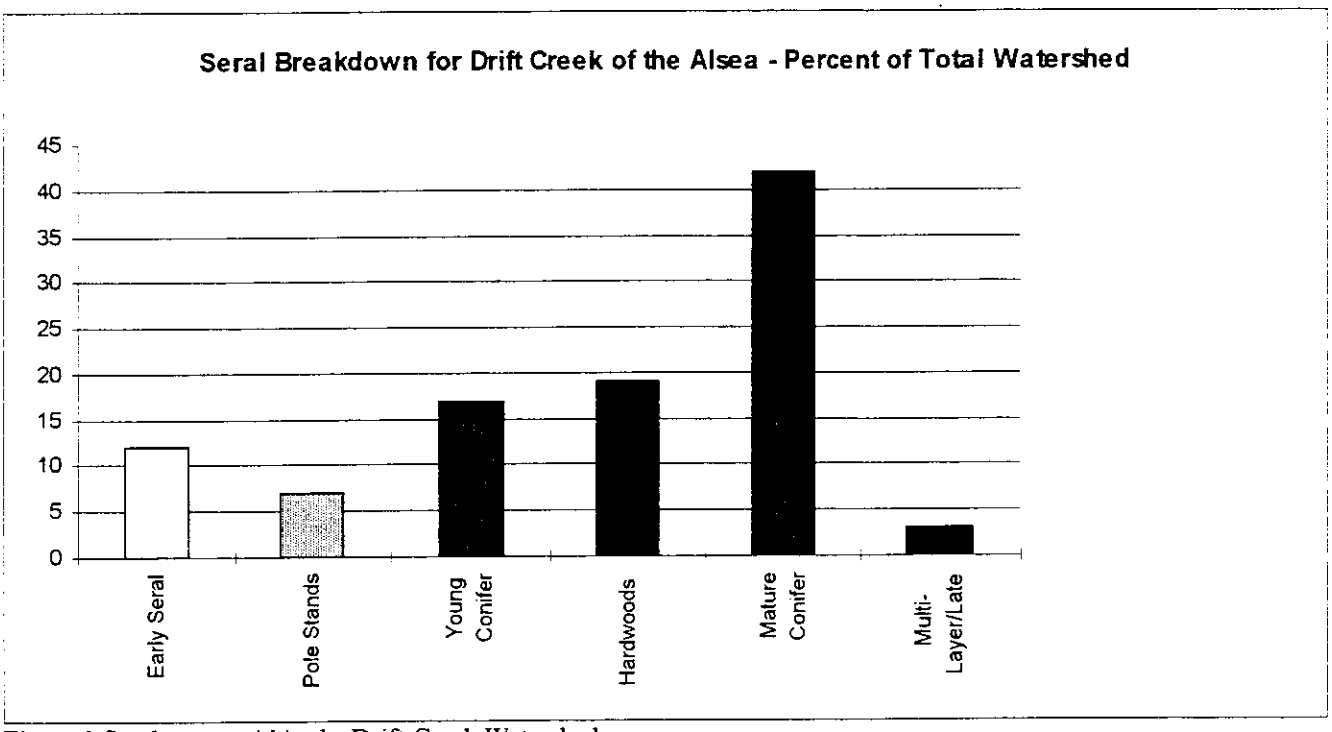


Figure 9 Seral stages within the Drift Creek Watershed

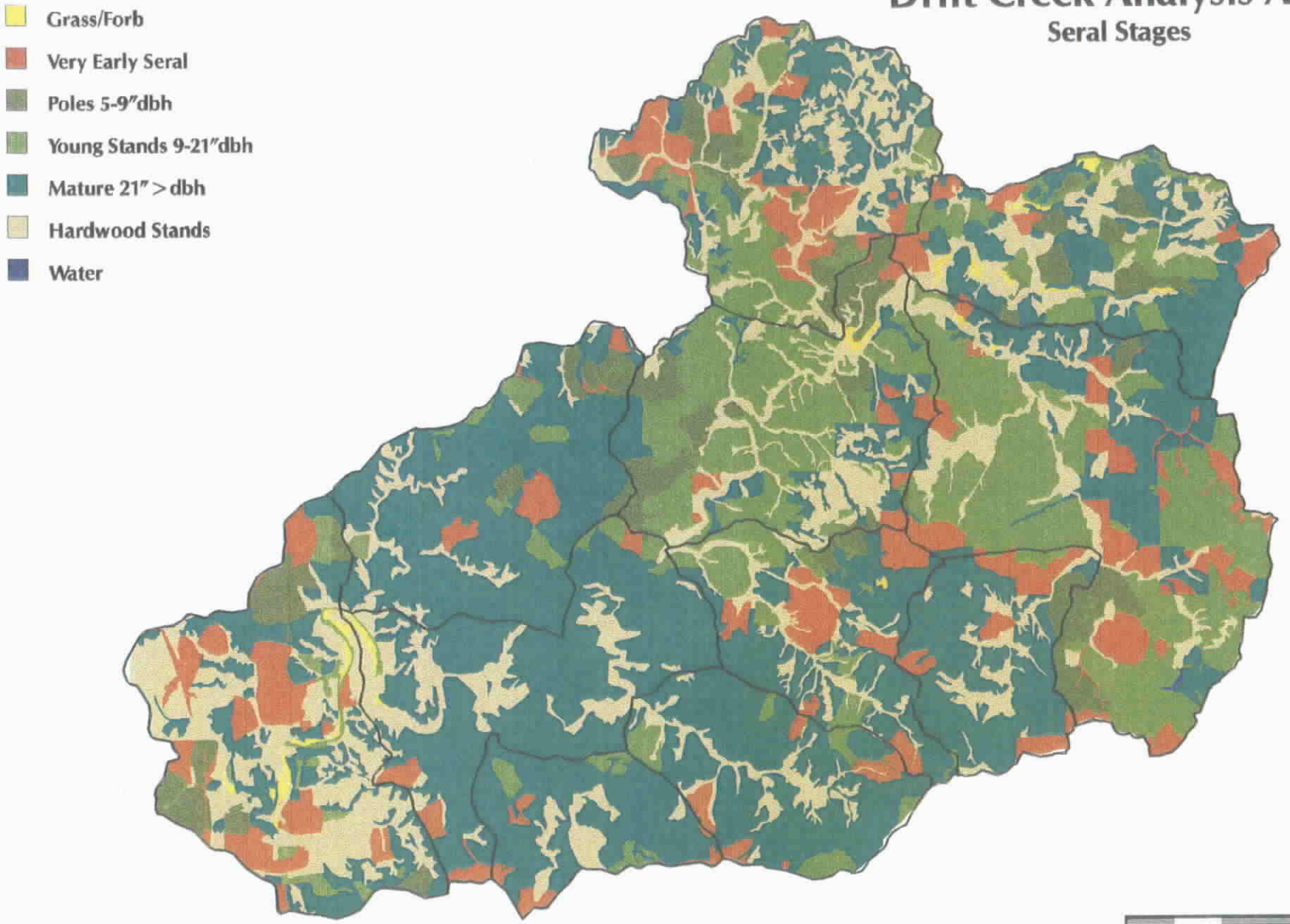
Approximately 12% of the analysis area are in permanent pastures or an early seral stage (primarily recent clearcuts). The agricultural areas are located in the lower and upper reaches of the analysis area. Approximately 7% of the Drift Creek drainage is in young plantations, ranging in age from 8 to 24 years old. Another 17% of the area is in older plantations (25-50 years old). Hardwoods or hardwood-dominated mix stands compose 19% of the area. Most of the hardwood stands in this watershed are along the riparian areas and on private lands. The remaining 45% of the landscape (primarily on federal lands) is mature conifer (roughly 150 years old), remnant old growth stands and conifer-hardwood mixed stands. The majority of the remnant old growth stands are primarily located within the Trout, Drift and Cougar sub-watersheds.

Some of the mature conifer stands (primarily in Gopher Creek) within the analysis area were commercially thinned in the '70's. Between 30-50% of the overstory and nearly all of the commercially merchantable snags and logs (or those that posed a safety hazard during operations) were removed in the thinning and along road corridors during this time period.

Snags and coarse wood are important components to the watershed and ecosystem health. Table 11 of the assessment for LSR RO268 (USDA 1996) desribes the composition of snags and coarse wood generally found within similar seral stages on the forest. Permanent survey plots have been established under the Current Vegetation Survey (CVS) program, unfortunately the data obtained for Drift Creek has not been evaluated.

Drift Creek Analysis Area

Seral Stages



Map 18

Available information indicates snag and log levels are exceedingly low in stands other than the late-successional patches. This shortage of large woody material on the landscape is a direct result of past management activities and, in the mature stands, represents the ecological low end of the wood cycle during stand development (Spies, 1988).

Mature Forest and Status of Allocated Lands

When evaluated at the slightly finer subwatershed scale, the current effects of ownership, historic land use and management objectives, a different pattern emerges. Those areas that have the least amount of settlement or management activity still contain the highest percentage of mature seral conditions (Figure 10).

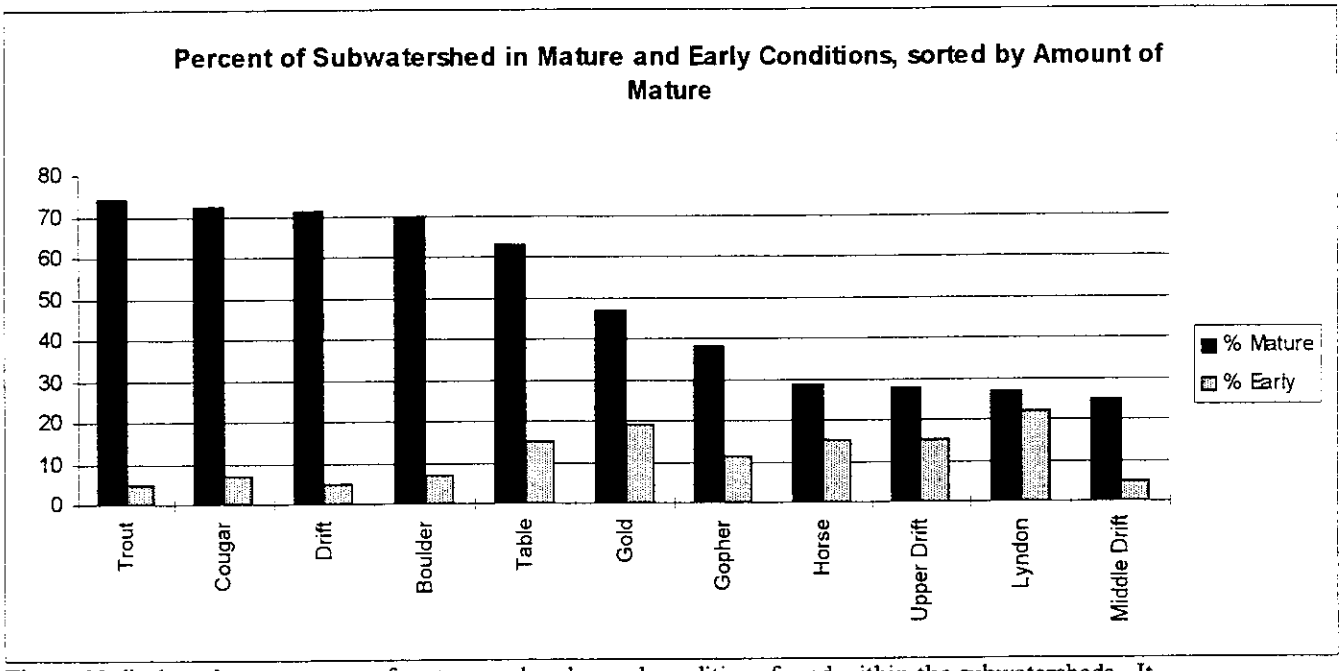


Figure 10 displays the percentage of mature and early seral conditions found within the subwatersheds. It is sorted by the percentage of mature seral stage.

The shift in vegetation patterns on the landscape from large homogeneous patches of mature conifer stands to the mosaic of mixed age groups and small patch sizes (<100 acres) and the acceleration of disturbance regimes on the landscape has dramatically altered the amount, distribution and quality of the terrestrial habitat. Species that once had adjacent refuge to escape to after major disturbance events, are now restricted to smaller mature forest habitat patches and are competing for limited resources. Figure 11 displays the composition of seral types by subwatershed.

The edge effect of forest fragmentation further reduces the amount of available interior forest habitat by increasing the risk of predation and competition by edge-associated and non-native species. Forest fragmentation inhibits the survival and reproductive success of spotted owls, marbled murrelets and neotropical migratory songbirds. In general Trout,

Cougar, Drift and Boulder subwatersheds contain large blocks of mature interior forest habitat (Map 19, Figure 12). These subwatersheds contain scattered stands of old growth, a legacy from previous stands. Within these areas LSR RO268 is functioning relatively well.

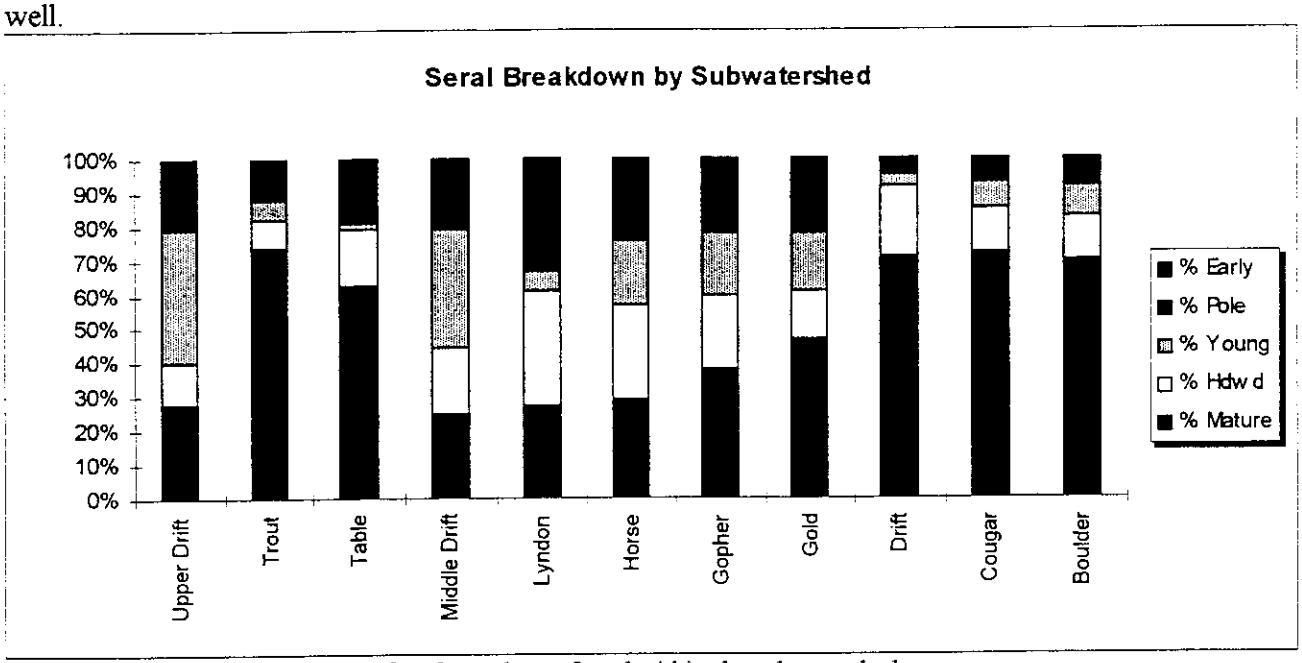


Figure 11 displays the percentage of each seral type found within the subwatersheds.

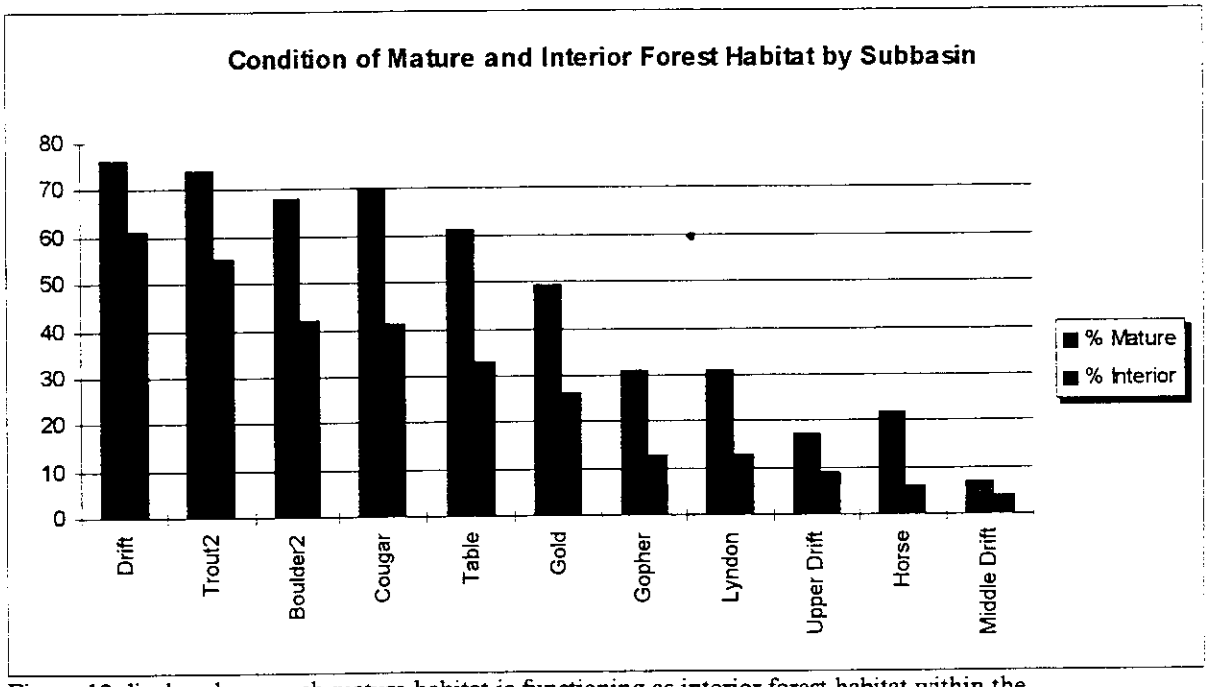
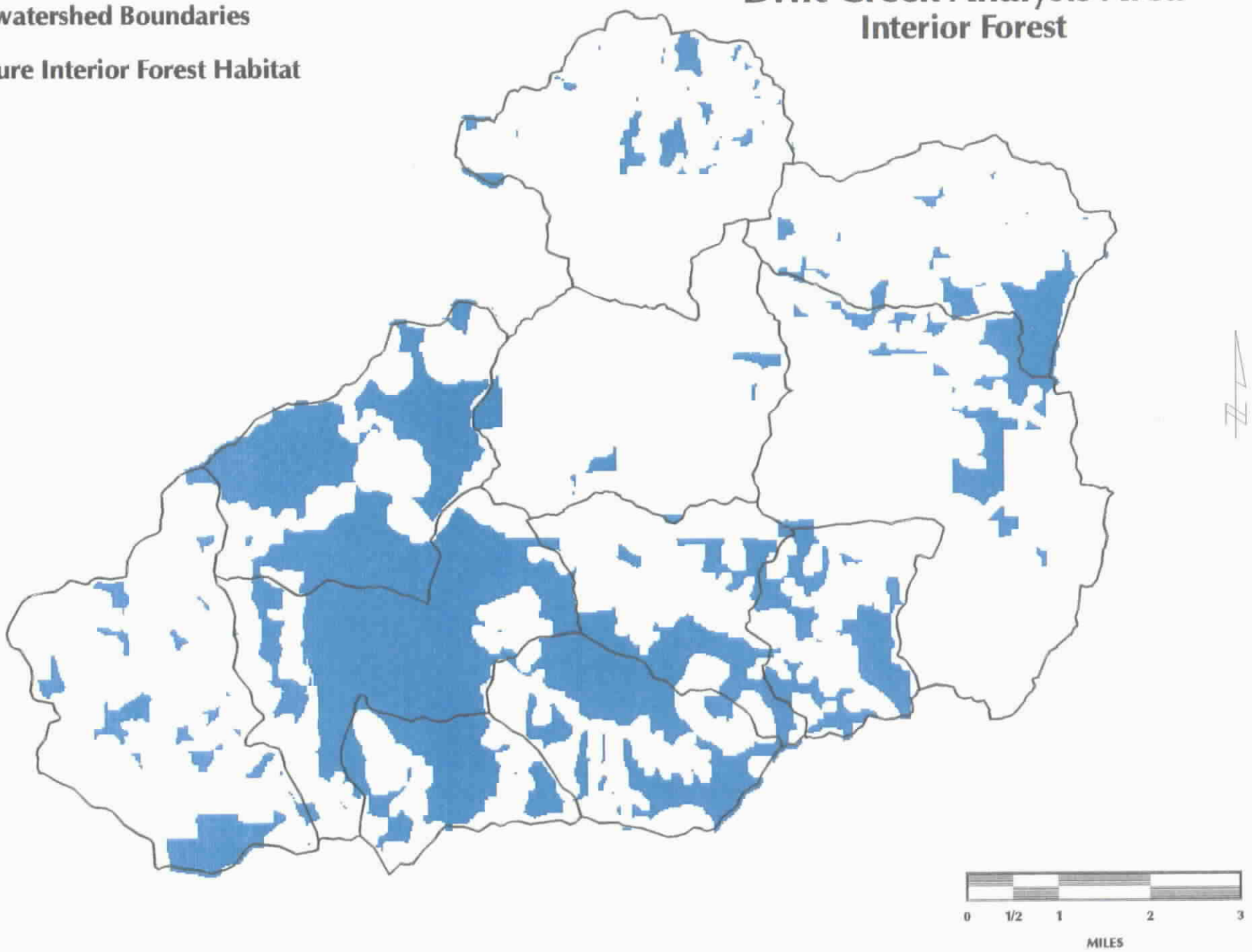


Figure 12 displays how much mature habitat is functioning as interior forest habitat within the subwatersheds.

The high percentage of younger seral stages and hardwoods in the remaining subwatersheds, reflect intense timber management activities and settlement patterns.

Drift Creek Analysis Area
Interior Forest



Map 19

Within these subwatersheds, the function of LSR RO268 is severely limited. A more complete description of the LSR and it's connectivity with other LSR's is described in the Late-Successional Reserve Assessment for RO268 (USDA,1996).

The same seral stage patterns described for the watershed as a whole is seen within the Riparian Reserve. Those subwatersheds that have the most intact mature and interior forest habitat, tend to have the most intact Riparian Reserves. Map 20 displays the current seral stage distribution within the riparian reserve.

There are only 544 acres of matrix land within the watershed. The majority of the matrix is located in the Upper Gopher Creek subwatershed, and are primarily composed of hardwoods and managed stands. Approximately 60 acres of natural conifer in scattered patches remain in the matrix land.

Threatened, Endangered or Sensitive Species within the Analysis Area

Survey efforts are limited to recent timber sales and include spotted owl, marbled murrelet, bald eagle and botanical surveys. Through 1993 approximately two thirds of the analysis area has been surveyed to regional protocol for spotted owls. Murrelet surveys conducted to current standards are limited to Randall Salado units 1, 2 and 3 and Wheelock 403, both 318 sales. Botanical surveys were conducted within the upper drainage for most of the range allotments and riparian areas as well as the wilderness.

Five spotted owl activity centers are located within of the analysis area, in Cougar, Drift Gopher, Upper Drift and Horse Creek subwatersheds. The pair located near the Flynn Creek Research Natural Area is a historic pair (located in 1981) and has not been monitored since 1988. A new pair was located in Traxtel Creek in 1992, but has not produced young to date. In addition to the two pairs, a resident single owl was found in the upper Drift Creek area in 1991 (Nettle). Pacific Northwest Research personnel are monitoring some of the owl sites in the upper drainage, but survey information is sketchy for most of the area.

Analysis of habitat indicates the owl pairs located in Cougar and Drift Creek subwatersheds have sufficient suitable habitat within their provincial home range to consider them relatively secure for normal breeding and rearing activities. Owl pairs residing in the Gopher, Upper Drift and Horse Creek subwatersheds reside within provincial home ranges that contain less than 40% of the suitable habitat normally associated with successful breeding and rearing activities.

Surveys within the watershed for marbled murrelets started in 1988. These surveys were part of the initial studies used to develop more suitable survey protocols. The 14 known marbled murrelet sites within the watershed are the result of these earlier surveys and those associated with the Randall Salado and Wheelock 403 Timber Sales. Considering the current habitat conditions, it is not surprising that known sites are clustered around areas with some level of survey, with the greatest concentration in the Table Mountain

subwatershed. It is likely that the number of known sites within the watershed would be higher if additional areas were to be surveyed.

A historical bald eagle nest site is located near the top of Table Mountain. Although this site has been inactive for a number of years, adult bald eagles have been observed along the confluence of Nettle Creek and Drift Creek. They may have an alternative nest site in the area. Historical observations of this pair indicated that they may have been foraging as far away as the coast, an 11 mile one way trip. Although the Drift Creek drainage has a high potential to support bald eagles, the overall habitat suitability rating was considered to be moderate due to low fish stocks and unstable year-round runs.

The disturbance history of the upper drainage (Gopher and Upper Drift as well as the adjacent Big Elk Drainage) has resulted in the highest concentration of Poa laxiflora (loose-flowered bluegrass) on the forest. This grass species is strongly associated with riparian hardwood conditions and favors a moderate level of disturbance. A species management plan was completed by the Forest Botanist, Katie Grenier, in April 1993 and the species was down-listed from sensitive to C3 the following year. The forest is currently managing the species based on protection populations and buffers outlined in the management plan. Under the management plan there is one no-impact population and six buffered populations. Wilderness designation protects those populations located within the wilderness.

Many of the non-vascular plants identified as survey and manage under the Northwest Forest Plan, are suspected to occur within the mature and old growth habitats found in the watershed. It is speculated that once survey protocols have been established, their location and distribution within the watershed will be better understood.

Other Species of Concern

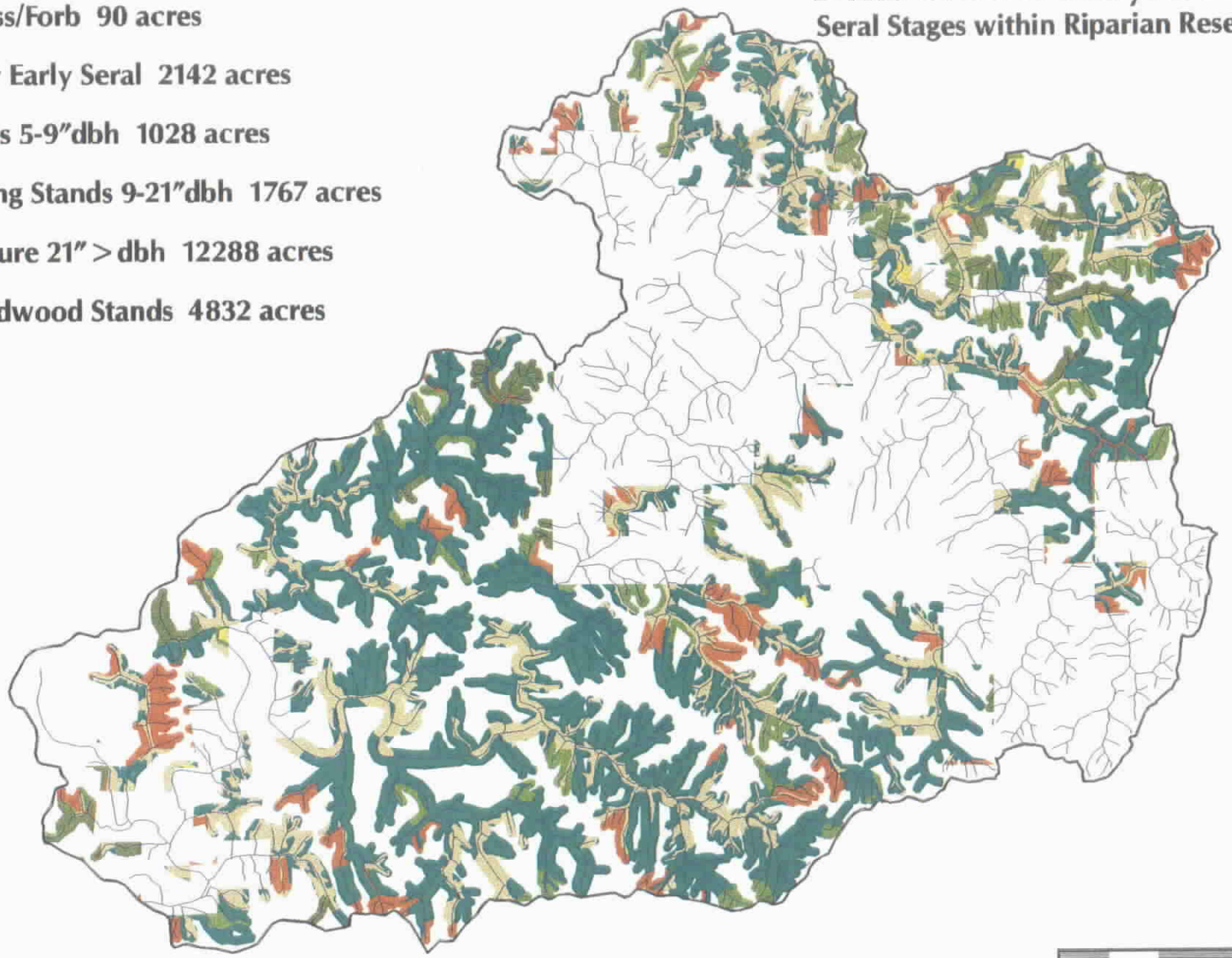
Several species of amphibians (i.e. torrent salamander, tailed and red-legged frogs) and bats (silvery-haired, lump-nosed, long-legged, long-eared, hoary, fringed and Yuma bats), red tree voles, and species which are proposed for listing are regional species of concern which occur within the analysis area. Recent location information has become available for some of these species (red tree vole and some of the bats), but data is limited to research areas. In addition to these terrestrial vertebrates, numerous plants (particularly non-vascular plants) and invertebrates, such as freshwater mollusks and forest arthropods, are species that are highlighted in the Northwest Forest Plan as survey and manage species (C-3 species). No known survey and manage sites are located within the analysis area.

Wetlands, particularly ponds associated with beaver activity in the riparian areas, are relatively common in the tributaries of the upper drainage. Stretches of low gradient flats in Gopher, Cape Horn, Needle Branch, Flynn, Nettle and other creeks are virtually back-to-back beaver ponds (Figure 13).

Drift Creek Analysis Area

Seral Stages within Riparian Reserves

- Grass/Forb 90 acres
- Very Early Seral 2142 acres
- Poles 5-9″dbh 1028 acres
- Young Stands 9-21″dbh 1767 acres
- Mature 21″ > dbh 12288 acres
- Hardwood Stands 4832 acres



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Map 20

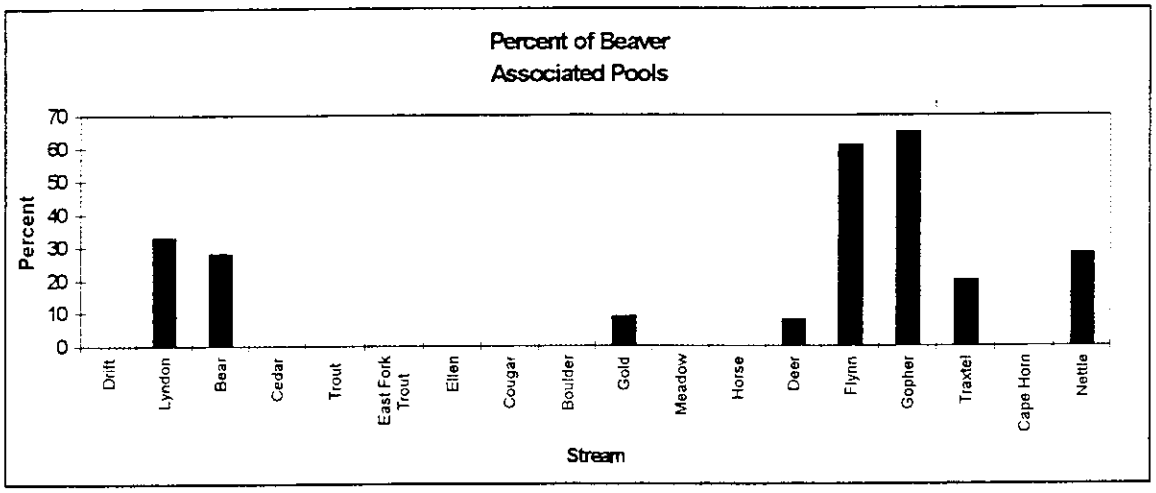


Figure 13 is based on stream survey information. It reflects the percentage of pool habitat associated with beaver dams.

These areas provide excellent breeding and feeding habitat for many species of concern, such as amphibians, bats, wetland plant species, white-footed voles, western pond turtles, river otters, and waterfowl.

Elk

The long-term management of elk habitat is a regional issue due to the commercial and social value of elk as a big game species. In particular, there is a growing concern that browse damage on private lands will increase with a reduction in clear-cut practices on federal lands. According to Oregon Department of Fish and Wildlife (ODFW) reports, the Alsea subunit, which covers most of the Siuslaw National Forest, currently support approximately eight elk per square mile. This level is considered to be at the carrying capacity for the habitat.

Considering reports from local hunters, ODFW personnel and signs of elk use in the area, elk is relatively abundant throughout the analysis area. Somewhat higher numbers of animals are in the upper drainage and wilderness area than are seen the in lower drainage.

Neotropical Migratory Birds

Neotropical migratory songbirds are defined as those species which overwinter in Mexico and South America and fly north in the summer to breed. All of them rely on a seasonal food supply (insects, nectar, fruit) to raise their young. Surveys indicate that many species of neotropical migrants are declining, particularly those which are associated with mature forest or wetland habitats. Management of these international migrants is complex. Habitat loss, competition and predation, and the uses of agricultural chemicals are some of the major reasons cited for their decline. Songbirds are attracted to hardwood and hardwood mix stands (McGarigal, 1993), since deciduous forests generally support higher concentrations of insects. These stand types are relatively abundant in the analysis area. Banding information gathered over the past 4 years within Homestead Creek, immediately adjacent to the analysis area, indicates those bird populations within the northern drainage's seem to be relatively stable.

Guilding Analysis

A species guild analysis was conducted for the Alsea River basin and the Drift Creek drainage to evaluate the current condition of the watershed and compare the habitat quality to the rest of the forest(Austin, 1996). A guild is defined as a group of species that use the same set of environmental resources in a similar way. Thus the suitability of a given landscape can be characterized or rated for all species, including those with limited mobility and small home ranges.

This analysis confirms that the area is not functioning adequately to support species with large home ranges which require mature forest habitat. Less than 40% of the area was rated as suitable for this guild. On Federal lands less than 10% of the land base contain suitable habitat to support the large home range contrast guild. These species require a combination of mature forests adjacent to openings (e.g., elk). Contrast species use the forests for security and breeding and forage close to the edge in the openings. Although it may seem contradictory the habitat for this guild rated so low, (especially when considering how fragmented the landscape is), the amount and distribution of mature forest habitat were again the limiting factor. In contrast, the landscape rated out well for patch species (these utilize a homogeneous patch of habitat and generally have small home ranges) and mosaic species with small and medium home ranges (use several patches of habitat in aggregate). These guilds include many of the neotropical migratory songbirds, most of the rodents and several reptiles.

Introduced Non-native Plants and Animals

Forest fragmentation and maintenance of early seral conditions encourage the spread of non-native and invasive plant species, such as Himalayan blackberry, Scotch broom, tansy ragwort and many of the European pasture grasses. The change in vegetation patterns is also beneficial to non-native or non-indigenous wildlife species that were uncommon or absent in this region. Competition and parasitism by European starlings, brown-headed cowbirds and english sparrows, along with predation by feral cats and opossums are causing nation-wide declines in our native songbird populations.

CHAPTER 5 INTERPRETATION AND SYNTHESIS

Chapters 3 and 4 reviewed the dominant processes, as well as the historic and current conditions of key elements within the watershed. In addition, the causal mechanisms that help explain the relationships between historic and current conditions were also reviewed. Interpreting the available information, trends associated with the key questions were identified. In addition, potential barriers to meeting land management objectives as defined by the Siuslaw National Forest plan as amended by the Northwest Forest Plan, were also identified. Synthesizing factors such as resource issues, habitat function, conditions, trends, and barriers the watershed was delineated into areas with common themes.

TRENDS

The trends assumed no changes in existing laws would occur and the existing forest plans would remain in place over the next five years.

ISSUE 1: HOW HAVE CHANGES IN HUMAN VALUES AND EXPECTATIONS ASSOCIATED WITH DRIFT CREEK INFLUENCED NATURAL PROCESSES?

Landslides

A decline in harvest-related landslides is expected to occur with the associated decline in harvest activities on federal lands, and with the maturation of managed stands. However, it is not expected that landslide levels would return to natural rates for several decades. With intensive management on industrial lands expected to continue, landslide rates on private lands are expected to remain higher than background levels, especially on the moderate to high susceptibility slopes.

Sediment Routing

Management activities on Federal and industrial lands will continue to influence the delivery of sediment and large wood to the stream system. The existing road system will continue to act as an intercept and initiation site for debris torrents. Valley bottom roads and low conifer recruitment will continue to influence the connectivity of streams with their terrace's and sediment sources.

Settlement

Population levels within the watershed are expected to remain fairly steady under existing county zoning regulations. However if the zoning changes seen elsewhere in the county begin to occur within the watershed then the potential exists that small parcels may eventually be subdivided. Following the same pattern, the number of residences adjacent to streams is likely to increase. Adjacent watersheds are experiencing increased growth, primarily on the western boundaries. Disposal of household and hazardous waste will

increase as the cost and restrictions at disposal sites increase.

Access to residences between Waldport and Lyndon Creek will primarily be through the county road system. Linkages with Toledo will become more difficult as portions of the 50 and 51 road are maintained at a lower level. Access between Toledo and residences in the upper basin area will remain the same. Residents may see a change in road conditions since the Forest has returned maintenance responsibilities back to the county on the 609 road (Gopher Creek Road). Residents will find fewer alternate routes as non-ATM roads become closed through a lack of maintenance.

Intensive Forestry

Private Industry
Commercial thinning of managed stands by industrial landowners is expected to continue. Starting in 10-15 years a final harvest of these stands will begin. Overall, the industrial lands will be managed on 40-50 year rotations.

Federal Management
Final resolution for the remaining 318 sales is contingent on meeting the requirements of the Replacement Volume Settlement Agreement of August 1996. Currently there are no sales planned on Federal Lands within natural stands. The limited amount of matrix land will limit the amount of probable sale quantity contributing to the local economy. This is especially true in the short term due to the shortage of natural stands of commercial age within the matrix. Managed stands within the LSR and riparian reserve are managed to meet LSR and ACS objectives. Meeting those objectives will continue to dictate the prescribed activities on managed stands.

Roads

On industrial lands only minor increases in road miles are expected. Sediment yield from road surface erosion will decline between harvest cycles due to larger 3" rock and infrequent grading. Upgrading culverts to meet the standards of the State Forest Practices Act will help reduce barriers to fish passage and peak flow. Existing problems will continue until the road fails or the road is upgraded to meet harvest schedules. Access to the general public will be highly controlled, and fewer miles will be available for public use.

On federal land the miles of high standard roads will decrease as road maintenance funds continue to decline and the ATM plan is fully implemented. The ATM roads will be maintained at a lower level than originally constructed or utilized but within their designed maintenance standards. The non-ATM road system will continue to compete poorly with the ATM system for the allocation maintenance funds. Recreation demands for road access will continue to increase while the miles of road open to low clearance vehicles is decreasing. Conversely much of the ATM system will require high clearance vehicles. Maintenance of the non-ATM system by other project funds will probably be limited to the

minimum amount required to meet project objectives. Overall, vehicle use will be constrained to fewer road miles.

The future bid rates for greenery leases will be affected by access to lease areas. Generally, as access becomes more difficult bid values are expected to decline. The removal of alders adjacent to the ATM road system will be the primary source of firewood.

Mineral Development

The load and placer claims have been sold recently, with the new owners requesting regulations concerning the development of their claims. As long as the area remains open to mineral entry, the potential exists for future development. The existing quarries are likely to continue supplying road aggregate for private lands and the Forest ATM system.

Recreation

The demand for Semi-primitive Non-Motorized or a Primitive recreation experience is expected to increase. This includes the demand for additional trail access for hiking and equestrian use. Conflicts with sport utility owners in the upper basin is likely to continue as the availability of industrial forest lands decreases. As users lose access to that special spot, disagreements with management priorities will be more common. Although seasonal kayaking use is expected to increase, the level of use will probably remain low. The opportunity to explore eco-tourism is likely to increase but is most likely to be limited by the economics of access.

Research

Drift Creek will continue to provide unique research opportunities within the Coast Range Province. Cooperative planning efforts between management agencies and the research community will increase as priorities and timelines slowly merge.

ISSUE 2: WHAT IS THE CONDITION OF THE AQUATIC COMMUNITY? WHAT OPPORTUNITIES EXIST TO PROTECT PROPERLY FUNCTIONING AREAS AND RESTORE DEGRADED STREAM AND RIPARIAN AREAS.

Habitat

One of the major goals for the Forest Practices Act was to improve aquatic conditions on private forestlands. Since relatively little harvest activity under the revised act has occurred within the watershed, it is too early to evaluate the effects of the new law. The expectation is habitat quality on private land will improve over current conditions if industrial land owners develop and maintain large conifers in riparian areas as well as pursue management activities that reduce management related landslides.

Habitat conditions within federal lands are stable if not slightly improved over past years. Recruitment and retention of CWD is likely to continue on federal lands where sources are currently available. Areas previously harvested or settled will continue to have poor recruitment opportunities in the near term as will private land parcels. Valley bottom roads will continue to constrain channels and flood plains, restricting the recovery of aquatic habitat. Gopher Creek is especially affected by the adjacent road system, including County Road 609.

Water Quality

Stream temperatures will continue to be higher than expected at this point of succession. However, we expect to see a decrease in summer maximum temperatures if future management activities are designed to prevent temperature increases on all streams. Considering current conditions, the potential exists that Drift Creek will be listed on the state list of watersheds not meeting water quality standards. Small cold streams below Gopher Creek will continue to provide refuge.

Population and Distribution

Expect smolt production to be influenced by fish harvest strategies, hatchery management, and habitat conditions. The million dollar question remains if the habitat condition improves will anadromous populations increase or will ocean conditions, estuary conditions, harvest and hatchery influence's continue to keep populations suppressed.

ISSUE 3: WHAT IS THE CONDITION OF THE TERRESTRIAL COMMUNITY? WHAT OPPORTUNITIES EXIST TO PROTECT OR RESTORE THE FUNCTION OF MATURE AND LATE SUCCESSIONAL FOREST CONDITIONS ON FEDERAL LANDS?

Seral Stage Distribution

The mixture of ownership will continue to influence the vegetative patterns seen on the landscape. The private lands will continue to provide large blocks of early seral stages, nestled between the larger blocks of federal ownership. The medium size blocks of early seral stages seen on Federal land will eventually disappear as the plantations mature. Natural stands will continue to develop at a natural rate. Recruitment of snags and CWD will start to occur at a higher rate as stands begin to mature in 20-30 years. As these stands mature the multi-layer late successsional forest should increase. This would include the return of the ecosystem dynamics associated with small gaps.

Mature Forest and Allocated Lands

On federal land the quality and quantity of interior forest habitat will increase as adjacent plantations mature. The exception will be stands adjacent to private land that will

experience a chronic edge effect associated with younger plantations and shorter harvest cycles on private land. The quality of interior forest habitat within plantations will be influenced by the stocking level within the plantation. Stands allowed to reach the stem exclusion stage will take longer to start developing characteristics associated with natural stands. The recruitment of conifers in hardwood dominated stands may be limited by vegetative competition. Hardwood stands are expected to experience greater mortality in the next 10-20 years.

Within the Drift, Trout, Boulder, Cougar and Table subwatersheds, the LSR and Riparian Reserve will continue to serve as a cornerstone of quality habitat within the watershed. The remaining subwatersheds, especially Gopher and Horse, will continue to contribute isolated parcels of functioning LSR and Riparian Reserve. This patchwork will likely continue until the plantations eventually develop some characteristics associated with natural stands. Within this LSR, this would include the return of the large block disturbance regime.

BARRIERS

This section describes current conditions, management activities or practices that prevent or retard the landscape from meeting the objectives for the management of the Late Successional Reserve or the Aquatic Conservation strategy. They account for the cumulative effects from activities on federal and private land.

Landslides and Sediment Routing

Landslides and sediment routing must be seen as a natural process with an important function in the riparian and aquatic ecosystem. Roads will continue to initiate and intercept debris torrents. Cumulatively, the delivery of large wood to streams will be at levels lower than under natural disturbance processes. Within existing harvest units on federal lands the lack of large wood adjacent to first and second order streams will continue to be low until the stands mature. On private land, clear-cut harvest adjacent to non-fish bearing streams will prevent these areas from contributing CWD to channels downstream on Federal Lands. Restoration of this disturbance process may take decades since it is dependent on the recruitment of mature conifers.

The storage of sediment and the connectivity of streams to their flood plains is also dependent on the availability of large wood. Restoration of natural sediment routing process and stream connectivity is retarded by the current availability of large wood in the streams. Hardwood dominated stands and high stem density in managed stands will reduce the future availability of large wood for recruitment into the system. The upper basin areas will continue to be the most suppressed due to past management practices on federal and private lands.

Settlement

Human dependence on natural resources will continue to influence the resource conditions. The demand for domestic water continues to increase countywide. Historically there is little review or oversight on existing authorizations. New water withdrawals and withdrawals above authorized use will have a difficult time meeting the standards and guidelines established as part of the ACS strategy to maintain or restore riparian resources, channel conditions and fish passage.

Based on past experience, earlier settlers channelized streams adjacent to their property. Through time, the history of these efforts has been lost but they continue to influence channel morphology. It is likely that un-inventoried structures (such as dikes) will continue to influence stream function and retard restoration.

Connectivity between residents will continue to be important to the social fabric of the community. Often the most direct travel routes for residents are along the valley bottom roads. Valley bottom roads, particularly sections along Gopher and Horse Creek, will continue to alter stream function.

Intensive Forestry

Private Industry
The cumulative effects of commercial thinning on industrial lands should not be a barrier to attainment of LSR or ACS objectives in the short term. In 10-15 years when the stands are commercially suitable to clear cut, attainment of LSR and ACS objectives on federal lands may be more difficult. The LSR will experience increased edge affects along its boundaries with the industrial lands. These stands will be exposed to increased wind-throw. We are uncertain as to how attainment of the ACS on Federal Lands will be facilitated by implementing the State Forest Practices Act on private lands. If there is inadequate CWD or stream shading on private lands, then attainment of the ACS will be retarded on Federal lands.

Federal Management
If the 318 sales are eventually harvested, the loss of large wood and slope stability in unbuffered areas as well as increased solar heating will retard attainment of ACS objectives. The salvage of blowdown within stands to meet social desires will slow the recruitment of LWD within the reserve and retard attainment of LSR objectives. This includes salvage along non-ATM roads and outside the road prism of ATM roads.

Infection of plantations by Swiss needle cast may affect the growth and development of existing plantations. How attainment of ACS and LSR objectives may be influences is unknown at this time. Allowing plantations to develop on their own may not prohibit attainment of ACS and LSR objectives, however the rate at which they are obtained would be affected.

Roads

Maintaining a road system to meet residential, industrial, recreation and project needs will continue to influence the watershed. Restoration of hydrologic function will be retarded where valley bottom roads constrain the flood plain, especially in the Gopher Creek subwatershed. Road maintenance practices which inhibit the recruitment of conifers, especially along valley bottoms and across drainage's will retard the recruitment of CWD into the system. Roads that intercept debris torrents or which contain undersized culverts will slow the restoration of natural hydrologic process. Stream channels on closed roads will remain disconnected and constrained at channel crossings. The risk of sediment surges from culvert failures at these sites will increase in time.

Minerals Development

Unless a Plan of Operation or Notice of Intent is filed, the level of work to maintain the validity of existing claims would not serve as a barrier to attaining current management objectives. Until a Notice or Plan is submitted, proposed activities would be conjecture, with potential impacts to aquatic or terrestrial resources being purely subjective.

Recreation

Generally dispersed and wilderness recreation activities will have limited effect on attaining LSR or ACS objectives. Several recreation activities have the potential to defeat or retard restoration efforts. Vehicle use of the non-ATM road system degrades the condition and functional life of waterbars. Waterbars were installed to ameliorate the effects of reduced road maintenance on aquatic resources. Off-Highway vehicle use in the Gopher Creek area retards the stabilization and recruitment of conifers through compaction of the meadows and physical destruction of the seedlings. Allowing the use of OHV vehicles onto decommissioned roads retards the stabilization process on freshly disturbed soils. The removal of logs that are deemed a hazard to boaters, retards the restoration of hydrologic processes.

With no controls, allowing horse use within the wilderness increases the potential for non-native plants to be introduced. Additional soil compaction associated with equestrian trail use leads to increased erosion on steep slopes and slows the restoration of riparian areas. Flats used to picket livestock compacts the site, degrades or slows the vegetative recovery of the area.

Aquatic Habitat

Low levels of CWD and the potential to recruit CWD will limit the rate at which aquatic function is restored. Consequently, the capacity of Drift Creek to develop high quality fish habitat, especially in the Meadow and Horse Creek areas, will be retarded. Hardwood stands lacking a conifer component in the understory, will have difficulty recruiting this component as the stand matures.

Water Quality

High summer stream temperatures will reduce the quality of existing habitat for cold water depended species. Long reaches of bedrock, and inadequate stream shading will retard the development of a cooler temperature regime within the watershed. Increasing wild stock numbers may be hindered through competition for the remaining suitable habitat with hatchery strays. Habitat seeding will be influenced in part by commercial harvest rates. Commercial fish harvest prior to fully seeding available habitat will inhibit aquatic production.

Terrestrial

The rates at which managed stands develop will influence the rate at which fragmentation and edge effects decrease. High stem densities in plantations will reduce the opportunity for species diversity and reduced tree size. Generally increased species diversity will start to occur when gaps of sufficient size develop to allow shade tolerant species to become established or major disturbance initiates a new stand. The function of the LSR, especially in the Gopher and Horse Creek subwatersheds, will continue to be reduced due to the isolation of natural stands and the edge effect along plantation boundaries. Snag recruitment in natural stands will be delayed where past pre-harvest salvage retained the most vigorous stems.

A lack of connectivity for late successional species between Mary's' Peak, Big Elk, Upper Drift Creek and the remainder of the LSR reduces genetic connectivity between these areas, especially for species with small home ranges.

SYNTHESIS

OPPORTUNITY AREAS

Utilizing characteristics such as landslide hazard, ownership, aquatic function and seral stage, the watershed was segregated into blocks with common characteristics or function. Approximately sixteen areas were initially delineated. After further synthesis, seven areas were delineated (Map 21) and descriptions prepared. The following summarizes the general characteristics of each area.

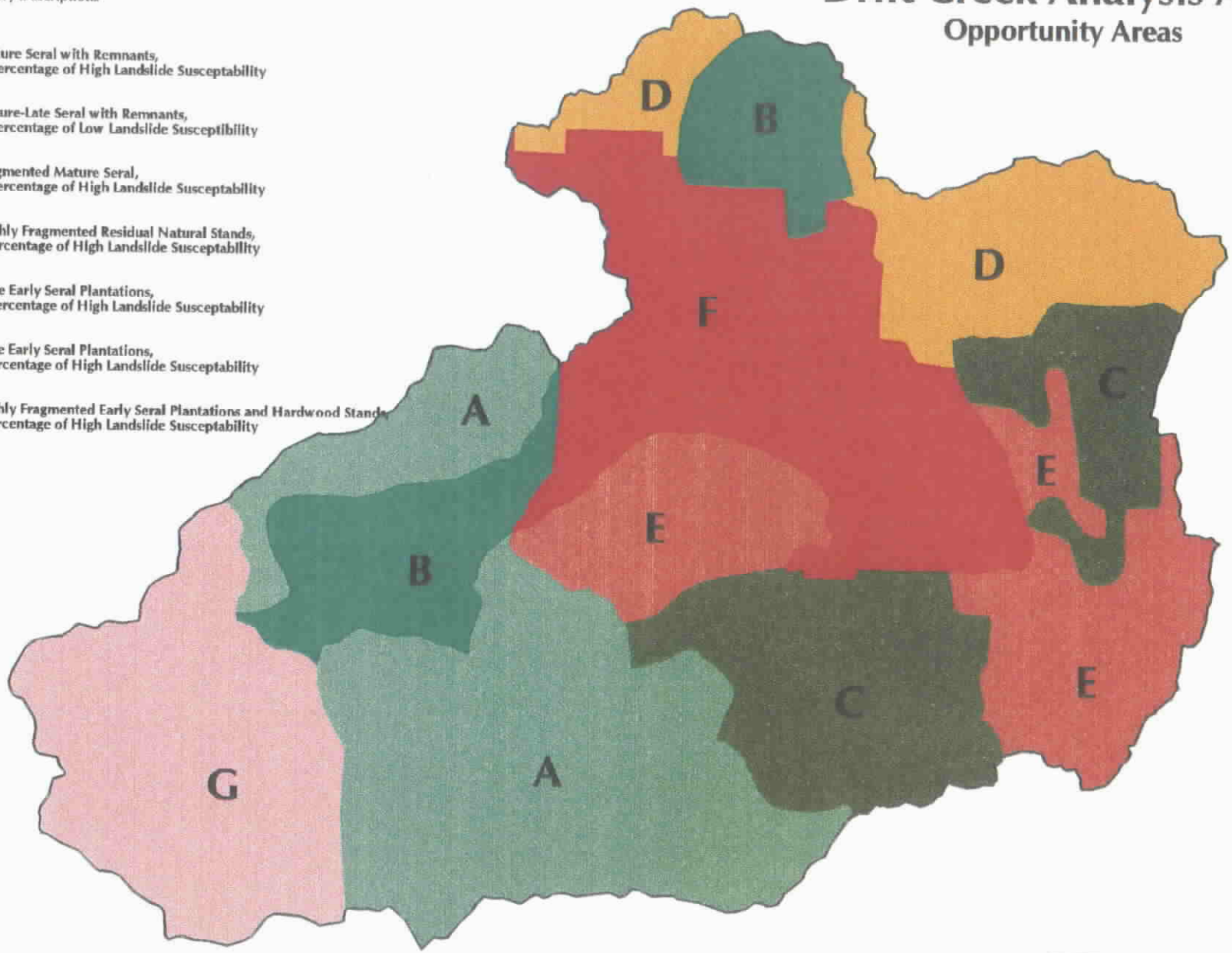
Area A

Area A (along with Area B) contains some of the most intact aquatic and terrestrial habitat remaining the watershed. At the provincial scale these areas contain some of the best habitat left for aquatic and terrestrial species. Large segments of the Trout, Drift, Cougar, and Boulder subwatersheds, as well as a large portion of the Drift Creek Wilderness, compose Area A. Throughout the analysis process and across resource interests, these subwatersheds served as bench marks for comparison between natural process and managed conditions. Area A contains short to moderate and moderate to steep slopes.

Drift Creek Analysis Area
Opportunity Areas

Summary Descriptions

- A - Mature Seral with Remnants, High percentage of High Landslide Susceptability
- B - Mature-Late Seral with Remnants, High percentage of Low Landslide Susceptibility
- C - Fragmented Mature Seral, High percentage of High Landslide Susceptability
- D - Highly Fragmented Residual Natural Stands, Low percentage of High Landslide Susceptability
- E - Large Early Seral Plantations, High percentage of High Landslide Susceptability
- F - Large Early Seral Plantations, Low percentage of High Landslide Susceptability
- G - Highly Fragmented Early Seral Plantations and Hardwood Stands, Low percentage of High Landslide Susceptability



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Map 21

The land base contains a high percentage of high landslide susceptibility. Stream gradients are moderate to steep. Mature seral stages dominate the stands although a few managed stands are scattered through out the area. A high percentage of the stands contains residual components of the previous stand.

Area B

Area B contains the same high quality aquatic and terrestrial characteristics as Area A. Portions of Horse Creek and Trout Creek contain landscapes reflected by the Area B description. The Flynn Creek RNA and portions of the wilderness are found in Area B. Slope stability is the primary difference between Areas A and B. Area B is dominated by short to moderate slopes and contains a low percentage of high landslide susceptibility. Stream gradients and adjacent slopes are low to moderate. Mature and late successional seral stages dominate the landscape. The stands contain a high percentage of remnant trees from the previous stand. There is a low percentage of plantations.

Area C

The Area C landscape is dominated by mature to late seral stages. However, unlike Areas A and B, fragmentation of the landscape is more evident. When compared to other watersheds, Area C still represents some of the most intact habitat remaining within the Coast Range Province. Area C represents the first opportunities to build upon the larger habitat blocks associated with Areas A and B, especially in the Table Mountain and Gold Creek Subwatersheds. Short to moderate slopes predominate in the area. Area C contains a high percentage of high landslide susceptibility. Stream gradients and adjacent slopes range from moderate to steep. Mature to late seral stages dominate the landscape but more fragmented stands than in Areas A or B. There is a larger percentage of plantations within this landscape area.

When considering the rest of the watershed and other portions of the Coast Range Province, Areas, A, B, and C should be considered as a single block. Primarily under Federal ownership, these areas simply represent some of the best opportunities to quickly reconnect large blocks, protect existing habitat or developing restoration opportunities for terrestrial and aquatic species.

Area D

Area D represents the common landscape characteristics of an intensively managed forest on Federal lands. Portions of Horse Creek and Gopher Creek are represented by this landscape. The frequency of early seral stages (including a high percentage of hardwood stands) severely fragments the remaining natural stands. This contrasts sharply with the large tracts of uniformly aged plantations on adjacent private lands. When combined with the watersheds to the north, this part of the watershed represents the northern edge of the LSR. This sliver of the LSR is nestled between the large tract of industrial land to the north and the industrial lands with the watershed. The adjacent Flynn Creek Research

Natural Area (part of Area B) presents a nucleus for building larger, more intact blocks of habitat within Area D. Throughout the analysis, aquatic habitat found in Area D was consistently lower in quality than other areas found on federal land. Short to moderate slopes with a low percentage of high landslide susceptibility dominate the land form in Area D. Stream gradients and adjacent slopes are low to moderate in grade. Federal management dominates the area with some small private parcels along the valley bottom.

Area E

Primarily located in the Middle Drift and Upper Drift Creek subwatersheds, Area E (Along with Area F) reflects a landscape dominated by large blocks of intensively managed forest. Long term management objectives are associated with the economic and resource objectives of the industrial landowners. Early seral stages (primarily plantations) dominate the landscape. Unlike areas dominated by federal management, the early seral stages are in the large to jumbo size disturbance pattern. Area E provides an important linkage between the low gradient streams of Area F and the steeper but more intact streams found on federal lands. Short to moderate slopes with a high percentage of high landslide susceptibility dominates the landform. Lower slopes and stream gradients are moderate to steep. Industrial forest lands dominate the landscape with some in-holdings of federal ownership. The remaining natural stands are found within the federal ownership.

Area F

Area F is primarily located in portions of Horse Creek and Middle Drift Creek Subwatersheds. Its characteristic is essentially the same as Area E. Some of the most potentially productive anadromous habitat in the watershed can be found in Area F, as well as in portions of Area E. Consequently, the potential benefits of aquatic restoration activities within Area F are very high. Short to moderate slopes dominate the landscape. There is a low percentage of high landslide susceptibility in the areas. Stream gradients and adjacent slopes are low to moderate in grade. Early seral stages (plantations primarily) predominate, however stands fall into the large to jumbo disturbance pattern. Small private landowners and industrial forestry dominate the area.

Area G

Located in the Lyndon Creek Subwatershed, Area G includes the estuary portions of Drift Creek. The current landscape texture is similar to Areas E and F but long term management objectives are more diverse. The lower slopes are dominated by small woodland owners, while the upper slopes are under Federal ownership. Short to moderate slopes are found in this area. The area contains a low percentage of high landslide susceptible slopes. Stream gradients are low to moderate as are the adjacent slopes. Area G lies with in the sitka spruce zone. Very early seral stages and hardwood stands dominate the vegetation. Remaining natural stands are medium in patch sizes but highly fragmented.

CHAPTER 6 RECOMMENDATIONS

RECOMMENDATIONS

The difference between the current resource conditions and management objectives drive the potential management activities that may facilitate meeting the objectives of a given area. The following potential opportunities were based on a number of factors. These included the legislated objectives associated with wilderness management, the goals established in the Northwest Forest Plan for management of LSR's, and meeting of the Aquatic Conservation Strategy. The concept of protecting the best habitat first and restoring the most disturbed habitat last influenced the setting of priorities. It was presumed established standards and guidelines would be met.

General Recommendations

Within the watershed there are opportunities that do not fall neatly into a specific area or priority. This section describes some of those opportunities.

Land Adjustment

Pursue land exchanges or acquisitions that help protect or restore key aquatic or terrestrial areas. The highest aquatic priorities include estuary areas and reaches of high potential productivity. Terrestrial priorities include land acquisition which provides a linkage within the LSR or blocks up land within the LSR. The lowest priority is to acquire lands that consolidate federal ownership.

Research

With the Flynn Creek RNA, Drift Creek Wilderness and ownership patterns, Drift Creek will continue to provide research opportunities related to the Oregon Coast Province. Support research strategies and projects which integrate individual research projects. Work with the research community, state agencies and private industry to help interpret the affects on aquatic and terrestrial environments from different management objectives among owners. Cooperate with the research community to help identify research priorities within the province.

Recommendations by Opportunity Areas

Areas A, B, C

The current condtions within Areas A, B and C were considered similar enough to consolidate recommendations for future activities. These three areas form the conerstone for aquatic and terrestrial conservation measures within the watershed. Consequently, restoration and protection within the watershed should begin in these three areas. The primary goal within these areas is to preserve the larger blocks of natural stands and to

reduce the influence of past management activities on the aquatic and terrestrial habitat. This includes maintaining landslide frequency within the range of natural variability and improving wilderness conditions.

- Reduce the influence of roads on aquatic processes, LSR function and wilderness values.
    - To allow natural disturbance events such as landslides and wind throw to fulfill their role in the ecosystem, close non-ATM roads and operator spurs upon completion of management activities. Consider removal from the road system if the lack of maintenance is not likely to lead to a major road failure or the road is not likely to intercept landslide debris.
    - Decommission those non-ATM roads whose closure is likely to result in a major road failure or where channel crossings are likely to intiate or intercept debris flows.
    - Update road maintenance plans to include priorities for upgrading culverts along with identification of waste disposal sites and procedures for routine and emergency conditions.
    - Evaluate moving wilderness trailheads to junctions of arterial and collector road junctions (Roads 3446-346&348, 3464 and 5087).

- Accelerate the change in management direction of plantations within the LSR and Riparian Reserve.
    - Increase the diversity of stand structure and species composition through pre-commercial and commercial thinning opportunities. Within Areas A and B, use the concept of single entry to design projects that meet management objectives. Place emphasis on securing habitat associated with known owl pairs.
    - Develop prescriptions that provide for recruitment of large conifers in headwall areas, toe slopes and valley bottoms. Emphasis is on recruiting existing conifer component.
    - Second priority is to develop wind firmness in units adjacent to private land and the wilderness boundary.
    - Continue to monitor stream temperatures within the watershed.

- Manage recreation activities consistent with LSR and ACS objectives.
    - Monitor the influence of boating and kayaking on recruitment of CWD. Develop education programs to reduce the potential conflict between the desire to maintain CWD and boating activities.
    - Maintain the unique values associated with the north end of the Horse Creek Trail, including road and trail design criteria and maintenance programs.
    - Prevent the potential introduction of non-native and noxious weed species by retaining the current prohibition of recreational horse use within the Drift Creek Wilderness and adjacent subwatersheds.

- Restore the influence of coarse wood on sediment routing and floodplain connectivity.

- Increase the CWD within the main stem of Drift Creek in the Upper Drift Creek subwateshed.
- Monitor the abundance of CWD in the main stem of Drift Creek to help assess the cumaltive affects on federal lands from timber managment activities on industrial lands.

Area D

On Federal lands, Area D provides the greatest opportunity to build upon the conservation efforts initiated in Areas A, B, and C. In addition, project opportunities can be planned in conjunction with project opportunities identified in the Big Elk Watershed Analysis. The aquatic goal places emphasizes reducing the influence of roads (especially valley bottom roads), managed stands and historic homestead meadows on aquatic conditions. This includes increasing the influence of CWD on sediment routing and flood plain connectivity. The primary terrestrial goal in Area D emphasizes building larger blocks of mature and late seral stages within the LSR. This includes reducing the activities associated with road use on species associated with later seral stages. If funding is a limit to project implementation, treatments in Area D are a lower priority than Areas A, B and C.

- Reduce the influence of roads on aquatic processes, and LSR function.
  - To allow natural disturbance events such as landslides and wind throw to fulfill their role in the ecosystem, close non-ATM roads upon completion of management activities. Consider removal from the road system if the lack of maintenance is not likely to lead to a major road failure or the road is not likely to intercept landslide debris. This does not include roads under cooperative maintenance agreements, or which provide access to private land.
  - Decommission those non-ATM roads whose closure is likely to result in a major road failure or where channel crossings are likely to intiate or intercept debris flows.
  - Prohibit OHV traffic in meadows and on closed or decommissioned roads.
  - Update road maintenance plans to include priorities for upgrading culverts along with identification of waste disposal sites and procedures for routine and emergency conditions.
    - Develop road maintenance operating procedures that reduce the effects of valley bottom roads on hydrologic process.
    - Evaluate opportunities to change drainage structures or road location as a longer term solution to conflicts associated with beaver dams anchored to culverts.
  - Work with Lincoln County to reduce or eliminate the effects of the Gopher Creek Road (County Road 609) on hydrologic process while maintaining community linkage between Harlan and Drift Creek.

- Accelerate the change in management direction of plantations within the LSR and Riparian Reserve.
    - Develop prescriptions that provide for recruitment of large conifers in headwall areas, toe slopes and valley bottoms. Emphasis is on recruiting the existing conifer component.
    - Increase the diversity of stand structure and species composition through pre-commercial and commercial thinning opportunities. Within Area D, consider the use of multiple entries in the design of projects that meet management objectives.
    - Place emphasis on securing habitat associated with known owl pairs.
    - Second priority is to develop wind firmness in units adjacent to private land.

- Restore the influence of CWD on sediment routing and flood plain interactions. Concurrently restore the ecological succession process on valley bottom meadows, including their historic interaction with their stream channels. Reduce the effects of past activities on stream temperature regimes.
    - Develop prescriptions that provide for recruitment of large conifers in meadow areas.
    - To allow for conifer and hardwood establishment within the meadows, adjust the term grazing permit to protect plants from grazing during spring bud break. Upon expiration of the term grazing permit, consider terminating grazing program to provide long term riparian protection.
    - Increase the CWD component to at least 40 pieces per mile in Gopher Creek.
    - Inventory homestead sites for potential barriers (dikes) to channel migration.
    - Continue to monitor stream temperature regimes within the watershed.
    - Evaluate the quality of shading provided by existing stands on wider reaches. Adjust stand composition if solar protection is not adequate in those areas experiencing the greatest amount of heating.

Areas E and F

Industrial forest practices dominate the human influence on aquatic and terrestrial resources. This area contains the largest percentage of potentially productive aquatic habitat. The primary aquatic goal is to cooperatively reduce the influence of industrial forest management to aquatic habitat located on federal lands. Providing a linkage between adjacent federal lands is a primary objective on federal lands. An additional objective is for federal land to serve as a refuge for late-successional species with small home ranges.

- Pursue cooperative basin management plan with industrial landowners to reduce the affects of intensive forest practices on aquatic resources.
    - Evaluate opportunities to reduce or eliminate impacts of valley bottom roads on hydrologic process's.
    - Pursue opportunities to develop a cooperative access management plan between the industrial and federal land interface.

- Work cooperatively to identify stream reaches susceptible to stream heating.
- Develop cooperative opportunities to increase CWD in Horse, Flynn and the mainstream of Drift Creek, with the highest priority being above the confluence with Gopher Creek.

- Reduce the influence of the federal road system on aquatic processes, and LSR function.
  - To allow natural disturbance events such as landslides and wind throw to fulfill their role in the ecosystem, close non-ATM roads upon completion of management activities. Consider removal from the road system if the lack of maintenance is not likely to lead to a major road failure or the road is not likely to intercept landslide debris. This does not include roads under cooperative use agreements or that provide access to private land.
  - Decommission those non-ATM roads whose closure is likely to result in a major road failure or where channel crossings are likely to intercept debris flows.
  - Prohibit OHV traffic in meadows and on closed or decommissioned roads.
  - Update road maintenance plans to include priorities for upgrading culverts along with identification of waste disposal sites and procedures for routine and emergency conditions.
  - Develop road maintenance operating procedures that reduce the effects of valley bottom roads on the hydrologic process's.
  - Evaluate opportunities to change drainage structures or road location as a longer term solution to conflicts associated with beaver dams anchored to culverts.

- Accelerate the change in management direction of plantations within the LSR and Riparian Reserve.
  - Develop prescriptions that provide for recruitment of large conifers in headwall areas, toe slopes and valley bottoms. Emphasis is on recruiting the existing conifer component.
  - Increase the diversity of stand structure and species composition through pre-commercial and commercial thinning opportunities. Multiple entries should be considered in the design of projects that meet management objectives.
  - The highest priority is to develop wind firmness in units adjacent to private land and the wilderness boundary.

- Restore the influence of CWD on sediment routing and flood plain interactions. Concurrently, restore the ecological succession process on valley bottom meadows, including their historic interaction with their stream channels. Reduce the effects of past activities on stream temperature regimes.
  - Develop prescriptions that provide for recruitment of large conifers in meadow areas.
  - Adjust allotment management plans to allow for conifer and hardwood establishment within the meadows. Protection of plants from grazing during spring bud break is the highest priority.

- Inventory homestead sites for potential barriers to channel migration.
- Continue to monitor stream temperature regimes within the watershed.

Area G

The mixed ownership patterns influence the establishment of goals for Area G. Restoration opportunities within Area G is the lowest priority in the watershed. However the opportunities for restoration should not be ignored. On Federal Land, the aquatic goal emphasizes reducing the influence of roads, managed stands, power line management and historic homestead meadows on aquatic conditions. In addition, working closely with landowners interested in reducing the influence of settlement on aquatic resources. The primary terrestrial goal in Area G emphasizes building larger blocks of mature and late seral stages, along with reducing the influence of road use on species associated with later seral stages.

- Reduce the influence of roads on aquatic processes, and LSR function.
    - To allow natural disturbance events such as landslides and wind throw to fulfill their role in the ecosystem, close non-ATM roads upon completion of management activities. Consider removal from the road system if the lack of maintenance is not likely to lead to a major road failure or the road is not likely to intercept landslide debris. Consider potential for trespass from private lands in developing closure strategies.
    - Decommission those non-ATM roads whose closure is likely to result in a major road failure or where channel crossings are likely to intercept debris flows..
    - Update road maintenance plans to include priorities for upgrading culverts along with identification of waste disposal sites and procedures for routine and emergency conditions.
        - Develop road maintenance operating procedures that reduce the effects of valley bottom roads on hydrologic processes.
        - Evaluate opportunities to change drainage structures or road location as a longer term solution to conflicts associated with beaver dams anchored to culverts.

- Accelerate the change in management direction of plantations within the LSR and Riparian Reserve.
    - Develop prescriptions that provide for recruitment of large conifers in headwall areas, toe slopes and valley bottoms. Emphasis is on recruiting the existing conifer component.
    - Increase the diversity of stand structure and species composition through pre-commercial and commercial thinning opportunities. Multiple entries that meet management objectives should be considered in the design of projects.
    - The highest priority is to develop wind firmness in units adjacent to private land and the wilderness boundary.
    - Work with BPA to develop a vegetative management plan that allows conifers to grow taller where power lines cross riparian areas.

- Pursue cooperative basin management plan with industrial landowners to reduce the affects of intensive forest practices on aquatic resources.
    - Evaluate opportunities to reduce or eliminate impacts of valley bottom roads on hydrologic processes.
    - Pursue opportunities to develop a cooperative access management plan between the industrial and federal land interface.
    - Work cooperatively to identify stream reaches susceptible to stream heating.

- Pursue the opportunity to develop coordinated resource plans with private landowners.
    - Emphasize opportunities to protect and restore conifers along stream banks.
    - Identify cooperative opportunities to recruit CWD into stream channels and floodplains.

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