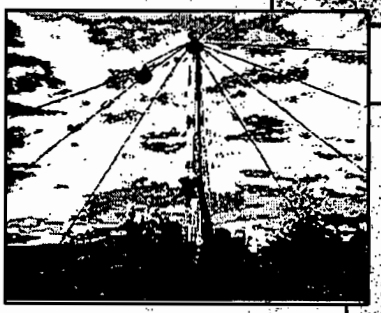
# North Fork of the Siuslaw River



# Watershed Analysis

December 16, 1994

Siuslaw National Forest

This analysis was done by staff of the
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"Sit still and be quiet, and listen to this stream tell its story."
Andrew Charles
(Native Siuslawan)

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# CHAPTER 1 - *INTRODUCTION*

This watershed analysis is our first attempt at understanding the ecosystem of the North Fork Siuslaw watershed and how it fits within the Coast Range province. It s purpose is to create a basis from which to provide management recommendations. We needed to see where we've been and where we're headed and how we fit into this ecosystem. The intended audiences for this document are land managers and the general public. We attempted to write the report using plain English with a minimum amount of technical jargon. The processes and principles discussed within this document are meant to bring us all to the same level of understanding with the hope that once there, we can work together to come up with solutions on how to manage this area within a sustainable ecosystem framework. This is only the first step in that direction.

## WHAT IS WATERSHED ANALYSIS?

A watershed analysis is a systematic procedure performed to help us understand how a watershed works. It is intended to guide future management decisions in a scientifically credible way. By understanding the ecological processes and limitations of a watershed, human needs and desires may be met in a sustainable manner without impairing the ability of the ecosystem to function. Basic questions a watershed analysis seeks to answer include:

1. *How does this landscape work?* What are the relationships between physical processes (climate, erosion, streamflow), natural disturbances (fire, windstorms, floods), vegetation patterns, and fish and wildlife habitat?

2. *What was the landscape like in the past?* The purpose of this question is to understand what range of conditions existed in the past. For example, how much of the forest was old growth and where was it located?

3. *What is the current condition of the watershed?* Answering this question about various parts of the watershed allows the present conditions in the watershed to be compared to historic conditions. In this way, the health of watershed conditions, such as stream condition and fish habitat, can be evaluated.

4. *What is the potential for this area?* For example, how many miles of stream are potential anadromous fish habitat? What are the opportunities for recreation? What is the sustainable level of timber harvest? How and where can old growth development be accelerated?

5. *Where and what type of impacts are likely in the future?* For instance, existing unstable roads may cause landslides that could put sediment in creeks and affect fish habitat. It is also important to understand what types of natural disturbances are likely to occur, such as flooding frequency, fires and rates of landslides in undisturbed areas.

## WHAT WATERSHED ANALYSIS IS NOT

Watershed analysis is not a detailed study of everything in the watershed. The watershed analysis is built around the issues that are identified as the most important. For example, if salmon are an important issue, factors that affect salmon and their habitat are analyzed. These aspects may include stream and riparian habitat conditions, sources of sediment, water quality (e.g. temperature) and water quantity (streamflow).

Watershed analysis is not intended to be detailed, site-specific project planning. Watershed analysis provides the framework in the context of the larger landscape and looks at the "big picture". It identifies and prioritizes potential project opportunities.

Finally, a watershed analysis is not done under the direction and limitations of the National Environmental Policy Act (NEPA). If a specific project is proposed, more detailed project level planning will be done. An environmental analysis will be completed at that time.

## PRODUCTS AND OUTCOMES OF A WATERSHED ANALYSIS

When completed a watershed analysis will provide some of the following:

1. A description of large-scale interactions and landscape patterns.

2. A synthesis of existing data.

3. Identification of data gaps--what we don't know about the watershed.

4. Guidance for future monitoring and data collection to fill in the data gaps.

5. Guidance for designation of Riparian Reserves at the landscape level. The actual riparian boundaries will be identified during project planning because of the site-specific field work needed that is beyond the scope of watershed analysis and because their location will partially depend on what type of project is proposed.

6. A list of potential projects and opportunities that are appropriate to the watershed under the President's Forest Plan.

## BASIS FOR WATERSHED ANALYSIS

Watershed analysis focuses on implementing the Aquatic Conservation Strategy of the President's Forest Plan. In a broader context, it is intended to help implementation of ecosystem management. The Record of Decision (ROD) for the President's Forest Plan states that "Watershed Analysis is required in Key Watersheds, for roadless areas in Non-Key Watersheds, and Riparian Reserves prior to determining how proposed land management activities meet Aquatic Conservation Strategy objectives...Timber harvest, including salvage, cannot occur in Key Watersheds without a watershed analysis. Ultimately, watershed analyses should be conducted in all watersheds on federal lands as a basis for ecosystem planning and management" (ROD, p. B-20).

# CHAPTER 2 - *DESCRIPTION OF THE NORTH FORK SIUSLAW*

## LOCATION

The North Fork Siuslaw watershed is located in the Oregon Coast Range northeast of Florence, Oregon. It extends from 1 mile east of Florence approximately 17 miles to the northeast (Figure 1). The North Fork Siuslaw empties into the main Siuslaw River approximately 3 miles from the Pacific Ocean. The watershed contains 12 subwatersheds, and is approximately 41,078 acres in size.

## CLIMATE

The North Fork Siuslaw watershed has a mild, maritime climate that is moderated by its proximity to the Pacific Ocean. Most rainfall occurs between October and March. The average annual rainfall varies from 58 inches along the coast to 115 inches in the upper elevations. Temperatures are mild, and snow storms are rare. Windstorms with hurricane-force winds occasionally occur during the winter (NCASI, 1985).

## GEOLOGY

The watershed is underlain by the Eocene Tyee Sandstone with a few scattered basaltic dikes. The Tyee Sandstone is an interbedded sandstone and siltstone that is gently folded. Landslides, in the form of debris torrents and a few rotational slumps, are the dominant geologic processes that help shape the landscape. Debris torrents tend to occur on the steep slopes that are perpendicular to bedding and flow down existing stream channels, while the rotational slumps tend to occur parallel to bedding planes. The Coast Range is geologically active, and is being uplifted and tilted to the east. Earthquakes have occurred at an interval of approximately 300 years along the coast of Oregon and Washington. Possible effects from an earthquake in the North Fork Siuslaw include flooding due to tsunamis (large ocean waves caused by earthquakes) in the tidewater areas, and possible landslides associated with ground shaking (Orr et al., 1992).

## TOPOGRAPHY

Elevations in the watershed range from 2,220 feet at Saddle Mountain, on the northern boundary of the watershed, to a few feet above sea level at the mouth of the North Fork Siuslaw River. The area has rugged topography and steep slopes, especially in the headwaters. Well-developed, broad flood plains are present along the lower portion of the mainstem.

## VEGETATION

The North Fork of the Siuslaw lies within the Cascade Mixed Forest-Coniferous Forest-Alpine Meadow Province (Bailey, 1994) and is part of the Pacific Coast Coniferous Forest Ecosystem. Within this ecosystem several vegetation zones occur. This watershed lies mainly within the Western Hemlock Zone. Portions along the western margins and the tidewater area are adjacent to or lie within the Sitka Spruce Zone.

Within the Western Hemlock Zone the climax tree species is western hemlock. However, the current dominant tree species is Douglas-fir because of the disturbance history of the area. It has been burned or logged (or both) within the last 150 years. Given enough time (400+ years) and no major disturbances, western hemlock would eventually become dominant in most areas. Other important conifer tree species within the watershed include Sitka spruce and western redcedar.

Hardwoods are a minor element in this area. The most common hardwood is red alder. This tree is an early seral or pioneer species which quickly dominates areas where the soil has been disturbed. Currently, it is most commonly found along valley bottoms and occasionally occurs within the higher slopes. Other hardwoods in this area include bigleaf maple, cascara, and bitter cherry. Understory vegetation is quite diverse and is discussed in more detail in Appendix B.

## WILDLIFE

A wide variety of wildlife species live here ranging in size and shape from the tiniest microbe to the largest native species, the Roosevelt elk. They each have an equally important role in the functioning of the local ecosystem.

Currently, there are approximately 300 species of vertebrates (not including fish) that can be found within this watershed throughout the year or during their seasonal migrations. There are even more species of invertebrates (some have yet to be identified).

Over the last century and as a result of European settlement, at least 6 different vertebrate species have been extirpated from this area (and in some cases have nearly become extinct) including the gray wolf, Columbia white-tailed deer and the California condor. Today, 29 out of the 300 vertebrate species and 3 of the local invertebrate species are currently listed by federal or state agencies as being of some concern throughout all or a portion of their home range (see Appendix C for specific listings).

## FISH

The North Fork Siuslaw watershed contains over one hundred miles of anadromous fish habitat. It has historically produced large numbers of fall chinook salmon, coho salmon, winter steelhead, and sea-run cutthroat trout. An intensive hatchery supplementation program for steelhead and sea-run cutthroat trout has been in place for many years. The Siuslaw River is one of the outstanding sea-run cutthroat trout fisheries in the state.

With the exception of chinook salmon, all of the wild anadromous fish populations have declined drastically over the past several years. Coho salmon and steelhead trout are currently being reviewed for listing under the Endangered Species Act. Sea-run cutthroat trout is listed as a Stock of Concern by the Oregon Department of Fish and Wildlife (ODFW).

Because of the importance of wild anadromous fish populations in the basin, the relatively good habitat, and the potential to act as refuge areas for depleted fish stocks, the upper portion of the basin has been designated as a Key Watershed (Figure 2).

## PEOPLE

Throughout prehistoric and historic periods, humans living in this area have depended on it s natural resources and agriculture for their survival. Primary sources of income have included logging, fishing, dairy farming, peeling of cascara bark, and picking of sword fern and huckleberry brush. Today, while some the originally tilled land has grown back from non-use, most is used for raising beef cattle. Except for those that are retired, most local residents have jobs away from home in the surrounding communities. Logging, fishing and miscellaneous forest products continue to be important to the local economy. Even though sources of income and lifestyles have changed over the years, values have remained more traditional.

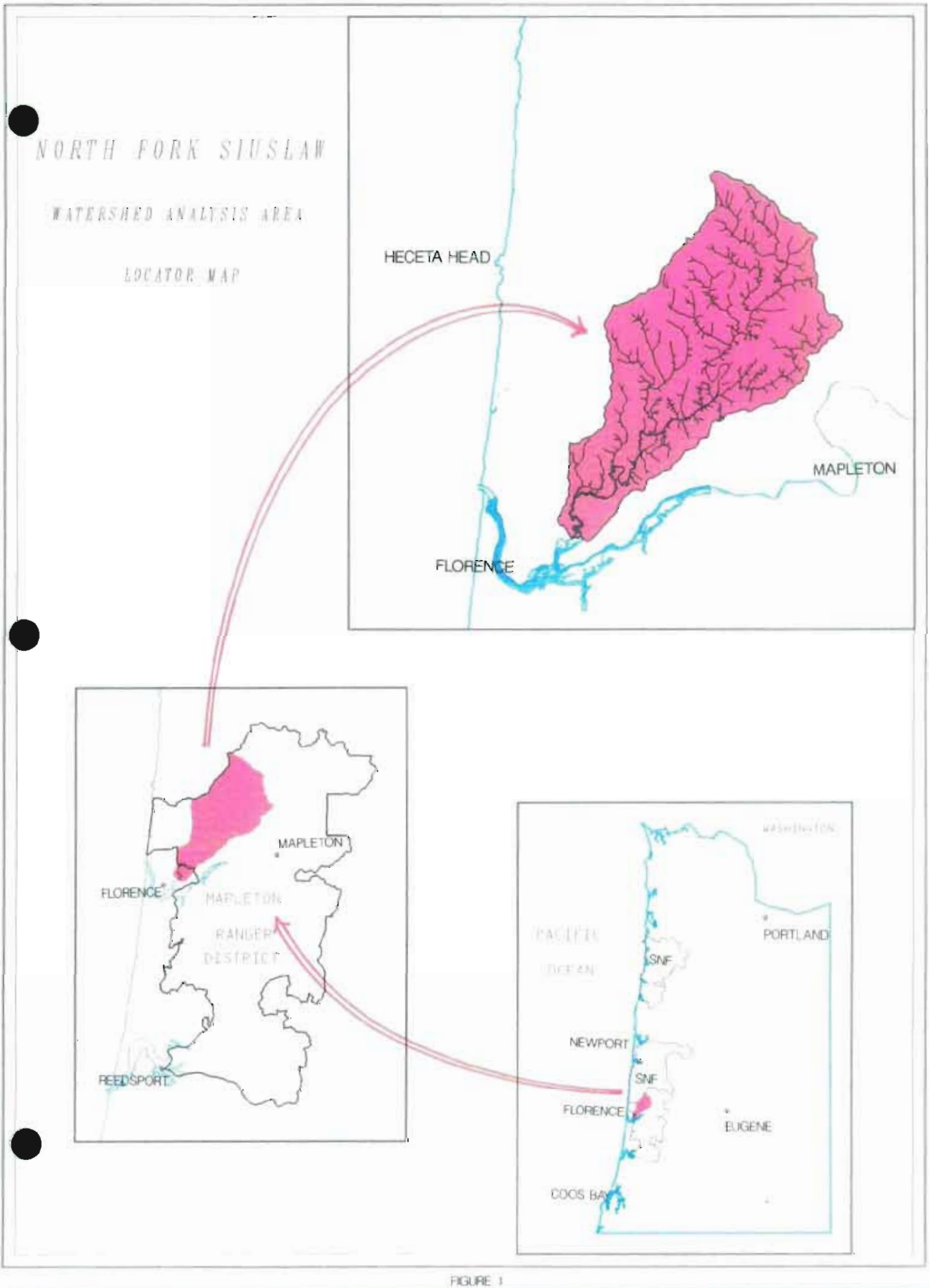

NORTH FORK SIUSLAW
WATERSHED ANALYSIS AREA
LOCATOR MAP
HECETA HEAD
MAPLETON
FLORENCE
MAPLETON
FLORENCE
RANGER
DISTRICT
REEDSPORT
PACIFIC
OCEAN
PORTLAND
SNF
NEWPORT
SNF
FLORENCE
EUGENE
COOS BAY

FIGURE 1

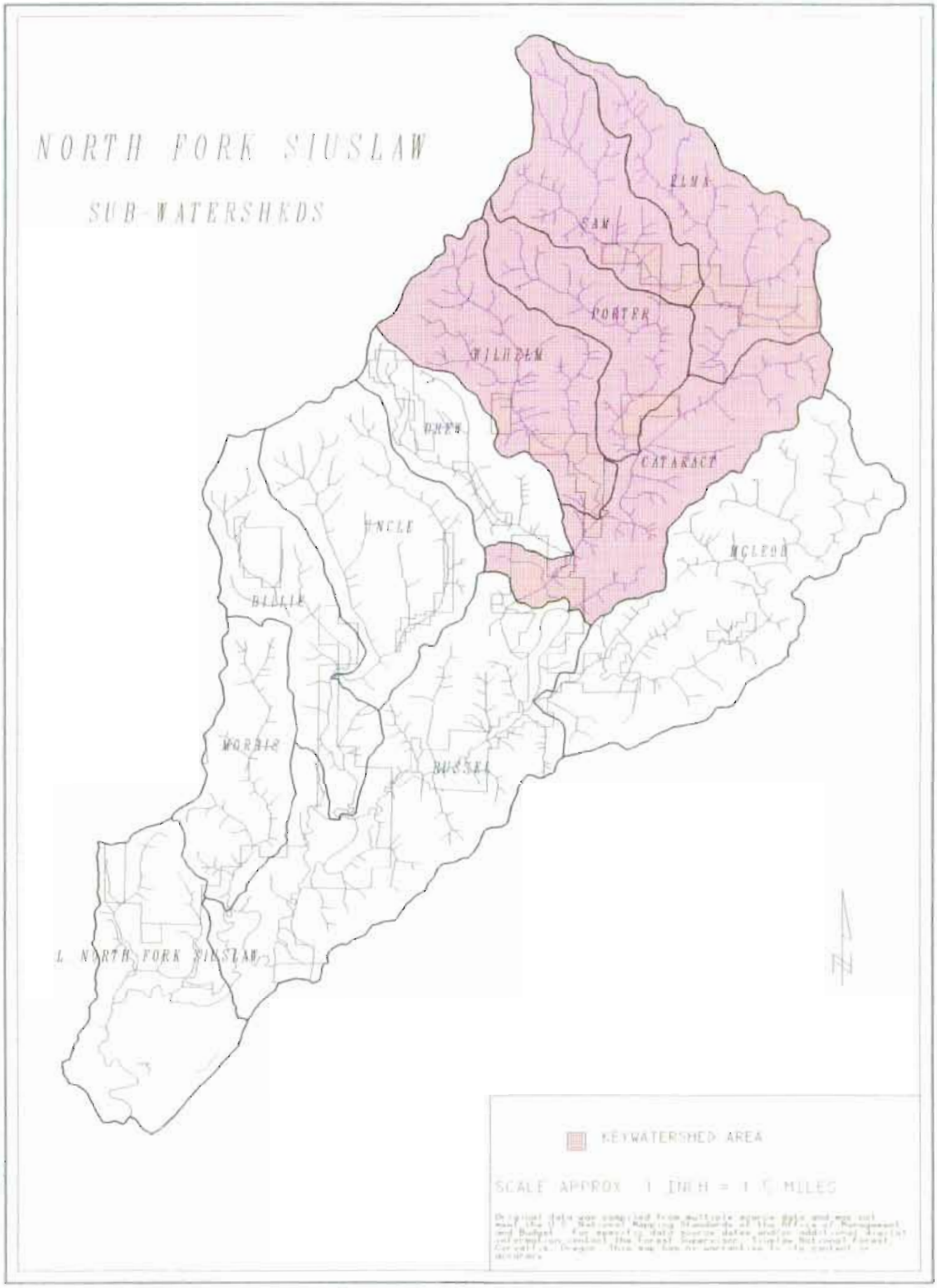

NORTH FORK SIUSLAW
SUB-WATERSHEDS
ELMA
SAM
PORTER
WILHELM
DRIFT
CATARACT
UNCLE
MCLEOD
BIGLIE
MORRIS
RUSSEL
L. NORTH FORK SIUSLAW
KEYWATERSHED AREA
SCALE APPROX. 1 INCH = 1.5 MILES

FIGURE 2

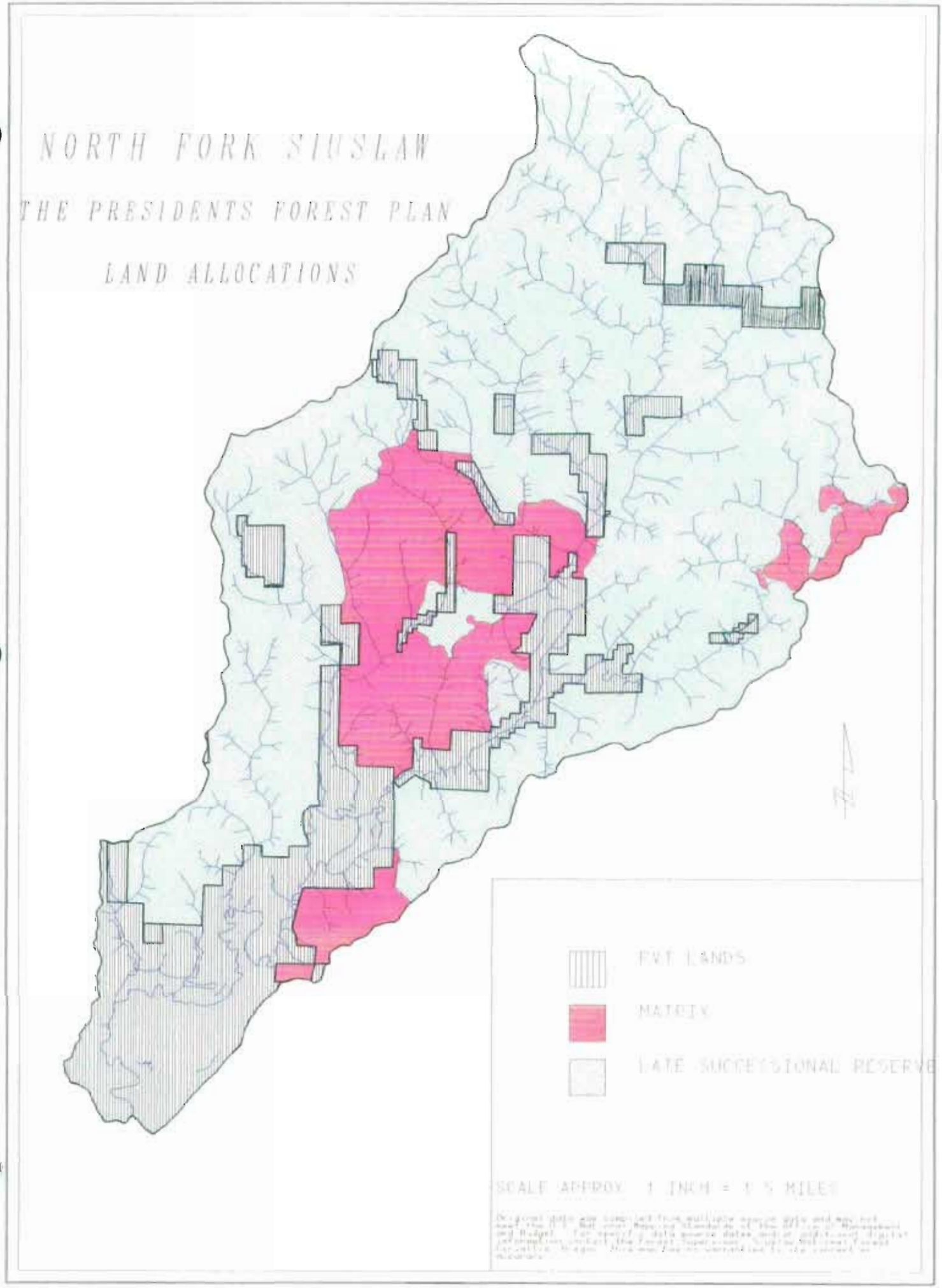

NORTH FORK SIUSLAW
THE PRESIDENTS FOREST PLAN
LAND ALLOCATIONS
PVT LANDS
MATRIX
LATE SUCCESSIONAL RESERVE
SCALE APPROX. 1 INCH = 1.5 MILES

FIGURE 3

## LAND OWNERSHIP

Several different ownerships occur within this watershed. Public lands, managed by the U.S. Forest Service and Bureau of Land Management, cover approximately 32,164 acres or 78% of the watershed. Most of the public land is managed by the Siuslaw National Forest (approximately 160 acres is managed by the Bureau of Land Management). Private land makes up the remaining 22% or 8,913 acres. Approximately 31% of the private land is owned by the timber industry including Davidson, Champion, International Paper, Starker and Seneca. The remaining private land is owned mostly by local farmers, ranchers, dairymen, small woodlot owners and absentee land owners.

## LAND ALLOCATIONS

Land allocations, as designated by the President's Forest Plan, apply only to federal land **and not** to private lands. Approximately 83% of the federal land in the North Fork Siuslaw watershed is designated as Late Successional Reserve, and the remaining 17% is designated as Matrix land under the President's Forest Plan (Figure 3.). Five subwatersheds within the northern part of the North Fork Siuslaw watershed are designated as a Key Watershed. These subwatersheds are Elma, Sam, Cataract, Porter, and Wilhelm. Riparian Reserves, which are adjacent to all streams, overlay all other land allocations but **do not** cross private land boundaries.

# CHAPTER 3 - *ISSUES AND KEY QUESTIONS*

As a result of public involvement and current national direction and policy, five main issues were identified concerning the North Fork Siuslaw. For each issue a key question was posed as to how to address the issue. Both issues and key questions are listed below:

**ISSUE #1 - FRAGMENTATION AND LACK OF OLD GROWTH HABITAT: How will the watershed be managed to provide for future mature and old growth habitat?**

Over the last century, at least 33% of the North Fork of the Siuslaw watershed has been clearcut harvested, removing approximately 35% of the post-1846 fire second growth (mature conifer habitat) and 92% of the old growth habitat which survived the same fire. These clearcuts are scattered throughout the watershed and have resulted in severe fragmentation of the remaining mature conifer habitat.

Several wildlife species require this habitat for their survival. Fragmentation reduces interior habitat through the creation of edges and impedes movement of wildlife. Over time isolated populations may suffer from the adverse effects of inbreeding. Increases in edge habitat attract predatory bird species thereby increasing predation of certain late seral preferring species. Because of the reduction in this habitat, what little remains is highly sought after by the surviving species. This results in crowding and increased competition for resources within and between species. Increased competition results in high energy expenditures and stress. Lack of mature and old growth conifer habitat and fragmentation decrease these species' chances for survival in this area.

The northern spotted owl, northern bald eagle and marbled murrelet are federally listed as threatened under the Endangered Species Act. These three species require late successional habitat for their survival. Spotted owl populations in the watershed have declined by 23% over the last five years. Currently, there are four spotted owl pairs and one resident single spotted owl within the watershed. Barred owls are invading the watershed and have already displaced one spotted owl pair and are hybridizing with the male spotted owl of a historical pair. In addition, several observations of occupied behavior by marbled murrelets have been documented throughout the watershed.

There is a need to identify and prioritize management activities which will reduce fragmentation and recreate large blocks of mature conifer habitat within this watershed.

**ISSUE #2 - ELK HABITAT: How will the river basin be managed to provide habitat for both old growth dependent species and elk?**

Conversion of pre-existing wetlands into pasture lands, hunting regulations, clearcut harvesting and forage seeding have greatly increased elk herd numbers within this watershed over the last 50-85 years. As future clearcutting on federal land decreases, elk will lose some of their existing foraging habitat (approximately 4,000 acres). As a result, elk populations within the watershed will probably decrease. In addition, elk damage to private lands (which has been increasing over the last couple of decades) will probably increase as a result of the current management direction.

Private pasture lands provide most of the watershed's grass/forb habitat (which is currently at 6%). Around 10% of all private land within the watershed is within forage habitat conditions for elk. Due to shorter timber harvesting rotations on private lands, over time we can assume that these percentages will remain more or less the same. This equates to approximately 8% of the entire watershed remaining in elk forage condition over time. The Oregon Department of Fish and Wildlife recommends that 9-12% of a watershed be maintained for elk forage through time.

Elk hunting and viewing is a popular activity within this watershed. There is a need to identify and prioritize areas to provide elk forage and early seral habitat within the watershed. This habitat will not only benefit elk but will increase the local habitat diversity and benefit other wildlife species requiring early seral habitat for their survival.

**ISSUE #3 - ROAD MANAGEMENT: How should the roads be managed to meet ecosystem-based management objectives and meet the public's access needs?**

In relation to the area they cover, roads have a greater potential for causing ecological disturbances than most other forest management activities. The primary concern regarding roads is their impact to water quality and fish habitat due to accelerated rates of landslides. Although roads cover approximately 3% of the land area in the North Fork Siuslaw watershed, most of the landslides that have occurred since 1953 resulted from failure of unstable material in fill slopes, fills and culverts at stream crossings, and sidecast waste materials. Often the cause was poor drainage of surface and ground water, and/or inadequately engineered design and construction. The increased landslide activity has resulted in increased sedimentation in adjacent streams. Surface erosion due to poor drainage is also of concern because it can result in an increase in fine sediments. Also, because roads subdivide contiguous areas and provide greater human access to the Forest, the potential for disturbance of wildlife is increased.

In the past, erosion and landslides were minimized by annual road maintenance and inspections. Maintaining proper road drainage by cleaning ditchlines and culverts, for example, was the main preventative measure used to avoid road-related landslides. Due to recent changes in management direction and decreases in timber-generated revenues, road maintenance funds have been reduced. Routine road maintenance is no longer feasible. There are over 180 miles of roads in the North Fork Siuslaw watershed alone.

There is a need to identify and prioritize those roads that pose the greatest risk for erosion, landslides, and potential sediment delivery to streams. Site-specific projects to prevent uncontrolled road drainage from causing erosion or landslides ("storm-proofing" roads) need to be identified to prevent adverse impacts to water quality and fish habitat. There is also a need to identify and prioritize those roads most important to meet future forest management and public access needs.

**ISSUE #4 - FISHERIES: How can stream channel and watershed conditions be improved in the basin to provide better habitat for fish and other aquatic species?**

The North Fork Siuslaw watershed contains over one hundred miles of anadromous fish habitat. It supports large populations of chinook salmon, coho salmon, steelhead trout, and sea-run cutthroat trout. With the exception of chinook salmon, the populations of each of these species have declined drastically over the past several years. The coho salmon and steelhead trout are being reviewed for listing under the Endangered Species Act. The sea-run cutthroat has been listed as a stock of concern by the Oregon Department of Fish and Wildlife.

Because of the importance of the anadromous fish populations within the watershed, the relatively good condition of the habitat compared to other streams in the region, and the potential to act as refuge areas for depleted fish stocks, the upper portion of the North Fork Siuslaw has been designated as a Key Watershed under the Siuslaw National Forest Watershed Protection and Restoration Strategy (Siuslaw National Forest, 1993) and the President's Forest Plan (USDA Forest Service et al., 1994).

The degradation of freshwater fish habitat is an important factor in the decline of anadromous fish populations. Impacts from past timber harvest, road construction, grazing, and settlement have resulted in fish habitat that is generally in poor condition and far below its potential production capacity. Activities within the riparian zone and other areas adjacent to stream channels have substantially altered riparian conditions and have greatly reduced the amount of large trees available to fall into the streams.

There is a need to identify any existing risks which have the potential to further degrade fish habitat and to eliminate them as much as possible, especially within the Key Watershed area. There is also a need to identify and prioritize projects which have the greatest potential to improve anadromous fish habitat over both the short and long term. Manipulating riparian zones to re-establish conifers and treating upland sites to grow large trees on areas that are likely to be carried into the streams by future landslides or debris torrents may be a significant part of the long-term strategy.

**ISSUE #5 - COMMODITY PRODUCTION: What is the sustainable level of harvest of timber and other forest products from the river basin?**

Timber harvesting has been part of the North Fork Siuslaw watershed area's economy since the turn of the 20th century. Harvesting has cycled back and forth between private lands and National Forest lands. The earliest timber cutting was associated with settlement that opened up the area for agriculture. Then industrial lands started their own timber management programs. From the 1960's through the 1980's timber harvest shifted to National Forest lands. Only a few years ago the Siuslaw Land and Resource Management Plan was projecting harvest rates on the Mapleton Ranger District between 80 and 100 million board feet of timber per year. Today, industrial lands and small non-industrial owners are liquidating their timber at unprecedented rates.

Economically and emotionally this area is tied to timber production and harvest. Nearly everyone in this community is affected by the uncertainty associated with recent timber management direction on National Forest lands. The Mapleton Lawsuit of the mid-1980's, followed by years of turmoil associated with appeals and lawsuits and recently the adoption of the President's Forest Plan, has resulted in a local population that is upset and worried about their future.

In the North Fork watershed, over 11,000 acres have been clearcut on National Forest lands in the past 40 years. Somewhere between 700 million and one billion board feet of timber were removed. With change in management philosophy toward large late successional reserves, the question about appropriate timber commodity production levels needs to be addressed.

The watershed has also been a rich supplier of other forest products. These include cedar posts, rails and shake bolts, cascara bark, moss, burls, western redcedar and Douglas-fir boughs, firewood, mushrooms, transplanting of small trees and shrubs, and picking evergreen huckleberry, salal, Oregon grape, and sword fern for floral arrangements.

Products such as cedar posts, rails and shake bolts, burls and firewood have historically been in high demand. Further cedar and burl harvesting is encumbered because only limited quantities of high-valued materials remain within the watershed and because quality cedar materials are usually found within sensitive lower slopes and riparian areas. Also, restrictions related to endangered, threatened or sensitive animal and plant species may restrict harvest.

Early in the century, cascara was abundant within the watershed. Its natural habitat is semi-open forest to upslope clearings. These were common after the large early forest fires and prehistoric and historical patch burning. While most cascara currently exists on private land, vigorous reforestation of Douglas-fir beginning in the 1950's has shaded many of these areas to the point that limited cascara remains on North Fork Siuslaw National Forest lands.

Harvest of floral greenery, moss, western redcedar and Douglas-fir boughs, and mushrooms will be more difficult as brush along unmaintained roads closes in. Also, a reduction in early seral stage vegetation will reduce available small tree and shrub transplant stock.

The Siuslaw National Forest is currently conducting a Forest-wide assessment of special forest products. Monitoring programs for each species or product category will be initiated from that effort to determine sustainability and levels of harvest that are appropriate.

# CHAPTER 4 - *STORY OF THE NORTH FORK SIUSLAW*

It is, at best, difficult to determine the historical conditions of this area prior to the arrival of European man. The earliest written records for the Pacific Northwest come from explorers and trappers like Lewis and Clark (1805-1806) and Franchere (1811-1814). Some of the earliest written records found specific to this general area (the North Fork of the Siuslaw watershed) were from the 1826 journals of the English botanist, David Douglas.

It is important for us to try to understand how this area looked and functioned prior to the arrival of European man. This understanding allows us to determine which pieces or processes we have altered or removed over the last century. With this knowledge we can attempt to restore these pieces or processes to their original condition and, hopefully, restore the ecosystem to its original functioning parameters. In essence, this area's history holds the keys to its sustainable future.

Since we have become a new "piece" of the ecosystem, we need to realize that restoring the watershed's ecosystem to its original condition may not always be possible. As with all energy systems, when a new piece is added, the balance is altered. It causes the system to fluctuate until it reaches a new and usually different equilibrium point. History has shown that sometimes it is possible for us to alter the balance enough to cause the system to fail entirely. This collapse of an ecosystem may occur suddenly or, more often than not, it may take several years and a long chain of interrelated events. It is our purpose to avoid this scenario and attempt to find this system's new equilibrium; a balance in which the needs of people are met while maintaining ecosystem health and viability.

Historical and current conditions of the watershed, the processes that shaped them and future trends will be discussed in the following sections.

## HUMAN HISTORY

### Native American Homeland

The North Fork Siuslaw watershed was part of the original homeland of the Siuslawan Indians. While their main camp was located along the lower North Fork and main river estuaries,where clams, mussels, seals, shell fish, and other saltwater and freshwater food supplies were abundant, the watershed contributed to their inland food supply. Most Siuslawans passed the winter season along the lower-most part of Siuslaw River, moving to upriver villages during peak salmon fishing times or to camps for lamprey fishing, hunting, and trapping (Zenk, 1990). "...The (Siuslawan) Indians would come up the North Fork of the Siuslaw River in family-sized canoes with many large deep woven baskets to hold meat and berries for winter. They would spend several weeks camping. The men hunted while woman and the children picked and dried huckleberries, blackberries, salal, and whortle berries (red huckleberries).... When all the baskets were filled with food and kerosene cans were full of soft pure white bear lard, and many brook (cutthroat) trout had been smoked the Indians would break camp, load their canoes and come down past our home paddling quietly and never speaking loudly on their way home to Indian Town...at the mouth of the North Fork" (Farris, 1982). Several Indian camp locations are also known to have existed within the upper North Fork areas.

The Siuslawans were very fortunate in the fact that they lived in an area of very abundant food resources. In addition to the water-related foods, deer, elk, bear, ducks, geese and other game foods were also abundant. Other abundant natural resources used extensively were various fibrous plants and western redcedar. The fibers from the plants and cedar bark were used in making baskets, traps, weirs and other necessities. The cedar was important in making houses and canoes.

Early Euro-American settlers described the Siuslawans this way, "They were a small tribe of rather short statured people (Farris, 1982). They were not nomadic.... "They were not war-like but home lovers, family men, not driven to quarrel and were peaceful, quiet people" (Knowles, 1965). They had houses, marriage ceremonies, families, schools; doctors (medicine women in the case of the Siuslawans) were disciplinarians, and also deeply religious. They hunted and fished, not for sport but only for survival. They were conservationists, leaving female animals to reproduce young and letting the smaller fish go that were caught in their fish traps (Knowles, 1965).

While the Siuslawans were a small tribe in terms of Euro-American history, as of 1806, it is estimated that approximately 900 Siuslawans inhabited this area (Zenk, 1990). In 1863, Amos Harvey, who was then in charge of the Alsea Sub-agency of the Siletz Reservation,reported 129 Siuslawans living on the River and Zenk (1990) puts the number at 133 in 1867. Just 8 years later, in 1875, a report to the commissioner of Indian Affairs listed only 45 Siuslawans (Schwartz, 1991). These population reductions were largely due to a variety of epidemic diseases transmitted from Euro-American contact of which smallpox caused the greatest mortality. Before the arrival of the Euro-Americans,the Northwest Coast, like the rest of the Americas, seemed to have been relatively free of lethal infectious diseases (Zenk, 1990).

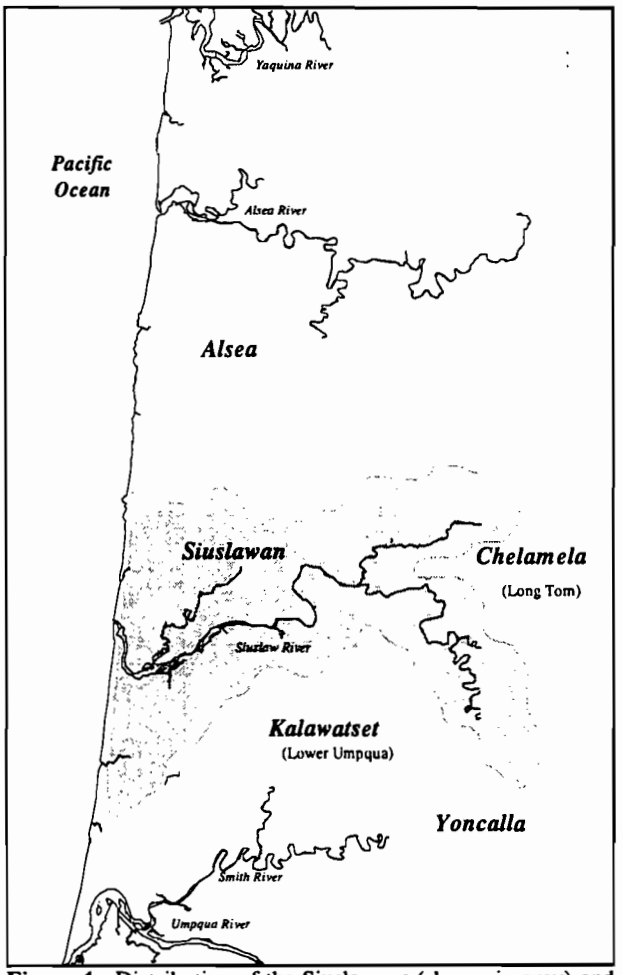



**Figure 4.** Distribution of the Siuslawans (shown in gray) and neighboring tribes (from Beckham, 1976).

**Figure 5.** Dan Quixote Johnson (commonly known as Indian Dan) was a well known Siuslawan Indian. Here he poses with a bucket of clams in front of a deer mural (circa 1900).

## Euro-American Settlement

Euro-American contact with the Siuslawans began long before they settled within the watershed area. By the 1790's, mariners were sailing regularly along the Oregon coast in their voyages of exploration and in their quest for furs. The Hudson Bay Company established regular trade relations with most Indian villages in the region in the 1820's. For three decades, from the early 1820's into the early 1850's, fur seekers had regular and generally good relations with the region's Indian population. The Indians acquired a variety of trade goods and adapted to these new materials and technologies (Beckham, Toepel & Minor, 1982). John Garnier, formally of the Hudson Bay Company, early on taught the Siuslawans how to farm while living with an Indian woman near the mouth of the Siuslaw River. By 1850, the Siuslawans were cultivating gardens, raising potatoes and other produce (Don Whereat, personal communication).

The Donation Land Act of 1850, which provided free land to the Europeans for the price of clearing and living on it, brought a sudden influx of settlers to the region. This influx spawned hostilities and fighting between Indians and settlers up and down the coast. In an effort to clear Indian title to these regions, treaties with the Indians were sought and reservations created. One such agency was the Alsea Sub-agency of the Siletz or Coast Reservation, created in 1855. While a series of treaties with tribes in western Oregon were ratified by the United States, the agreement with the tribes of this area never was. Even so, the United States acted as if it were a binding agreement and took these lands without any form of compensation to the indigenous people. All of the North Fork watershed's 41,078 acres were within the boundaries of the new reservation.

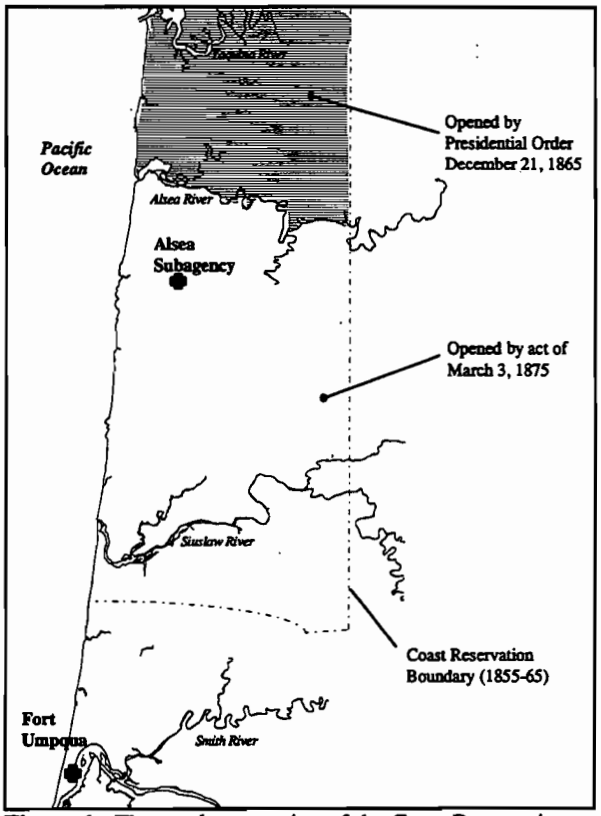



**Figure 6.** The southern portion of the Coast Reservation from present day Newport to just south of the Siuslaw River.

Pressure by the settlers to locate within the coastal areas continued, until in 1875 Congress abolished this portion of the reservation and opened it to "non-Indian" settlement. Though the area was opened to non-Indian settlement, the understanding was that the Siuslawans had the choice of staying here or moving to the remaining northern portion of the reservation on the coast. The catch, however, was that the Indians had no claim on the land. They could settle on a site but a new, incoming non-native could file claim on that land and boot them off. This was the case until the Indian Allotment or Dawes Act of 1887 permitted Indians to acquire 160 acres or smaller tracts. Figure 8 (Early Land Status) only shows two Indian allotment blocks. By 1912 many of the allotments had already reverted back to government ownership.

Beginning in 1887, land allotments were given to Indians who wanted them. The allotments were given as a measure to keep the Indians from selling their land and ending up with nothing. Titles of the properties were kept in trusts, which they could get only after living on the land for 25 years. Later, some Indian families lost their places because of the inability to pay the taxes due on the land.

Soon after the abolishment of this portion of the reservation in 1876, the Euro-Americans began looking at the North Fork Siuslaw drainage for possible homestead sites. The first white settler known to have located and built a cabin in this area was Sam Lindsley, for which Lindsley Creek is named. Sam's homestead was already established when Amos Haring, Jim, Bill and Joe Morris and Tom Safley came up the beach from Coos Bay in November 1878. They borrowed a boat in Florence and rowed up the North Fork Siuslaw several miles in hopes of finding a place to build a home and raise a family. They wanted land near water that had bench land where cattle could be run in case the lower level land flooded in winter as well as a fishing stream through the property. They each found land meeting this description, and in February of 1879 Mr. Haring moved his family into a small split cedar cabin which became home to the first European family on the North Fork (Farris, 1982). Others soon followed and by 1894, thirty-nine separate ownerships had been established within the watershed (1894 Metsker map, U. of O. Map Library). For a glance at these ownerships refer to Figure 8 (Early Land Status). Today there are approximately 130 families living within the watershed.

Semi-open clearings throughout the watershed were important to the Siuslawans as well as the early settlers in providing abundant big game browse and good hunting and were common into the 1930's. To accomplish a light underburn of brush and shrubs and to diminish the risk of a large wildfire, they would often do their burning in a freezing dry spell in January or February (Ed Reindl, personal communication, 1994). Burning in the fall just before a rain was also common.

**Figure 7.** The Lafayette Akerley split cedar house which was built in about 1890. The lower chimney portion of the fireplace was lined with clay to prevent it from catching on fire.

While excitement and thrill must have accompanied the early settlers, life for most families living within the watershed during these early years must have been difficult. For some, businesses and dairy farming prospered, but for many, self-sustaining farm units could not be developed. They lived in home-made housing and had few material possessions. Many were obliged to go out at some time during the year to earn a grubstake, while others found work and a source of cash nearer home such as peeling chittum (cascara) bark. Often these homesteads were abandoned as soon as the bark was gone (Toepel & Beckham, 1986; Forest Service, 1939). Bartering with neighbors for produce, work, meat and other goods was the normal way of life for most of these folks, while fur trapping was also a major source of subsistence (F.E. Large, personal communication, 1994).

"Why did they come? They wanted homes, and schools, and churches; and enough land to make them a living. They wanted space, and trees, and streams and wildlife about. What matter what they wanted: They wanted most to be free men and women. A chance to work out their lives. To love their neighbors. That's why they came, and they endured much to achieve it" (M. Knowles, 1950).

The later pioneers who lived along the main North Fork Siuslaw valley were not without the latest necessity of life, the telephone. A single wire cooperative farmer telephone line was first available between 1914 and 1918, and while it worked, voice transmission was scratchy at best. A much improved multiple-party, double-wire system came in just after electric power lines were run up the road in the mid-1940's (N. Judd Huntington, personal communication, 1994).

While in 1894 there had been 39 separate ownerships established within the watershed, today there are approximately 124 families living within it. Besides more people, some of the more evident changes in the last 30 years include pavement on the main county roads along the North Fork River and McLeod Creek as well as many private driveways, private telephone lines, TV cable for some and satellite dishes for others, speedy automobile and truck transportation, and concrete and block home foundations, only to name a few. Private land use patterns have also changed over the years. Figure 9 shows the breakdown of various land uses including timber industry, residential, small woodlot and other uses. A major shift from only 30 years ago, when those who owned the land also lived on it, is that many acres are now owned by absentee owners for possible investment.

For a discussion of current population, employment and economic trends of Lane County and the North Fork Siuslaw Watershed refer to Appendix D.

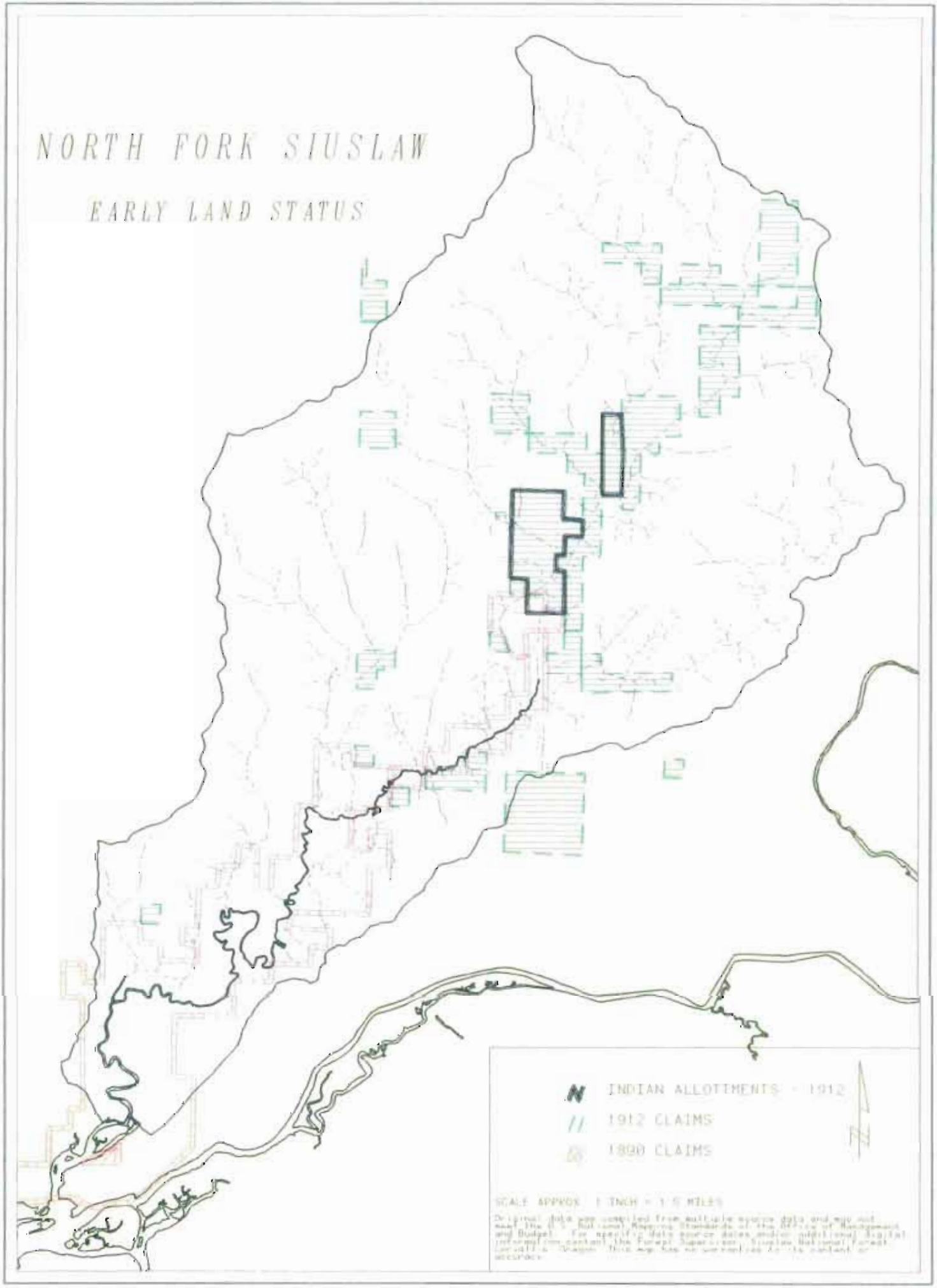

NORTH FORK SIUSLAW
EARLY LAND STATUS
INDIAN ALLOTTMENTS - 1912
1912 CLAIMS
1890 CLAIMS
SCALE APPROX. 1 INCH = 1.5 MILES

FIGURE 8

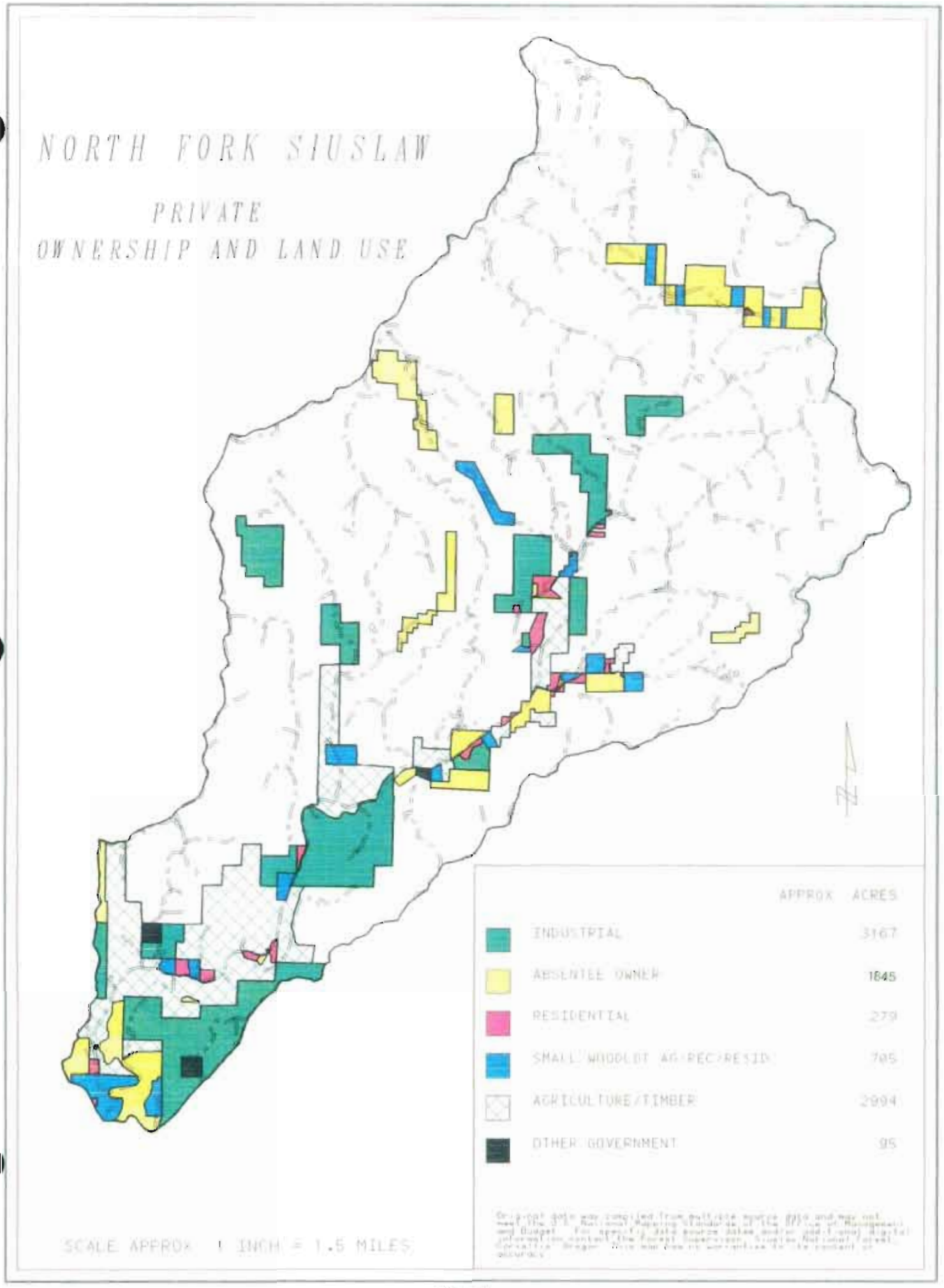

NORTH FORK SIUSLAW
PRIVATE
OWNERSHIP AND LAND USE
APPROX. ACRES
INDUSTRIAL 3167
ABSENTEE OWNER 1845
RESIDENTIAL 279
SMALL WOODLOT AG-REC/RESID 705
AGRICULTURE/TIMBER 2994
OTHER GOVERNMENT 95
SCALE APPROX. 1 INCH = 1.5 MILES

FIGURE 9

**Transportation**

The lower watershed came with its own built-in transportation system, the North Fork River. It was used by the Indians as well as the early settlers. At first, access into the area was extremely difficult. The early settlers would come up the beach from Coos Bay, as did David Morris in 1876; come down the Umpqua River in homemade flat boats and then continue on up the beach from Reedsport, as did James and Lavinia Mitchell and their baby in 1889; arrive by sailing vessel, as did Leonard Christensen in 1886; or walk from Eugene, as did Mr. and Mrs. Jared Scott in 1886. Of great assistance to them, however, were the Siuslawans (The Siuslaw Pioneer, 1950). For example, Indian Lester and Indian Charlie would hire out as native boatmen (A. Knowles, 1950).

The major historical industries within the watershed have been fishing, timber harvest, and dairy farming. The town of Florence was founded in 1876, but shifting sand dunes hindered its development from the start. Three-masted schooners were a common site in early Florence. Huge shipments of lumber and canned salmon were destined for San Francisco and Astoria ports -- and sometimes disaster. While the schooners would come and go over the bar during high tide, the heavily laden out-going vessels would sometimes hang up on the sandbars or have other difficulties. Several of the ships were dashed apart in the waves and lost all of their cargo. Even so, because of the vast fish and timber resources within the area, there was much political interest in Lane County to maximize the navigable use of the Siuslaw River system. Consequently, funds were appropriated and in 1892 construction began on the north jetty by hauling quarried rock up from the main river by barge. The Siuslaw River continued to be an important port, exporting large quantities of lumber and other products. In an effort to improve bar conditions, jetty construction has continued over the years as a sporadic project,with the last project being competed in 1986.

As settlers came in, an extensive trail system was developed along the river, as well as up various drainages and ridges which connected the valley settlers to points including Acme (Cushman), Indian Creek, Mercer Lake, Three Buttes and Saddle Mountain. The Forest Service, which located it s first office in Florence in 1907, recognized roads as the greatest need to facilitate management of the areas' National Forest lands. With a limited budget, Ranger Carl Young hired a trail crew of farmers and Indians, hoping that someday the trails could be widened to roads -- many of which were. With the construction of the locally named "government trail" along the Herman Peak-Saddle Mountain ridgeline, fire lookouts, which were nothing more than a platform in a tree and a lean-to to sleep in, were located on these points. Fire tool caches, called Ranger Stations on early maps, were also located at various points. A real fire lookout was constructed on Herman Peak as well as on other points outside of the watershed in the early 1950's and torn down in the mid-1970's.

In 1908, a road was constructed by hand, oxen and horse power from the Portage (Figure 11) on the North Fork to near Mapleton on the main Siuslaw River where a stage line continued on to the Willamette Valley. In 1918 the road was tied through to Florence. As quoted from The West (the Florence newspaper) on January 25, 1918, "When this road is finished there will be a road the entire distance between Florence and Eugene. It will be a part of the Central Oregon Highway which will be built jointly by the State, County and the Forestry Service." While the road that is now Highway 126 was not constructed for another several years, completion of the railroad provided service from Eugene to Cushman in 1916 and contributed to the growth and commerce of the watershed area. By 1920, the road from the Portage to Cushman and Florence was in pretty good shape during the summer months (Clarence Hubbard, personal communication, 1994). Simultaneously with construction of the mainline county road was the ongoing construction of roads up valley bottoms to farm sites and private timber tracts. The road was graveled in stages, beginning in the late 1920's for the Florence to Portage section and winding up with the Meadows bridge to Wilhelm Creek section in about 1944. Roads above Wilhelm Creek were first "rocked" and later graveled after the early 1960's (N.Judd Huntington and George Esgate, personal communication, 1994).

Covered bridges were once a common sight on the North Fork County road; a total of seven were scattered within the watershed. Two were located at the Portage and one each on Condon Creek, the mouth of McLeod Creek (Meadows bridge), upper McLeod Creek, Smith cut and Wilhelm Creek (Holden, personal communication, 1994).

**Figure 10.** Mr. and Mrs. H.N. Huntington and others posing in front of the original covered bridge on upper McLeod Creek in about 1916.

Due to heavy harvest activity during the 1950's, most of the roads on private land were built during this decade. Major road construction on National Forest lands began about 1958 to facilitate a surge of logging activity beginning in 1960 (Figure 12). Two basic road construction techniques were common: sidecast and full bench. In sidecast construction, the excavated material is pushed over the side, usually uncompacted, and,if oversteepened in relation to the slope,is highly unstable. End-haul or full-bench construction removes the excess material on steep slopes and in critical areas and it is moved to stable sites. Sidecast construction methods were the common practice on both private and National Forest lands during early road construction. Although culverts were installed, most were sized to handle only a 25-year storm event. The sidecast technique is still used as a construction practice today, but to a broader extent on private lands than National Forest lands. Road construction on National Forest lands shifted to full-bench construction in critical areas and on slopes over 50% in the early 1970's. (Refer to the Human History/Timber Harvest and Forest Roads section for further detail.)

On National Forest lands, road construction continued in direct proportion to timber harvest through the 1960's and 1970's, but slowed considerably in the early 1980's. At this point, all of the major ridges and most of the spur ridges were roaded within the watershed. In addition, the Mapleton lawsuit as well as other lawsuits stopped most harvest of timber and subsequent road construction. These harvest reductions over the past several years brought about substantial road maintenance budget cuts which, in turn, brought about the Forest-wide Access and Travel Management (ATM) Plan in 1994. This plan, which is available for reference at the Siuslaw National Forest Supervisor's Office in Corvallis, identifies roads which will be kept open as main travel routes. Within the North Fork Siuslaw watershed, these roads include all county roads and Forest Service road 25, which are subject to the Highway Safety Act. Forest Service roads 5800, 5841, and 668 will be maintained as secondary, high-clearance roads and are not subject to the Highway Safety Act. (Refer to the ATM map, Figure 12.) This selection does not preclude keeping other roads open, but depends on road maintenance funding and district priorities. Because of the declining road maintenance budget, all other roads that are currently open to vehicle

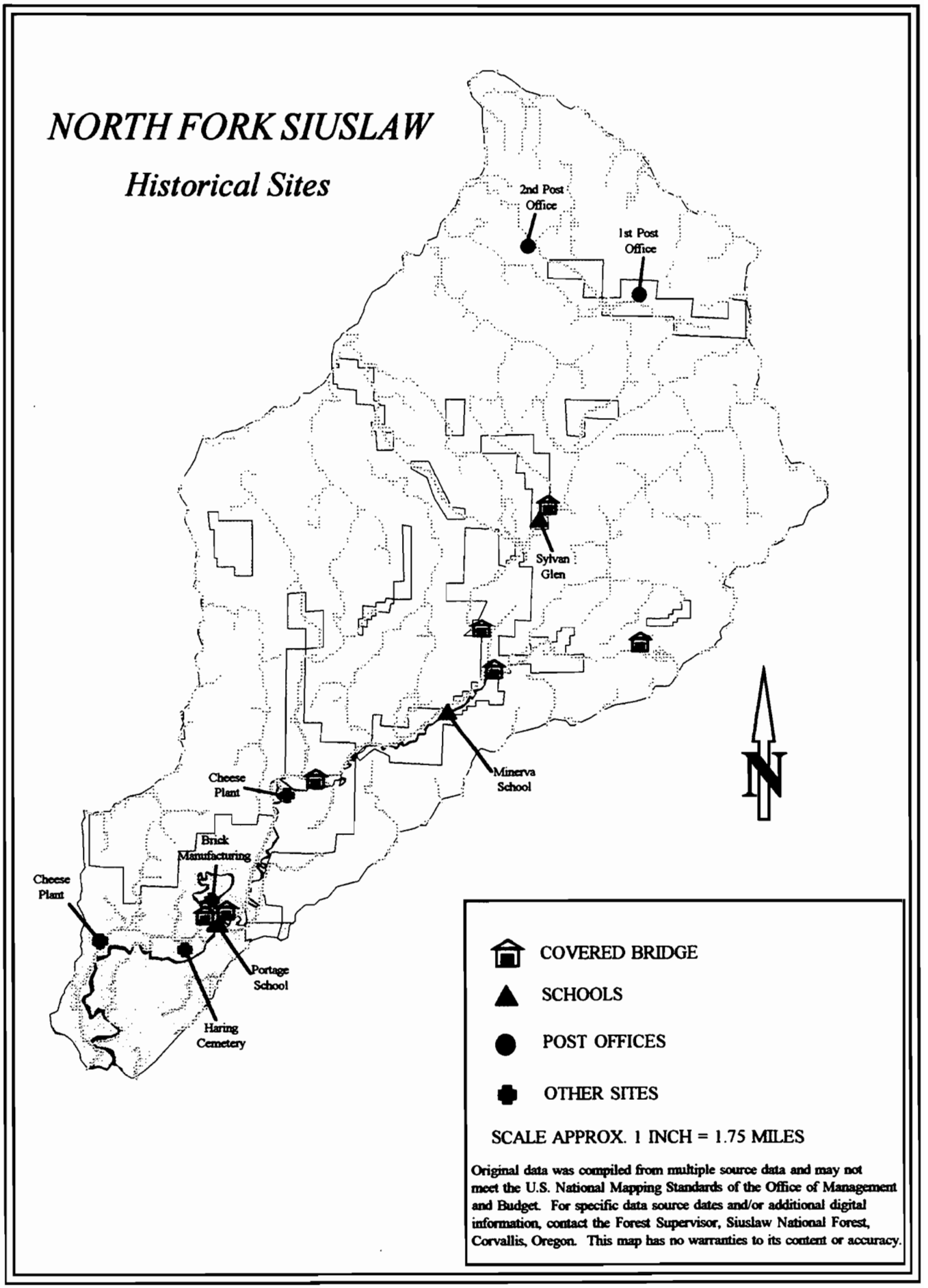
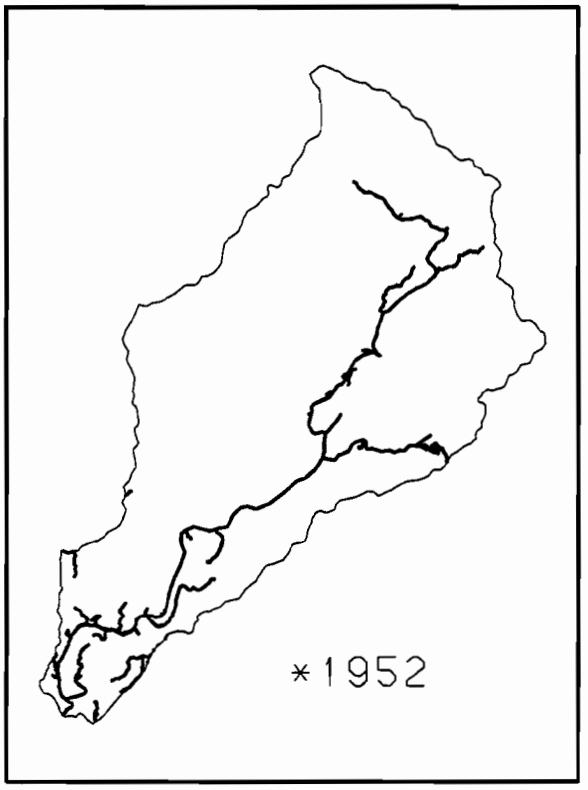

NORTH FORK SIUSLAW
Historical Sites
2nd Post Office
1st Post Office
Sylvan Glen
Minerva School
Cheese Plant
Brick Manufacturing
Cheese Plant
Portage School
Haring Cemetery
N
COVERED BRIDGE
SCHOOLS
POST OFFICES
OTHER SITES
SCALE APPROX. 1 INCH = 1.75 MILES
Original data was compiled from multiple source data and may not meet the U.S. National Mapping Standards of the Office of Management and Budget. For specific data source dates and/or additional digital information, contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon. This map has no warranties to its content or accuracy.

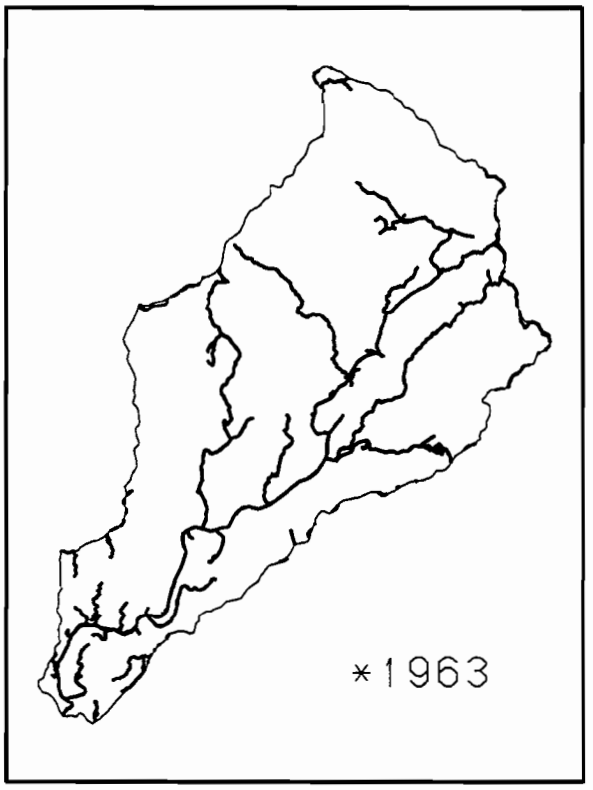
Figure 11

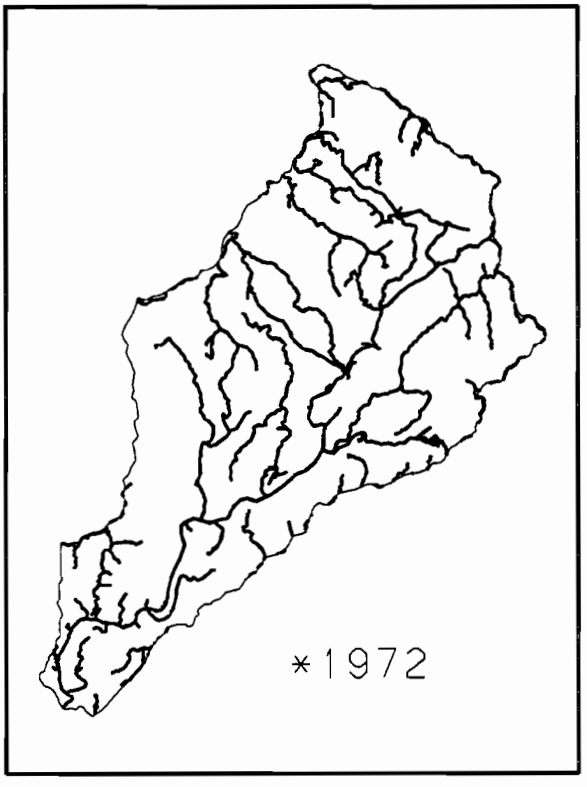
NORTH FORK SIUSLAW WATERSHED

# GROWTH OF ROAD SYSTEM THRU TIME

*DATES REPRESENT SYSTEM ROADS BUILT UP TO THAT TIME



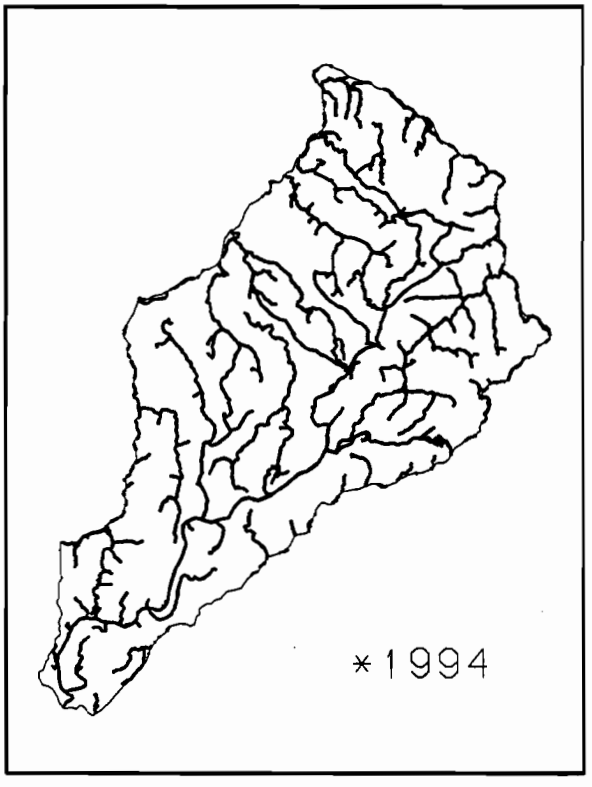




FIGURE 12

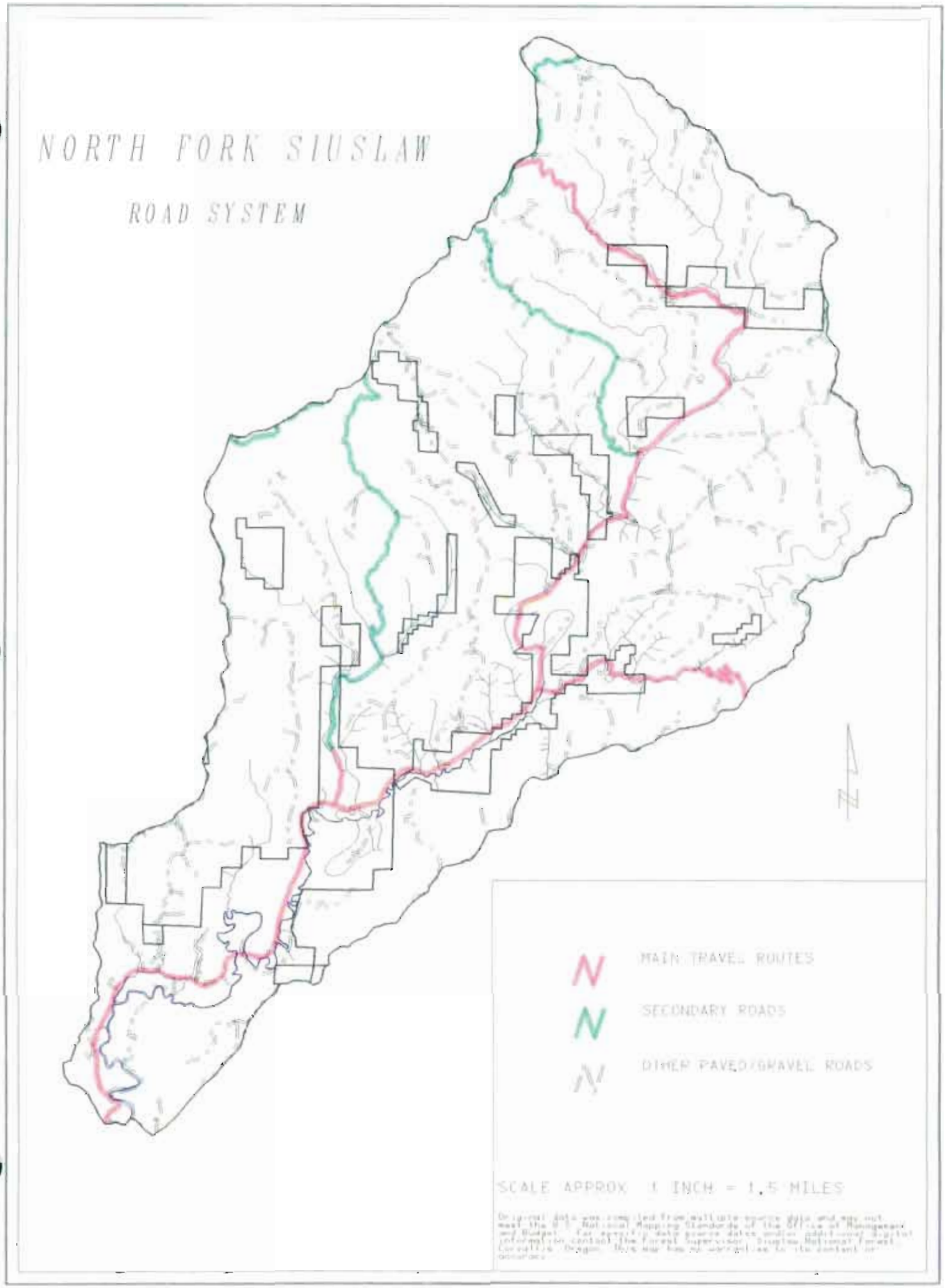

NORTH FORK SIUSLAW
ROAD SYSTEM
MAIN TRAVEL ROUTES
SECONDARY ROADS
OTHER PAVED/GRAVEL ROADS
SCALE APPROX. 1 INCH = 1.5 MILES

FIGURE 1?

travel may not be maintained at a level sufficient to allow access. To minimize surface water collection and prevent surface erosion and road slope failure, waterbars have been installed on these roads (refer to Appendix S).

Because of a significant drop in road maintenance money, the miles of maintained forest roads has recently sharply declined. This trend is expected to continue into the foreseeable future. These unmaintained roads will gradually grow shut with brush and other vegetation.

**Figure 14.** A track mounted excavator retrieves unstable material slopes from early sidecast road construction in the mid 1980's.

**Schools, Post Offices and Cemeteries**

School for the Indian children consisted of memorization of stories around the fire (M. Knowles, 1965), and life sufficiency skills, including basket and clothing making, construction of bows, arrows, canoes and houses, were hands-on instruction. As the settlers came,so did the need for formal schooling. The Portage, Minerva and Pawn (later to be called Sylvan Glen) schools were established for grades 1 through 8. Most older youth boarded in Florence to attend high school. After a road was constructed the full distance to Florence, these upriver schools were closed and all of the students attended the schools there.

Post offices were established in private homes: e.g., the Akerley home (later Minerva) and the Poole home (later Pawn). In the mid-1920's, the Pooles moved from their home just above the mouth of Elma Creek and the Pawn post office was relocated in the Woosley home near the mouth of Sam Creek. Mail was picked up weekly by horse and sometimes wagon and transferred to a boat at the Portage. The Pawn and Minerva post offices were closed about 1936 and 1940,respectively (George Esgate and Wally Holden, personal communication, 1994).

Cemeteries were developed. The Frank Drew Memorial Cemetery was used exclusively for burial for those of Indian ancestry since about 1897, and the Haring Cemetery was developed by the Harings soon after the turn of the century. The Masonic Cemetery, located at the mouth of the North Fork River, was established in 1893 and renamed Pacific Sunset Memorial Park in 1976. This cemetery continues to serve the greater Florence area. Groupings of Indian graves and some individual settlers' graves are also located within the watershed (Martin Peterson, personal communication, 1992; Don Wherat and Ella Vanderburg, personal communication, 1994.)

**Small Independent Industries**

The first independent industry known to have existed within the watershed was Sam Lindsley's cheese and butter processing plant. Warren Vanderburg remembers playing in the barn and looking at the equipment, including large copper vats, in about 1910. Sam made several varieties including a "full cream cheese" that had such a soft consistency it could be spread with a butterknife. These products were used locally and also shipped by coastal steamer to San Francisco, California (Warren Vanderburg, personal communication, 1994).

August Funke bought the ranch at the Portage in 1900. Along the river bank of his place he found a thick gray clay. As there was a need for brick during this settlement period, he built a kiln and went to work making brick. Many early homes on the North Fork and Florence area used these bricks for foundation and chimney construction. This brick plant (Figure 11) was in active use from approximately 1900 to 1910 (Edna Steers, personal communication, 1994).

A cheddar cheese factory developed and operated by J.L. Houghton was also an active private industry from the 1920's through the early 1930's. Cheese bricks ranging from 5 to 25 pounds were made and shipped out. This cheese was made primarily from the milk of his own dairy and the whey was fed to the hogs (Norman Dick, Sr., The Siuslaw Pioneer 1982, page 17).

Since the turn of the century, the watershed has had a rich history in wood products milling. While a scattering of small mills and a few larger ones were involved, primary products included lumber, cedar shakes and shingles, railroad ties, electrical power pole cross arms, and cants for resawing elsewhere.

A thriving family owned and operated cabinet factory has been operating in the watershed for the last 20 years. Products are used locally, as well as being shipped to California and other locations. This is the only small business currently operating within the watershed. Largely due to Lane County zoning and limited sites, small businesses are expected to make up only a tiny portion of the local economy.

**Fishing**

Fishing was a way of life for the early Siuslawans who constructed fish weirs (traps) in the lower river and netted and speared salmon as they migrated inland to spawn in the fall. While fish were eaten fresh, most were salted, smoked or dried for the winter.

Later, for the Indians and the new settlers alike, fishing not only provided food, but of greater consequence, it provided money. "The fishing on the main river is done for the most part by the Americans and Norwegians, on the North Fork mostly by Indians" (Fish Commission, 1897). For nearly every resident, great quantities could be caught by using gill nets, even at a time when "seals are regarded by the fisherman to be by far the worst enemy of the salmon (Fish Commission, 1897)." In 1876 the first salmon cannery was established, and by 1883 three canneries were in operation in Florence.

Documented in 1897, "The North Fork, though not a large stream, has from tide water to a distance of about 8 miles above a number of excellent spawning beds, and all showed much evidence of having been used this year." While records are not available for the early years, within the North Fork itself approximately 25,928 chinook and 80,551 silvers (coho) were processed in the eight years between 1889 and 1986. In 1889 alone, 4,667 chinook and 19,171 silvers were processed. While there were general ups and downs between these years, a dramatic decline followed and in 1896 2,450 chinook and 5,425 silvers were processed-- a 48% drop in chinook and a 72% drop in silvers between seven years (Fish Commission, 1897). 1896

Fisherman and government agencies recognized the declining salmon population, so at some point prior to 1897 the commonly called "Saturday night law" was enacted making it unlawful to commercially fish Saturday nights. In 1897 the Siuslaw hatchery was constructed near Mapleton. During the period of heavy commercial fishing, there were others who fished for sport and personal household subsistence. As "set nets" (which were gill nets tied off at both ends on each side of the river) were the common net used during this period, few fish could maneuver upstream past them. This law was established in an effort to satisfy the interests of both the commercial and the sport fisherman. Under it, the commercial fisherman could fish all week except for Saturday night, which was reserved for sport or personal-use fishing. But, as reported in an 1879 Fish Commission report, "During the past year very little attention was given to the Saturday night law." While fishermen seemed to agree that all would benefit by respecting this law, a few persisted in setting their commercial nets. In order that these few men had no advantage over the others, the others, too, put out their nets on Saturday nights (Fish Commission, 1897; Ed Reindl, personal communication, 1994). On the mainstem Siuslaw, use of set nets was made illegal in the late 1940's, while drift nets were in use until the late 1950's. It's unclear just when netting of salmon on the North Fork was made illegal and how significant the Saturday night law was for the North Fork. Long-time area resident Trig Nordahl (personal communication, 1994) said that at the time he first started netting with his father in 1926, the North Fork was already closed. This is not to say that some netting did not go on afterwards-- because it did, at least sporadically for many years.

Although fishing has been popular on the North Fork Siuslaw for centuries, it has primarily been limited to personal-use and recreational fishing. It was fished mostly by locals up until about 20 years ago. People from the Willamette Valley began to fish the river when drift boat fishing became popular and when two public boat ramps were constructed. In addition to resident cutthroat trout, fishing begins in the river when the sea-run cutthroat (blueback) begin their run in the late summer and continues with chinook, coho and finally steelhead in the winter.

While the watershed does contribute to the ocean fishery, no commercial fishing is done within the watershed and none is expected. Good runs of chinook currently exist in the river, while numbers of coho, steelhead and sea-run cutthroat trout have sharply declined. Sport fishing is expected to continue to be popular. The level of fishing effort will likely be proportional to size of the sportfish populations.

**Timber Harvest and Forest Roads**

When reviewing historic records, the most often recurring statement is on the subject of previous fire history in the area and the expanse of dead timber as viewed by the earliest European trappers, surveyors and settlers. Repeatedly mentioned are statements like "timber deadened by fire, much decayed" (Wright, 1883), "there is nothing but old burned stubs on the claim" or "...silvered snag remnants of a once magnificent forest", or "...a crisscross of jumbled fallen snags" (Pagter, 1914). Pagter continued, "This area was thoroughly burned over and countless snags and down logs are found as testimonials of the havoc wrought by the fires of the past" (Siuslaw National Forest, 1919, pages 80-81). Early historian Frachtenberg, who conversed with the local Indians as documented in 1914 relates, "I was told by the Indians of that region that some eighty years ago a big fire almost destroyed the whole county. Even to this day thousands upon thousands of acres of burnt timber bear mute testimony..." (Toepel & Beckham, 1986).

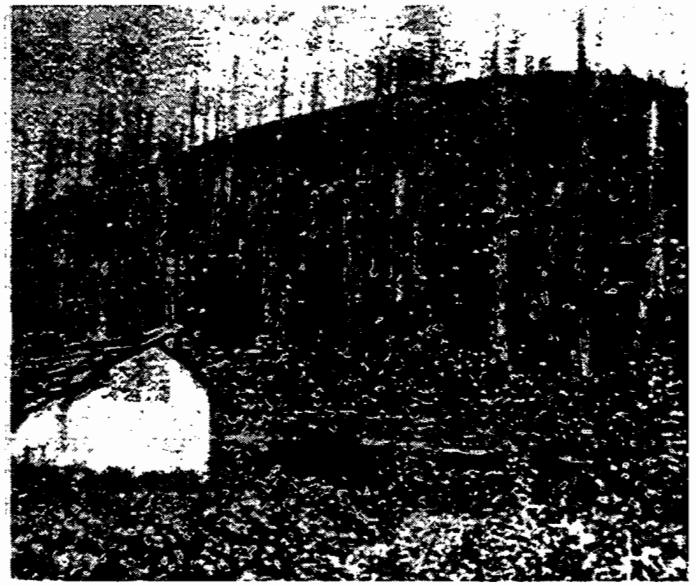


**Figure 15.** Looking westerly from Herman Peak a sea of snags remain after early fires. "You could ride a horse up Clover Ridge from Cape mountain, past Herman Peak, the Three Buttes, Saddle Mountain then on towards Fairview and come out at Yachats during that time

However, "Of the many places where mills were constructed on the central Oregon coast prior to 1900, the two most important locations were the lower Umpqua and Siuslaw Rivers (Beckham, Toepel & Minor, 1982)." By 1893, four or five large sawmills near the mouth of the river had been established. In 1900 the mills had a combined capacity of 200,000 board feet per day (Farnell, 1979). While lumber was used for local building construction, most was shipped by schooner over the bar and down the coast to San Francisco or to Astoria. At these ports, the cargo was often reloaded onto larger ships enroute to further destinations.

Earliest logging was done with jack-screws, horses, oxen and mules. As shown by rotten old-growth stumps and scattered logs along the upper river as far up as Elma Creek (about 1 1/2 miles above the Pawn Trail), old growth was probably harvested with these means and the logs floated down the river to the mills sometime around 1910 to 1920 (George Esgate, personal communication, 1994).

For the larger operator, these methods soon became dated. William Kyle, a sawmill owner in Florence in its early years, had this to say in a letter written in the 1890's: "This idea of hauling logs into the river with bull teams is out of date, and is to costly, the proper way is with a logging engine and wire rope, when the machine

don't work it don't cost any thing to keep it and you don't have to feed it when it is not earning anything..." (Farnell, 1979).

Concerning the F.W. Musgrave homestead settlement located between the North Fork Campground and the Pawn Trail, Assistant Forest Ranger G.E. Simmons in 1913 reported, "The method of logging now in use by logging companies of this region is to follow up some driveable stream and log only the readily accessible timber that can be reached by extending yarding lines out from a donkey engine placed along stream" (Simmons, 1913). Steam engines were popular until the mid- and latter 1930's when gasoline engines were fitted to the donkeys.

As ridge top cable log suspension systems (skyline) were another 60 years into the future, steam donkeys would usually be set up in canyon bottoms. The large cable lines were then strung uphill and the logs yarded down the slopes to form cold decks (piles of logs) in the canyon bottoms. While this was most often done during the dryer months, they would move the yarder down to the mouth of the tributary and pull the up-canyon cold decks into the river during winter high-flow periods. Dragging the logs displaced soil and vegetation,and although probably a bit of exaggeration, long-time resident Wally Holden once commented that after the crews spent the summer logging and the first fall freshet hit, the river would be so thick with mud it would hardly flow.

Most harvest during these early years was on private land. However, as noted in a Forest Service 1939 publication, during the period between 1919-1925, the Delta Shingle Company at the mouth of the North Fork of the Siuslaw was an extensive operation in government timber, selling fir logs on the open market and sawing shingles. While there was some harvest of government timber during these years, the statement of "extensive operations" may be an overstatement, at least by today's standards. Mapleton Ranger District records show that only 38,263 board feet of timber was harvested from National Forest lands within the entire Mapleton district during these years.

Railroad logging was not common in the North Fork watershed but its use is reported in the Morris, Slover and Harring creek drainages from about 1918 through the early 1920's (Wally Holden and Ella Vanderburg, personal communications, 1994). When this practice was used, a steam donkey would have often gone ahead of the railroad construction operation and cold decked logs in the narrow valley bottoms. They were later loaded and hauled out on the railroad and dumped into the river to be floated to the mills.

The river was the exclusive mode of log transportation until a network of roads came on the scene. The further up the river one tried to float logs, the more difficult the job became because of the river's smaller size and numerous sharp bends. To give logs an extra boost, at least one splash dam was used in the early 1920's at the mouth of Wilhelm Creek. Again, the logs were yarded to form cold decks and these decks were then yarded into the river behind the dam. During a freshet of high water, the steam donkey would pull the dam apart, causing a surge of water to carry the logs down the river (N. Judd Huntington and Wally Holden, personal communication, 1994).

Through the 1930's to the early 1950's, while donkeys continued to drag and cold deck logs in the canyons, crawler tractors became the common method of transporting logs from the cold decks to the river and also to roads as they were developed. Tractors operated both on the stream banks and directly in the streams. While records don't exist that show just in which streams this method was used, it was a fairly common practice and took place in both Condon and Billy Creeks in the 1950's. The river was used to some extent for log transport through about 1955 (Reindl and Wally Holden, personal communication, 1994).

**Figure 16.** An old-time crawler tractor and arch brings in another log for truck haul to the mill in 1940's.

Running donkeys up canyon bottoms, raising a wood spar and downhill highlead logging was the norm on private land and was also used on the limited timber harvest of National Forest lands until about 1950. Brought about

initially because logs continually hung up on stumps as they were skidded downhill, uphill logging was initiated. While it took a decade or more to make this transition, sidecast roads were constructed which wound their way along sideslopes up to the ridgetops. During this period, harvest on National Forest lands focused on providing small sales to area locals. Harvest mostly consisted of cedar, scattered old growth fir, and salvage of dead second growth. The 1950's were also a time when buildings were torn down and trees were planted in the meadows at old homestead areas that had reverted to government ownership.

Like other industries, loggers were always developing new and more efficient ways to harvest timber. In 1960 the first steel spar was moved into the valley (Wally Holden, personal communication, 1994). This was also a time when timber harvest suddenly increased on National Forest lands. In the ten years prior to 1960, harvest in the North Fork watershed averaged 30 acres per year, while the following ten years averaged 423 acres per year. With the 1960's came a more focused emphasis on muliple-use management of the Forest resources as a commodity for the public, and also the beginning of the patch-cut land pattern we see today. Many independent loggers with small mobile equipment moved from logging on private land to the National Forest. Clearcut sales, salvage sales, cedar sales, intermediate harvest sales were items in demand from the watershed. On National Forest lands, this period was the beginning of a ridgetop road system, large clearcuts, hot burns and aggressive reforestation programs. It was also a time of numerous landslides, which originated from both the over-loading of steep slopes and headwall areas with sidecast road construction material, and from within clearcut units. These slides generated large quantities of soil, gravel, logs and logging slash which jammed up in various locations, including some anadromous streams. Recognized at the time as substantial barriers for spawning salmon, a program of pulling these apart was initiated.

The mid- and latter 1970's brought dramatic changes and skyrocketing bid prices to this industry. Spurred on by concern for degradation of fish habitat, endhauling excess material on critical slopes, compacting fills, appropriate sizing of drainage culverts, skyline logging systems and retention of conifer streamside buffers and headwall leave areas were initiated. Large crawler tractors pushing soil and rock, and loading a dynamite charge large enough to blow the material down the canyon and out of the way, changed to careful excavation with tractors and scrapers. These machines would haul the material to designated waste areas and would be compacted and seeded with grass. While uphill highlead systems were still permitted on non-critical slopes, new skyline yarder systems suspended logs over sensitive areas and streams. Previous equipment changes in the logging industry were mostly modifications of equipment they already had at comparatively modest investments, but these new yarders were big, heavy, high tech, and very expensive -- $1,000,000 or more back then! This was also a period when concern for a lack of dissolved oxygen within the streams and the number of debris torrents within harvest units, demanded the removal of all woody debris from stream channels within the units.

**Figure 17.** A large Skagit yarder with a 110 foot tower and motorized radio controlled carriage.

The high bid prices of the latter 1970's was a near catastrophe for most companies buying Forest Service timber when lumber prices dropped in the early 1980's. When the companies could not afford to harvest the sales purchased earlier by the contract expiration dates, the government provided opportunities for five year contact extensions and then later bought many of them back in exchange for designated penalties. To further stress an already highly stressed industry and workforce, the Mapleton lawsuit in 1984 curtailed new sales except for limited thinning and salvage. To somewhat soften the economic impact on local loggers and communities, special legislation within the mid-and latter 1980's permitted the Mapleton District to sell some sales and re-offer others. These efforts fueled environmental controversy and resulted in a series of legislative appeals and later, industry and environmental gridlock.

On National Forest lands during the late 1970's and through the 1980's, concerns of soil compaction, the depletion of soil nutrients through hot burns, and wildlife and fish habitats and needs surfaced. Highlead and tractor logging was nearly curtailed as were hot burns. Large slackline yarding systems occasionally spanning distances exceeding one mile to obtain adequate log suspension, and motorized carriages to better protect stream buffers and adjacent managed stands were almost exclusively used. The big crawler tractors and scrapers of the 1970's went to large hydraulic operated excavators and dump trucks for greater excavation control.

Timber sales during the 1980's included fewer large old-growth trees. As the big slower yarders wore out, they were replaced with faster, slightly smaller ones with a focus on second growth timber harvest-- trees that were mere seedings and small poles when the first settlers came to the area. As wildlife needs were recognized, the large 80 to 120-acre clearcuts were reduced to less than 60 acres and later to less than 40 acres. Woody debris and standing snags and trees were retained. Habitat reserves were created for various species including the pine marten, pileated woodpecker, northern spotted owl and marbled murrelet. Also, existing logs and limited logging slash were to be left in streams to create and maintain fish spawning and rearing habitat. This reversed the 1970's decision to remove all woody material from stream courses.

Within the 1980's an aggressive program began to thin the managed stands for commercial value within National Forest lands. This led to highly mobile and still smaller yarders and almost exclusive use of highly engineered multi-span logging systems (the skyline is supported at various points along the slope to insure proper log suspension).

Helicopter logging has occurred in the area since the early 1970's. Because of the expense involved in this type of logging, it was primarily limited to areas where roads could not be built. With the increase in stumpage prices over the last decade, logging with helicopters has been increasingly popular, especially on private lands. Because of the reduced road system and precise harvest prescriptions, an increase in helicopter logging is also expected on National Forest lands.

**Figure 18.** The Cataract Thinning operation in 1992. Approximately 10,000 board feet per acre were removed from this site.

With a reduction of harvest on National Forest lands and recent high stumpage prices, harvest on private lands within the watershed has dramatically increased within this decade. Most of this harvest is relogging areas that were logged earlier in the century.

Within the foreseeable future, only limited harvesting of mature timber within Matrix lands can be expected. Substantial commercial thinning of stands 25 to 30 years old may be expected. Within the watershed, there are 2,573 acres of stands currently in this age class. In addition, another 3,605 acres will reach this age class in the decade beginning the year 2001.

## Agriculture

Of the three major industries within the watershed, agriculture was the backbone of the economy and what families were historically raised on. From the turn of the century until the mid 1950's, nearly everyone milked at least a small herd of cows, cut and put up hay and planted a garden. Dairymen with smaller herds still had to work away from the homestead/farm to make ends meet.

While the early settlers found the North Fork to have substantial bottom land, they also found much of it to be choked full of brush, down logs and scattered trees. Norman Dick Sr. documented some of the work he did in clearing land about 1923 near the mouth of Condon Creek: H.N. Huntington "had about 5 acres of land he wanted slashed so he could burn it the following summer. He offered $25 per acre to get it cut. We accepted the job, sharpened up our axes, and built ourselves a log cabin to live in and went to work. It had the usual maple, elder, and occasional second growth fir, but about two-thirds was salmonberry and crab apple with vine maple running through it. When you cut a crab apple tree down, it was taller than it was on the stump. So we had to get in there and cut it into smaller pieces before it would lay down tight enough to burn. It is a beautiful field now and no one would have any idea of the blood and sweat expended there" (Norman Dick Sr., The Siuslaw Pioneer 1982; page 19). Bill Meadows who moved to the upper North Fork when he was a boy about 1912 and said the bottom land was basically brush, and all had to be cleared by hand and with the help of a team.

In addition to the brush and trees, the lower several miles of the now cleared agriculture land was tidal marsh. These marshes were of little value in the eyes of the early settlers, so the river was diked using a steam dredge on a wood plank barge between 1910 and 1915. Mud from the bottom of the river was dredged out and placed along the rivers' edges to contain the water within it's banks during high tide and/or high flows. Tide boxes were also installed at the mouths of streams and other areas to restrict the inflow of water. These water control structures are still vital the to agricultural use of these lands today.

In addition to the main river bottom land, dairymen also settled the many adjacent valleys. In addition to the brush which would be cleared, they also found streams meandering back and forth across the valleys. Beginning about 1950, the Soil Conservation Service (SCS) developed a cost-share program that assisted the farmer with ditching and leveling his land. The SCS was very helpful to the farmers and provided an SCS engineer to assist in staking the best ditch locations and low spots in the pasture. An SCS Siuslaw District was formed which bought a Navy surplus dragline, and from about 1950 to 1960, skilled operator Gordon Andreson had mud, logs, stumps and sometimes even a fish flying; if not from the big bucket of the dragline it was from charges of dynamite.

To make more efficient use of the land, ditches were dug usually along the toes of the slopes on each side of the valley. Located here, the ditches would catch draining tributaries and springs and create large contiguous pastures rather than having several small ones separated by the meandering creek. After dredging, sticks were removed and the spoils then dozed into low spots of the pasture and diverted meandering streambeds. While the North Fork River also meanders considerably, no records or personal interviews indicate that it was ever straightened or channelized except for diking.

The primary early dairy products were cream, butter and veal. Some dairymen made and sold butter to the local stores and shipped out larger quantities by ship. For others, the cream was stored in 5 and 10 gallon cream cans which were kept cool in creek water until market time. Milk that was not consumed by the family was fed to the hogs. Once a week, a journey with the old wagon and team was made down to the Portage where a boat hauled it along with any fresh veal to Cushman where it was transported to Eugene and Portland by train. The veal was butchered, cooled and shipped with the hides on while hogs were usually shipped on the hoof (N. Judd Huntington, personal communication, 1994). By 1920, the road from the Portage on to Cushman and Florence was in pretty good shape during the summer months. As the roads permitted, transportation of dairy products by old pickups and automobiles converted to pickups were used.

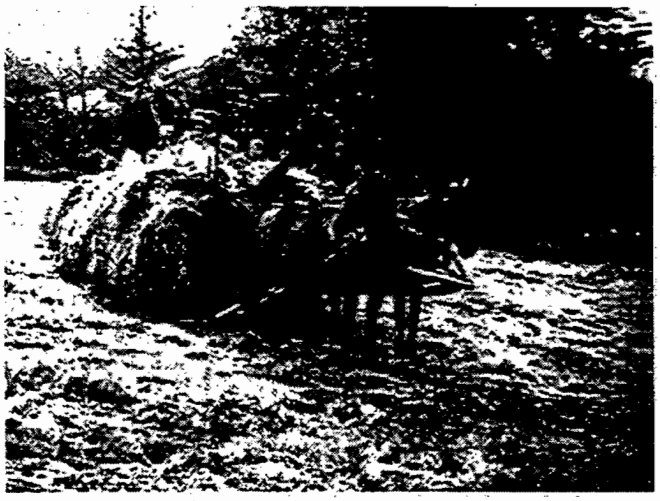


**Figure 19.** Behind the team, the Haring family rides a load of loose hay from the field in the 1940's.

Milk was also added to the transportation route when a cheese factory was built in Cushman. It was in sporadic operation from the mid 1930's to about 1950. By 1950, trucks from the creameries in Eugene and Reedsport were making daily trips, picking up whole milk and delivering butter and cheese. While in later years some dairies converted to Holstein cattle, Jersey and Guernsey breeds were most widely used because of their higher butter-fat production.

Cows were all milked by hand until about 1920 when gasoline powered vacuum pumps became available. When electric power came in four or five years later, these systems were converted to electricity. For several years after, they had the gas engine close at hand as the power would go out during almost any wind storm -- and sometimes in between! During the 1940's and 1950's there were at least 20 dairies which milked more than 12 cows and of these, 5 were much larger Grade A operations. In addition, there were several of smaller operations milking 3-6 cows and others milking a single cow for home use only. Because of tighter Grade A regulations, general dairy farming expenses and competition from large Willamette Valley dairies with local grain and supplies, by 1960 only the larger or more die-hard dairymen were still in operation (Willard Bordon, personal communication, 1994). In 1983, the last and largest dairy herd of 120 milking cows was sold. While most farmers transitioned into raising beef cattle, maintenance of the once lush pastures has been neglected and many acres of once cleared bottom land has grown to rank sedge, blackberries and brush as may be seen on the lower North Fork valley today.

During the early years, barns were large and tall. Loose hay was stacked overhead while the cows were milked below. With the advent of the hay bailer which came into use about 1950, this type of barn was no longer needed. As these big barns deteriorated, they were replaced with the more modern lower and usually longer ones.

Sowing and harvest of Astoria bentgrass seed was also a significant industry on the lower river for many years. Large old rusty thrashing machines overgrown by blackberries are the only remnant of this early industry.

While no commercial dairy farming is expected on private lands within the watershed, a constant level of raising beef cattle will likely continue.

### Miscellaneous Forest Products

The North Fork watershed is a rich source for miscellaneous forest products. As noted earlier in the Human History, Euro-American Settlement section , peeling and selling cascara bark was a principle income for many early settlers. Forest Supervisor Cohoon observed in 1912: "Were it not for the large amount of chittum bark in these mountains, it would have been almost impossible for these settlers to have made a living" (Forest Service, 1939). Good money was paid for the bark up until the 1920's when the price began to taper off. Harvest of cascara on National Forest lands declined sharply in the late 1930's when lower prices coupled with charge permits on these lands was initiated. Harvest has continued at a modest rate through the 1970's and has continued at a decreasing rate since. It is almost non-existent in National Forest lands today. Although not so common in the last 25 years, cascara was also a source of income for kids growing up in the area. They would peel it, dry it on a roof top, chop or break it into small pieces to make it more compact, then take it to town and sell it by the pound. The bark was then refined into a form of laxative. Fox-glove, a natural source of digitalis, was also a health-driven product picked from the forest in early years.

Good straight-grained western redcedar snags and downed logs have long been a forest item in high demand for shake bolts, posts and rails. The easy splitting and rot resistant properties of the wood has made it one of the most highly demanded products of the forest. Over the past several decades while cedar has been harvested, Douglas-fir has been the primary regeneration species on both National Forest and private lands resulting in less available cedar for future markets.

Picking "brush," moss as well as fern for floral greenery has been both a primary and secondary source of income for many families within the watershed. Historically, evergreen huckleberry was the principal species picked. When plastic greenery became popular in the florist industry in the mid-1960's, salal became and is to date in most demand. Only limited amounts of Oregon grape have ever been picked in this area. While sword fern has had its ups and downs in the greenery market, it is still picked and in moderate demand. Moss is also used in floral decoration, hanging baskets etc. Although moss has been a marketable product since the 1940's, it has been in higher demand since the early 1970's. A long-time North Fork resident tells the story about coming home from a day of picking moss in the 1940's. He was stopped by the local game warden for what he hoped was nothing more than a casual chit-chat. Because it was during the depression, the now very nervous moss picker had shot a deer out of season and covered it with the moss he had picked. After glancing in the back of the old truck in the course of ending the conversation, the warden told him he had better "get on home before that moss bleeds to death.". The deer had not gone undetected by the keen eyes of the warden. Collection of big leaf maple and Douglas-fir burls for clocks, and table tops has also been popular for commercial resale and for personal use.

Harvesting of western redcedar and Douglas-fir boughs is not a big item but some harvesting is done each year for seasonal Christmas decoration. Both species have fundamental drawbacks in this area. The cedar seems to have a form of rust on the boughs making it less marketable. Also, to market Douglas-fir, these boughs must be harvested just after a hard frost, which is only a sporadic event in this area, to set the needles which keeps them on longer.

Cutting firewood within the watershed is probably as old as the earliest habitation. Since electricity didn't arrive on the North Fork until about 1945 the only source for home heat was wood. Even then electrical wiring was substandard at best and would not generally handle electrical heating current demands. Cutting firewood was often a "family affair." While they would sometimes all help cut, split and stack, other times dad and the boys cut wood while mom and the girls picked berries for a pie. There has been a gradual transition from wood heat but it is still used in many homes as the primary heat source.

Only incidental picking of mushrooms is known to have existed within the watershed until the last 25 years or so. While several edible species are found within the forest, the chanterelle is the most common and is picked for personal and commercial purposes.

Transplanting native trees and shrubs for commercial nursery stock is also common in the area. In addition to tree seedlings, shrub species include vine maple, willow, evergreen huckleberry, salmonberry and thimbleberry.

The following shows the anticipated trends of miscellaneous forest products. For those products whose demand is greater than the supply, the reduction may largely reflect difficulty in road access. In the case of moss and firewood, the reduction is coupled with restrictions concerning biological needs.

Cascara Bark Collection: Early in the century, cascara was abundant within the watershed. Its natural habitats are sunlit semi-open and upslope clearings. These were common after the large early forest fires, and as Indians and early settlers patch burned various slopes. With the vigorous Douglas-fir regeneration program that began in the 1950's, these stands soon shaded the cascara to the point that less amounts remain on National Forest lands. While demand doesn't seem to be high, supply is expected to be less.

Harvest of Cedar Posts, Rails and Shake Bolts: These products have long been in high demand and are more commonly found in the Morris, Billy and Condon creeks lower slopes and riparian areas. Because of the short supply remaining within the watershed, and because of its natural location within sensitive lower slopes and riparian areas, little if any harvest of the product can be expected in the foreseeable future.

Picking Floral Greenery: The amounts of quality greenery are expected to remain fairly static. While there will be an abundance of floral greenery within the forest as a whole, this supply will be offset because the reduction of maintained roads within the forest will make access difficult. A very high demand is expected for those more easily accessible areas.

Harvest of Moss: Harvest of moss may likely decrease as forest roads close in and environmental concerns for moss retention increase.

Harvest of Burls: Harvest of bigleaf maple and Douglas-fir burls has been discontinued in recent years because of difficulty in administration and scarcity of the product. Often the high valued burls are found in the lower bowl of the tree. Occasionally, in the process of cutting high value fiddle back and birds eye burls, the entire tree is cut down or left in such a weak condition that it is unsafe to leave standing. Primarily because of permit abuse by some, no harvest of burls is anticipated.

Harvest of Western Redcedar and Douglas-Fir Boughs: There is little demand for Douglas-fir and western red cedar boughs in this area because of inherent diseases and climatic conditions.

Harvest of Firewood: Many families within the watershed use wood as their primary heat source while many in the greater Florence area rely on wood from National Forest lands for a secondary home heating source. Because of the dramatic reduction of harvest on National Forest lands and the high value now placed on snags and downed logs related to their benefits for various wildlife habitats, only limited harvest quantities can be expected. Alder from along maintained roads may be the greatest source.

Harvest of Mushrooms: The demand for edible mushrooms, especially chanterelles, has grown considerably within the watershed in recent years. Most species thrive under dense forest canopies such as in old-growth forests that have several canopy layers and also in managed stands that may be high candidates for commercial thinning. Mushroom populations are expected to increase, especially within Late Successional Habitat and unthinned areas while only limited quantities will be found in areas of timber harvest. Difficult road access will limit mushroom harvest accessibility.

Transplant of Trees and Shrubs: The demand for this type of forest product is expected to increase proportionally with the demand for urban dwellings with rural landscaping. The supply is expected to decrease as existing clearcuts and roads grow up.

Future Trends for Christmas Tree Cutting: Christmas tree cutting from National Forest lands for the annual family Christmas tree has been a form of family activity over the past several decades. Within the past five years, the number of Christmas tree permits issued on the Mapleton District has been about half of previous years. This is probably due to an increase in permit cost, the average family finding less time to search for a tree in the woods, and because prices of commercially grown trees on private lands are lower. Cutting of these trees from National Forest lands are expected to continue to decline as the many clearcut areas grow up and much of the road system grows shut.

**Rock Quarries**

Six rock quarries are known to have been within the watershed. One was located about 1 mile west of the mouth of Russell Creek, one just above the last bridge on McLeod Creek (a hard sandstone type rock), two near the Pawn Trail, two at Three Buttes and one on Saddle Mountain. The quarries near Russell Creek and one of the two on Three Buttes are on private land. Only the Forest Service quarries at Three Buttes and Saddle Mountain remain in use today.

A supply of rock remains on both Three Buttes and Saddle Mountain. Only limited demand is expected because of decreased harvest and road construction on National Forest lands and because of environmentally related

operating season restrictions for private uses. Most rock for private road construction is currently being quarried from sites near Mapleton and Swisshome.

## Recreation

Early recreation by settlers within the watershed focused mostly at meetings and parties at various homes, dances at the grange hall, "turkey shoots" (where folks would gather to shoot at targets made from anything from paper to pumpkins and receive prizes of whatever the people could bring), small family and large community picnics, hiking, and camping. Essential activities for survival of historic and prehistoric cultures were fishing, hunting, berry picking and firewood cutting. Over the last several decades, these activities have gradually transitioned to become more recreational for forest users today. Other types of current forest recreation includes camping, big game viewing, hiking, mountain biking and probably of greatest demand, general sightseeing. During these years a transition from only locals to more non-local users has also increased substantially.

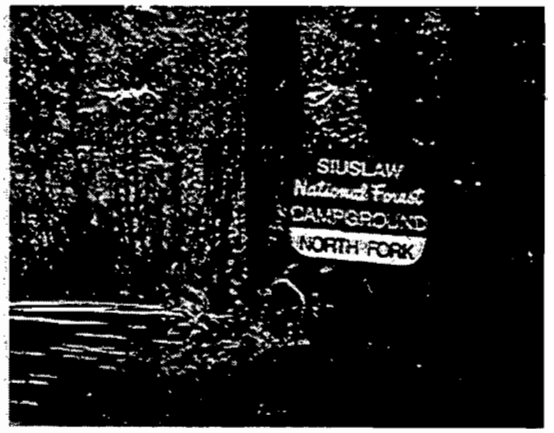



**Figure 20.** The North Fork Campground is very popular during summer months for family camping and get-togethers. Groups also use it as a camp while hunting elk, deer and bear.

Current managed recreation activities on National Forest lands include the Pawn Old Growth Trail, the Mapleton Hill Pioneer Trail, and camping at the North Fork campground. In addition, several dispersed recreation sites are located throughout the watershed.

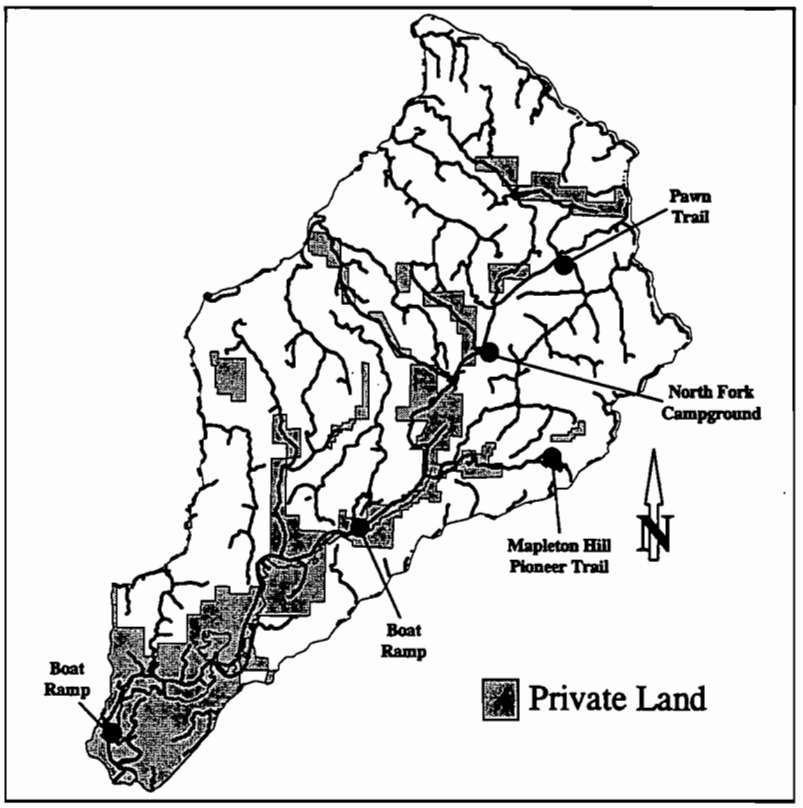



**Figure 21.** Recreation sites within the North Fork Siuslaw Watershed.

The North Fork tradition of family and community gatherings and camping will continue, as well as quality hunting and fishing within the watershed. Traffic and use will be focused in tighter corridors which will reduce areas of solitude and privacy as road systems are reduced. The demand for tie-through road and trail systems will increase. While some additional development of dispersed camping areas and trails may be expected, other forms of recreation, including firewood gathering and berry picking, are expected to decline because of limited road maintenance and firewood harvest restrictions.

## Special Uses

Historic types of National Forest special use permits issued within the watershed include road surface quality pit run rock and crushed gravel, road use for timber, rock and gravel haul, TV antenna and electronic sites, water use and pasture. Some pasture allotments have historically been in use within the watershed but all are currently expired.

Future trends for permitted special uses indicate that, while the Mapleton Ranger District will try to meet the needs of the public, it is likely that there will be a decline in the number of special use permits and pasture allotments issued. As existing clearings grow up and as browse acres in managed stands decline, some of the few National Forest pasture lands will be managed for big game forage. Road use is often regulated due to concerns for endangered and threatened animal species. Domestic water use and water related issues surrounding fish and riparian areas may often conflict. Also, current policy that the permittee pay for permit preparation expenses will likely cause the would-be permittee to look for other alternatives.

## THE AQUATIC ECOSYSTEM

The aquatic ecosystem in the North Fork Siuslaw watershed is formed by the interaction between physical processes, biological processes, and interactions with the terrestrial environment.

Physical processes form the foundation of the aquatic ecosystem. Geologic factors such as landforms, climate, and soil types define many of the characteristics of the stream network. Geology shapes the drainage patterns, determines the type of sediment available to the streams, and influences water chemistry. Climate controls the amount and timing of precipitation and streamflow patterns. The type of soils present influence water infiltration rates, erosion potential, and vegetation.

Biological processes include the aquatic organisms present, food chain interactions, and nutrient cycling. Within anadromous streams, the amount of nutrients available is often related to the size of the fish populations. Ocean conditions, predations by marine animals, fishing mortality, and other factors outside of the watershed exert a strong influence on fish populations within the North Fork.

The terrestrial environment has a profound effect on the aquatic ecosystem because it supplies the large woody debris necessary to trap gravel and create deep pools, and provide cover for fish and other aquatic organisms. Large woody debris also influences how quickly sediment is routed through the system and how the energy generated by flowing water is dissipated. Terrestrial vegetation affects channel stability and upslope erosion rates. Shade created by terrestrial vegetation affects stream temperatures. Leaf litter and organic debris are important components of the aquatic food chain.

### Channel Morphology and Classification

Stream morphology is influenced by eight factors which change over time. They are: channel width, channel depth, water velocity, discharge (amount of water), slope of the stream channel, roughness of the stream bed, amount of sediment, and size of sediment (Leopold et al., 1964). In addition, stream bank vegetation influences stream bank stability. All of these factors interact with each other. A change in one causes all of the other factors to adjust. This concept of continuous adjustment to changes is called "dynamic equilibrium". For instance, an increase in the amount of sediment may cause the stream channel to fill with sediment (or aggrade), which in turn may cause the channel to become wider. Or an increase in discharge may cause more sediment to be transported. The stream bed is scoured, and the channel may downcut. Specific factors which influence the streams in the North Fork are discussed below.

Channel classification is a first step in providing a framework for understanding how the North Fork Siuslaw stream network functions, especially the movement of sediment, woody debris and water through the system. It is useful in identifying reaches of streams most sensitive to changes in water flow, sediment and wood input. It is also used to identify those parts of the stream system that have the potential to provide the best fish habitat.

Stream segments were classified using two variables: channel gradient (Figure 22) and confinement (Figure 23). Stream gradient serves as a surrogate for stream energy, the dominant control on sediment transport and channel morphology. It is divided into 6 categories: $<1\%$, 2-4%, 4-8%, 8-20% and $>20\%$. Channel confinement is described as a ratio of the valley floor width to the bankfull channel width. Confinement controls potential channel response to changes in flow and sediment inputs, and also reflects the long-term history of a valley where past climatic and geologic events have left an imprint. Confinement is divided into three categories: An unconfined channel has a valley floor/stream channel width ratio greater than 4. A moderately confined channel has a ratio between 2 and 4, and a confined channel occupies a valley floor less than 2 channel widths wide. The method described in the Washington State Timber/Fish/Wildlife (TFW) Watershed Analysis Manual, Module E: Stream Channel Assessment (1993) was used to classify streams (Figure 24). For more detailed information on the method used to classify streams, see Appendix E (Stream Channel Classification Methodology).

In terms of sediment routing, the stream network can be divided into source, transport and response (or depositional) reaches. Source reaches have a gradient that is greater than 20%, and are subject to periodic scour by debris torrents. Transport reaches have a relatively high gradient (4-20%). They are fairly resistant to changes in stream morphology because any increase in sediment input is quickly passed downstream. Response reaches have a low gradient (less than 3%) and are areas of sediment deposition. They can experience significant changes in stream morphology if sediment supplies increase. The most sensitive areas are locations where transport reaches empty immediately into response reaches because of the rapid decrease in the stream's ability to transport sediment. Also, the changes are more persistent (Montgomery and Buffington, 1993). Identifying reaches that are sensitive to increased sediment supply is important because these reaches are also the most critical for anadromous fish habitat (Montgomery and Buffington, 1993). In general, reaches that are sensitive to change are low-gradient, unconfined channels, especially if they are downstream from high-gradient reaches or tributaries. The majority of sensitive reaches are on private land. See Figure 25 for the location of sensitive reaches within the North Fork Siuslaw watershed.

The confinement of a stream also influences its behavior. In general, an unconfined stream has a floodplain, and streamflows above the bankfull discharge can spread over it. This dissipation of the flow limits its depth and basal shear stress (the force necessary to transport the sediment on the stream bed). This in turn reduces the effect of peak flows during storms on changes in channel morphology. In a confined channel, assuming it is not cut down to bedrock, increases in peak flows results in greater basal shear stresses, greater scour, and subsequent downcutting of the stream channel (Montgomery and Buffington, 1993).

It is useful to note whether a stream is entrenched. Even if a stream occupies a wide, unconfined floodplain, it may behave as a confined channel if it is downcut into the floodplain. This attribute can only be assessed in the field, as it does not show up on aerial photos. A number of streams were field checked. In the upper tributaries of the watershed, such as Wilhelm and Porter Creeks, any entrenchment resulted from the stream channel downcutting through past debris torrent deposits. Usually, these entrenched reaches were relatively short.

Entrenchment of unconfined channels results in the isolation of the channel from the floodplain. Prevention of flooding by diking or straightening the stream may trigger channel entrenchment. Flood prevention may also affect the long-term soil productivity of flood plains by preventing the delivery of sediment and nutrients associated with overbank deposits (Mongtomery and Buffington, 1993). There is anecdotal evidence that the mainstream of the lower North Fork has become entrenched in the vicinity of, and downstream from, the Meadows Bridge. Bill Meadows, who lived near the Meadows Bridge for several decades, reported that he used to take a cat to clear away the gravel bars that would accumulate in the river bed in order to prevent erosion of the opposite bank. The gravels were not removed, instead they were pushed aside to "straighten out the channel". Also, three logs that were apparently placed to protect the stream bank just upstream from the meadows bridge were buried, and are being exposed again by bank erosion. The bottom of the lowest log is approximately 5 feet above the current level of the creek bed (Information courtesy of Roy Ott).

The sinuosity of the North Fork Siuslaw's mainstem also appears to be out of balance. Sinuosity is defined as the ratio of the stream length to the valley length over the same distance. Generally speaking, as gradient decreases, the sinuosity (or meandering) of the river increases. According to Rosgen's (1993) classification of natural rivers, an unconfined stream with a gradient of less than 2% should have a sinuosity ratio greater than 1.4. The gradient of the North Fork Siuslaw below the confluence of McLeod Creek is less than 1%. Sinuosity was measured using the United States Geological Survey topographic maps, scale 1:24,000. The reach from the confluence of McLeod Creek downstream to River Mile 14 (approximately 2.5 miles) had a sinuosity ratio of 1.12. The reach from River mile 14 to the Portage at River Mile 6 (approximately 3.5 miles distance) had a sinuosity ratio of 1.39. Over this entire reach from the confluence of McLeod Creek downstream to the Portage, the sinuosity ratio was 1.28, still below natural variability. These low sinuosity ratios imply the river channel is straighter than it would be naturally. Because the sinuosity is out of balance, the river will continue to try to re-establish a more natural meander pattern by cutting into its banks and depositing gravel bars on the new floodplain within the entrenched channel.

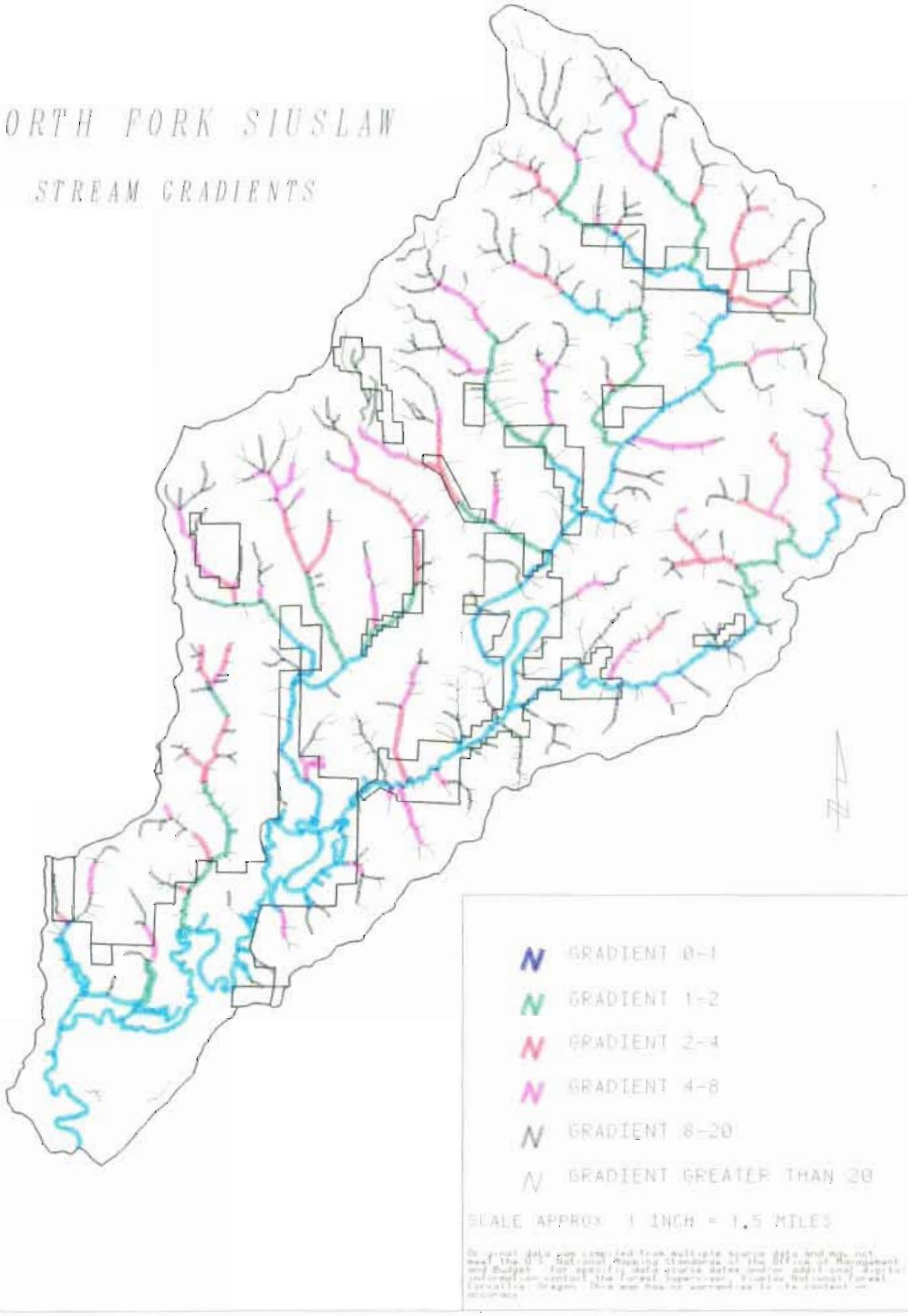

NORTH FORK SIUSLAW
STREAM GRADIENTS
GRADIENT 0-1
GRADIENT 1-2
GRADIENT 2-4
GRADIENT 4-8
GRADIENT 8-20
GRADIENT GREATER THAN 20
SCALE APPROX 1 INCH = 1.5 MILES

FIGURE 22

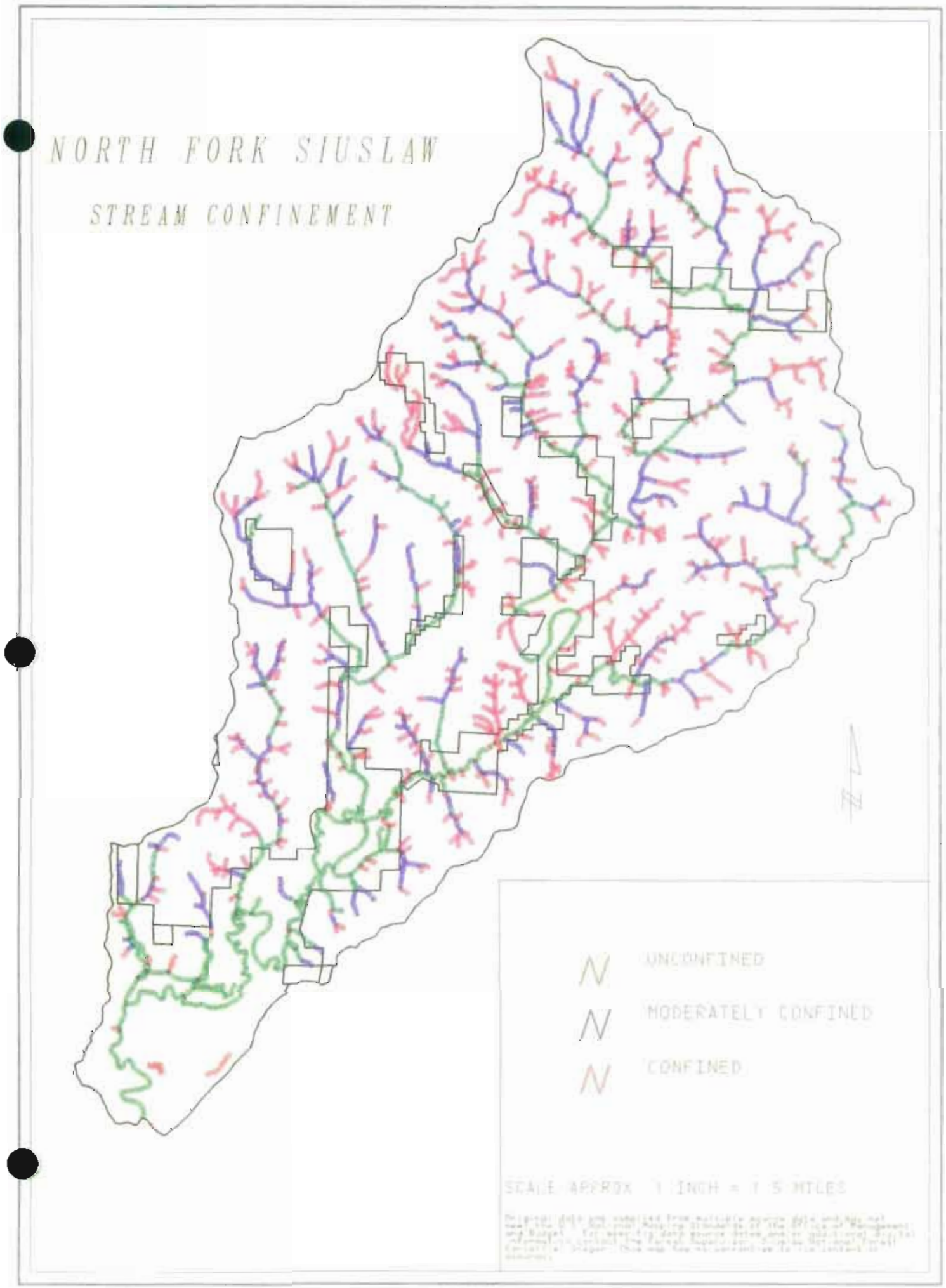
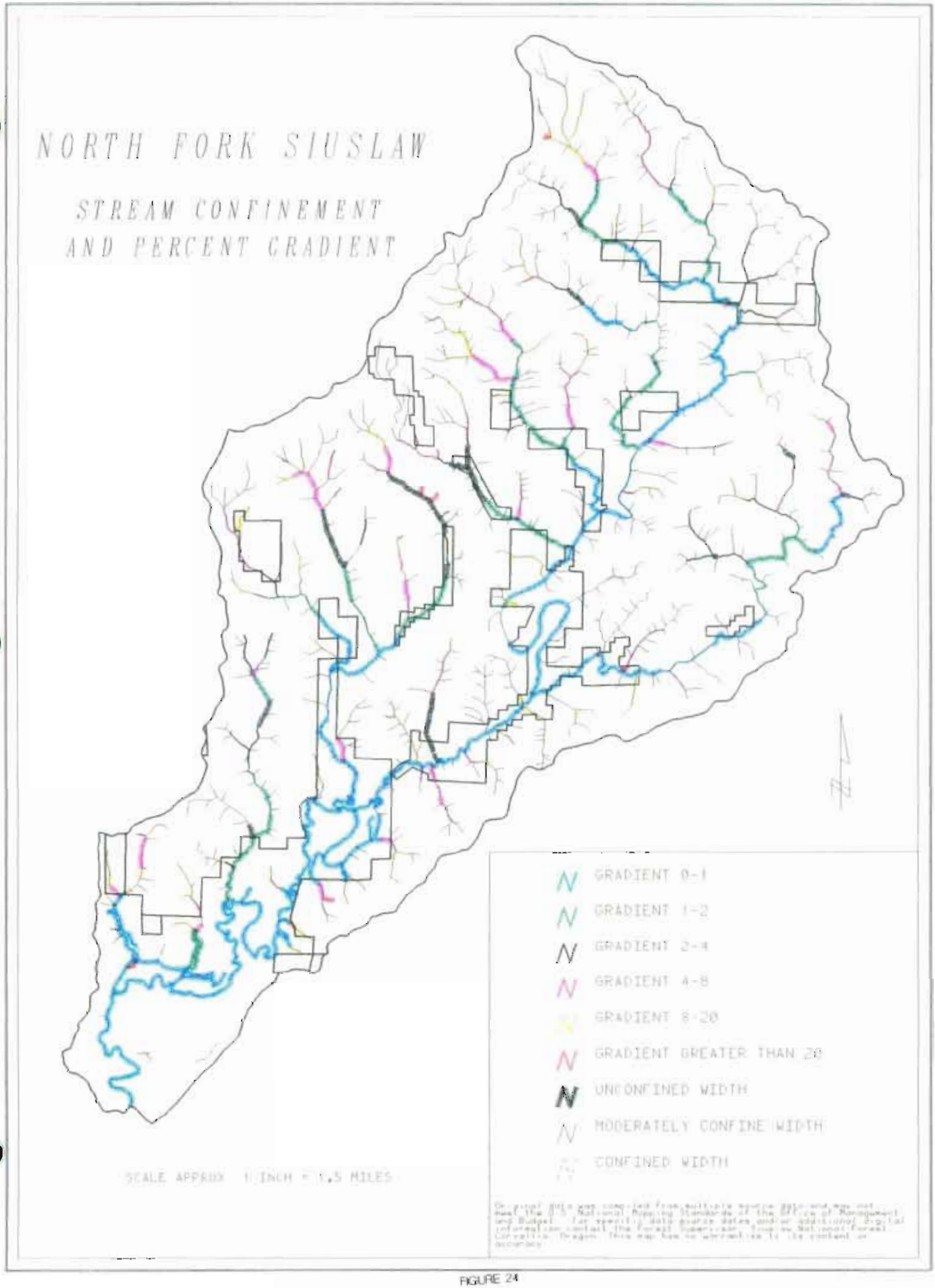

NORTH FORK SIUSLAW
STREAM CONFINEMENT
UNCONFINED
MODERATELY CONFINED
CONFINED
SCALE APPROX 1 INCH = 1.5 MILES

FIGURE 23


NORTH FORK SIUSLAW
STREAM CONFINEMENT
AND PERCENT GRADIENT
GRADIENT 0-1
GRADIENT 1-2
GRADIENT 2-4
GRADIENT 4-8
GRADIENT 8-20
GRADIENT GREATER THAN 20
UNCONFINED WIDTH
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CONFINED WIDTH
SCALE APPROX 1 INCH = 1.5 MILES

FIGURE 24

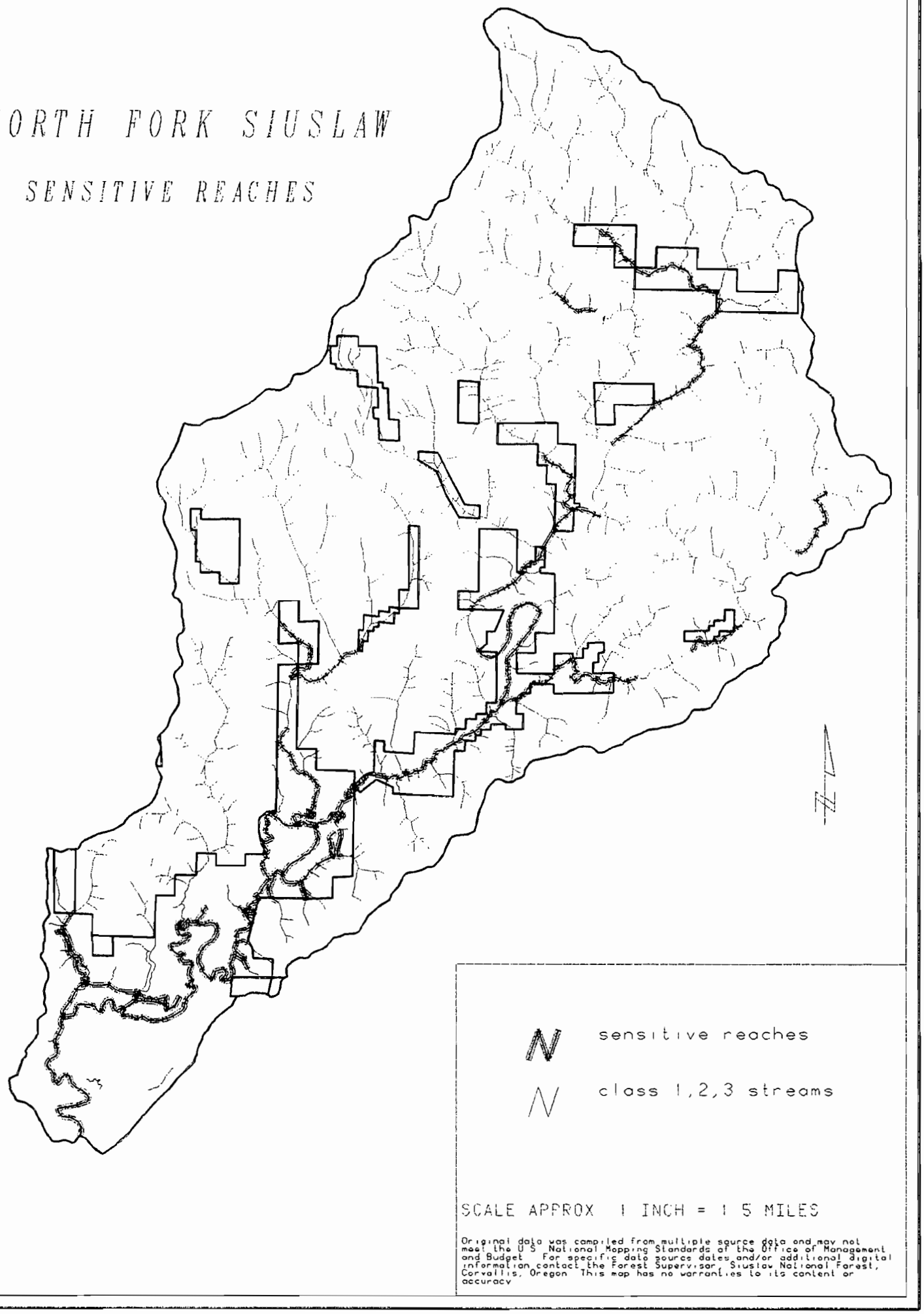

NORTH FORK SIUSLAW
SENSITIVE REACHES
N
sensitive reaches
N
class 1,2,3 streams
SCALE APPROX 1 INCH = 1 5 MILES
Original data was compiled from multiple source data and may not meet the U S National Mapping Standards of the Office of Management and Budget For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon This map has no warranties to its content or accuracy

FIGURE 25

## Landslides

Two types of landslides are present in the North Fork Siuslaw watershed, debris flows and rotational slumps. In general, debris flows occur on steep slopes that are perpendicular to the bedding planes in the Tyee Sandstone. The Tyee Sandstone has numerous cracks (joints) that are perpendicular to the bedding, and failures tend to occur along the joints. Debris torrents usually originate at the top of steep, first order stream channels (headwalls) and follow the stream channels. They occur suddenly, usually during rainfalls that are of sufficient intensity to saturate the soil. Most of the landslides in the North Fork Siuslaw watershed are debris flows. They are a major source of sediment and wood in larger streams. Rotational slumps are large features that can cover many acres. The slip plane is usually parallel to, and takes advantage of bedding planes in the Tyee Sandstone. Rotational slumps can move slowly, but continuously; however, rotational slumps can also move quickly.

Using the Soil Resource Inventory (Badura et al., 1974), the North Fork Siuslaw watershed was divided into areas of landslide risk (Figure 26). The Soil Resource Inventory divides the landbase of the Siuslaw National Forest into mapping units based on soil type, underlying lithology, and geomorphology (landforms). Areas that have a high probability for debris torrents tend to be steep (greater than 70%), highly dissected by intermittent streams, and mantled by thin soils. Rotational slump areas are present in the upper part of the Wilhelm and Billie Creek subwatersheds. The slump in Wilhelm subwatershed has been active since Road 670 in Section 26 was built. The road crosses the landslide scarp and the roadbed has dropped approximately 12" since it was built. The slump has pushed the Wilhelm Creek stream channel to the southwest, so the stream flows around the toe of the slide. This stream channel path suggests the rotational slump has been active for a long time (see Figure 27). Figure 26 also shows the relationship of landslide occurrence to mapped areas of relative soil risk for erosion and landslides. For more detailed information on the methods used to identify land types and landslide risk, see Appendix F.

### *Influence of Debris Flows on the Aquatic Ecosystem*

The recurrence interval for debris flows from a single location in the central Coast Range is on the order of thousands of years. Debris flow deposits usually scour the high-gradient, first and second order streams, and deposit material in the first downstream reach with a low enough gradient, typically between 3 and 6 degrees, to cause the material to stop moving (Montgomery and Buffington, 1993). Periodically, the lower reaches are aggraded by the influx of sediment, then gradually degraded as the stream downcuts through the deposit. This cycle occurs on the order of 100's to 1000's of years. The channel slope and tributary junction angles are important controls on how far a debris flow travels. Debris flows that travel down a long, straight channel tend to travel far, examples can be seen in the headwaters of Uncle, West Branch and McLeod Creeks. Debris flows that come out of tributaries oriented at a high angle to the mainstem of a stream tend to be deposited at the tributary junction (Montgomery and Buffington, 1993, see also: Grant et al., 1984; Benda and Cundy, 1990). Landslides contribute various sizes of sediment to the streams, and provide a source of gravels (Benda and Dunne, 1987). In addition, they supply large woody debris to the stream (Benda and Dunne, 1987), especially those that originate on unmanaged lands.

Debris flow scour and deposition also disturb channel margin vegetation, and may expand the canopy opening over a stream channel. This disturbance may also affect rates of large woody debris recruitment. The correlation between past debris torrent locations and hardwood-dominated riparian zones can be seen in the North Fork Siuslaw watershed.

Dam break floods may also be associated with debris flow deposits. The deposits may act as a temporary dam, and when the dam fails, the impounded water and sediment moves as a large flood wave down the stream channel (Montgomery and Buffington, 1993). An example of this happened in Gwynn Creek along the Oregon Coast. During a large storm event in 1982, several headwalls failed and dammed the headwaters of Gwynn Creek. The dam broke, and a wall of water and sediment scoured the stream channel. Logs and debris covered Highway 101, with some of the material making it all the way to the ocean (Jim Reim, personal communication, 1994).

*Accelerated Rates of Landslides Due to Management*

Landslides are a natural erosion process. They are an important source of gravels and large woody debris for streams, and only become a concern when the rate of landsliding is above natural levels. When this happens, the amount of sediment added to a stream may overwhelm the stream's ability to transport and distribute sediment. Some of the effects of increased sedimentation include: filling in pools with fine sediment, aggradation of the stream bed, widening of the stream channel in unconfined reaches, decreasing the size of sediment deposited on the stream bed, and filling in gravel deposits with fine sediment (Montgomery and Buffington, 1993).


**Figure 27.** Map showing location of roads and landslides in the North Fork Siuslaw watershed.

Various landslide surveys of the Mapleton District and the North Fork Siuslaw indicate that debris torrents have increased due to past land management practices. A 1985 landslide survey of the Mapleton District showed an overall increase in landslides that was 3.4 times greater in clearcuts than in undisturbed areas. This number was

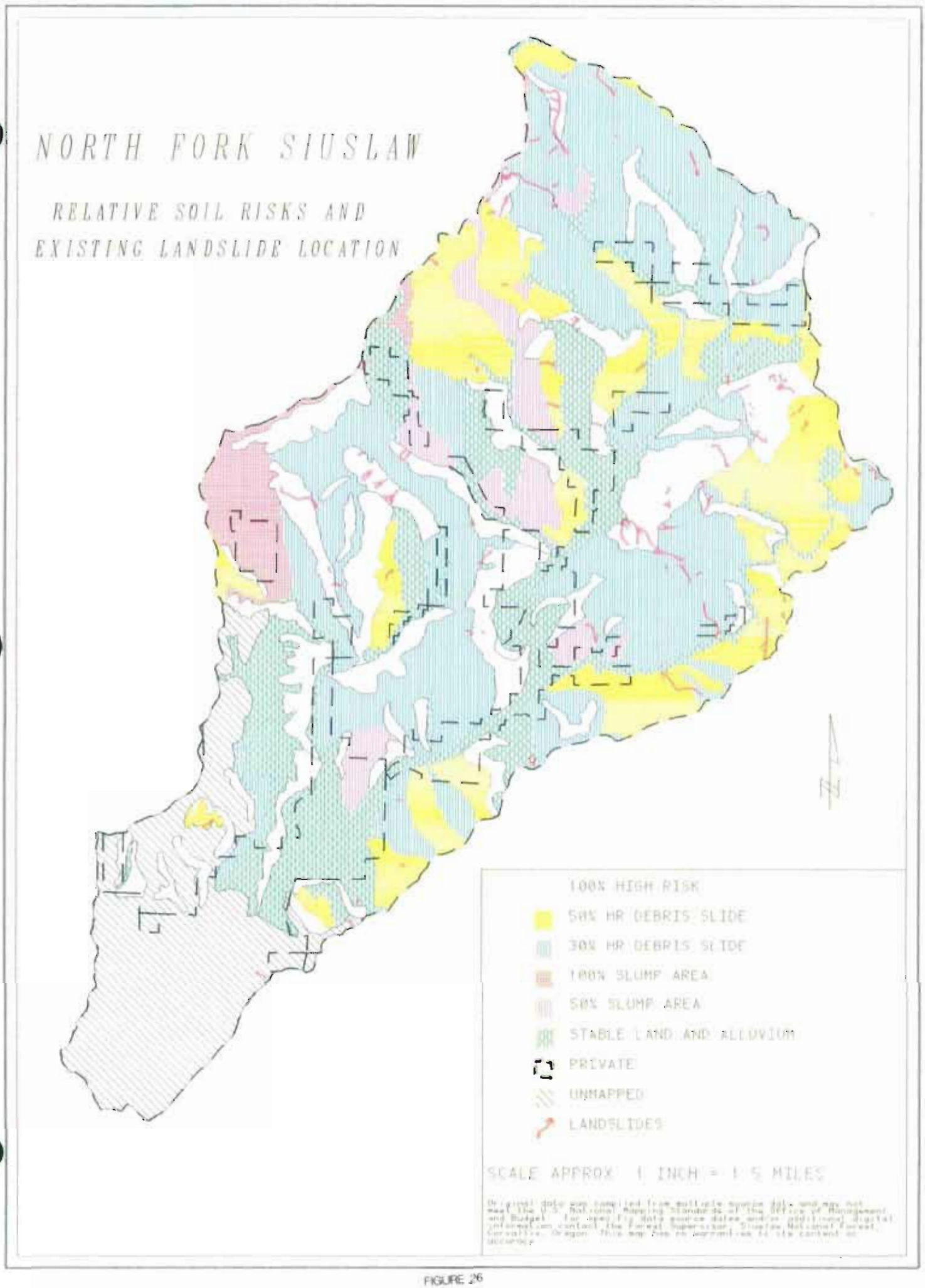

NORTH FORK SIUSLAW
RELATIVE SOIL RISKS AND
EXISTING LANDSLIDE LOCATION
100% HIGH RISK
50% HR DEBRIS SLIDE
30% HR DEBRIS SLIDE
100% SLUMP AREA
50% SLUMP AREA
STABLE LAND AND ALLUVIUM
PRIVATE
UNMAPPED
LANDSLIDES
SCALE APPROX 1 INCH = 1.5 MILES

FIGURE 26

considered a conservative figure because it did not take into account road-related slides. Surveys from 1978-1983 show that most slides related to clearcuts occur in young clearcuts that are less than 4 years old, and most were on slopes greater than 70%. Road-related debris torrents were usually related to sidecast roads and/or poor road drainage. In the 1981 survey of the Mapleton District, 61% of road-related failures occurred from sidecast roads. In the 1975 survey following the November 1975 storm, 47% of the road failures were related to road surface drainage problems (NCASI, 1985). A landslide survey of the North Fork Siuslaw watershed was done for this analysis using consecutive sets of aerial photos beginning with the 1953 set. Of 140 debris flows, 8 occurred in undisturbed areas, 21 occurred in clearcuts and 110 were related to road failures. The majority of debris flows occurred in the late 1960's and early 1970's.

***Future Trends for Landslides***

The rate of landsliding is expected to decrease and approach natural levels in the future as existing plantations grow and root strength increases. Additional road-related debris flows are likely unless road stabilization and sidecast pullback projects are implemented.

**Sediment Routing**

In general, sediment is transported from the high-gradient streams and deposited in the low gradient streams. There is an interplay between sediment supply, the ability of the stream to transport sediment, which is dependent on gradient and discharge, and sediment storage. Beaver ponds, pools and areas behind large woody debris in the stream may provide temporary storage sites, and slow the movement of sediment downstream. The size of sediment that is deposited is directly related to the energy (gradient) of the stream. In upper reaches, with relatively high gradients, the bedload is usually cobbles and boulders. In lower reaches with less energy, sand and gravel is deposited. Changes in the sediment supply or amount of water may cause channels to widen or deepen; change the stream gradient through aggradation, degradation, or changes in the sinuosity, or alter bedforms (e.g. gravel bars) or particle size of the substrate. An increased sediment supply is a concern because it may result in significant aggradation of the stream bed, channel widening in unconfined reaches, particles deposited on the stream bed becoming finer-grained, and filling in pools.

Sediment may move downstream in pulses, depending on storm events. Madej (1978, 1982) found that disturbances associated with logging increased sedimentation to stream channels. The resulting pulse of sediment took 20-40 years to pass through the watershed.

Streambed substrates in surveyed streams throughout the watershed were analyzed to determine:

1. Whether an individual stream's substrate was in keeping with the gradient.
2. Whether the downstream effects of past landslides could be detected.
3. How much change had occurred between stream surveys completed in the early 1950's and stream surveys completed in the early 1990's.

The dominant and subdominant substrates listed in stream surveys are noted by reach. This information is compared to the landslide survey, which shows which stream and subwatersheds have been directly or indirectly affected by past landslides. The presence of beaver ponds is also noted, as they influence sediment storage. The type of sediment present is also compared with the stream gradient, to see if the size of sediment present is consistent with the stream's energy to transport it. For instance, there are two high-gradient (10% and 11%) headwater stream reaches that have a dominant substrate of sand. This is probably due to past landslide activity in those drainages. These streams have not yet had time to flush the fine sediment. The presence of gravel deposits were also noted. For descriptions of individual streams, see Appendix G (Subwatershed Descriptions). For more detailed information on sediment routing within the North Fork Siuslaw watershed, see Appendix H.

**Stream Flow Patterns**

In the Coast Range, most of the rainfall comes during the winter months. As a result, streams follow an annual cycle of high flows during the winter and low flows during the late summer months. Storm events during the winter months (October through March) generate flashy peak flows (see graphs of individual storm events, Appendix I). For example, in December, 1980, stream flow on the North Fork Siuslaw increased from approximately 400 cubic feet per second (cfs) to 2000 cfs in a 24 hour period. The December 16, 1972 storm increased flow from 200 cfs to 1100 cfs in a 24 hour period. Rain-on-snow events are rare in the Coast range, as very little winter precipitation falls as snow. Lowest flow conditions occur in August and September, the latter part of the dry season.

Stream flow data for the North Fork Siuslaw river is based on records from a stream gage that was maintained by the United States Geological Survey downstream from the "Meadows" bridge, 0.3 miles upstream from the mouth of Condon Creek, from 1967-1985.

The magnitude and probability of peak flow levels for the North Fork Siuslaw River is summarized below (Wellman et al., 1993):

**Table 1:** Flood Discharge By Reoccurrence Intervals.

| Recurrence Interval | Annual Probability | Cubic Feet/Second (cfs) |
|---|---|---|
| 1.25 year | 80% | 2230 cfs |
| 2 years | 50% | 2870 cfs |
| 5 years | 20% | 3650 cfs |
| 10 years | 10% | 4120 cfs |
| 25 years | 4% | 46890 cfs |

***Changes in Peak Flows***

Stream flow analysis was conducted to determine if management activities have altered stream flow regimes, such as peak flows during storm events, low flows during summer months, or the total amount of water coming from the watershed. Increases in peak flows can alter the stream channel morphology and affect fish habitat. Most of the "work" done by streams to move sediment and alter channel shape occurs during the high-energy runoff of storm events.

In order to determine whether stream flow patterns had changed over time, stream gage data from the North Fork Siuslaw River were compared to data from Big Creek. Big Creek was chosen as a comparison because of its proximity to the North Fork Siuslaw, and because less timber harvest had taken place in that watershed. As it is adjacent to the North Fork Siuslaw, the timing and magnitude of rainfall is assumed to be similar for both watersheds. In addition to stream gage data, timber harvest and road building history was collected for both basins.

Four different methods were used to compare stream flow records from the North Fork Siuslaw and Big Creek. The methods are described in detail in Appendix J. All four methods suggest that the high flows associated with storm events have increased over time in the North Fork Siuslaw River as compared to Big Creek. An alternative theory is that the peak flows in Big Creek have decreased, possibly due to harvest within the fog zone decreasing the amount of precipitation captured as fog drip. The most significant changes appear to have happened since 1979 (Appendix J, Figure 1).

*Comparison of Management in North Fork and Big Creek*

During the time that stream gage records for the basins overlaps, 1972-1985, the amount of the North Fork Siuslaw watershed under management went from 12% to 29%. In Big Creek, the amount of land under management went from 3% to 17% in the same time period. Two major types of management activities, timber harvest and road building, are described in more detail below.

Harvest History

From 1972 to 1979, there was a steady increase in clearcut timber harvesting in the North Fork Siuslaw. From 1980-1982, there was a lull. Harvest rates similar to those prior to 1979 resumed in 1983. In Big Creek, little harvesting was done prior to 1980, when acreage harvested jumped from 8.9% to 14.8%. The difference in the percentage of land harvested between the two areas steadily increased between 1972 and 1979 (the time when timber harvest in the North Fork was proceeding at a steady pace) but no harvest was done between 1975 and 1979 in Big Creek. After the relatively large amount of harvest took place in Big Creek in 1980, the difference in percent of the area harvested between the two basins decreased (Figure 28).

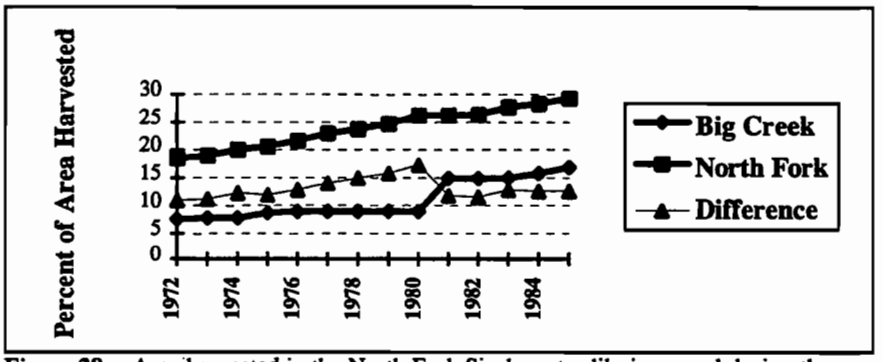



**Figure 28.** Area harvested in the North Fork Siuslaw steadily increased during the 1970's. During that time, very little harvest was done in Big Creek. Area harvested in Big Creek increased in the early 1980's, while harvest rates in the North Fork slowed. As a result, the difference in the percent area harvested decreased in the early 1980's.

Road Building History

The number of miles of roads in the North Fork steadily increased during the 1970's. Very few roads were built during the 1980's, as most of the needed road system was in place. The percentage of land in roads in Big Creek was similar, therefore the difference between the two basins remained the same through time (Figure 29).

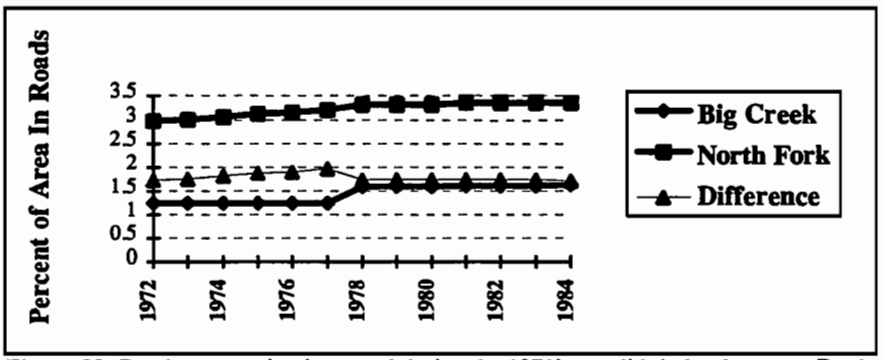



**Figure 29**: Road construction increased during the 1970's, as did timber harvest. By the early 1980's, most of the road system was in place. In Big Creek, there was an abrupt increase in the number of road miles in the late 1970's. Thus, the difference in the amount of area in roads between the two watersheds steadily increased during the 1970's, then leveled off in the late 1970's and early 1980's.

*Discussion of Causes of Changes in Peak Flows*

Between 1972 and 1979 the cumulative area harvested in the North Fork Siuslaw steadily increased, while little or no harvest occurred in Big Creek. The difference between the percent of area harvested in the two watersheds also increased until about 1980, when timber harvest increased in Big Creek. Peak flows appear to have increased in the North Fork Siuslaw (see Appendix J, Figure 1) since 1979. The higher amount of timber harvest may be partially responsible for increases in peak flows in the North Fork Siuslaw,and. the steady increase in the total area harvested prior to 1979 might show up as a "cumulative effect". Conversely, peak flows in the Big Creek watershed may have decreased relative to the North Fork due to harvest within the fog zone. Reducing the amount of precipitation due to fog drip may have an effect on peak flows.

Scientific research by Jones and Grant (1993) in the Oregon Cascade Mountains has suggested that roads may be a major factor accounting for increases in peak flows in managed watersheds. The roads act as an extension of the intermittent stream network via ditchlines and culverts. Thus, the watershed becomes more efficient at routing water quickly. Midslope roads are especially effective at re-routing water because they intercept groundwater flow and catch it in the ditchlines. The theory that roads act as intermittent stream channels has ramifications for road management and watershed restoration. The Record of Decision states that "the timing, magnitude, duration and spatial distribution of peak, high and low flows must be protected." (p. B-11, Aquatic Conservation Strategy Objectives, number 6). In the North Fork Siuslaw, a higher percentage of the basin is occupied by roads (3.4%) as compared to Big Creek (1.5%). However, the theory that roads are a major cause of increased peak flows may not be as applicable to the Coast Range. At the time that peak flows appear to increase in the North Fork relative to Big Creek (around 1979), the difference between the percent area occupied by roads in the two basins decreases. It is possible that there may be a delayed effect in peak flows due to roads, and the increase in road building in the 1970's did not show up in the peak flow data until around 1979.

Other factors may be important in changing peak flows. At this time, no causal mechanism can be definitively identified. Possible causes include:

> *Climatic changes*. Not likely, as corresponding changes in Big Creek should be evident. Storms should be random events, and it would not consistently rain more in the North Fork Siuslaw watershed.
>
> *Roads and debris torrents*: A large number of debris torrents related to road failures occurred in the late 1960's and early 1970's. It is possible that the debris torrents made the affected intermittent stream channels more efficient at delivering water, and may have made the stream network more connected to the roads. The effects of the road building and debris torrents may not show up immediately, and may only become apparent after a storm of sufficient size triggers changes in channel morphology.

If peak flows have increased, the question is how to restore the watershed so that peak flows return to their range of natural variability. Determining the restoration methods appropriate in the North Fork Siuslaw watershed to address changes in peak flows is difficult, as peak flows appear to have increased without an obvious difference in road building between the two watersheds. Further study is needed to determine the causes of changes in peak flows between the two watersheds.

*Future Trends for Stream Flows*

The stream gage in the North Fork Siuslaw was discontinued in 1985, therefore no data exists for the last decade. The future trend of peak flows depends on what mechanisms are responsible for the increases in peak flow between 1979 and 1985. If the removal of timber was the major reason for peak flow increases, peak flows should decrease as harvest is limited and the plantations grow in the future. If road density is a major reason, peak flows may remain elevated for the foreseeable future.

## Fish Populations and Distribution

The North Fork Siuslaw watershed contains about 114 miles of anadromous fish habitat. It supports large populations of fall chinook, coho, steelhead trout, and sea-run cutthroat trout. It also provides habitat for resident cutthroat trout.

Because of the importance of wild anadromous fish populations within the watershed, the relatively good condition of habitat compared to other streams in the region, and the potential to act as refuge areas for depleted fish stocks, five sub-basins have been designated as a Key Watershed under the Siuslaw National Forest Watershed Protection and Restoration Strategy (Siuslaw National Forest, 1993) and the President's Forest Plan (USDA Forest Service et al.,1994). These include Wilhelm, Porter, Elma, Sam, and Cataract (Figure 2). The following summarizes anadromous fish populations and distributions within the watershed:

### *Chinook Salmon*

Fall chinook salmon (*Onchorhynchus tschawytscha*) utilize 63 miles of streams within the North Fork watershed (Figure 30). Approximately one third of their habitat is on National Forest lands. The remainder is on private lands along the lower portion of the mainstem and the major tributaries.

Chinook tend to spawn in the mainstem and in the lower portion of larger tributaries. Historically, they used to spawn from the head of tide near the Portage upstream as far as Sam's Creek. Heavy fine-grained sedimentation now precludes any significant spawning below Meadows Bridge (W.Beidler, personal communication). Primary chinook spawning areas now include the mainstem from Meadows Bridge upstream to about 1/2 mile above the North Fork Campground and the lower portions of Porter, McLeod, and Wilhelm Creeks.

Juvenile chinook salmon fry generally migrate downstream to the Siuslaw River estuary shortly after emerging from the gravels in the spring. They remain in the estuary until they enter the ocean. Because the young fry do not spend much time in freshwater, the amount and quality of spawning gravel is the primary habitat factor limiting production of fall chinook.

The chinook population within the Siuslaw River basin has been estimated at approximately 7,400 fish in recent years (Nicholas and Hankin, 1989). The population appears to be healthy and on an increasing trend. Escapements over the past six years have been well above historic levels. This can generally be attributed to: 1) good egg-to-fry survival due to moderate winter weather and a lack of major floods; 2) lower ocean harvest as a result of the U.S. - Canada Salmon Treaty: and 3) good ocean survival from juveniles to adults.

There has been no hatchery supplementation of fall chinook in the North Fork Siuslaw watershed.

### *Coho Salmon*

Coho Salmon (*Onchorhynchus kisutch*) utilize 81 miles of streams within the North Fork watershed (Figure 30). They are generally distributed throughout the basin including the mainstem and most tributaries. Slightly less than one half of the coho habitat is on National Forest lands. The remainder is on or adjacent to private lands.

Coho generally spawn in smaller, shallower streams than chinook salmon. Coho spawning areas are widely distributed throughout the upper mainstem and most relatively low gradient tributaries.

Coho fry emerge from the gravels in early spring. They spend an entire year in freshwater before migrating to the ocean the following spring. During their first summer, the young fry will utilize almost all areas of the stream. However, during winter they seek out deep pools with an abundance of cover, beaver ponds, or side channels where they can withstand winter floods without being washed downstream (Nickelson et al. 1992, Reeves et al. 1989). The amount of complex pool area is the primary habitat factor limiting production of coho in the basin.

Coho populations have declined dramatically since the 1980s. Over the past three years, the average escapement for the entire Siuslaw River basin was only 3,280 fish. This is less than seven percent of historical levels (ODFW, 1993). Habitat degradation, poor ocean survival, and overharvest appear to be predominant factors in the decline. The Oregon Department of Fish and Wildlife has listed the coho salmon as a "stock of concern." The National Marine Fisheries Service is currently evaluating a petition to list Oregon Coast coho salmon as a threatened or endangered species under the Endangered Species Act.

From 1980 to 1986, juvenile coho were stocked throughout the North Fork Siuslaw watershed to supplement natural production. The stocking program has been discontinued, and the watershed is now managed for natural production.

***Steelhead***

Winter steelhead trout (*Onchorhynchus mykiss*) utilize 114 miles of streams within the North Fork watershed (Figure 31). They are generally distributed throughout all areas of the basin accessible to anadromous fish. Slightly more than one half of the available steelhead habitat is on National Forest lands. The remainder is on or adjacent to private lands.

Steelhead trout spawn in the upper portion of the mainstem and throughout all tributaries accessible to anadromous fish. They generally prefer smaller streams and/or steeper gradients than either coho or chinook.

Juvenile steelhead usually spend two years in freshwater before they migrate to the ocean. When small, the young steelhead are often found in shallow riffles or fast water at the head of pools. As they become larger, they seek out deep pools with moderate velocities and an abundance of cover where they can hide from predators and avoid being swept downstream by high winter flows. The amount of these deep, complex pools appears to be the primary habitat factor limiting steelhead production in the North Fork.

Populations of wild steelhead in the Siuslaw River basin have declined drastically from around 2,000 in the 1950s to only a few hundred in recent years (ODFW, 1993). The primary causes for the decline appear to be poor ocean survival from juvenile to adult, habitat degradation, hatchery interactions, and heavy fishing pressure. The National Marine Fisheries Service is currently reviewing the status of Oregon coast steelhead for potential listing under the Endangered Species Act.

Winter steelhead populations within the North Fork watershed have been heavily supplemented with hatchery fish from the Alsea River since the early 1960s. In recent years, hatchery fish have made up 75% to 89% of the total steelhead catch (ODFW, 1993). The Oregon Department of Fish and Wildlife is currently proposing a change in management to phase out steelhead stocking on the North Fork and to manage the watershed for natural production (W.Beidler, personal communication).

***Cutthroat***

Sea-run cutthroat trout (*Onchorhynchus clarki*) utilize 114 miles of streams within the North Fork watershed (Figure 31). They are generally distributed throughout all areas of the basin accessible to anadromous fish. Slightly more than one half of the available sea-run cutthroat habitat is on National Forest lands. The remainder is on or adjacent to private lands.

Sea-run cutthroat trout generally spawn in headwater streams and tributaries. Because of their smaller size, they generally utilize smaller streams and/or steeper gradients than other anadromous fish. Juvenile cutthroat usually spend two to five years in freshwater before they migrate to the ocean. The larger juveniles are most often found in pools around concentrations of woody debris or other cover. Adult sea-run cutthroat trout return from the ocean each fall to spawn and overwinter in the North Fork. Deep pools with an abundance of cover are critical for avoiding predators and surviving high winter flows.

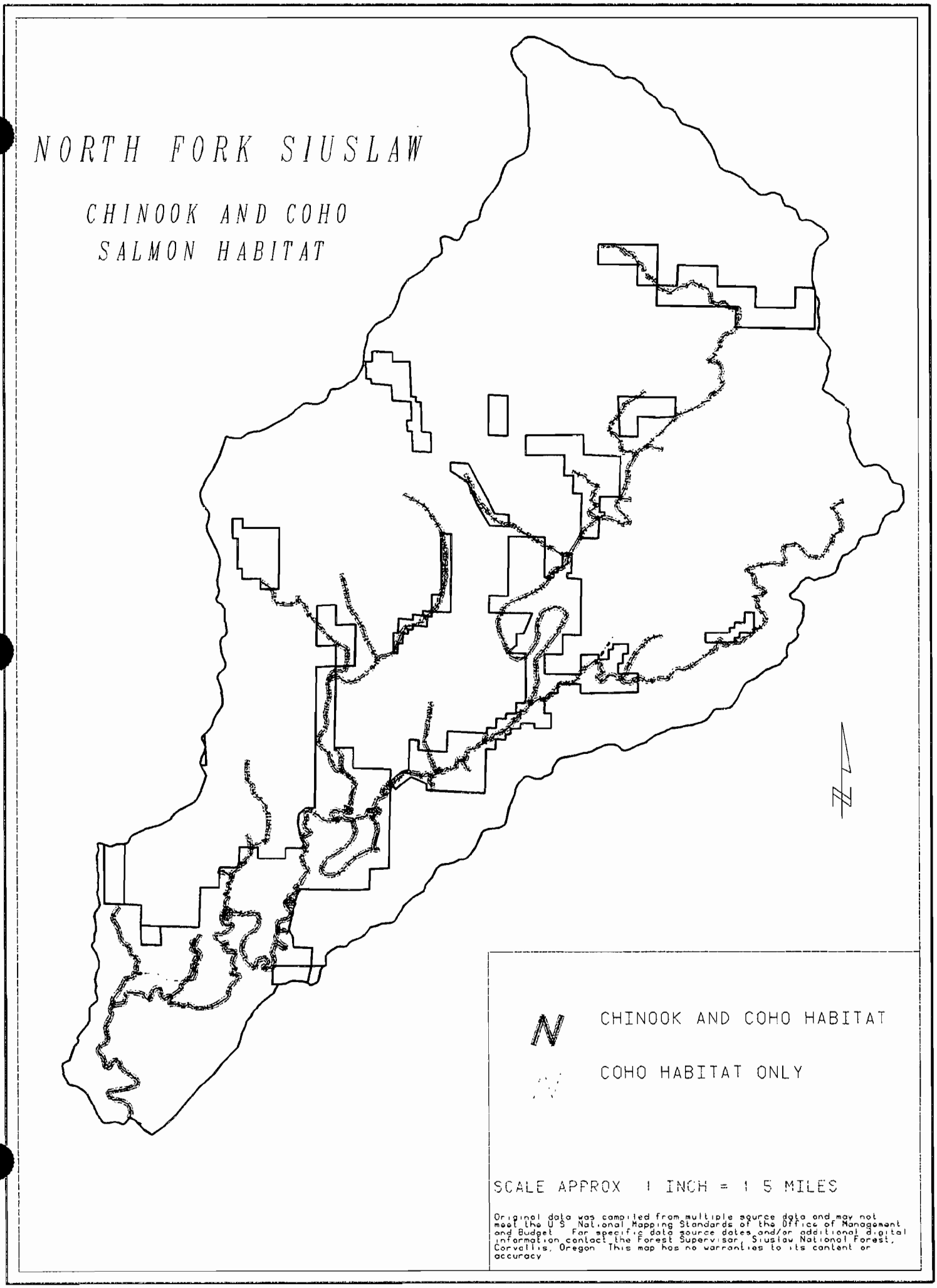
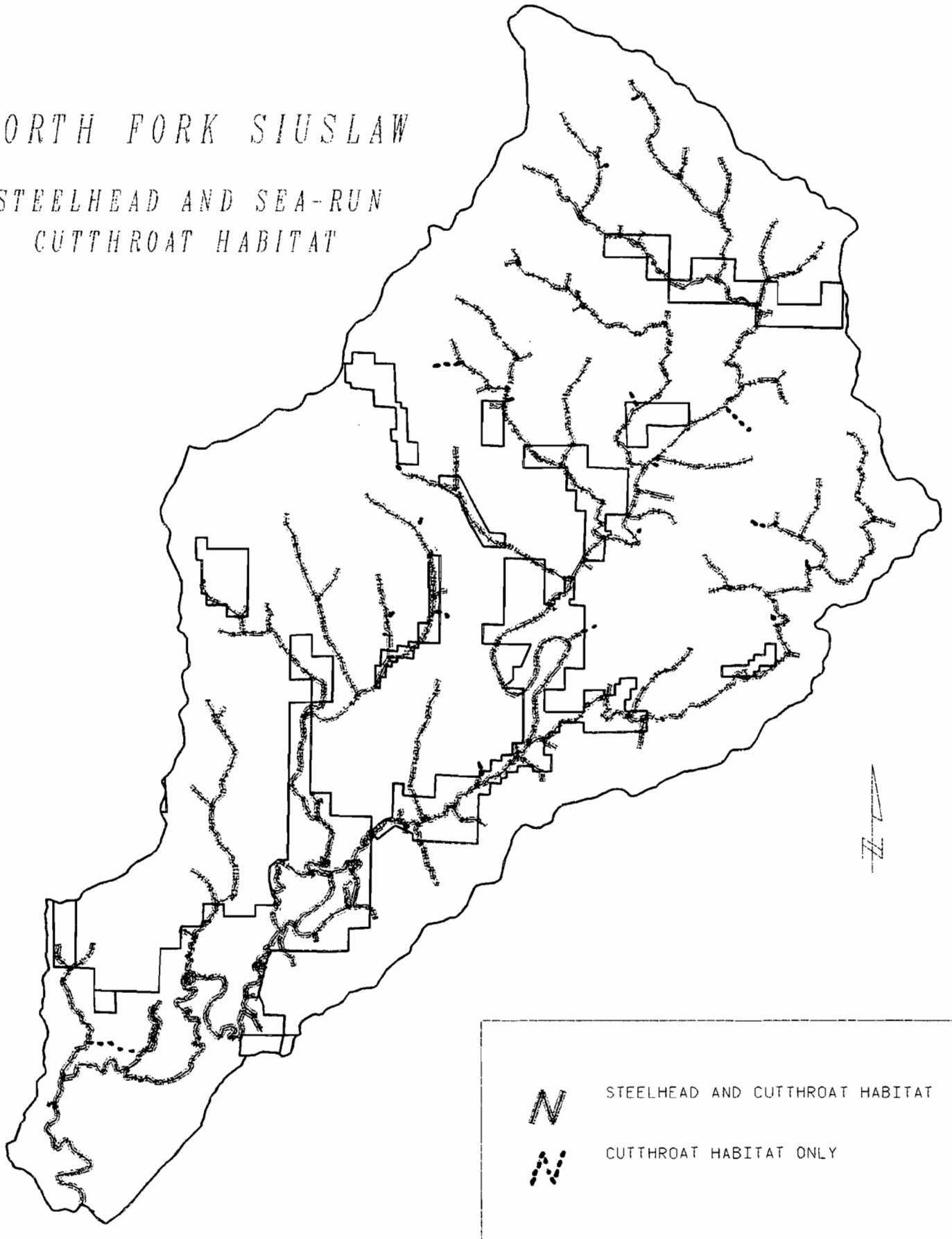

NORTH FORK SIUSLAW
CHINOOK AND COHO
SALMON HABITAT
N
CHINOOK AND COHO HABITAT
COHO HABITAT ONLY
SCALE APPROX 1 INCH = 1 5 MILES
Original data was compiled from multiple source data and may not meet the U S National Mapping Standards of the Office of Management and Budget For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon This map has no warranties to its content or accuracy

FIGURE 30

# NORTH FORK SIUSLAW

## STEELHEAD AND SEA-RUN CUTTHROAT HABITAT



STEELHEAD AND CUTTHROAT HABITAT

CUTTHROAT HABITAT ONLY

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Original data was compiled from multiple source data and may not meet the U S National Mapping Standards of the Office of Management and Budget For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon This map has no warranties to its content or accuracy

FIGURE 31

Although the Siuslaw River has a reputation as one of the best sea-run cutthroat rivers in Oregon, little is known about them. Catch rates have declined drastically in recent years and are currently only about eight percent of the 1965-70 period (ODFW, 1994). The primary causes for the decline appear to be poor ocean survival from juvenile to adult, habitat degradation, hatchery interactions, and heavy fishing pressure. Due to declining populations coast-wide, all sea-run cutthroat trout stocks, including the Siuslaw River stock, are being reviewed for listing under the Endangered Species Act.

Sea-run cutthroat trout populations within the North Fork watershed have been supplemented with hatchery fish since 1949. The stocking program has increased substantially since about 1970. In recent years, hatchery fish have made up 63% of the total sea-run cutthroat catch (ODFW, 1994). The Oregon Department of Fish and Wildlife is currently reviewing the sea-run cutthroat stocking program because of poor returns and the high proportion of hatchery fish in the population (W.Beidler, personal communication).

Resident (non-anadromous) cutthroat trout generally occur throughout all perennial streams within the North Fork watershed. They often occur as small isolated populations in small headwater streams where gradient and/or migration barriers preclude extensive movement. It is unknown whether some resident cutthroat migrate downstream and contribute to the sea-run cutthroat populations lower in the basin.

Little is known about the resident cutthroat population in the North Fork. Observations and catch data indicate that resident populations in the lower mainstem have been relatively stable over the past several years (W.Beidler, personal communication). No surveys have been done in non-anadromous portions of the watershed. The amount of fishing pressure greatly effects the number of large resident cutthroat present within a stream section.

*Other Aquatic Species*

The North Fork Siuslaw River provides habitat for numerous species of aquatic insects, mollusks, invertebrates and amphibians. Two species on the Regional Forester's Sensitive Species list may occur within the watershed. These are the western pond turtle (*Clemmys marmota marmota*) and the red-legged frog (*Rana aurora*). There is little or no information on population trends for these species within the North Fork watershed.

**Fish Habitat**

*The Physical Processes*

Fish habitat is created by the interaction of water, sediment, and wood flowing through the stream system. Water provides the energy to move and sort materials, scour deep pools and erode streambanks. Sediment supplies spawning gravel and streambed substrates. Wood forms the obstructions necessary to dissipate stream energy, trap spawning gravels, scour deep pools, and create complex habitats. Changes in streamflow and the sediment regime and their effects have been discussed in previous sections.

The importance of large woody debris (LWD) in creating fish habitat in streams has been recognized since the early 1980s (Bisson et al. 1987, Sedell et al. 1988). Perhaps the most important function of downed logs is to dissipate stream energy. The obstructions slow water velocity and cause the stream to meander. Steep streams develop a stair step profile of productive pools separated by small falls or rapids rather than a single long and relatively unproductive riffle. Maintaining adequate amounts of large wood to slow water velocities and dissipate stream energy is particularly important in sandstone systems like the North Fork Siuslaw because, unlike basalt streams in the Cascades, there are very few boulders or other obstructions to break up high winter flows.

Downed logs and debris jams often dam a stream forming deep, slow moving pools and trapping spawning gravels and other substrate materials. Currents deflected off downed logs scour additional pools. Large amounts of woody debris create complex habitats and provide the cover necessary to support a variety of fish species and age classes. Numerous researchers have documented the relationship between increasing amounts of large woody debris in stream channels and increasing fish populations (Sedell et al. 1985).

The primary sources of large woody debris inputs into streams are from trees within the riparian area and from debris torrents and landslides from upland sites.

The condition of fish habitat within a stream is linked closely with the condition of the floodplain and the adjacent riparian vegetation. As stated above, riparian areas provide a major source of large woody debris inputs to the stream. Undercutting, channel migration, blowdown, and tree mortality all contribute wood to the channel. The amount, size, and type of trees adjacent to the stream have a great effect on the amount of large woody debris in the stream and the resulting habitat quality. The amount and type of riparian vegetation also influences how stable the streambanks tend to be.

Floodplains serve an important function in providing slow, quiet water refuges for young fish during floods. Under normal conditions, water spreads out quickly onto the floodplain as the water rises. While the flow in the main channel may be a raging torrent, the shallow overland flow through the riparian vegetation across the floodplain is much slower. Side channels, backwaters, and sloughs provide numerous places for small fish to take refuge in until the water drops and conditions in the stream channel become more tolerable.

***Historic Fish Habitat Potential***

Different streams have different capabilities to produce anadromous salmon and trout. Low gradient streams in wide valley bottoms generally have the greatest potential to produce large numbers of anadromous salmonids. These streams usually have lots of meanders, undercut banks, and deep pools. They also have large numbers of downed logs and complex wood cover and log jams. Because the channels shift frequently, there are numerous side channel and off-channel areas where small fish can take refuge during high winter flows. Flood waters tend to rise up and spread out over the floodplain rather than forming a raging torrent within the main channel. Gravels washed down from upstream accumulate in these reaches providing excellent spawning habitat.

Higher gradient streams or streams confined by narrow valleys certainly produce anadromous salmonids and are important from a watershed perspective, but they generally have less potential to produce fish than low gradient unconfined areas. Steep confined streams tend to be relatively straight with few large, deep pools. The stream channels turn into raging torrents during winter high flows. The powerful streams carry away woody material and the finer substrate materials. With few refuges available in which to escape the high flows, small fish are flushed downstream. Debris jams are often the most productive areas in these systems.

The historic fish habitat potential for anadromous streams in the North Fork Siuslaw was developed by combining average stream gradients and valley confinement information. It was rated as either very high, high, moderate, or low using criteria similar to the Washington State Timber, Fish, and Wildlife Watershed Analysis Manual (Washington Forest Practices Board, 1993). Historic fish habitat potential for anadromous streams in the North Fork Siuslaw is shown in Figure 32.

It should be noted that historic potential is not the same as current fish habitat potential. Most of the lower mainstem below the campground and the lower portions of the major tributaries have a high historic potential for fish habitat due to their broad alluvial floodplains and low gradients. However, these areas have become entrenched to the point where they now function as confined stream channels. Current fish habitat potential in these areas is low. Without extensive restoration efforts, this is unlikely to change.

Although private lands make up only about one quarter of the basin, they account for over 60% of all of the anadromous streams with the greatest historical habitat potential. This is to be expected, since the low gradient valley bottoms were most desirable for homesteading and were developed most rapidly. Streams on Siuslaw National Forest lands within the watershed are generally further up in the headwaters, smaller and steeper than streams on private lands.

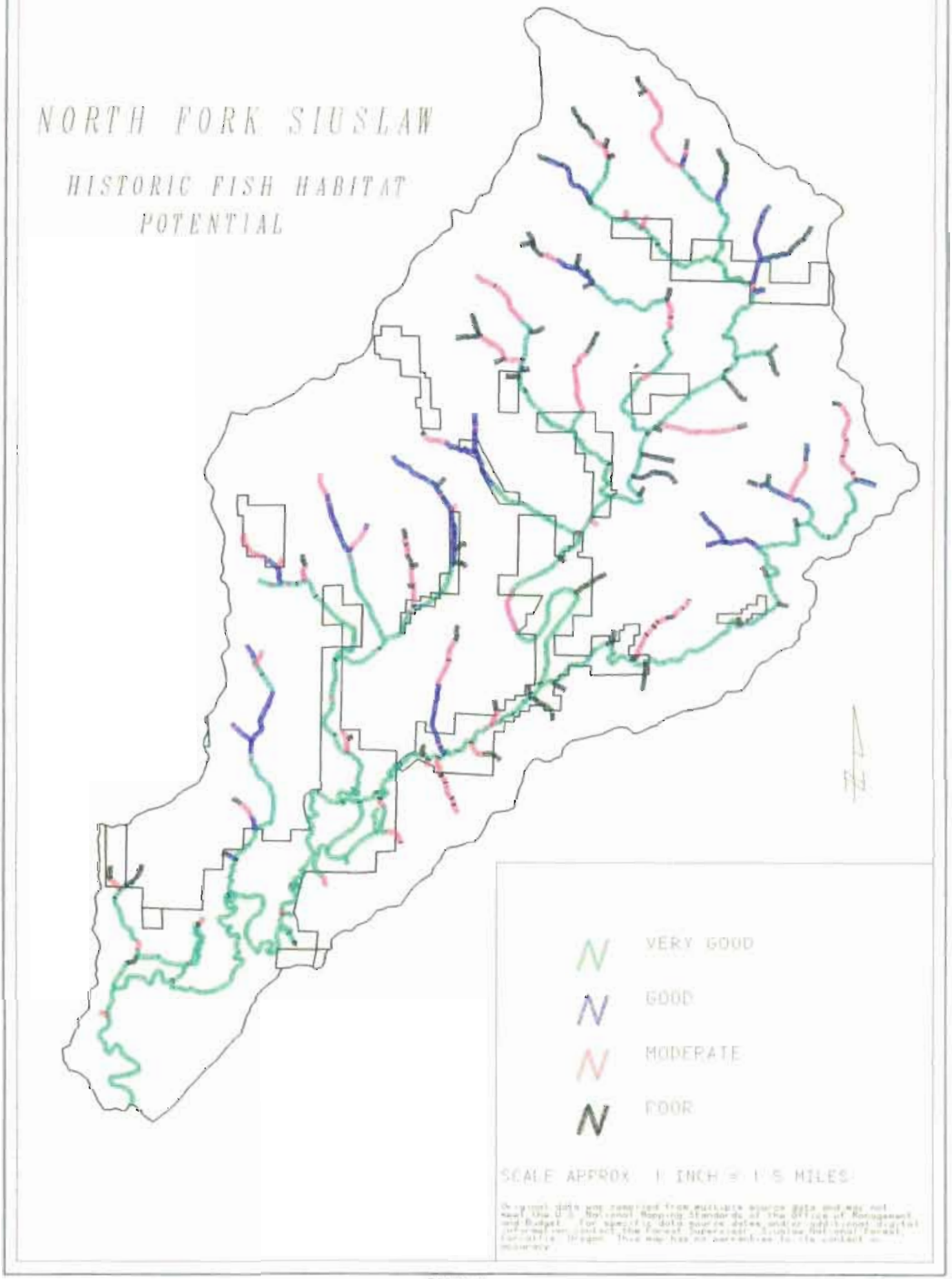
NORTH FORK SIUSLAW
HISTORIC FISH HABITAT
POTENTIAL
VERY GOOD
GOOD
MODERATE
POOR
SCALE APPROX. 1 INCH = 1.5 MILES

FIGURE 32

*Historical Alterations of Fish Habitat*

Fish habitat in the North Fork Siuslaw watershed has been altered substantially since European man first arrived in the mid-1800s. Some of the major activities which have occurred and changes which they have created are detailed below.

Much of the valley bottom land in the lower basin has been cleared for pasture lands and home sites. Many areas along the lower mainstem and the lower portion of the larger tributaries have been diked and large woody debris has been removed from stream channels to reduce flooding. Some channels, such as the lower portion of Condon Creek, have been excavated and straightened. These activities have substantially reduced the amount of active floodplain and have eliminated many of the productive flats, side channels, and seasonal refuge areas within the lower basin and the North Fork Siuslaw estuary. Changing the stream channel morphology and removing stream bank vegetation has increased channel scour, reduced bank stability, and increased sedimentation in these same areas. The number of large conifers that have the potential to fall into streams has been reduced substantially along most streams adjacent to developed pasture lands.

A number of areas were initially cleared and developed as homesteads in the late 1800s and early 1900s. These sites, which were primarily in flat valley bottom areas, were distributed throughout the valley and often extended up into the headwaters and tributary streams. Many of the initial homesteads failed and were abandoned. Without management or replanting, most abandoned pastures have reverted back into thick alder stands or brush patches. The initial clearing eliminated almost all of the large conifers which had a potential to fall into streams in these areas. The dense alder canopies which now exist preclude the establishment or growth of any new conifers which might provide future sources of large woody debris for adjacent streams.

Before roads were built in the watershed, stream channels served as the primary transportation network. Impassable log jams such as those reported by early explorers (Ogden, 1961), downed trees, snags, and logs were removed from the river to improve navigation.

Since that time, roads have been constructed along the North Fork from the mouth up to above Sam Creek and along the lower portions of McLeod Creek, Drew Creek, Condon Creek and other tributaries. Many of the roads are within 100 feet of the stream channels. In addition to increases in sediment and alterations in the drainage network which are detailed in the soil and water section, the physical presence of roads immediately adjacent to stream channels has substantially reduced the amount of riparian vegetation and the number of large conifers available to fall into the streams.

Streams within the North Fork watershed have played a key role in the logging industry. In the late 1800s and early 1900s, the most common practice was to work a stream donkey up into a tributary, fell the trees, yard them into the stream, and wait for high winter flows to carry the logs downstream to Florence. Existing woody debris and obstructions were removed from stream channels to facilitate the log drives. A splash dam near the mouth of Wilhelm Creek was used to help drive some of the logs. A second splash dam has been reported near the mouth of Porter Creek (Sedell and Duval, 1985). As late as 1954, logs were yarded down the lower portion of Billie Creek because a road was not available (ODFW internal communication, 1954).

Early timber harvest adjacent to streams and the associated log drives removed most of the existing large woody debris and obstructions from the lower river and larger tributaries. The masses of moving logs also scoured streambed materials and damaged stream banks and riparian areas.

Prior to the 1970s, few buffer strips were left along stream channels during timber harvest. Most of the large conifers adjacent to streams were removed. Merchantable trees, especially cedars, were often removed from stream channels as well. These practices substantially altered riparian vegetation and reduced or eliminated both the number of trees available to fall into streams and the amount of stable large woody debris within the streams.

Early logging practices also deposited large quantities of cull logs and slash into adjacent stream channels. This material often consolidated into log jams large enough and tight enough to became potential barriers to fish

migrations. Stream surveys in the mid 1950s on Billie, McLeod, Cedar, Drew, and Porter Creeks documented over 30 logging-related debris jams.

Numerous debris removal projects were implemented by private, state, and federal agencies in the late 1960s through the early 1980s to remove potentially harmful accumulations of logging debris and improve fish passage. Approximately 10.2 miles of streams within the North Fork watershed were cleaned by Forest Service crews alone. Because of the amount of slash in the streams, much of this work was needed. However, in many areas, these projects over-cleaned the stream channel and removed all of the wood, including all naturally occurring pieces. Removing the existing large stable pieces of wood from the streams simplified the systems by removing the obstructions which trapped gravels, created pools, and provided cover for fish.

Since 1987, the Forest Service, ODFW, and private individuals have attempted to improve fish habitat within the watershed by installing instream structures. Approximately 5.5 miles of stream have been treated to date. Early projects in the mainstem above the campground and portions of McLeod Creek generally involved placing log or rock weirs to create pools and trap spawning gravels in scoured bedrock stream channels. Recent instream structure projects in the mainstem and Condon Creek have focused more on restoring channel function and improving complexity and cover by installing multiple log complexes and log jams.

The Wilhelm Creek falls was modified in 1979 to improve fish passage over the barrier.

***Current Condition of Fish Habitat***

Coho salmon, steelhead trout, and cutthroat trout all require an abundance of cool, clear water, clean gravel for spawning, and large deep pools with an abundance of cover.

The current habitat condition for streams within the North Fork Siuslaw watershed was evaluated by comparing data from recent (1990-1994) stream surveys to four numerical habitat objectives. These included:

1. Pieces of large woody debris per mile
2. Percent of the stream in pools
3. Percent of the pools which were deep enough to provide overwinter habitat
4. Percent of the pools which had both depth and an abundance of cover

The numerical objectives represent desired values for optimal fish production. They were developed from a combination of current PacFish standards, State of Washington Timber, Fish and Wildlife standards, and results of recent research by the Oregon Department of Fish and Wildlife in the Oregon Coast Range. The values were variable and depended on both stream size and gradient. Habitat objectives and the range of values associated with a good, fair, or poor rating are shown in Table 2.

An overall rating of each stream segment was made by using the four numerical habitat objectives as well as any supplementary information available such as stream survey descriptions, composition of streambed materials, and presence of beaver ponds. The current condition of fish habitat for surveyed streams on National Forest lands is displayed in Figure 33. Detailed information on current fish habitat condition for each stream reach is included in Appendix K.

Fish habitat throughout the North Fork Siuslaw watershed is generally in fair to poor condition. It is far below the optimal production potential. None of the stream segments fully met all four habitat objectives. Only 11% of the streams met the objective for large woody debris. Thirty-two percent met the objective for amount of pools, but only 19% met the objective for adequate amounts of deep pool habitat. Less than 4% of the streams surveyed met the objective for pools with both depth and cover.

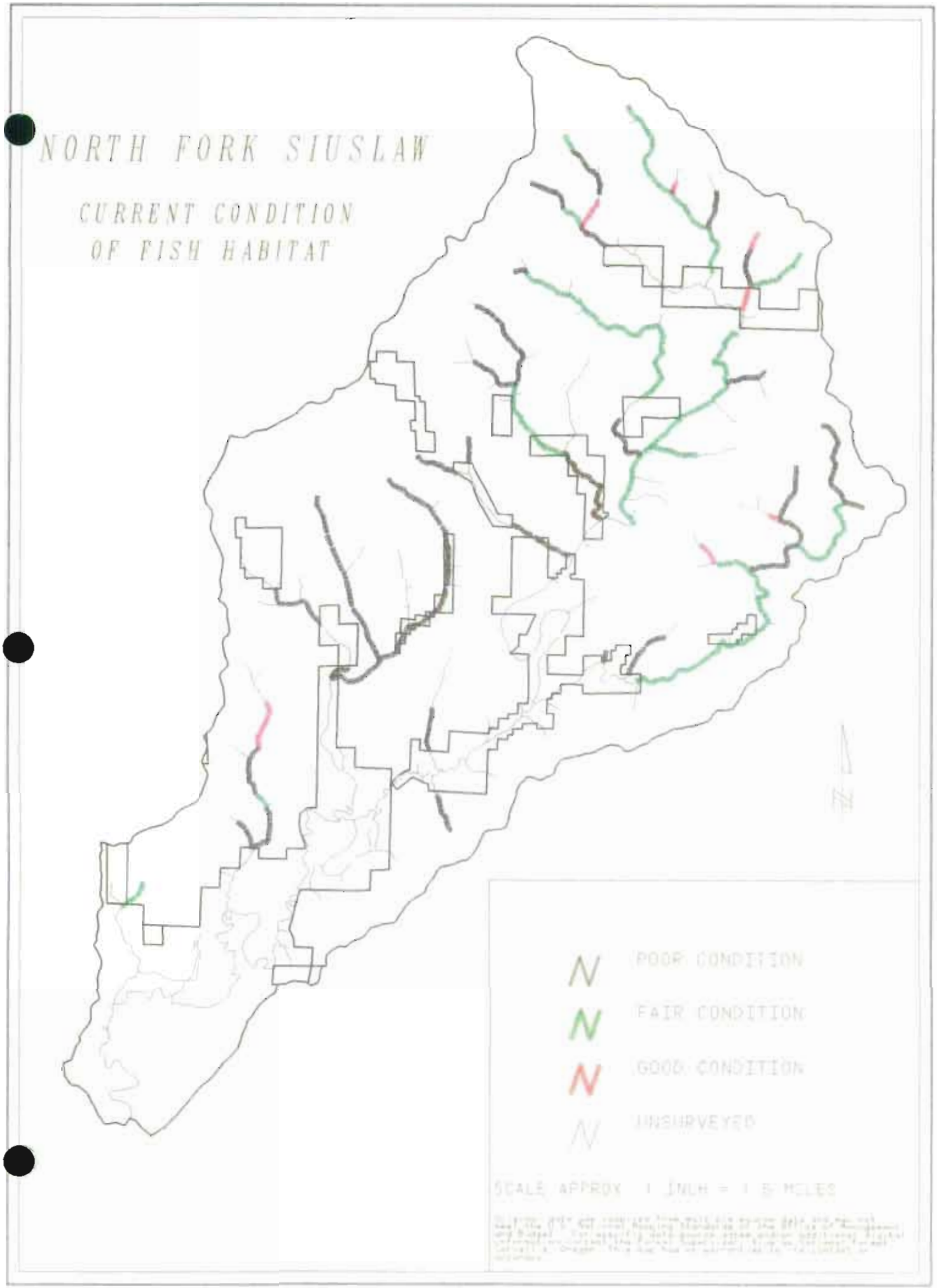
NORTH FORK SIUSLAW
CURRENT CONDITION
OF FISH HABITAT
N
POOR CONDITION
FAIR CONDITION
GOOD CONDITION
UNSURVEYED
SCALE APPROX 1 INCH = 1 5 MILES

FIGURE 33

Because of differences in management between federal and private ownerships, habitat conditions on unsurveyed private lands were assumed to be similar or poorer than habitat conditions on federal lands.

**Table 2.** Fish Habitat Objectives and Rating Criteria.

| FISH HABITAT | GOOD | FAIR | POOR |
|---|---|---|---|
| **Large Woody Debris Pieces per Mile** (Greater than 24 in. dia. and 50 ft. long) | 80 | 40-79 | <40 |
| **Percent of Stream in Pools** | | | |
| (0-2% Gradient Streams) | >55% | 40-55% | <40% |
| (2-5% Gradient Streams) | >40% | 30-40% | <30% |
| (>5% Gradient Streams) | >30% | 20-30% | <20% |
| **Percentage of Pools that are Deep Pools *** (No. of deep pools/total number of pools) | >20% | 10-20% | <10% |
| **Percentage of Pools that are Complex Pools**** (No. of complex pools/total number of pools) | >20% | 10-20% | <10% |

* For streams with an average width greater than 10 feet, deep pools have a maximum depth of at least 3 feet. For streams with an average width less than 10 feet, deep pools have a maximum depth of at least 1.5 feet.

** Complex pools are deep pools that have at least 3 pieces of woody debris (greater than 12 in. dia. and 25 ft. long) in them.

The primary problem with fish habitat in the North Fork Siuslaw watershed is a lack of complexity within the stream channels. There is a preponderance of long cobble or bedrock riffles and shallow, open pools with little large woody debris or cover. With few obstructions in the channels to dissipate stream energy, storm events generate high flow velocities capable of scouring smaller substrate materials and flushing small fish downstream. There are few large, deep pools or side channel areas in which fish can take refuge. Severe channel entrenchment along the lower mainstem and lower portions of the major tributaries exacerbates these problems by containing flood waters within the channels rather than allowing them to spread out onto the floodplains.

Much of the poor current fish habitat condition appears to be a direct result of removing existing large woody debris from stream channels as well as removing potential replacement sources of large woody debris from riparian zones. If human activities have not entirely caused the channel entrenchment, scoured bedrock substrates, and generally poor habitat conditions that we see today, they have certainly prevented the streams from shifting back towards a more productive habitat condition.

Existing large woody debris in stream channels will continue to decay and to get washed away by floods. In areas where potential sources of replacement large woody debris are available, fish habitat condition can be expected to remain stable or to improve over time. In areas where sources of replacement large woody debris have been removed or substantially reduced, habitat condition can be expected to remain poor or decline further.

Log and boulder instream structure projects have been successful at maintaining or improving fish habitat at several localized sites throughout the watershed. These are strictly short-term measures designed to fill the gap until sufficient numbers of large trees can grow in the riparian areas and begin falling into the stream. Limited access for heavy equipment, cost, and availability of construction materials preclude the use of instream structures throughout much of the watershed.

Substrate

The available stream survey information is not sufficient to actually quantify proportions of sand, gravel, cobble, and bedrock within each stream, but it gives strong indications that conditions are out of balance in several streams. More than a quarter of the stream segments appear to have extremely high amounts of sand in the substrate. The most consistent problems are in McLeod Creek, Morris Creek, Taylor Creek, Drew Creek, and

Porter Creek. The amount of surface area with a dominant substrate of sand ranged from 20% to 53 % in each of these streams. Comparisons between 1949-50 stream surveys and recent surveys also give strong indications that the amounts of sand in these sub-basins have increased substantially in recent years.

The amount of sand within stream channels should decrease over time. Changes in road construction techniques, retention of vegetative leave areas on steep slopes, and a reduction in both the number of new roads being built and timber units being harvested will all reduce human caused landslides within the watershed. This will reduce the amount of sediment carried into streams. Existing sand substrate will eventually be flushed downstream during flood events.

Portions of the North Fork Siuslaw River and McLeod, Morris, Billie, Condon, Wilhelm, Sam, and Porter Creeks all have relatively large amounts of scoured bedrock substrate. This is important because of the extensive nature of the bedrock substrate throughout the watershed and the extremely poor habitat which it generally provides. Almost a quarter of the stream segments which were surveyed on National Forest lands within the North Fork watershed had a dominant substrate of bedrock at least 20% of the time.

Extensive scoured bedrock substrates usually provide poor fish habitat. They generally have few pools and very little cover. They produce many fewer macroinvertebrates than a gravel or cobble riffle. Exposed bedrock substrates also tend to absorb solar radiation and increase stream temperatures during summer low flow conditions.

There is some evidence that amounts of bedrock have increased in portions of Condon and Porter Creeks between 1949 and 1992. This may be a reflection of a stream cleaning project which was completed in Porter Creek.

A reduction in the amount of bedrock substrate from 1949 to 1992 appears to be more common, especially in portions of Billie, McLeod, Uncle, and Condon Creeks. This probably reflects the increased sediment loads which appear to be present in these sub-basins.

The proportion of streams within the North Fork watershed which historically had a bedrock substrate is unknown. It likely varied substantially with changes in large woody material within the stream channel and changes in the sediment supply. Removing obstructions and wood from the stream channel, diking and straightening, and rafting logs have likely increased amounts of scoured bedrock substrate. They have at least prevented conditions from improving.

Stream Temperature

Stream temperatures have a strong influence on fish species composition, growth, disease resistance, and survival. The optimal range for summer water temperatures for anadromous fish in the North Fork watershed is 50 to 60 degrees F.

Stream temperatures are generally controlled by the amount of direct sunlight that hits the stream. The amount of sunlight, in turn, is controlled by the amount and type of riparian vegetation shading the stream. In the North Fork watershed, wide expanses of bedrock substrate which are exposed at summer low flows tend to increase the effect of sunlight be acting as a heat sink and transferring the heat to the water.

Summer water temperatures in the mainstem and the lower portions of the major tributaries have undoubtedly risen as streamside trees were removed to create pastures and home sites and riparian areas were logged. ODFW has expressed concerns about excessive summer stream temperatures in the lower North Fork (W.Beidler, personal communication). Bottom et al. (1985) have reported water temperatures as high as 87 degrees F in the mainstem Siuslaw River.

Water temperature data collected during recent stream surveys indicate that most streams on National Forest lands are well within the optimal range of temperatures. Most temperatures ranged from 55 to 60 degrees. The only

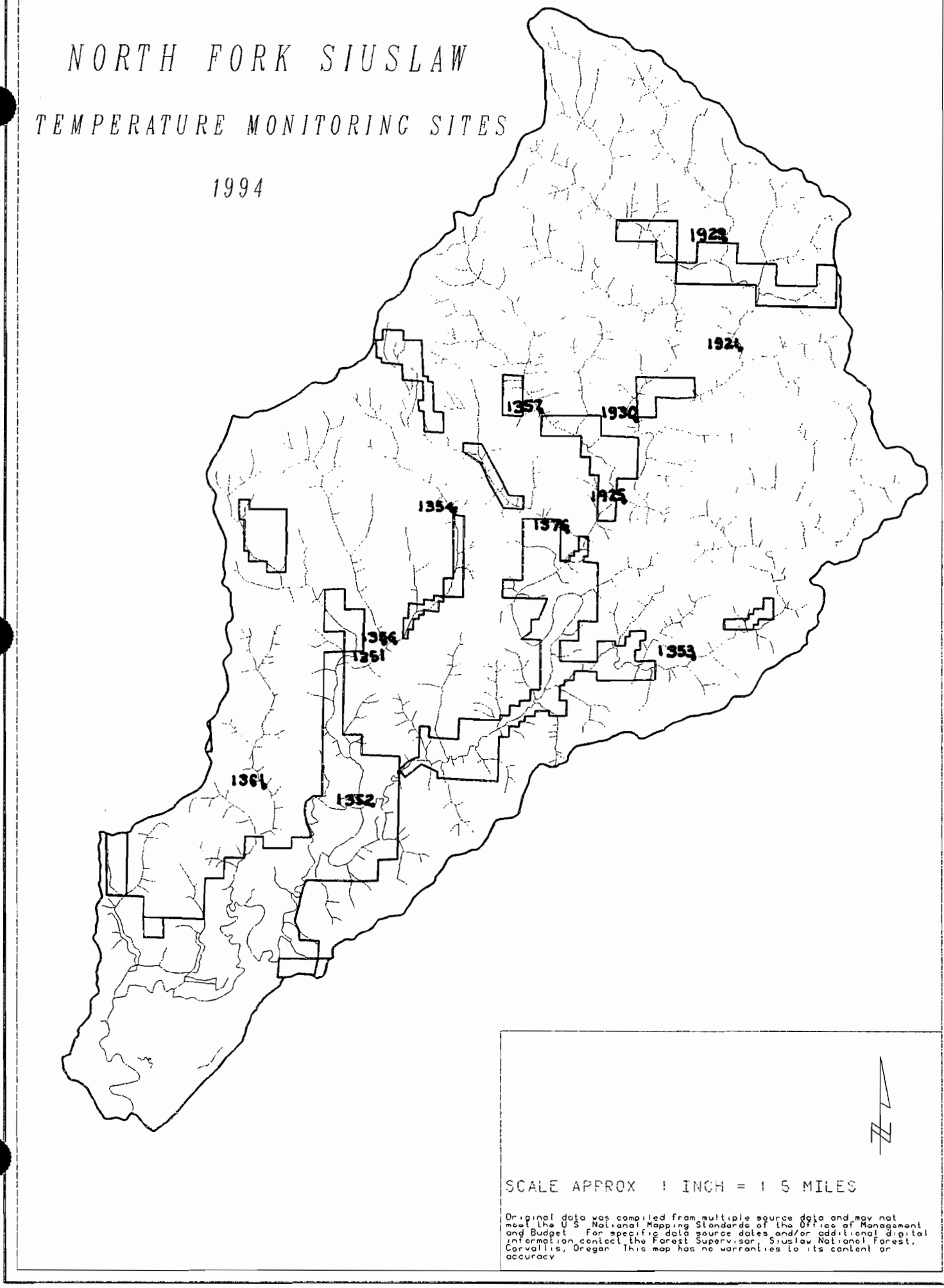
NORTH FORK SIUSLAW
TEMPERATURE MONITORING SITES
1994
1928
1924
1357
1930
1925
1354
1376
1386
1361
1353
1361
1352
SCALE APPROX 1 INCH = 1 5 MILES
Original data was compiled from multiple source data and may not meet the U S National Mapping Standards of the Office of Management and Budget For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon This map has no warranties to its content or accuracy

FIGURE 34

exception appears to be Wilhelm Creek, where summer temperatures were consistently above 60 degrees and went up as high as 65 degrees.

A temperature monitoring study was initiated in June 1994 to collect more detailed information on stream temperatures throughout the watershed, including the lower mainstem. Initial results will be available this fall or winter (Figure 34).

Potential Sources of Large Woody Debris for Streams

Large wood is delivered to stream channels by landslides, by falling from adjacent riparian areas, and by transport from upstream sites. To maintain optimal fish habitat conditions a relatively constant source of large trees is needed to replace the existing large woody debris in the channel as it decays or is carried away by floods.

Both the size and species of the potential large woody debris are important. Large trees are more desirable than small trees because they last longer, they are more effective at forming roughness elements and causing scour, and they are more likely to be of sufficient size to stabilize log jams and debris complexes.

Conifer trees are much more desirable as pieces of large woody debris than hardwoods because they last much longer. A typical alder tree will generally decay within several years after it dies and falls in a stream channel. A large cedar tree may last for centuries before it finally disintegrates (Andersen et al. 1978, Swanson et al. 1976).

As stated earlier, human activities have altered riparian vegetation and have substantially reduced potential sources of large woody debris. Conversion to pasture lands and home sites has removed potential sources of LWD. Homesteading, logging, and road building within riparian areas have shifted many areas from conifer or mixed conifer stands to dense alder thickets.

Approximately one quarter of the land adjacent to anadromous streams within the watershed has been converted to pasture or grass lands (Figure 35). Twenty percent of the areas adjacent to anadromous streams are pure alder stands. Only about 30% of the land adjacent to anadromous streams within the watershed currently supports a predominately conifer stand. Another 20% supports mixed hardwoods and conifers.

Landslides on high risk soils adjacent to stream channels provide a substantial amount of large woody debris to stream channels in the Coast Range. Timber harvest has removed a substantial portion of this source. Designating vegetative leave areas on steep unstable headwalls within harvest units should help maintain potential sources of large wood for streams on National Forest lands.

Most existing large woody material within stream channels appears to be relatively old. This material will continue to decay and get washed away by floods. The current fish habitat condition and the amount of riparian area which has been altered suggests that the remaining sources of potential large woody debris are not sufficient to either maintain or improve fish habitat in the immediate future. This is especially true in the lower portion of the basin adjacent to pasture lands.

This situation will improve somewhat as young conifers in plantations and landslide prone areas grow large enough to act as sources of debris. Recent efforts to reestablish conifers in alder dominated riparian areas will improve sources in localized areas. Basin-wide improvements in fish habitat or riparian condition are not likely without an intensive broad-scale effort to manipulate riparian vegetation.

**Future Trends of Fish Habitat**

Without substantial changes in riparian management on private lands and a large-scale habitat improvement program on Federal lands, fish habitat within the North Fork Siuslaw will remain in the current degraded condition for the forseeable future. Existing large woody debris in stream channels will continue to decay and to

get washed away by floods. In areas where potential sources of replacement large woody debris are available, fish habitat condition will remain stable or improve over time. In the large number of areas where sources of replacement large woody debris have been removed or substantially reduced, habitat condition will remain poor or decline further. This is especially true in the lower portion of the basin adjacent to pasture lands.

Fish habitat conditions in the upper basin will improve somewhat as young conifers in plantations and landslide prone areas grow large enough to act as sources of debris. Recent efforts to reestablish conifers in alder dominated riparian areas will improve sources in localized areas.

The amount of sand within stream channels should decrease over time as the number of human-caused landslides decreases and the existing fines are flushed through the system. However, additional road-related slides are likely unless road stabilization projects are implemented. New debris torrents would seriously degrade or obliterate existing habitat in drainages where they occur. At best, new landslides would retard recovery in these streams.

Under current management, summer stream temperatures in the upper mainstem and tributaries adjacent to managed stands will likely decrease somewhat as the riparian vegetation grows up and provides additional shade. Riparian conifers which have already been planted will provide additional shade in some localized areas. These minor changes will be unlikely to effect temperatures further down in the mainstem. Stream temperatures will likely remain high on the lower mainstem where the North Fork flows through sections of private pasture land.

## THE TERRESTRIAL ECOSYSTEM

Like the aquatic ecosystem, the terrestrial ecosystem is an ever dynamic product of both the physical and biological processes. Not only does it interact with the aquatic ecosystem, but it is interacted upon by the later. This interaction between the terrestrial and aquatic is emphasized here within the coastal rain forests where much of the forest occurs within what we define as riparian areas. One does not have to travel far to find a flowing stream. What ever happens up the hill will soon be felt within the streams.

Both the terrestrial and aquatic ecosystems are interconnected and function together to create a larger part of the North Fork Siuslaw's ecosystem. This larger ecosystem includes man. Man has had a role within this ecosystem for approximately the last 10,000 years. As part of the ecosystem, man has effected changes upon it. However, and as a result of increasing populations, increasing demands on natural resources and recent technological advances made in the last few decades, our effects are larger today than they have ever been. It is difficult to predict what the ultimate consequences these changes may have in a ecosystem which has been functioning for so long in the absence of modern man's impacts.

History is full of many examples from which to learn. This is true for the North Fork Siuslaw's history also. Within the last century, we have caused the local extinction or near extinction of various local wildlife species and their habitats. If we do not try to learn from these events and adjust our harvesting strategy of natural resources accordingly, we may eventually lose a vital piece of the puzzle we call the ecosystem. The days of viewing the forests as an unlimited cornucopia of resources is over. We need to adjust our harvests to levels sustainable over the long run.

### Vegetation Patterns

The forests of the Pacific Coast coniferous forest ecosystem (of which the North Fork Siuslaw is part) have been called the most luxuriant and productive vegetation in the world (FNA, 1993). They produce some of the largest and longest-lived representatives for several different conifer species (Franklin, 1979). Some other distinctive characteristics of this ecosystem that separate this forest from other forests are the dominance of coniferous trees within it, the massive organic accumulations, and its productivity and growth patterns (Franklin, 1979). The vegetation within the North Fork of the Siuslaw was divided into seven broad habitat types based on stand age,

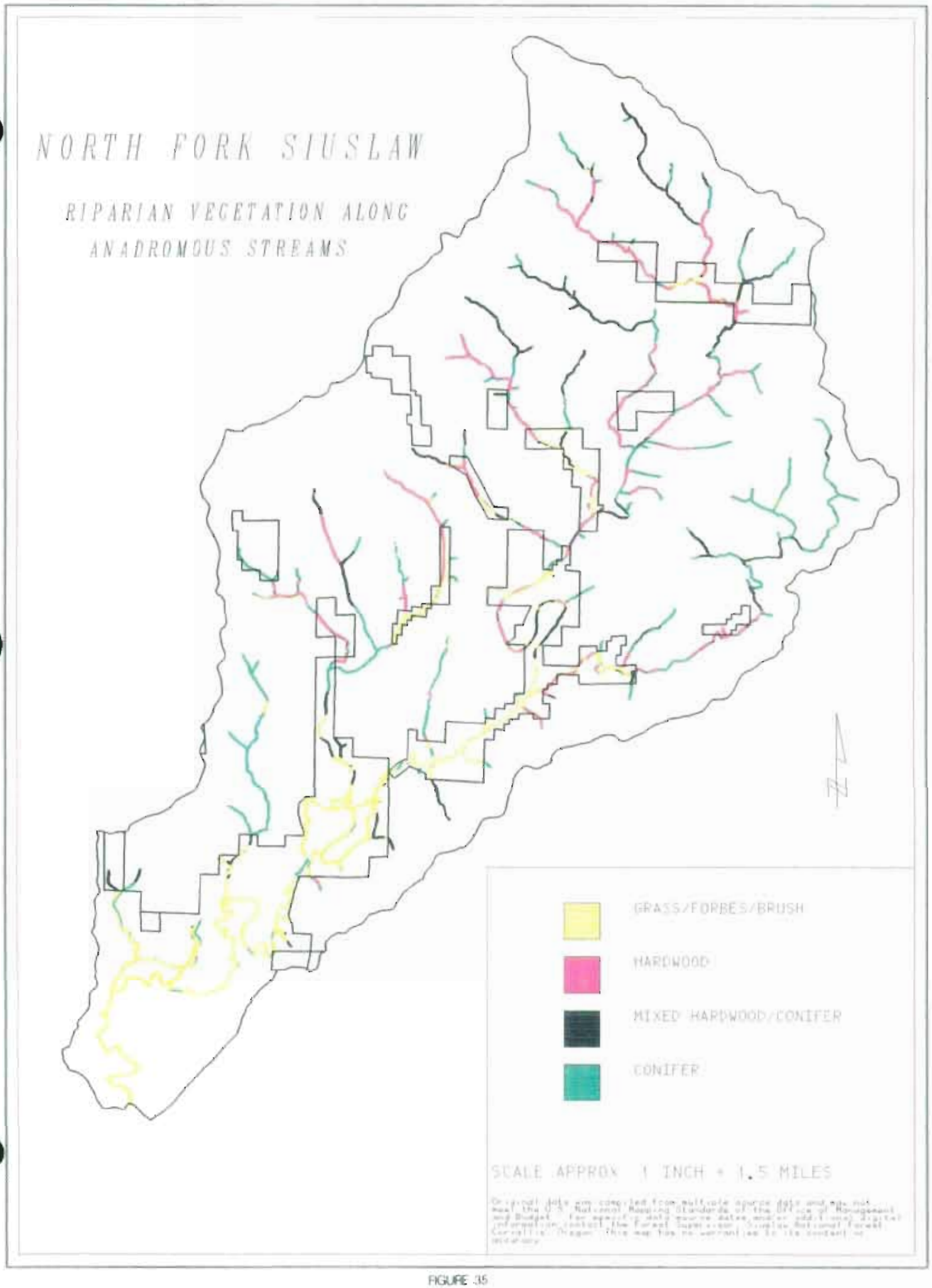
NORTH FORK SIUSLAW
RIPARIAN VEGETATION ALONG
ANADROMOUS STREAMS
N
GRASS/FORBES/BRUSH
HARDWOOD
MIXED HARDWOOD/CONIFER
CONIFER
SCALE APPROX 1 INCH = 1.5 MILES

FIGURE 35

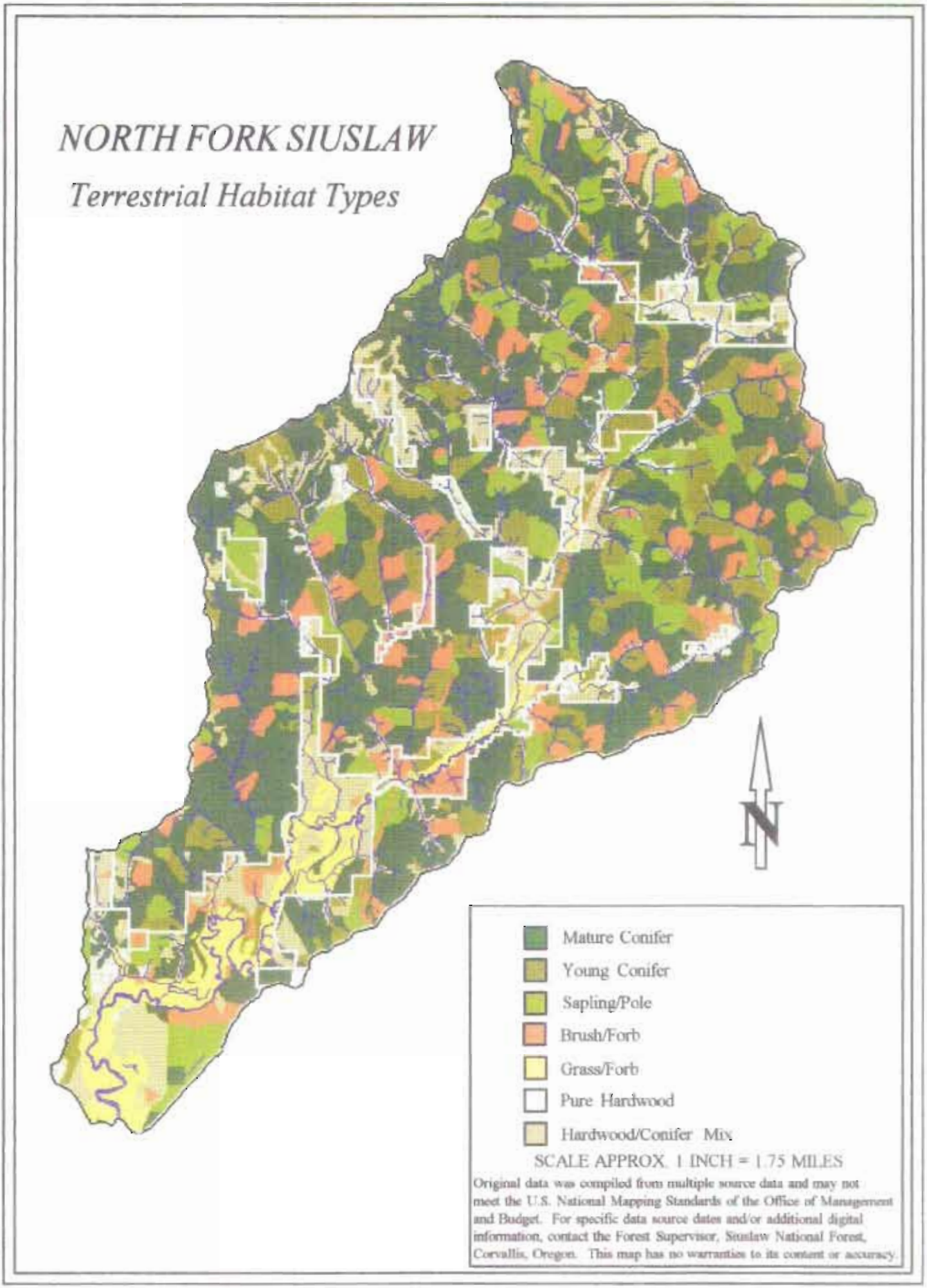
NORTH FORK SIUSLAW
Terrestrial Habitat Types
N
Mature Conifer
Young Conifer
Sapling/Pole
Brush/Forb
Grass/Forb
Pure Hardwood
Hardwood/Conifer Mix
SCALE APPROX. 1 INCH = 1.75 MILES
Original data was compiled from multiple source data and may not meet the U.S. National Mapping Standards of the Office of Management and Budget. For specific data source dates and/or additional digital information, contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon. This map has no warranties to its content or accuracy.

Figure 36

structure and species composition. These habitat types are shown in Figure 36 and discussed in detail in Appendix N. Wildlife relationships to these habitat types are shown in Appendix L.

**Vegetation and Wildlife**

Vegetation and wildlife are closely intertwined. To estimate wildlife population compositions and abundance it is useful to first determine the condition of the vegetation within the area. Vegetation provides the structure and food base necessary to support these creatures. It is a product of the climate, soils, topography, and disturbance regime. It changes through time, and changes in wildlife populations are directly related to changes in the vegetation structure and composition of an area. Figure 37 shows the relationship between habitat conditions and wildlife populations for species closely associated to various seral conditions and how they can fluctuate through time.

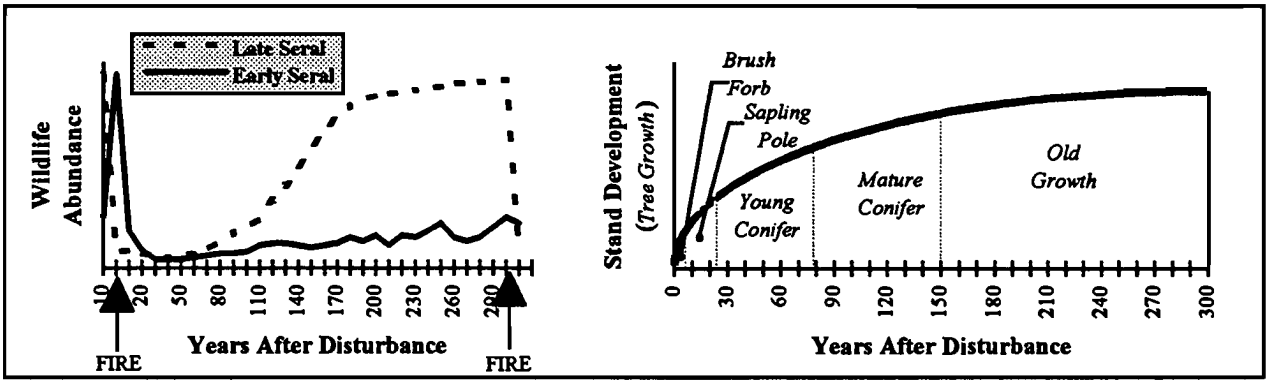


**Figure 37.** The graph on the right shows a typical forest stand development pattern for this area after a stand replacing disturbance. The graph on the left shows an example of two different guilds of wildlife species (late seral and early seral preferring species) and how they change over time as a result of disturbances in the landscape.

Note the rapid decline in late seral preferring species (e.g.,northern spotted owl) abundance immediately following the disturbance. The population remains low, perhaps surviving in some of the larger blocks of older forest left after the fire, until approximately 80 years after the fire when the second-growth begins to reach conditions which allow the re-expansion of this guild of species until it eventually reaches its pre-disturbance level. The cycle repeats itself at various intervals, but what is important is that after each disturbance there remained enough suitable habitat to allow that species to survive until conditions allowed it to once again expand its range. The same phenomenon occurs for each different guild of species, causing their levels to increase and decrease in any one location through time. The system is always changing and never static for periods exceeding hundreds of years. Each guild fluctuates differently, as indicated by the early seral line, because of growth and ecological succession patterns associated with each different habitat type. Certain species have adapted to exist in a wide variety of conditions. Fluctuations in local vegetation structure have little to no effect on these species which we commonly refer to as generalists. Appendix L lists the several different guilds of wildlife species which inhabit this area along with a map of their respective habitats.

***The Physical Processes***

An important thing to remember about the vegetation of this area (and all areas for that matter) is that it is continually changing in both time and space. These changes can occur slowly over many hundreds to thousands of years or abruptly (Figure 37) in response to some catastrophic disturbance. An example of a slow change would be the effect that changes in the global climate have on the distribution and composition of vegetation throughout the world.

There are many theories as to the causes for global climate change. One theory, posed by Milutin Milankovitch in 1941, hypothesized that variations in the earth's orbit around the sun caused cyclic variations in the earth's climate (Milankovitch cycles). Through time, these variations resulted in the expansion and contraction of the polar ice caps. The average life span of a glacial period (ice age) was approximately 90,000 years. The interglacial periods

usually lasted for about 15,000 years. Pollen records and other studies have shown that the forests have expanded and contracted across the landscape over time in response to those climate changes.

Approximately 18,000 years ago one of two vast continental ice sheets extended from Alaska, through British Columbia and down into North America as far south as northern Washington, Idaho and Montana. During that ice age the ocean level was approximately 300 feet lower than it is today. This area lay within the Pacific coastal plain and was not forested but more like tundra covered with subalpine vegetation including grass/forbs, sedges and a few scattered Sitka spruce and lodgepole pine (FNA, 1993).

Global temperatures began to slowly rise about 17,000 years ago and then, about 12,000 years ago, there occurred substantial melting of the ice as global temperatures dramatically increased. Small, isolated patches of trees grew into forests of red alder, Sitka spruce, western hemlock, and lodgepole pine. As temperatures continued to increase, this area experienced some of its hottest summers between 7,000 to 10,000 years ago. In this area, this resulted in an increase in drought tolerant species such as Douglas-fir and red alder forming the forests that we see today. It also had the effect of increasing the frequency of forest fires.

Fire, over the last 10,000 years, has played a major role in shaping the vegetational characteristics of this area. These fires burned very intensely due to the long term accumulations of fuel (dead wood and organic material) on the forest floor associated with older stands (Figure 38). The intensity was usually enough to kill most of the trees in the stand. In some areas, however, the fire burned less intensely allowing some of the trees to survive. Fire scars are still visible on several of the remnant old growth trees within this watershed. These surviving trees are usually located in wetter areas such as riparian areas and northern facing slopes. Some areas were left completely unburned.

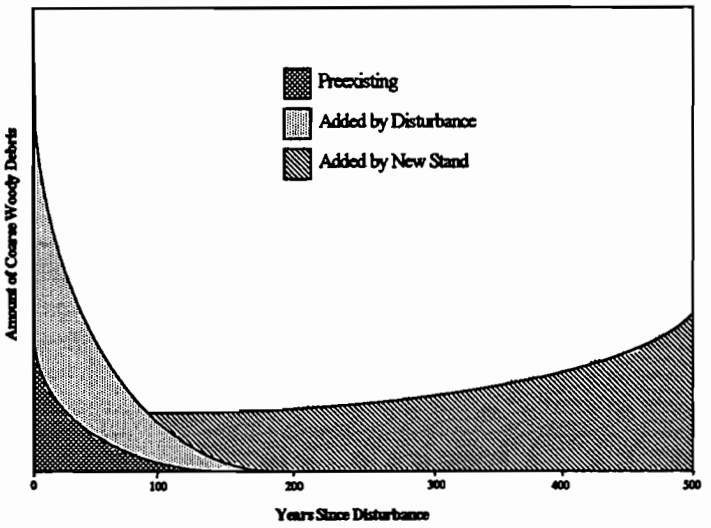


**Figure 38.** Changes in the amount of dead wood levels (snag and logs) through time after a large forest fire (from Agee and Huff, 1987).

These stand replacing fires occurred, on the average, every 300 years (Jane Kertis, personal comm.). In their wakes they left a mosaic of large patches of burned areas and unburned areas (Figure 39) scattered throughout the Coast Range. Within the larger patches of burned areas small clumps of the pre-existing forest remained.

After these fires passed, ecological succession became the dominant force shaping the landscape. Basically, for the first 1-3 years the area would be dominated by grass and annual forbs (forb species usually dominated). Brush and red alder intermixed with young conifer saplings quickly took over and covered these openings. Sometimes these brushy conditions set the stage for reburns but eventually and usually within 30-50 years the burned areas were covered with stands of young conifer approximately 15 inches in diameter and 40-120 feet high. The Forest was well on its way to recovery. Within 80-100 years the stands contained trees that were 20-40 inches in diameter and at 150 years (depending on the site specific conditions) the characteristics of old growth forests began to show themselves. Within 200 years the mature conifer forest was rapidly obtaining the characteristics of an old growth forest.

Climate, fire and ecological succession are not the only forces that shape the landscape. Although these forces shape the landscape on broader scales, many other processes occur which help shape the area to a finer texture. Some of these processes are wind, floods, earthquakes, insects and disease.

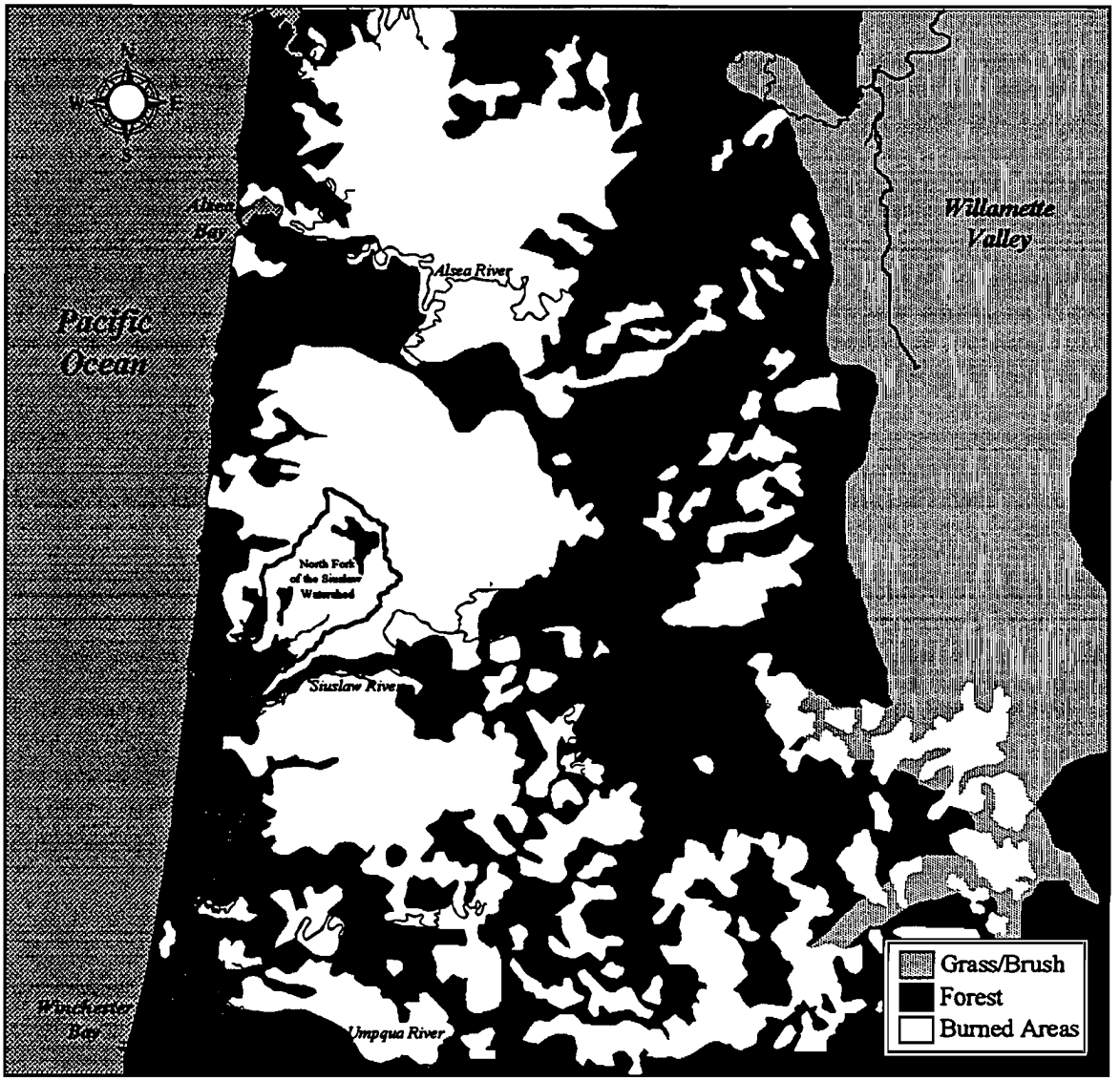


**Figure 39.** Fire history of the general area surrounding the North Fork of the Siuslaw Watershed showing the extent of the Umpqua Fire in 1846. Total acres burned by this fire was estimated at 450,000. Mapping was based on data from Teensma and updated with mapping done in 1900 and 1936.

Within the Sitka spruce zone, wind actually becomes the dominant force in shaping the landscape (Agee, 1993). That is not to say that fires do not occur in this area for they certainly do, however, the moister climate make this occurrence more infrequent. The most recent major wind storm to have occurred in this area was the Columbus Day storm of 1962. This windstorm caused much blowdown of local timber stands and resulted in a dramatic increase in salvage sale operations within this watershed and the forest. Each year, because of strong winds, small gaps are created in the forest canopy as the storms pass through and blow down trees.

Insects occasionally cause large amounts of mortality but often follow other events that kill the trees first (Maser et al. 1988). Diseases, such as laminated root rot (*Phellinus werii*) usually only kill small pockets of trees (1/4 acre) and are relatively common in Douglas-fir forests. Both insects and disease also make trees more susceptible to blowdown.

Ecological succession within these smaller openings (caused by wind, insects or disease) is different from that in burned areas. Instead of killing all of the understory vegetation, these disturbances create small gaps in the forest canopy benefiting the shade tolerant understory species and providing sunlight for the growth of grass, forb and

shrub species. In addition, they provided valuable wildlife habitat by creating snags, placing logs on the ground and increasing stand structure and species diversity. All of this makes these gaps (and the stands they are in) more desirable places for wildlife species to inhabit or utilize. These smaller types of disturbance are mostly associated with older forests and are principle factors in the development of old growth characteristics.

Three other forces, not yet discussed but which occur in this area and shape the landscape, are flooding, landslides and earthquakes. The first two occur relatively frequently and at varying magnitudes. The third, earthquakes, are estimated to occur approximately every 300 years in this area. The effects of these forces are mainly seen in the riparian zones and steeper slopes (tsunamis resulting from earthquakes would effect landscape dynamics within the tidewater areas of the watershed). The increased frequency of disturbances within riparian areas gives them distinctly different vegetational characteristics than those of upslope areas. Riparian areas can be considered to be the most constantly changing or dynamic areas within the watershed.

Flood events, debris torrents and the constant movement of the stream channel through time keep things changing within the flood plain on a more frequent basis than in upslope areas. This constantly pushes back the ecological clock and maintains the percentages of early seral species such as red alder, salmonberry and thimbleberry higher in riparian areas than in upslope areas.

Over time, and in the absence of any disturbances, the adjacent coniferous forest slowly encroaches upon the riparian area. These happens as large conifers fall or blow over into the riparian zone providing openings in the riparian brush, potentially releasing shade tolerant, understory conifer but more likely by providing seed beds (nurse logs) for conifer species such as hemlock and spruce. The larger the tree, the better it is for establishing riparian conifer. This is because the larger the tree's diameter the higher the seed bed is from the ground's surface (in some cases, above the brush canopy) and therefore, more light reaches the tree seedlings which establish themselves on the log. Secondly, the larger the tree is the rougher the bark (especially true for Douglas-fir and Sitka spruce) and therefore, more organic material and seeds are retained (Sollins, 1981). Given enough time, conifer can dominate the riparian zone (usually about 50 years after a disturbance if dead logs or remnant trees were left).

***Historical Conditions***

Up until this point we have described the major processes that shape the coastal conifer forest ecosystem over a broad perspective. Now let's take a closer look at the North Fork of the Siuslaw watershed.

In the fall of 1826, a young botanist from England by the name of David Douglas (for whom the tree, squirrel and county are named after) was guided from Vancouver, Washington to the mouth of the Umpqua River (20 miles south of the North Fork Siuslaw watershed) by Alexander McLeod, a trapper with the Hudson Bay Company. In his journals Douglas describes the people, country, vegetation and wildlife he encountered along the way. His descriptions of the Willamette Valley support the theory that the indigenous people of the area used fire to manage the vegetation and wildlife. He comments on the pain caused to his feet resulting from miles of walking on burned stumps of stiff grasses and brush. There is evidence that these fires were set annually in the fall and would keep much of the area in an open grass/forb condition as they killed tree seedlings and smaller trees. In fact,large areas adjacent to the Willamette Valley and historical Native American villages which are now forested were once covered with grass, forbs and brush. The only areas in the valley that seemed to escape the fire were areas adjacent to streams and rivers. These riparian areas were referred to as "woody rivulets" by Douglas. Douglas' party commonly made camp in these areas..."Camped on the side of a low woody stream in the centre of a small plain -- which, like the whole of the country I have passed through, is burned." (October 1826).

On October 16, 1826 (and heading in a westerly direction) they left the valley and entered the Coast Range forest... "Passed two miles of open hilly country...entered the thick woods.". In the forest they found their path frequently blocked by fallen logs... "Mr. McLeod and I took the lead...hewing the branches down that obstructed the horses from passing...numerous fallen trees, some of which measured 240 feet long and 8 feet in diameter..." covered the forest floor (at this point they were approximately 30 miles from the ocean). Some of Douglas' other descriptions of the countryside attest to the great amount of wood which occurred in the streams as they neared the coast. He

also makes mention of passing small, open, grassy areas or "small rich plains" along the river bottoms. Eventually, Douglas made his way to the mouth of the Umpqua River.

Some of the wildlife seen by Douglas and company, such as the Columbian white-tailed deer (now extirpated), the Columbian black-tailed deer and the Roosevelt elk, became their main course for dinner. He also makes mention of grizzly bear (which occurred mainly within the Willamette Valley) and in one instance a fellow named John Kennedy, a member of their company, almost became this animal's dinner. Observations were also made of the California Condor, a species which, along with the grizzly bear, is no longer to be found in western Oregon. One interesting observation Douglas made was on the use of a snare made from the woven fibers of the Oregon iris (*Iris tenax*). The Native Americans who lived just south of here once used this snare, which was "no thicker than the little finger", to capture elk and deer.

The North Fork of the Siuslaw, indeed the majority of the Siuslaw National Forest, remained forested with large conifer old growth until 1846. This was the year the Umpqua fire burned 450,000 acres, including about 75% of the North Fork of the Siuslaw watershed. The cause of this fire is unknown and may have been the result of a dry year and a lighting strike or it may have been caused by man (Indigenous or European). As mentioned earlier, not all of the North Fork burned. Records from land surveys and homestead records as well as maps from 1900 (Thompson, 1900) and 1936 (Andrews, 1936) were used to estimate the historical condition of the vegetation within the analysis area after this major fire. As of the turn of the century most of this area was forested in young conifer and mixed deciduous with dense patches of brush species. Large amounts of dead wood were present throughout the area. As of 1936 the majority of this area was dominantly forested in 20-40 inch diameter second-growth Douglas-fir.

Remnant patches and individual trees from the pre-existing forest were to be found throughout the watershed. There were two major pockets of the pre-existing forest which were located in the northern and western portions of the watershed as shown in Figure 46. Our best estimate indicates that these remnant pockets contained approximately 4,000 acres of old growth conifer (approximately 10% of the watershed). A homestead record dated from 1913 describes a portion of one of these stands located along the mainstem of the North Fork of the Siuslaw River just downstream from Deadman Creek. It describes the land as being "rough and steep" and forested with decadent timber from 200-300 years old, "...they being left from a once heavy stand that was destroyed by fire several years ago". Based on this information we can assume that the pre-existing forest had developed after an earlier major fire sometime around the end of seventeenth century.

We know from early settlement records that wildlife was abundant back then. This included waterfowl, big game (deer and elk), furbearers and other sorts. Fur trapping and market hunting were common practices. One of the most commonly trapped furbearers, at least until the 1940's, was muskrat (Warren Vanderburg, personal communication). Mink were also trapped as well as beaver, marten, river otter and raccoon.

The North Fork Siuslaw lies within the coastal strip and humid division of the Transition Life Zone of Oregon as mapped out by Vernon Bailey in 1935 (USDA Bureau of Biological Survey). The coastal strip is the equivalent to the Sitka Spruce vegetation zone. Some animals closely associated with this zone are the wrentit, song sparrow, pocket gophers (*Thomomys* spp.), sea otters and the Yaquina shrew. Bailey lists the Roosevelt elk, Columbian black-tailed deer, Columbian white-tailed deer, brush rabbit, Douglas' squirrel, dusky wood rat and white-footed vole as some of the characteristic mammals of the humid transition zone.

The Columbian white-tailed deer (now only found near the mouth of the Columbia River) was common from the Columbia River south to the mouth of the Umpqua River, where the black-tailed deer became the dominant deer species (Bailey, 1936). This deer was commonly called the "flag-tail" by early settlers and was closely associated with swampy lowlands. David Douglas noted that this species of deer was closely associated with brushy areas in the lowlands (salmonberry). By 1915 there were very few deer of this species left in this area. Bailey (1936) reports that only a few remained in the swampy areas west of Eugene (known as the Long Tom Swamp). The gray wolf (*Canis lupus*) was another species common prior to European settlement (Bailey, 1936). By 1913, they were uncommon in the Coast Range and only thirty wolves were killed for bounties that year in the State of Oregon (none from this area).

*Historical Alteration of Conditions*

As mentioned earlier, riparian areas are very dynamic. Anecdotal records from early settlers in this area describe these areas as brushy with scattered large conifer. Most of the lower portion of the North Fork Siuslaw River, especially in the tidewater areas, was swampy and braided. This area was undoubtedly exceptional habitat for waterfowl species and the Columbian white-tailed deer. Much of the large conifer within the lower portions of the watersheds riparian areas were felled for building materials or to clear the land. The river was diked and flood gates installed. Wetlands were pumped and converted into agricultural areas for grazing and farming. The development of wetlands is probably the main cause for the extirpation of the white-tailed deer from this area. Other wetland species (both plant and animal) were also adversely effected.

Other forms of land development went on. As discussed earlier, timber harvesting began in the late 1800's and has continued to this date. The first impacts were felt primarily in riparian areas where steam donkeys could traverse to the easily accessible timber. The initial focus was on old growth and large trees. Then as technology increased, harvesting began to occur in previously inaccessible areas. Roads were cut to increase access for timber harvesting. Fire frequency in the watershed increased and several backfires were set in 1911 during and exceptionally dry year to protect private land holdings from a potential forest fire (currently, man caused fires are the most common source of ignition in this area and have increased due to accessibility).

The introduction of European man also meant the introduction of non-native plant species. These plants were brought over from other continents (knowingly or unknowingly) and were used for agriculture or ornamental purposes. Some of these plants responded well to the exceptional growing conditions in this area. Ornamental shrubs such as scotch broom rapidly expanded its range and can currently be found throughout the watershed. Tansy ragwort is thought to have been introduced and spread through the process of logging. Many of these plants, now referred to as noxious weeds, are aggressive invader species and can quickly dominate over the existing native flora. This can cause serious impacts to the local landscape -- it interferes with natural ecological succession and adversely impacts wildlife populations which have evolved in this area to rely on the native plant species, for food or other purposes, which are now being replaced by non-natives. Appendix M summarizes botanical surveys that were conducted within the riparian areas of the Key Watersheds in 1994 to map out noxious weed populations along with sensitive plant populations..

*Current Conditions*

Excluding the Dunes National Recreation Area, the Siuslaw National Forest covers approximately 590,700 acres. Out of that approximately 34% has been harvested over the last 50 years. The following table summarizes the stand conditions across the Siuslaw National Forest:

**Table 3.** Stand Conditions across the Siuslaw National Forest (from the forest vegetation GIS database as of September 1994).

| DISTRICT | Mature Conifer | % | Harvested | % | Non-Forested | % |
|---|---|---|---|---|---|---|
| Alsea | 63,638 ac | 59 | 43,565 ac | 40 | 1,495 ac | 1 |
| Hebo | 94,807 ac | 65 | 47,844 ac | 33 | 4,200 ac | 3 |
| Mapleton | 131,205 ac | 66 | 63,194 ac | 32 | 4,337 ac | 2 |
| Waldport | 87,701 ac | 64 | 45,926 ac | 34 | 2,760 ac | 2 |

Mature and Over-Mature survey (MOMS) mapping performed on multi-layered stands in 1988 showed that out of 131,203 acres of mature conifer on the Mapleton Ranger District, approximately 18% had multi-layered characteristics. This was higher than on any other district and equated to twice as much area as that of the next highest district (Alsea at 10,032 acres). It appears that the steeper, harsher terrain of the Mapleton Ranger District provides overall more opportunities for the stands to differentiate. The dryer, steeper sites on the Forest show the most microsite variation and would also have a wider variety of plants present. It will be interesting to see if this hypothesis holds up after the Forest installs plots to verify natural stand structure.

Currently, the watershed has been heavily harvested. Approximately 35% of the mature conifer habitat has been clearcut in the last 40-50 years. The following figure breaks down this harvest by decade.

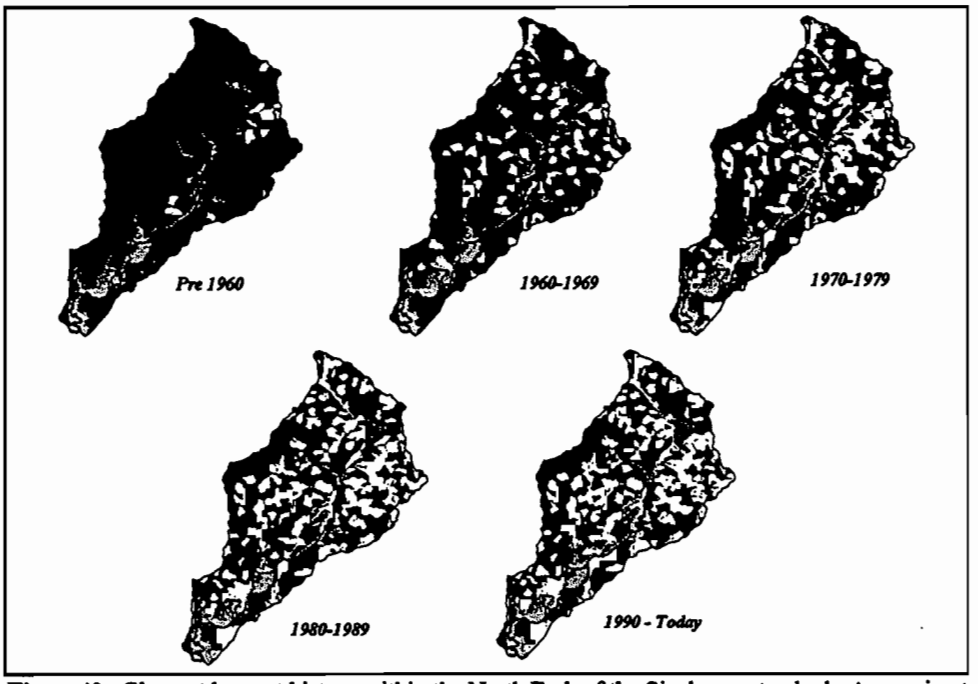


**Figure40.** Clearcut harvest history within the North Fork of the Siuslaw watershed. Approximately 13,500 acres have been clearcut harvested since 1942. Note the concentration of harvest units prior to 1960 in the remnant old growth patch which survived the 1846 fire.

Clearcut harvest units have been scattered across the entire watershed and have resulted in severe fragmentation of the natural landscape. Figure 41 shows the extent of this fragmentation and relates it to remaining interior habitat. Interior habitat is defined as that portion of a mature conifer or old growth stand that is far enough away from the edge of the stand as to not be affected in any way by it. Interior habitat is important to survival of several of the native wildlife species that have evolved in this area.

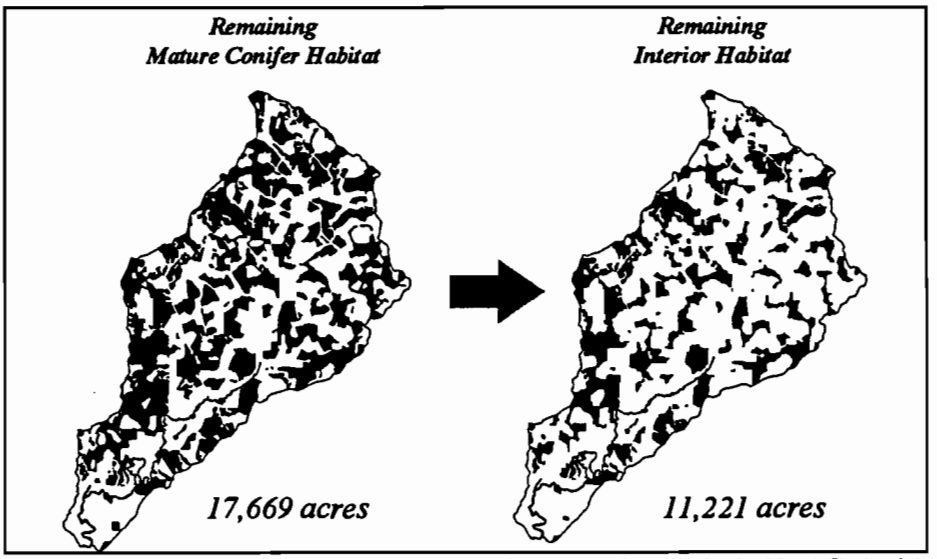


**Figure 41.** Remaining mature conifer habitat and interior habitat within the North Fork of the Siuslaw watershed. Edge effect was assumed to be minimal along mature/young conifer edges.

Fragmentation creates edges; these edges can affect the microclimates within the portions of the remaining mature conifer stand that are near the edge. They also attract predatory species (raptors, crows, ravens and jays), therefore increasing predation on species that prefer interior habitat. This two-fold effect can severely affect the ability of these species to survive in this habitat. Fragmentation indices suggest that the Lower North Fork is the most fragmented subwatershed in the entire North Fork Siuslaw watershed. This condition likely existed prior to the arrival of white settlers as this subwatershed is bisected by a broad flood plain and has historically contained the least amount of mature conifer which was interspersed within wetland habitats, brush and hardwood stands. Natural conditions for mature conifer stands within this subwatershed were probably always fragmented. For this reason, the most fragmented subwatershed (as compared to natural conditions) would be the Cataract subwatershed, the least fragmented being Morris. The following table compares the fragmentation between subwatersheds for both remaining mature conifer and interior habitats. Each subwatershed was ranked from 1-12 (1 = Least Fragmented, 12 = Most Fragmented) based on a combination of fragmentation indices (refer to Appendix T for methodology).

**Table 4.** Fragmentation analysis results for remaining mature conifer habitat and interior habitat (Mature Conifer / Interior) within the North Fork Siuslaw watershed. Techniques used are described in Ripple et al. (1989) and Lehmkuhl and Raphael (1993). The ranking values indicate degree of overall fragmentation in each subwatershed.

| SUBWATERSHED NAME | Habitat Remaining (%) | Diversity Index | Base Index | Frag Index | Patch Density (n/km$^2$) | Mean Patch Size (ha) | Overall Rank |
|---|---|---|---|---|---|---|---|
| Billie | 50 / 36 | 5.5 / 5.5 | 1.8 | 3.1 / 3.1 | 1.2 / 1.3 | 43 / 30 | 4 |
| Cataract | 28 / 13 | 6.2 / 4.9 | 1.9 | 3.4 / 2.6 | 1.2 / 1.1 | 24 / 13 | 11 |
| Drew | 40 / 27 | 5.4 / 6.4 | 1.5 | 3.7 / 4.4 | 1.6 / 1.8 | 25 / 16 | 7 |
| Elma | 49 / 37 | 6.7 / 7.3 | 1.7 | 4.1 / 4.4 | 1.5 / 1.5 | 33 / 25 | 3 |
| L. North Fork | 20 / 12 | 6.1 / 6.6 | 1.3 | 4.7 / 5.1 | 1.5 / 1.5 | 14 / 8 | 12 |
| McLeod | 47 / 25 | 6.8 / 7.5 | 1.5 | 4.6 / 5.2 | 0.5 / 0.7 | 90 / 38 | 8 |
| Morris | 70 / 55 | 3.2 / 4.1 | 1.4 | 2.3 / 2.9 | 0.1 / 0.4 | 641 / 227 | 1 |
| Porter | 40 / 23 | 5.2 / 5.4 | 1.6 | 3.3 / 3.4 | 1.4 / 1.3 | 28 / 20 | 9 |
| Russell | 37 / 25 | 7.1 / 7.5 | 1.7 | 4.1 / 4.3 | 0.7 / 0.8 | 51 / 32 | 10 |
| Sam | 53 / 26 | 5.4 / 6.2 | 1.5 | 3.7 / 4.2 | 0.8 / 1.5 | 66 / 19 | 6 |
| Uncle | 46 / 30 | 7.1 / 8.6 | 1.3 | 5.3 / 6.5 | 1.1 / 1.3 | 40 / 26 | 5 |
| Wilhelm | 53 / 37 | 6.0 / 6.2 | 1.5 | 4.1 / 4.3 | 1.1 / 1.4 | 47 / 31 | 2 |

In addition to this clearcut harvesting, other types of timber harvesting have occurred to remove habitat or components of suitable habitat. The major types of other harvesting that have occurred in this area are the historical logging of creek bottoms (for which records are scarce), partial cutting, salvage sales, commercial thinning and cedar sales. Figure 42 and 43 show the distribution and amount of some of these other harvesting activities (records were only found for federal land).

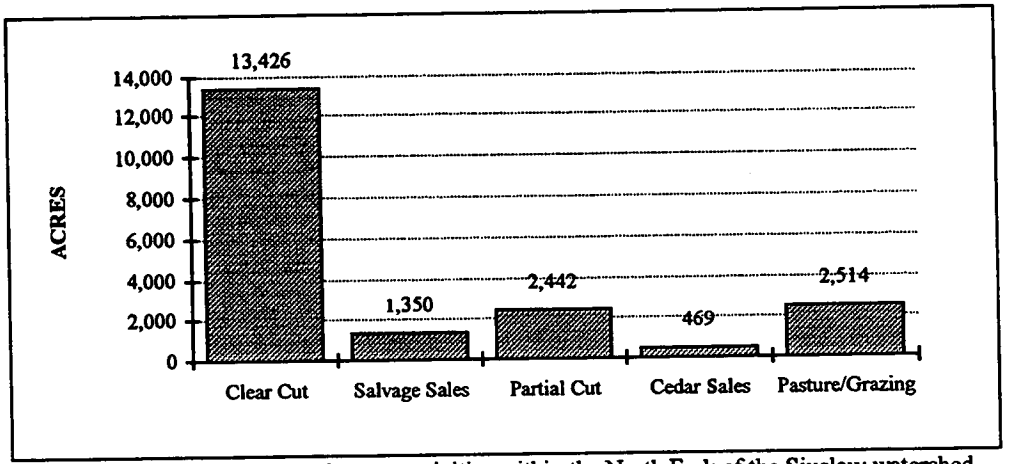


**Figure 42.** Summary of timber harvest activities within the North Fork of the Siuslaw watershed since the mid 1950's. Pasture land acres are shown to represent non-forested area.

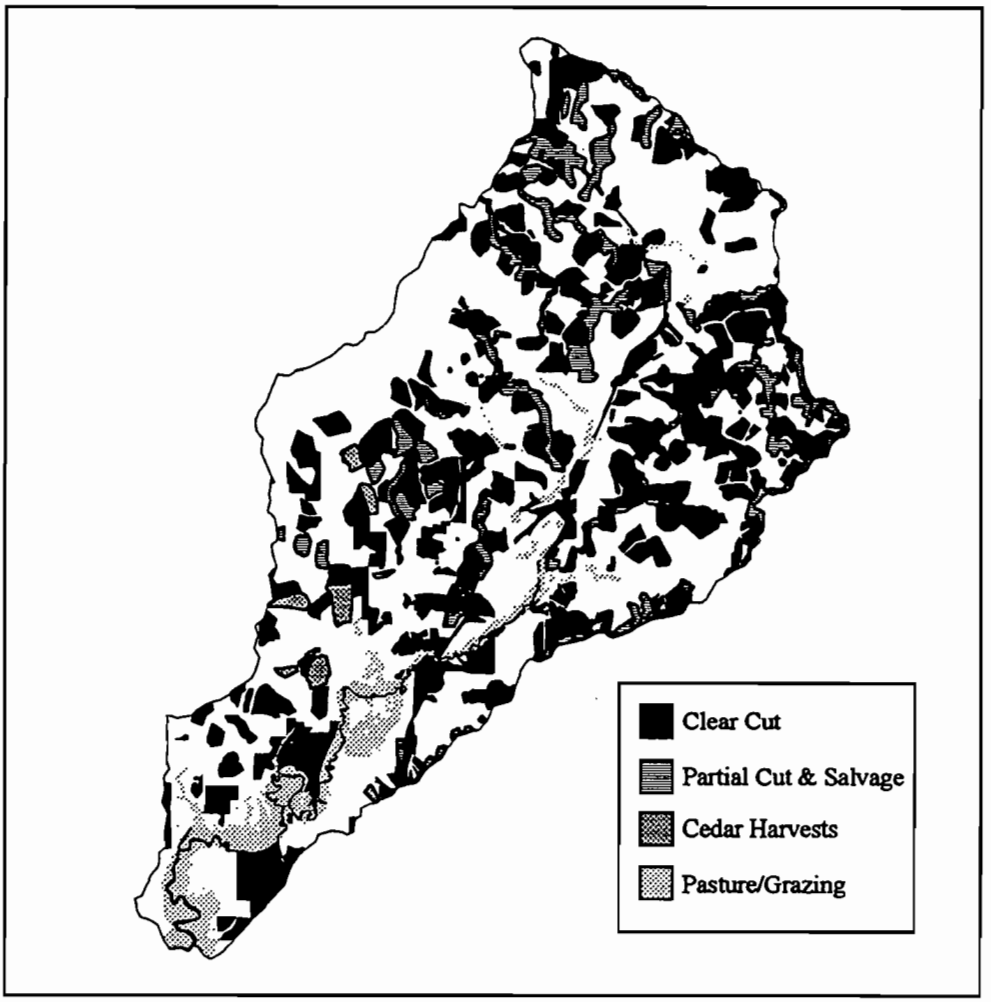


**Figure 43.** Current status of management history of the North Fork of the Siuslaw watershed. Early 20th century harvest of timber in riparian areas not shown due to lack of data.

Through timber harvesting, we have altered or removed several components of the natural ecosystem. Some of the missing pieces are obvious as seen in an aerial photo. Other pieces are less obvious as they occur beneath the forest canopy. Three major effects (other than fragmentation) that timber harvesting has had on vegetation and wildlife habitat within this watershed over the last few decades are:

1. Reducing structural diversity of forest stands
2. Reducing species diversity of forest stands
3. Removal of dead or dying woody material

These three effects are obvious in clearcuts where all of the merchantable timber and most of the large, dead woody material was removed. Most of these units were usually planted with a single species of tree (mainly Douglas-fir) genetically selected for its growth potential to produce more merchantable material as soon as possible. The stand was planted at unnaturally high densities to allow for mortality of some of the trees. Eventually it was thinned to release the healthier, least deformed and most merchantable trees and allow them to grow faster. Basically, the result was to convert a naturally functioning forest stand into a tree farm. These same effects also occurred in partial cut areas where the highest priority was to remove all dead and down trees. Specifically, those trees that were dead, blown down, beetle-killed or snapped off. Second priority went to high risk trees, or trees that would not live for much longer due to insects, disease, wind damage and so on. Priority number three went to the removal of intermediate or suppressed crown classes (understory trees). Priority number four was to remove

overstory trees of poor form (merchantability). And finally, all snags over 15 feet high and 12 inches in diameter were removed.

Diversity in the structure and species composition of a stand is strongly related to wildlife utilization of that stand. Species richness, or the number of species present in an area, shares a directly proportional relationship with these stand attributes. Figures 1 and 2 in Appendix L show this relationship for wildlife species within this area. The habitat type having the lowest species diversity is young conifer. These figures also show the importance of hardwood components in this ecosystem. Hardwoods are important to several species of neotropical migratory birds and certain mammals such as the white-footed vole. They also provide an excellent source of forage for several insect species, which in turn provide an excellent food base for larger wildlife species. Most hardwood habitat is associated with the riparian area. Figure 44 shows the current breakdown of riparian vegetation within a 100-foot strip extending out from both sides of all streams within the watershed.

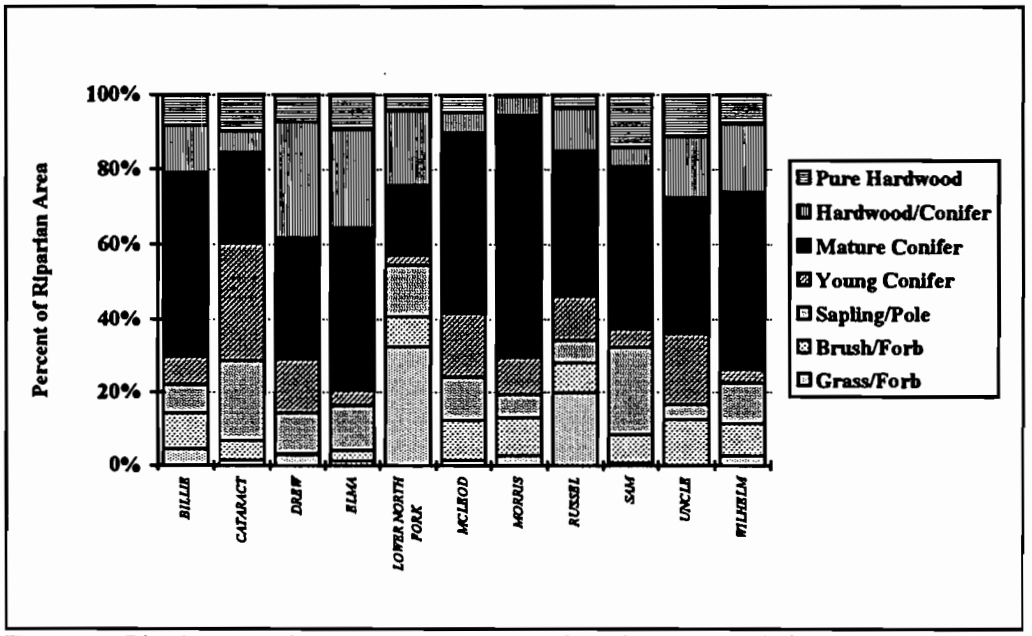


**Figure 44.** Riparian vegetation breakdown along a 200-foot-wide corridor within each subwatershed's riparian area as of September 1994.

These percentages vary from figures shown in the fish habitat section in levels of mature conifer and indicate that the upper reaches of the stream system (the headwaters that do not contain fish) are more densely forested in conifer. Also, current levels of hardwood-dominated or pure hardwood stands are probably somewhat higher than they would be naturally for this point in time (considering the 1846 fire). Best estimates, using neighboring watersheds in the Tenmile/Cummins Complex (Rock and Cummins) and old aerial photographs, indicate that the hardwood component should probably be somewhere around 10% for each subwatershed. Currently, Drew and Elma have the highest percentage of this habitat type.

Dead wood, in the form of snags or logs, also adds to the forest's structure and diversity. It provides important feeding, hiding and reproductive habitats for many wildlife species (see Table 17 in Appendix L) and also plays a vital role within the ecosystem by providing a nutrient continuum through time. Dead wood is a part of the nutrient cycle and returns vital nutrients to the soil as it decays. Each time a tree, log or snag is removed from the area, important minerals and nutrients are also removed. When a tree is left on the ground, it should be looked at as an investment in the future of the ecosystem and not as a loss of revenue.

The soil in this watershed is some of the most productive in the world. It evolved over many thousands of years through the weathering and mineralization of the parent bedrock and the recycling of organic materials. It is unknown if short rotation harvesting can have an adverse effect on the local soil fertility, but recent studies have indicated that after several rotations of timber harvesting in Central Europe, they are now beginning to be see a

decrease in the soil productivity (Maser et al., 1988). The following figures show current log and snag densities throughout the Siuslaw National Forest. It must be kept in mind that these log and snag densities vary greatly from stand to stand and these figures only represent the results of one sampling regime.

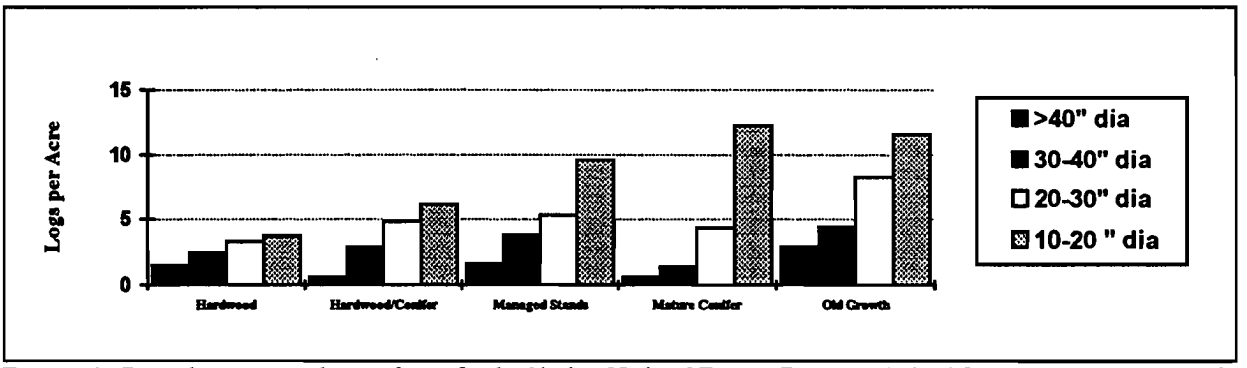


**Figure 45.** Down logs per acre by stand type for the Siuslaw National Forest. Data was derived from 1987 Managed Stand Surveys (MSS), 1987 Vegetation Resource Surveys (VRS), and 1990 Vegetation Structure Exams (VSE). This summary is only for logs greater than 10 inches in diameter and longer than 20 feet (no distinction is made between decay classes).

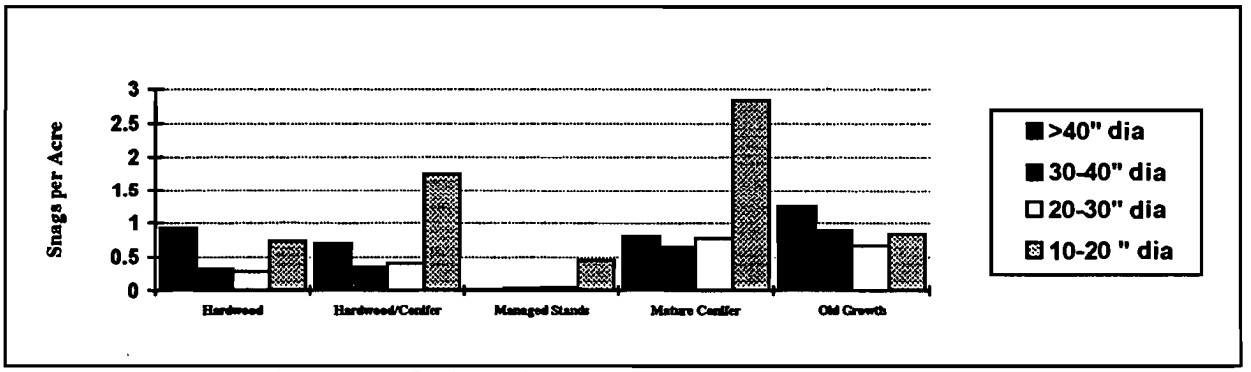


**Figure 46.** Snags per acre by stand type for the Siuslaw National Forest. Data was derived from 1987 Managed Stand Surveys (MSS), 1987 Vegetation Resource Surveys (VRS), and 1990 Vegetation Structure Exams (VSE). This summary is only for snags greater than 10 inches in diameter and taller than 20 feet (no distinction is made between decay classes).

As far as revenues and commodities go, in total, approximately 13,500 acres have been clearcut over the last half-century (11,034 acres on federal lands). Assuming that past regeneration harvesting ranged between 60-80 MBF/acre (net) (Pat Barnes, Mapleton Check Cruiser), this equates to a volume of between 810-1,080 MMBF (662-883 MMBF from federal lands) which has been harvested over the last half century. This estimated volume coming off the slopes of North Fork Siuslaw watershed does not include partial harvests, salvage harvests and commercial thinnings. Past commercial thinnings are shown below:

| NAME | YEAR | AC |
|---|---|---|
| Roger's Pole | 1975 | 15 acres |
| 3 Buttes Thinning | 1984 | 11 acres |
| Cataract Thinning | 1991 | 53 acres |

There is currently one sold, but not harvested, commercial thinning within the watershed (McLeod Landscape Thinning - 5 units @ 106 acres).

All of the clearcut harvest units on federal lands have been replanted with conifer. Over the years, tree spacing has widened out in managed stands. Early efforts at eight-foot spacing (680 trees per acre) have been replaced with later management goals of ten-foot initial spacing (435 trees per acre). If an average of 435 trees per acre have been planted, then a conservative estimate of seedlings planted in the North Fork basin is 4.8 million trees (plus up to 10% more for replants).

*The Future*

If timber harvesting had not taken place in this watershed the habitat breakdown within it would probably be similar to that mapped in 1936.

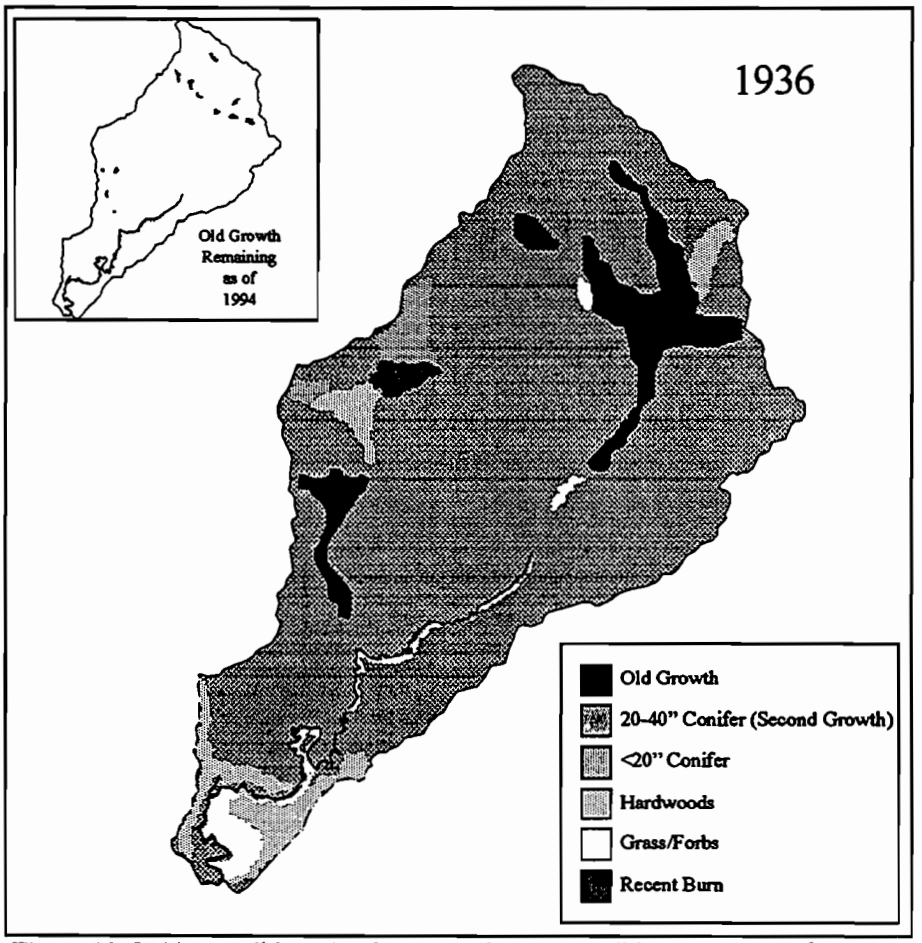


**Figure 47.** Habitat conditions showing past and present conditions of remnant old growth forest within the North Fork of the Siuslaw watershed. Vegetation mapping was performed using a USDA forest map dated 1936 and current knowledge of remnant old growth patch locations.

Most of the second-growth Douglas-fir stands would be beginning to show signs of an old growth forest. However, this is not the case. Projecting out 100 years into the future, given the past management activities and current management directions,we can expect the watershed to look like the following estimation in Figure 48.

These two pictures are relatively similar in appearance. The major difference would be in the structure of the late successional forest. Whereas, the majority of the watershed would be in old growth conditions in the first scenario, within 100 years, today's mature conifer stands within the LSR (approximately 15,000 acres) would be in old growth conditions. Today's managed stands (8,375 acres) would range from 100-150 years old and would be in mature conifer conditions with some stands beginning to obtain old growth characteristics. The center and eastern tip of the watershed would contain some recently harvested units and a mix of age classes. The majority of the riparian areas would be in conifer-dominated conditions.

Current management direction should allow us to maintain viable populations of late successional preferring species within this watershed. These species would be concentrated within Late Successional Reserves (LSR). Riparian reserves would allow movement of these species through the Matrix area.

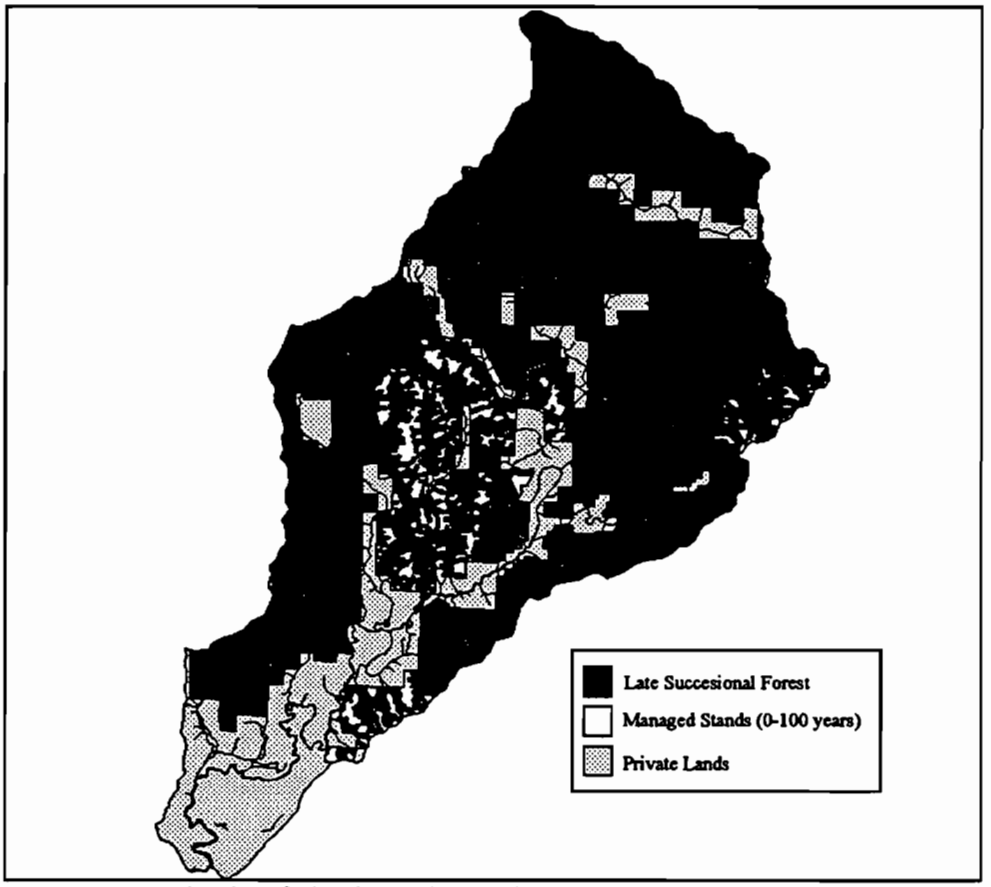


**Figure 48.** An estimation of what the North Fork Siuslaw watershed will look like by the year 2094, assuming current management direction.

Most early seral preferring species can be expected to decline in numbers locally with their declining habitat. Pockets of early seral habitat will most likely be concentrated on private lands and within the Matrix allocation of public lands. Smaller pockets of early seral habitat will also occur within the small natural gaps created by ecological forces (or through management) within the LSR. It is currently unknown how large the population changes will be. Some species, such as the elk, may shift to other habitat types and maintain viable self-sustaining populations (although at lower numbers than those occurring today). Overall, resulting wildlife populations will more closely resemble natural levels.

**Roosevelt Elk**

Archeological investigations of coastal Indian village shell middens have shown that elk have existed in this area for at least the last few thousand years. The Roosevelt Elk is one of two sub-species of elk native to the state of Oregon and currently resides (in part) within the North Fork of the Siuslaw watershed. Its range extends east to the western slopes of the Cascade Range, where it begins to overlap with the other sub-species, the Rocky Mountain elk (Figure 49).

The earliest written record of this animal in the Oregon Coast was made by Lewis and Clark in 1805. While establishing their winter camp, now known as Fort Clatstop, they were informed about large herds of elk to the south by the local Native Americans. Over the winter their company harvested 131 elk and 20 deer for food and leather.

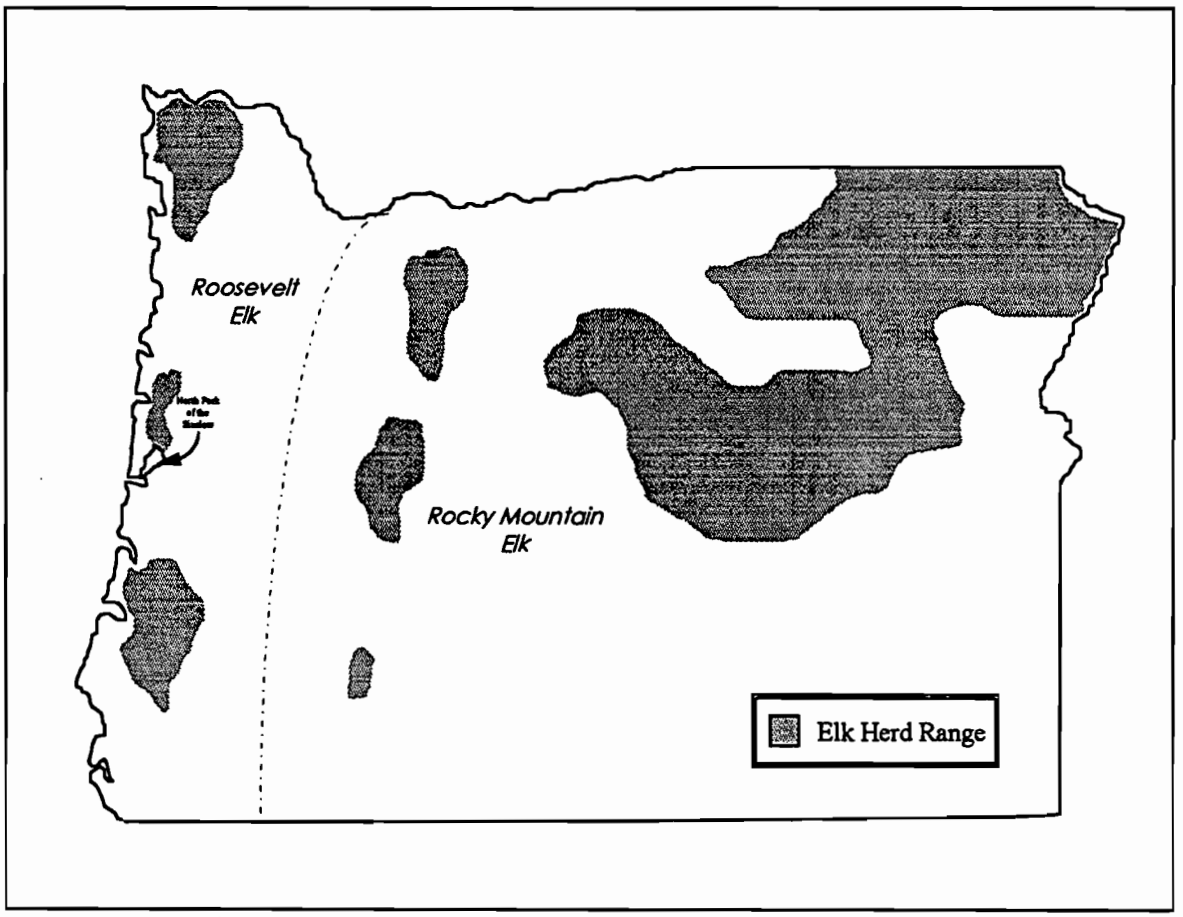


**Figure 49.** Distribution and historic elk herd ranges in the state of Oregon as of 1946.

In 1826 David Douglas mentions the existence of herds of elk in the Willamette Valley and the coastal forest approximately 20 miles south of here. Again in the 1820's, a trapper by the name of Jedediah Smith (for whom the Smith River is named) reported numerous elk along the coastlands between northern California and the Columbia River.

Elk were plentiful in this area until the late 1890's. The fact that they were plentiful both before and after the 1846 Umpqua fire suggests that this species had evolved to successfully live in both old growth habitat as well as early seral habitat. Elk in general are considered to be primarily grazers, but the Roosevelt elk is noted for its utilization of browse species. This may be an adaptation to vegetation conditions in the Coast Range. No hard numbers exist to allow us to compare pre and post-fire populations. Recent studies have shown that available forage increases after a clearcut and burn, then quickly decreases to near background levels within about five years. In intensely managed stands, forage levels almost drop to zero as canopy closure reaches 100%. Figure 50 shows forage changes after a clearcut or fire.

Elk populations may have followed this trend where numbers increased shortly after a disturbance and then fell slightly to rebuild as the canopy opened up and old growth habitat was formed. Cyclic fluctuations in population numbers is a trend common to all natural wildlife populations and usually follows trends in food supply, whether it be plant or animal. Ultimately, the fluctuations are linked to fluctuations in the habitat/vegetation conditions of the area.

Extreme reductions in elk populations, both local and nationwide, were brought about by the settlement of European man, the resulting changes in habitat and the advent of market hunting. Historical records for the North Fork area talk about the practice of market hunting elk and deer in the 1890's where it is stated that at least one of the local settlers, "Frank Condon sold elk and deer hides and teeth...shipped them to San Francisco". Elk were

also shot because they were seen as competition to grazing cattle and as a food source. As of 1907, two of the six sub-species of elk native to North America had become extinct (Merriam and Eastern Elk). The Roosevelt Elk was not far from extinction either. Across the nation, only about 41,000 elk could be counted that year. In this area elk were reported as "very scarce" within the Siuslaw National Forest (Bailey,1936; Maser, 1981). In 1914, only 48 head were counted within Lane County. Their numbers increased slowly as a direct result of protecting local populations. This was accomplished through the illegalization of market hunting in 1899, the closure of the hunting season in 1909 and the establishment of the Grassy Mountain Game Reservation just north of here. As of 1929 the population within the Siuslaw National Forest was estimated to be 279 head. By 1932 the forest's population had increased to 390 Roosevelt elk.

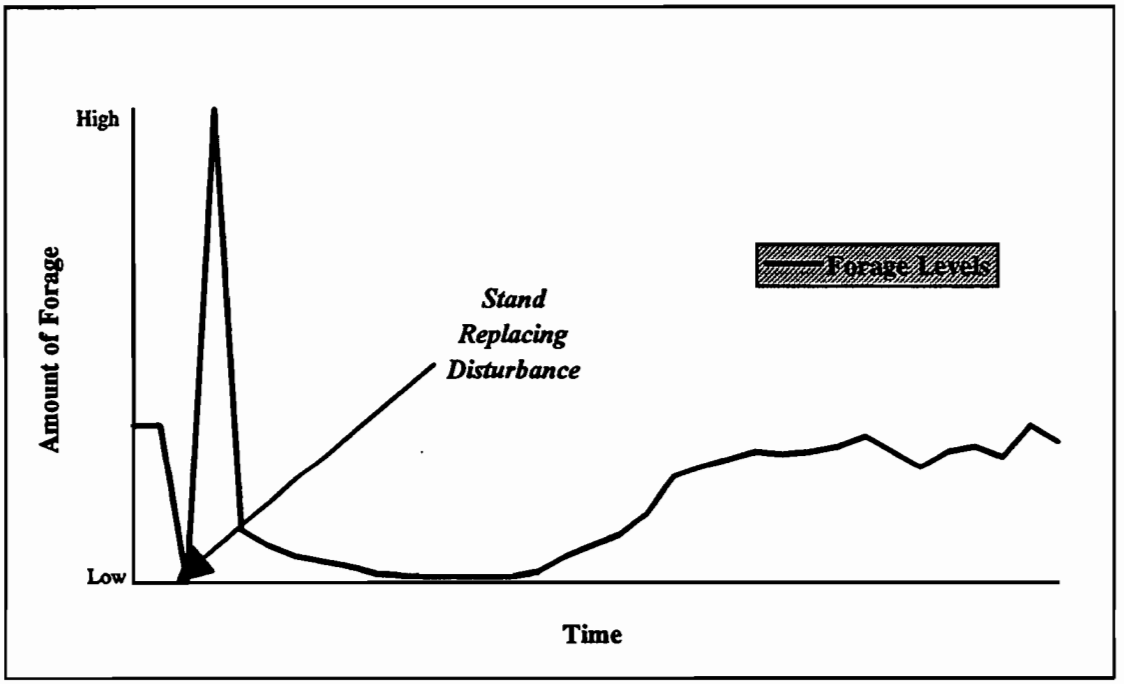


**Figure 50.** Changes in forage levels after a major stand replacing disturbance such as a fire or clearcut. Initially, the level skyrockets, but in this area the grass/forb habitat is quickly replaced by brush and eventually small trees. Elk utilize brush and tree saplings for forage in addition to grasses and forbs, therefore, the slow decline as the stand grows and eventually shades out understory vegetation. As the stand matures and opens up again, we see an increase in forage levels.

Hunting season for elk in this area was reopened in 1938 and has been closely monitored and strictly enforced by the Oregon Department of Fish and Wildlife. Since then, elk populations have continued to increase. In the late 1940's and early 1950's numbers were high enough to necessitate herd control measures within the coast range (although not within this watershed). Transplanting of problem elk in this watershed began in the 1970's and has occurred periodically within the North Fork drainage since then. By transplanting, we refer to the practice of capturing elk which may be causing property damage to a specific area and moving them to areas away from human inhabitation.

The increase in commercial clearcutting on national forest land since the 1950's in this area has provided the resident elk with a more or less continuous and well distributed supply of forage and cover. Because of this,elk herds currently do not have to move great distances away from their cover sites to obtain their subsistence. In this area, elk herds commonly stay within the same area and do not move by more than 6 miles from the core area. Currently, the Roosevelt elk population for the Alsea Unit (which covers the Siuslaw National Forest from Lincoln City to Florence) is estimated to be at 5,600 head of elk. Elk counts over the last six years indicate that this population is remaining constant and may be at carrying capacity levels for the current habitat conditions in the area (personal communication with Doug Cottam - ODFW).

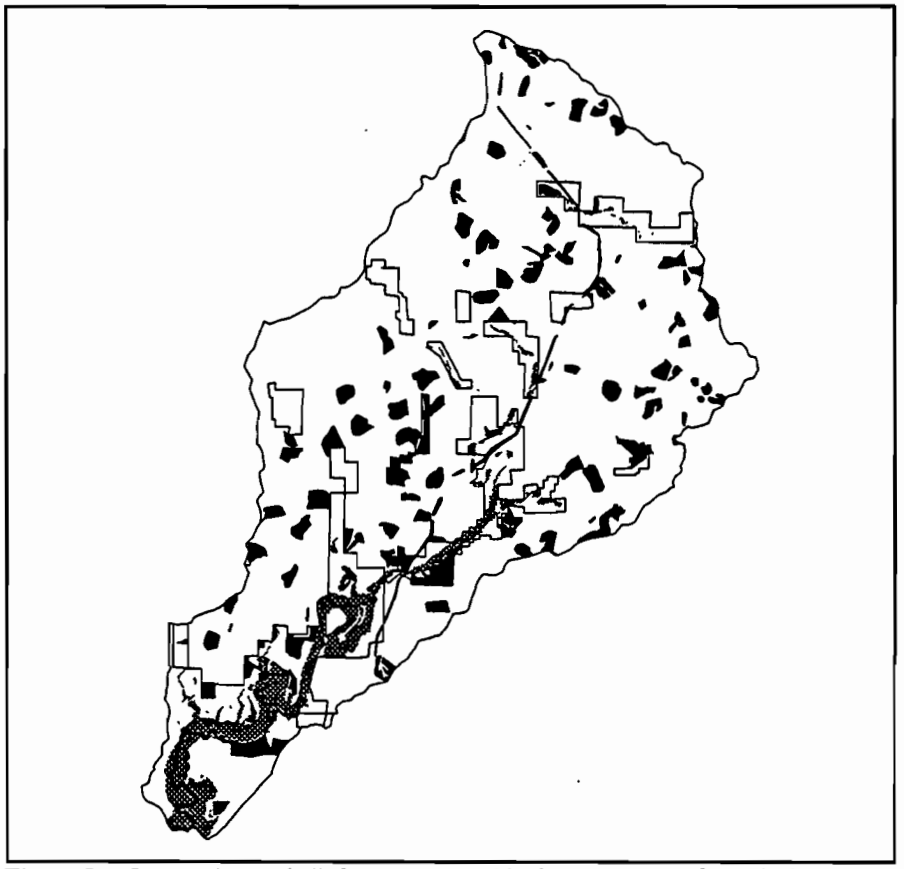

**Figure 51.** Current deer and elk forage areas within the North Fork of the Siuslaw watershed. As recent clearcuts (the black patches) revegetate and clearcutting ceases to occur, elk may concentrate to grass/forb habitat (gray shaded areas) on private lands.

Currently, there is some fear and speculation by local residents that local elk populations (as well as deer) will decline dramatically with the decline in available forage provided for by clearcuts on public lands. In conjunction with the expected decrease in this forage base, herds may concentrate on privately owned bottom land. As explained earlier, animal populations fluctuate locally with fluctuations in the local habitat composition. Elk, being primarily grazers, can be expected to prefer open, grass/forb conditions. What is not well known, however, is the extent of their use of forage and browse produced in old growth stands such as lichens, sword fern and shrub species. Black-tailed deer are considered to be primarily browsers and have been documented to consume large quantities of lichen common to old growth stands. This forage becomes more abundant and readily available as stands enter old growth conditions where lichen-covered limbs and fallen trees begin to accumulate on the forest floor and openings in the canopy allow more growth of understory vegetation.

Careful monitoring of the effects that reduced clearcutting on public lands have on elk herds needs to occur. Information should be provided by annual census and animal damage complaints filed by local private land owners. Some short-term forage will be provided by thinning operations. It is also recommended that existing grass/forb habitat be aggressively maintained especially in areas away from private inholdings. Serious consideration should be given to the opportunity to convert roads proposed for obliteration into "stringer" meadows which can be maintained in the future. Elk and deer hunting is a big recreational opportunity which attracts hundreds of people into the area, bringing their business to local communities and providing needed economic inputs. In 1992, an estimated 19,300 people hunted for deer and elk (archery and rifle seasons combined) within the Alsea unit.

# CHAPTER 5 - *DESIRED FUTURE CONDITIONS*

The "desired future condition" for the North Fork Siuslaw Watershed is described by land allocation. For each land allocation the assumptions concerning how natural processes that operate in the Coast Range are stated. The "desired future condition" is described and objectives for each land category are developed. Before proceeding into these descriptions of land allocations, a quick review of the basic underlying assumption of how the local landscape functioned and changed through time is given.

Fire disturbance is the main factor in determining vegetation patterns in the Coast Range. Fires tend to be infrequent, occurring at a return interval of 150-500 years, with an average interval of 300 years. When fires occurred, they tended to be stand-replacement events covering several thousand acres. Immediately after these fires, a large portion of the landscape would be in an early seral condition with patches of surviving trees along riparian zones and other wetter areas. In time,these burned areas grew back, forming large areas of intact mature and old growth forest. Through time, disturbed areas would move around the landscape. Wildlife, such as spotted owls and elk, would follow theses cyclic changes in habitat. Because large, intact patches of mature forest still existed after these fires, old growth-dependent species, such as spotted owls, would move into these different areas and were able to survive within the Coast Range over time.

## LATE SUCCESSIONAL RESERVES

### Description of Late Successional Reserves

In the President's Forest Plan and Record of Decision (ROD), Late Successional Reserves are identified to protect and enhance conditions of late successional and old growth forest ecosystems and serve as habitat for late successional and old growth forest related species, including the northern spotted owl (ROD, p. A-4). The Reserves are designed to serve a number of purposes. First, they provide a distribution, quantity, and quality of old growth forest habitat sufficient to avoid foreclosure of future management options. Second, they provide habitat for populations of species that are associated with old growth forests. Third, they will help ensure that late successional species diversity will be conserved (ROD, p. B-4,5).

### Assumptions

- Old growth forests have a high level of species diversity (see Appendix L).
- Because small-scale disturbances create small openings (e.g., windthrow, natural landslides, root rot killing small patches of conifers) and increased growth of understory forage and browse plant species, old growth habitat can also support elk.
- The Late Successional Reserves of the North Fork Siuslaw watershed are highly fragmented and do not imitate historical natural conditions. No large, intact patches of mature conifer or old growth habitat (which serve as refugia) exist within this watershed.
- Because of the abundance of forage that the dispersed clearcuts have provided, elk populations are higher than past levels, and are at carrying capacity.
- Managed stands were planted at a higher density than would naturally occur. Managed stands have lower species diversity, and are more prone to insects, fire, and wind damage if they are not thinned.
- Old growth characteristics can be developed in managed stands through silvicultural methods.

**Desired Future Condition**

Late Successional Reserves would consist primarily of mature conifer and old growth age habitat. The mature conifer phase of stand development begins around 80 years after a disturbance and is characterized by a slowed rate of tree height and crown growth, heavy limbs begin to form, gaps in the canopy begin to become larger and more stable and large dead and fallen trees begin to accumulate (ROD, p. B-2). After approximately 150 years, the dominant overstory trees approach maximum height. The canopy becomes more open and tree crowns become irregular in shape. Heavy-limbed trees with broken tops and dead portions become more common. Understory trees form multiple canopy layers. Dead wood (snag and log) levels are relatively high and small-scale stand disturbances due to wind, insects, and disease create patchy openings which promote the growth of understory vegetation. Existing special habitats, such as small meadows and wetlands, still exist and are protected.

**Current Trends**

All of the late successional forest within the LSR will remain in that condition for the forseeable future. Second-growth conifer will continue to attain old growth attributes as it ages. Younger, managed stands within the LSR will continue to develop into mature conifer. However, due to overstocking in some stands, some of these areas will become stagnant and development into late successional forest will slow down. If left alone, most of the LSR would become late successional forest within 200 years.

Riparian areas will slowly convert from hardwoods and develop into old growth characteristics. Managed stands will continue to grow back, but unnaturally high tree densities will likely slow development of tall, large-diameter trees and multi-story stand characteristics. High tree densities may also increase the potential for large-scale blowdown or disease infestations in these stands.

**Objectives**

According to the President's Forest Plan Record of Decision (ROD), "the objective of Late Successional Reserves is to protect and enhance conditions of late successional and old growth forest ecosystems, which serve as habitat for late successional and old growth related species including the northern spotted owl. (p. C-9)" "The intent is to maintain natural ecosystem process such as gap dynamics, natural regeneration, pathogenic fungal activity, insect herbivory, and low-intensity fire." (p. B-1). The use of silvicultural practices to accelerate the development of overstocked young plantations into stands with late successional characteristics, and to reduce to risk of loss from large-scale disturbances is encouraged. (p. B-1).

For the North Fork Siuslaw, specific objectives for LSR's include:

1. Maintain the old growth habitat that already exists.
2. Decrease the fragmentation (increase connectivity) and increase interior habitat across the landscape.
3. Reduce the potential for large-scale disturbances from wind, fire or insects.
4. Increase habitat and species diversity within managed stands (including partially cut mature conifer stands).
5. Develop old growth characteristics in managed stands.

## MATRIX

### Description of Matrix Lands

According to the President's Forest Plan and Record of Decision, the Matrix should provide connectivity between Late Successional Reserves and habitat for a variety of organisms associated with both late successional and younger forests. Production of timber and other commodities is an important objective of this land allocation. At the same time, the Matrix adds ecological diversity to the landscape by providing early-successional habitat. Standards and guidelines for the Matrix are designed to provide for important ecological functions such as the dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as downed logs, snags and large trees.

### Assumptions

- Historical stand-replacing fires left a landscape covered with large patches of late successional habitat intermixed with large patches of early seral habitat (burned areas).
- The remaining large patches of late successional habitat served as refugia for local plant and wildlife species associated with that habitat.
- The burned areas provided early seral habitat,which retained populations of early seral dependent species in the area through time.
- Through time, both of these areas would move around the landscape as burned areas grew back into old growth and newer fires occurred. Wildlife populations followed these local trends.
- Both of these seral conditions are equally important to maintaining healthy, viable populations of plants and animals within this ecosystem.
- Private land will contain at least 10% early seral habitat (<8 years of age) within this area at any one point in time.
- Recent clearcuts (1-3 years of age) provide valuable forage to elk and deer populations. Stands from 4-20 years of age also provide some forage intermixed with hiding cover.
- Culmination mean annual increment will be used to determine rotation age for stands within the Matrix lands. In the Coast Range, this age is between 60 and 150 years.

### Desired Future Condition

The Matrix land would serve as a patch of mixed early seral and managed stands between Late Successional Reserves, and provide habitat for big game and early-seral dependent species. They would mimic recently burned areas. To that end, riparian buffers, spotted owl and marbled murrelet areas would serve as old growth patches within the Matrix. A renewable supply of large downed logs and coarse woody debris is well distributed across the landscape in a manner that meets the needs of species and provides for ecological functions (ROD, p.10, C-40). Scattered green trees provide a future supply of down woody material as the stand regenerates and provide for the distribution of this substrate through the managed landscape (ROD, p. C-40). Anadromous streams are well protected through the use of riparian buffers,which also provide habitat for riparian species. Commodity production occurs at a sustainable level utilizing the newest forestry techniques. Existing meadow areas are maintained for big game management. Most roads that are obliterated are converted to linear meadows to provide early seral habitat.

### Current Trends

The matrix will develop similar to the LSR without management. Early seral habitats would diminish as younger stands and recent clearcuts develop into mature conifer. Most of the early seral habitats would be gone within 10 years.

### Objectives

The ROD states that "Production of timber and other commodities is an important objective for the Matrix. The Matrix also adds ecological diversity by providing early successional habitat (p. B-1, B-2). In addition to the ROD directions, specific objectives for the North Fork Siuslaw watershed Matrix lands include:

1. Maintain a sustainable level of timber harvest throughout the rotation.
2. Maintain as much elk foraging habitat as possible.
3. Minimize fragmentation.
4. Experiment with "new forestry" techniques.

## RIPARIAN RESERVES

### Description of Riparian Reserves

Riparian Reserves include those portions of the watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic and ecological processes that directly affect standing and flowing water bodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats (ROD, p. B-12). Riparian Reserves occur at the margins of standing and flowing water, intermittent stream channels and ephemeral ponds, and wetlands. Riparian Reserves generally parallel the stream network, but also include other areas necessary for maintaining hydrologic, geomorphic and ecological processes (ROD, p. B-13). They include primary source areas for wood and sediment, such as unstable or potentially unstable areas in headwater areas and along streams.

### Assumptions

- Shifting stream channels, floods, debris torrents, high moisture gradients, and intense competition for light and nutrients create a wide diversity of vegetation types, species, and age classes within riparian areas. They contain a variety of unique and special habitats such as wetlands, meadows, and beaver ponds.
- Riparian areas provide important habitats for a wide variety of animal and plant species and serve as corridors to connect other areas. They are generally the most species-diverse areas on the forest.
- Riparian Reserves were historically dominated by conifers. Because of their moist environment, old growth trees often survived stand-replacing fires. Areas subjected to disturbances, such as floods, debris torrents, beaver activity, or inherent soil instability, frequently developed into pure alder, brush, or mixed hardwood/ conifer stands.
- The number of large trees in a riparian area that have the potential to contribute large woody debris into the adjacent stream has a profound impact on the condition of fish habitat in the stream. In riparian areas and as wood in the stream, conifers are much more valuable than hardwoods because they are larger and last much longer.

- Throughout the last century, settlement and land management activities have altered riparian vegetation and have substantially reduced the number of conifers in riparian zones. The reduction in conifer numbers has contributed to a decline in fish habitat condition by limiting the amount of large woody debris available to the stream. Removal of stream-side trees has also reduced bank stability.

- The number of conifers which are potentially available to contribute large woody debris into stream channels from riparian areas on private lands is very limited, especially in the lower portion of the watershed. This is not likely to change under current management practices.

- Riparian Reserves on National Forest lands will be the primary source of large woody debris for streams within the basin. Maintaining the amount of conifer in these areas at the high end of the range of natural variability will help promote recovery in downstream areas.

**Desired Future Condition**

A wide diversity of vegetation types, species, and ages provides a variety of habitats to support riparian dependent plants and animals. The areas are dynamic and change over time. Much of the Riparian Reserve is dominated by conifer stands capable of contributing large woody debris into adjacent stream channels. A small portion of the riparian zone is dominated by deciduous trees or brush. Special habitats such as small wet meadows, ponds, seeps and wetlands are common. Riparian vegetation enhances stream bank stability and provides adequate shade to prevent undesirable increases in stream temperatures. Flood waters are free to spread out over the flood plain. Contributions of large woody debris into stream channels from adjacent riparian areas and landslide-prone areas within the Riparian Reserves approximate natural levels. Vegetation within the Riparian Reserves is self-sustaining.

**Current Trends**

A high proportion of the area immediately adjacent to anadromous stream channels will remain dominated by red alder and salmonberry for the forseeable future. Conifer regeneration in these areas will be poor. Given the high proportion of hardwoods and brush currently in these areas, and the lack of sufficient large woody debris sources on private lands, the Riparian Reserves will be unlikely to provide sufficient sources of LWD to maintain instream fish habitat.

Upslope areas will slowly develop old growth characteristics. Managed stands will continue to grow back, but unnaturally high tree densities will likely slow development of tall, large diameter trees and multi-story stand characteristics. High tree densities may also increase the potential for large-scale blowdown or disease infestations in these stands.

**Objectives**

In addition to protecting perennial streams, the Aquatic Conservation Strategy of the ROD states that the Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the Late Successional Reserves (ROD, p. B-13).

Specific objectives for Riparian Reserves in the North Fork Siuslaw include the following:

1. Increase the number of large conifers in riparian zones to provide adequate future sources of large woody debris for stream channels. The number of conifers will vary, but there should be an average of at least 10 conifer trees capable of contributing to LWD per 100 feet of stream length along anadromous streams and

at least 8 conifer trees per 100 feet along resident fish streams and intermittent streams. The trees should generally be greater than 12 inches DBH and within 100 feet of the stream bank.

2. Maintain a diversity of vegetation types, species, and ages.

3. Maintain alder in unstable and floodprone areas.

4. Protect and maintain unique riparian habitats such as wetlands, ponds, seeps and wet meadows.

5. Maintain overall bank stability.

6. Maximize growth and windfirmness of conifers within managed stands on unstable or potentially unstable areas adjacent to stream channels.

## FISH HABITAT

### Description of Fish Habitat

Fish habitat includes those portions of the rivers, streams, and ponds within the watershed that support populations of fish and other aquatic life. It is controlled by the hydrologic, geomorphic and ecological processes operating in the watershed. The condition of fish habitat is directly affected by past and present land management activities within the basin.

### Assumptions

- Over the past century, human settlement and land management activities have altered fish habitat substantially. Anadromous fish habitat within the watershed is currently in a severely degraded condition. It is far below the level needed to support optimal fisheries production.

- The majority of fish habitat with the best historic potential to produce anadromous fish is on private lands. The current condition of most of this habitat is poor. Under existing management strategies, the condition of fish habitat on private land is not likely to improve substantially.

- Fish habitat on National Forest lands will produce a major portion of the anadromous fish within the North Fork Siuslaw watershed over the long-term. Aquatic habitat on Federal lands should be maintained at the high end of the range of natural variability to serve as refuge areas and to help promote recovery in downstream areas.

### Desired Future Condition

Streams within the basin have a high degree of complexity and provide a diversity of habitats for large and well-distributed populations of fish and other aquatic species. There is an abundance of large woody debris. Deep pools with high levels of complex hiding cover are common. Beaver ponds and side channels provide additional habitats. Gravel is the predominate substrate, although areas of bedrock and sand occur occasionally. Streams frequently overflow their banks and spread out into their floodplains. The streams are dynamic and change over time; however, the hydrologic, geomorphic, and ecological processes within the watershed are in balance and the instream fish habitat conditions are self-sustaining.

### Current Trends

Fish habitat will remain in the current degraded condition for the forseeable future. Existing large woody debris in stream channels will continue to decay and to get washed away by floods. In areas where potential sources of

replacement large woody debris are available, fish habitat condition will remain stable or improve over time. In the large number of areas where sources of replacement large woody debris have been removed or substantially reduced, habitat condition will remain poor or decline further.

Low habitat complexity, inadequate deep pool habitat, and minimal cover will continue to be the primary habitat factors limiting populations of salmon, steelhead, and cutthroat trout in the watershed.

The amount of sand within stream channels should decrease slowly over time,although new road-related slides may retard recovery and further degrade or destroy existing habitat.

**Objectives**

Specific objectives for fish habitat in the North Fork Siuslaw include the following:

1. Increase the complexity and diversity of in-channel fish habitat.

2. Increase juvenile overwintering habitat in anadromous streams.

3. Increase and/or maintain the pieces of LWD per mile, the amount of pool area, the proportion of deep pools and the proportion of deep pools with complex cover to meet the "Good" habitat levels specified in Table 2 (Fish Habitat Objectives and Rating Criteria for Anadromous Streams).

4. Increase the proportion of gravel and decrease the proportion of sand in streambed substrates.

5. Where a stream has downcut through alluvial deposits, agrade the streambed to increase the interaction of the stream with its floodplain.

# CHAPTER 6 - *RECOMMENDED RIPARIAN RESERVE WIDTHS*

Watershed analysis provides the basis for modifying the interim Riparian Reserve widths specified in the President's Forest Plan and Record of Decision (p. B-13). The following discussion considers the option to modify Riparian Reserve widths along **intermittent streams within Matrix lands**. It also addresses the need to pursue vegetation management activities inside of Riparian Reserves to meet Aquatic Conservation Strategy objectives.

## RATIONALE FOR MODIFYING RIPARIAN RESERVES WITHIN MATRIX

Matrix lands comprise 17% of Federal lands within the watershed. They make up portions of the Russell, Billie, Uncle, McLeod, and Cataract sub-watersheds. Because of the high stream density in the North Fork Siuslaw watershed, interim Riparian Reserves overlay 86% of all Matrix lands. This greatly limits the amount of early seral habitat and commodity production available from within these lands. Existing landscape patterns due to past timber harvest further limit opportunities for elk forage and commodity production in the remaining 14% of the Matrix. In other words, much of the land available outside of Riparian Reserves is already in young plantations. If the interim Riparian Reserve width guidelines are applied, the available land base in the Matrix will limit our ability to provide early seral habitat for big game and timber commodities. Reducing the interim Riparian Reserve widths, where appropriate, would provide a better opportunity to meet these objectives while still maintaining ecosystem function.

Late Successional Reserves make up 83% of Federal lands within the North Fork Siuslaw watershed. Ultimately, they will form largely contiguous blocks of habitat. Interim Riparian Reserves along the 7.3 miles of perennial streams in Matrix lands comprise another 2.5% of the watershed. Interim Riparian Reserves along the 14 miles of intermittent streams in Matrix lands would account for approximately 3% of Federal lands within the watershed. Because of the large contiguous areas of Late Successional Reserves and the length and size of the Riparian Reserves along perennial streams, we assume that these areas will provide adequate habitat and connectivity for the movement and maintenance of viable populations of wildlife species which require late seral habitat (Figure 52).

Intermittent streams in the North Fork watershed are small and are generally located in steep V-shaped channels. Because of the V-shaped channels and the steep moisture gradients which are encountered as you move up the sideslopes, the actual riparian area adjacent to intermittent streams is relatively narrow. We assume that a buffer approximately 130 feet wide (0.5 site potential tree height) on each side of the stream channel will be sufficient to maintain riparian conditions immediately adjacent to intermittent streams and will provide adequate habitat for riparian dependent species.

The narrow floodplains and the steep moisture gradients on the sideslopes along intermittent streams generally result in a larger number of conifers adjacent to intermittent stream channels compared to along the larger perennial streams. This difference can be seen by comparing Figure 35, the proportion of various vegetation types within 200 feet of anadromous streams, to Figure 44, the proportion of the same vegetation types within 200 feet of all streams. Because of the small channels and the greater number of conifers adjacent to intermittent streams, we assume that a buffer approximately 130 feet wide on each side of the stream channel will be sufficient to maintain the majority of large woody debris inputs into intermittent stream channels where the streams flow through stable areas. If the channel was subjected to a debris torrent, a buffer of this size would maintain natural levels of large woody debris inputs into downstream fish habitat.

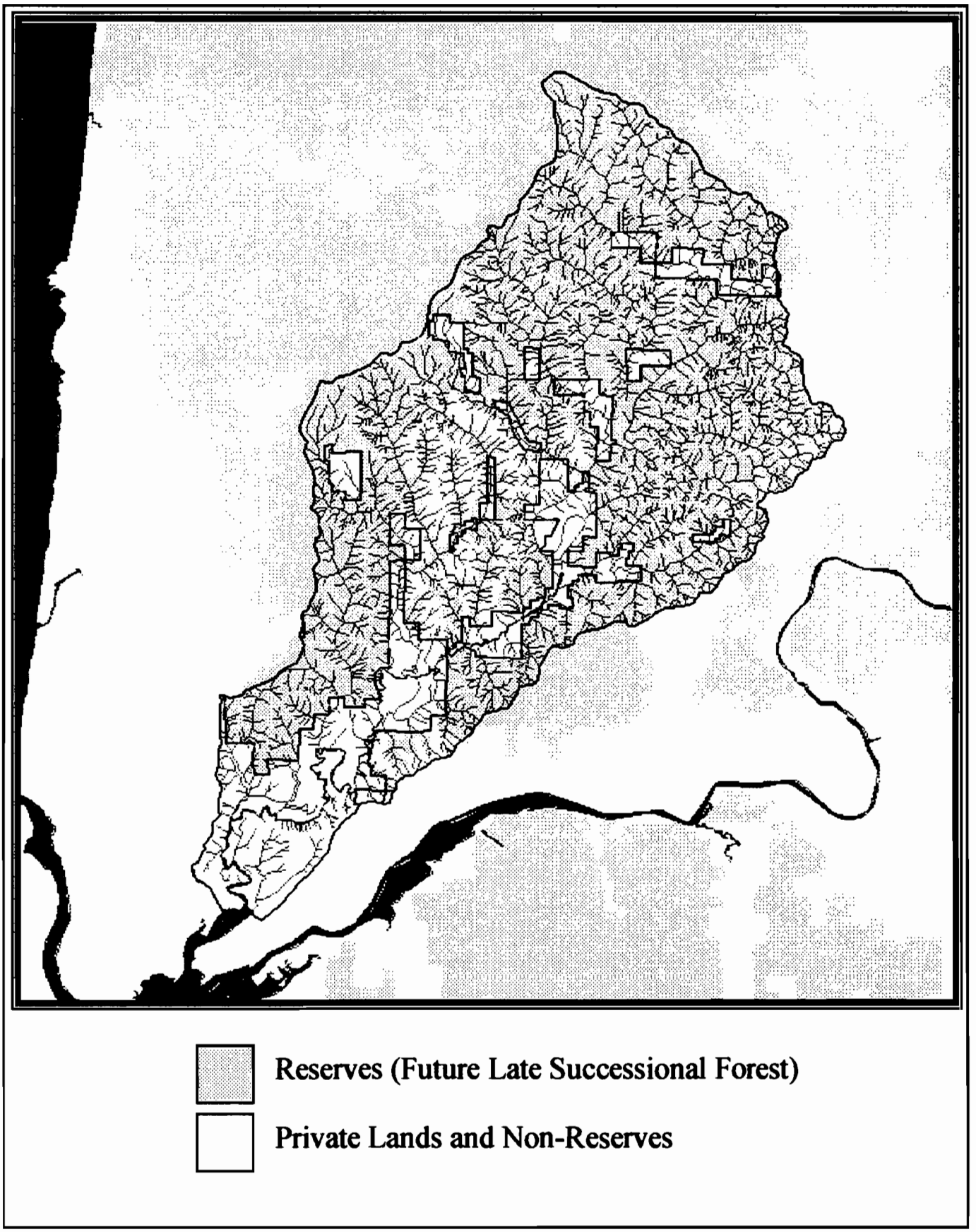


**Figure 52**. Late Successional Reserves, designated wilderness areas and interim Riparian Reserves along perennial streams will provide adequate connectivity of late successional forests within the North Fork Siuslaw watershed as well as the surrounding area. Proposed Riparian Reserve widths along intermittent streams would add on to the connectivity shown in the above figure.

## RECOMMENDED RIPARIAN RESERVE WIDTHS

Riparian Reserve widths for **perennial streams** within the Matrix should approximate the interim widths specified in the ROD (p. C-30). The poor condition of fish habitat throughout the watershed and the general lack of information about the numerous plant and animal species that inhabit riparian areas provides no basis for modifying the interim direction.

Riparian Reserve widths for **intermittent streams** within the Matrix should be reduced from approximately 1 site-potential tree height (260 feet) to approximately 0.5 site-potential tree height (130 feet) OR to the break in slope, **whichever is greater**, if they meet the following criteria:

Stability :

A. The stream channel is "V-shaped" and has less than a 60% slope.

B. The stream channel is shallow and "U-shaped" and has less than a 70% slope.

C. There is no history of instability in the headwall or stream channel.

Fish:

A. There is an average of at least 8 conifer trees capable of contributing to LWD per 100 feet of stream length within the Riparian Reserve. The trees should generally be greater than 12 inches DBH.

B. The windfirmness of the Riparian Reserve and headwall buffers will be maintained.

Wildlife:

A. No sensitive species occur which require larger buffers (e.g., Red Tree Vole).

B. No wetlands, ponds, riparian meadows, or other special wildlife habitats are present.

If the above criteria are not met, Riparian Reserve widths for intermittent streams should approximate the interim widths specified in the ROD (p. C-30). We assume that many intermittent streams will not meet these criteria and will require Riparian Reserves as specified in the ROD. In some instances, Riparian Reserves may need to be expanded beyond the interim widths to encompass unstable areas or to include sufficient conifers adjacent to alder or brush dominated riparian areas.

Recommended Riparian Reserve widths are not meant to be applied uniformly across the watershed. Actual Riparian Reserve boundaries for all streams will need to be established on a project-by-project basis considering local site characteristics.

## VEGETATION MANAGEMENT ACTIVITIES WITHIN RIPARIAN RESERVES

To meet the objective of increasing the potential contribution of large woody debris into stream channels, it will be necessary and desirable to manipulate vegetation within Riparian Reserves in both Matrix and Late Successional Reserves. Trees closest to the stream channel generally have the best potential to contribute to instream large woody debris. Conifer planting, release, precommercial thinning and commercial thinning activities designed to improve conifer survival and growth should be placed as close to the stream channel as possible while still maintaining bank stability and necessary amounts of stream shade. Existing sources of large woody debris, such as stream side alder trees should also be maintained as much as possible. Project designs will often require a narrow

strip of untreated vegetation, limiting the length of stream bank treated, or implementing the project over several years to meet bank stability, stream temperature, and vegetation diversity objectives.

Trees cut during thinning or release activities within Riparian Reserves will generally be left on site to increase downed woody debris or will be placed in adjacent stream channels. If excess trees are available beyond those needed to meet ecological needs, they may be removed for commercial purposes.

# CHAPTER 7 - *OPPORTUNITIES*

Opportunities to move this watershed toward the desired future conditions described in Chapter 5 are discussed below. These opportunities are grouped by the issues they address. Some opportunities address more than one issue, therefore, there is some redundancy in the lists. Although we recognize that large cooperative projects on multiple land ownerships are the most effective way to restore watershed conditions, this chapter focuses only on opportunities available on National Forest lands.

## OPPORTUNITIES RELATED TO FRAGMENTATION AND LACK OF OLD GROWTH

Approximately 11,034 acres of managed plantations occur on National Forest lands throughout the entire watershed. These stands have been intensively managed through clearcutting, burning, and reforestation. Most of these stands have been replanted at high stocking rates. These stands are at various age classes and tree densities. Some of these stands have been previously thinned. All of these stands are in an unnatural condition due to harvest, planting and thinning practices. Each stand breaks the continuity of the remaining mature conifer habitat with the watershed.

### Stocking Control and Diversity Enhancement (11-20 year old managed stands)

Historically, clearcuts were planted to a tree density from 400-500 trees per acre. At 10-15 years of age, these young managed stands were usually thinned to approximately 250 trees per acre. This management practice was called precommercial thinning because the young trees felled were left and not harvested. Approximately 2,390 acres of stands in this category lie within this watershed. Some of the more recent clearcuts have not been precommercially thinned.

If left alone, most of these stands would stagnate. Development into old growth would take longer than that in a naturally regenerated stand of the same age. Silviculturists estimate that it would take an extra 50-100 years before the stand could restore itself to natural conditions. Some of these stands may never even reach old growth conditions, but may die through disease or blow down as a result of the dense stocking.

For this reason, silvicultural treatments are recommended for these stands. The objective would be to maintain stand health and vigor while accelerating the development of old growth characteristics. Some of these characteristics include the development of multiple canopy layers, multiple species, and a diverse overall structure, including small gaps in the canopy and dead and down woody material.

To accomplish this, treatments would include thinning the stand to tree densities more closely resembling naturally regenerated stands in the area (overall stand average of 100-200 trees per acre). Spacing of trees would be diverse where dense clumps may be left in areas and small clearings created in others, depending on site-specific and topographic conditions. Emphasis should be placed on retaining non-dominant or shade-tolerant species such as western redcedar, western hemlock and Sitka spruce. Hardwoods such as big leaf maple and cascara should also be retained. Emphasis should also be placed on retaining some trees of "poor" form (not desirable for creating lumber) to further provide extra structural diversity to the stand. In addition to accelerating the growth of the trees, this treatment should increase the rate of root development and wind firmness.

**Priorities**: Priorities for thinning these managed stands are listed below in order of importance:

1. Stands that are within 0.7 miles of known northern spotted owl activity centers. Owl pairs are ranked in Appendix Q based on current habitat conditions. Highest priority should be given to stands within 0.7 miles of the owl activity centers with the poorest current habitat conditions.

2. Stands within the LSR that currently separate two or more mature conifer stands with known occupancy by marbled murrelets (e.g. occupied mature conifer stands adjacent on two or more sides).

3. Stands within the Matrix that currently separate two or more mature conifer stands with known occupancy by marbled murrelets.

4. Stands that currently separate two or more unoccupied or unsurveyed stands of mature conifer within the LSR.

5. Stands that currently separate two or more unoccupied or unsurveyed stands of mature conifer within the Matrix.

In general, stands that have not been previously thinned should receive a higher priority. If on-site inspections of the stand (for both previously thinned and unthinned stands) shows that current tree density is less than 200 trees per acre, then those stands would have lower priority.

In all cases, stands within subwatersheds which are currently the most fragmented (see Table 4) shall have the highest priority. Potential stocking and diversity stands management opportunities are shown in Figure 57.

**Stocking Control and Diversity Enhancement (> 20 year old managed stands)**

Most stands between ages 20-40 years have been thinned once and tree density is approximately 250 trees per acre. To better meet natural conditions and maintain tree vigor, most of these stands need to be thinned again. Generally, tree sizes in stands older than 30 years are large enough to provide some incentive for timber harvesting. These stands should be thinned to a tree density of approximately 60-100 trees per acre and underplanted with a diverse mix of tree species as describe above. First and foremost, trees felled within the Riparian Reserves or Late Successional Reserves should be left to meet ecological needs, such as providing wildlife habitat and down woody debris for maintaining soil productivity, instream structures and short-term erosion traps. Leaving some of the smaller wood available in these stands to decay into the soil will help provide nutrients and replenish the organic layer until the larger logs are available from the mature stand. Above these needs, trees may be removed for commercial purposes. Although it is preferable to let the trees grow in size before creating snag habitat, some of the larger trees may be girdled to create small snags greater than 15 inches in diameter to benefit certain primary cavity excavators which are known to use smaller trees such as the hairy woodpecker (*Picoides villosus*).

**Priorities**: Priorities for thinning these managed stands are listed below in order of importance:

1. Stands that are within 0.7 miles of known northern spotted owl activity centers. Owl pairs are ranked in Appendix Q based on current habitat conditions. Highest priority should be given to stands within 0.7 miles of the owl activity centers with the poorest current habitat conditions.

2. Stands within the LSR that currently separate two or more mature conifer stands with known occupancy by marbled murrelets (e.g. occupied mature conifer stands adjacent on two or more sides).

3. Stands within the Matrix that currently separate two or more mature conifer stands with known occupancy by marbled murrelets.

4. Stands that currently separate two or more unoccupied or unsurveyed stands of mature conifer within the LSR.

5. Stands that currently separate two or more unoccupied or unsurveyed stands of mature conifer within the Matrix.

In all cases, stands within subwatersheds which are currently the most fragmented (see Table 4) shall have highest priority. Potential stocking and diversity stands management opportunities are shown in Figure 58.

**Mature Conifer Stand Diversity Projects**

There is approximately 2,460 acres of mature conifer habitat that have been partially cut or have had the dead and down wood removed from them. Within these stands emphasis will be placed on recreating snag and downed log habitat. The objective is to restore these stands to a more natural condition for their age. Forest-wide levels of snags and logs are shown in the tables below. These levels should be used only as a general guideline for providing these missing components. Unmanaged mature conifer stands immediately adjacent to these areas should be surveyed for snag and log levels. This site-specific information should be used to better recreate this component within these stands.

**Table 5.** Logs per acre by stand type for the Siuslaw National Forest. Data was derived from 1987 Managed Stand Surveys (MSS), 1987 Vegetation Resource Surveys (VRS), and 1990 Vegetation Structure Exams (VSE). This summary is only for logs greater than 10 inches in diameter and longer than 20 feet (no distinction is made between decay classes).

| STAND TYPE | SIZECLASS (Inches Diameter) | | | |
|---|---|---|---|---|
| | >40 | 30-40 | 20-30 | 10-20 |
| Hardwood | 1.5 | 2.4 | 3.3 | 3.7 |
| Hardwood/Conifer | 0.6 | 2.9 | 4.8 | 6.1 |
| Managed (all ages) | 1.6 | 3.8 | 5.3 | 9.6 |
| Mature Conifer | 0.6 | 1.4 | 4.3 | 12.2 |
| Old Growth | 2.9 | 4.4 | 8.2 | 11.5 |

**Table 6.** Snags per acre by stand type for the Siuslaw National Forest. Data was derived from 1987 Managed Stand Surveys (MSS), 1987 Vegetation Resource Surveys (VRS), and 1990 Vegetation Structure Exams (VSE). This summary is only for snags greater than 10 inches in diameter and taller than 20 feet (no distinction is made between decay classes).

| STAND TYPE | SIZECLASS (Inches Diameter) | | | |
|---|---|---|---|---|
| | >40 | 30-40 | 20-30 | 10-20 |
| Hardwood | 0.92 | 0.31 | 0.28 | 0.72 |
| Hardwood/Conifer | 0.70 | 0.34 | 0.40 | 1.75 |
| Managed (all ages) | 0.01 | 0.03 | 0.04 | 0.45 |
| Mature Conifer | 0.80 | 0.64 | 0.77 | 2.84 |
| Old Growth | 1.24 | 0.90 | 0.67 | 0.84 |

Methods to create downed log habitat should be through felling with chain saw. Trees should be directionally felled to avoid toppling other trees or causing damage to private lands. If possible, trees should be felled into adjacent riparian areas and streams to serve a dual purpose of providing both fish and wildlife habitat. Snags should be created by topping large conifer with explosives or by girdling. Girdling should occur at varying heights. Small openings may result from falling activities. These clearings may be planted with a mix of native shade-tolerant conifer or hardwood species.

**Priorities**: Priorities for mature conifer diversity projects are listed below in order of importance:

1. Stands that are within 0.7 miles of known northern spotted owl activity centers. Owl pairs are ranked in Appendix Q based on current habitat conditions. Highest priority should be given to stands within 0.7 miles of the owl activity centers with the poorest current habitat conditions.

2. Stands within the LSR in subwatersheds below the minimum population level of 40% for cavity nesters.

3. Stands within the LSR in subwatersheds at or above the minimum population level of 40% for cavity nesters.

4. Stands within the Matrix in subwatersheds below the minimum population level of 40% for cavity nesters.

5. Stands within the Matrix in subwatersheds at or above the minimum population level of 40% for cavity nesters.

The focus should be on creating this diversity within the LSR. If cavity nester population level estimates require, stands within the Matrix should be manipulated. This activity with the Matrix may be included in the design of "new forestry" timber harvests as proposed later in this chapter. Potential diversity stand management opportunities are shown in Figure 53.

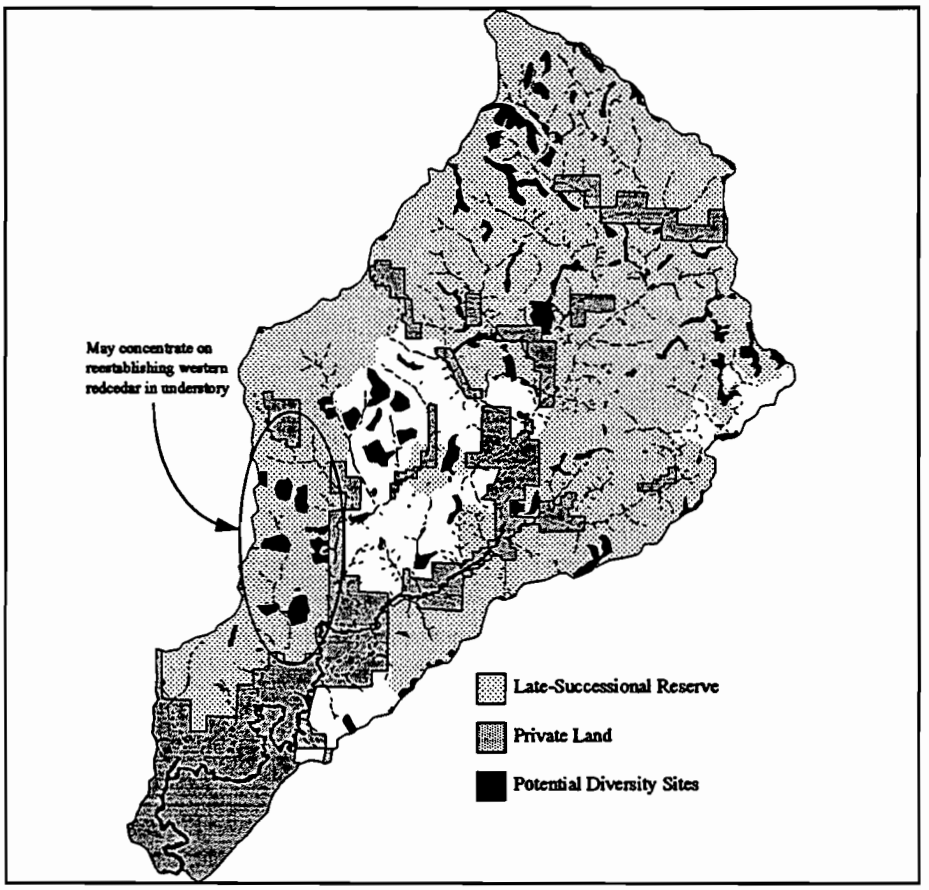


**Figure 53.** Distribution potential mature conifer diversity project sites within North Fork Siuslaw watershed. Stands within the Morris subwatershed are in need of cedar planting.

### Reestablishing Conifer in Riparian Areas

Reestablishing conifer within the riparian area is an important component in meeting the Aquatic Conservation Strategy. It also benefits terrestrial animals and riparian wildlife. Conifer planting in riparian areas will restore them to a more natural condition and reduce the overall fragmentation of the watershed. Riparian areas serve as movement corridors for many wildlife species and especially amphibians. With conifer planting, large existing gaps in these corridors will grow back to connect other stands of mature conifer throughout each subwatershed. As trees fall across streams, the logs will serve as important "bridges" between the two stream banks and further enhance the natural movement of wildlife.

## OPPORTUNITIES RELATED TO ELK HABITAT

One of the objectives of the ROD is to manage the Matrix lands to create ecological diversity by providing early seral habitat (p. B-1,2). This early seral habitat is desirable to many wildlife species including the Roosevelt elk. Under current management direction, the amount of this habitat we can provide is limited. Some opportunities to provide this habitat are discussed below.

### Timber Harvest

Within the Coast Range, forage is considered to be an important limiting factor for elk populations (Steve Smith and Doug Cottam, ODFW, personal communication). Timber harvesting provides a means to create this foraging habitat. The first three years after a clearcut provide excellent forage for elk. An important objective of the Matrix is to provide timber commodities. Some of this harvesting may include small clearcuts and selective harvesting. This activity would benefit elk and other early seral species.

Because of the need to maintain Riparian Reserves, clearcuts within the Matrix will be located on the mid to upper slopes and ridges. Harvest unit sizes will be much smaller than recent practices. Other silvicultural activities which may benefit elk would be thinning. Opening up stands (especially at low tree densities) will increase forage and browse production between the trees. Early thinning (11-20 year old stands) provides excellent habitat for elk because the structure of the stand provides good hiding cover intermixed with forage. Although some studies show that forage seeding in clearcuts does not greatly increase benefits to elk (Stussy, 1993), in some cases aggressive forage seeding does provide a longer term benefit. Forage seeding in harvest units should be considered, but done only with native forage or browse species. Clearcut units should be reforested with a wider variety of tree seedlings at a more natural stocking density. This would mimic more natural regeneration and increase the length of time the stand will remain open to provide forage for big game species such as elk.

Human disturbance limits the utilization of forage by elk. When designing harvest unit (including thinning units), "cover" buffers should be incorporated to reduce visibility of clearings/forage areas from adjacent roads.

**Priorities**: Priorities for harvesting mature conifer to provide forage are listed below in order of importance:

1. Mature conifer stands that are within the Matrix and are greater than 0.7 miles from known spotted owl activity centers.

2. Mature conifer stands that furthest away from private land have the highest priority. This is an attempt to attract elk away from private lands.

3. Thinning units following the above criteria in priorities 1 and 2.

Potential timber harvest stands management opportunities are shown in Figure 59 and Figure 60.

### Road to Meadow Conversion

Creating meadows out of roads can provide additional forage habitat for elk. These areas may also provide quality hunting areas and hiking trail opportunities. Roads proposed for future obliteration should be field verified for suitability for development into meadows. In some cases rocked road surfaces may need to be removed with heavy equipment or decompacted with a sub-soiler to allow grass and forb establishment. Encroaching brush and alder would be removed and the road bed would be seeded with native grass and forb species. Existing noxious weed populations would be removed during the initial conversion.

Once the conversion is completed, the road entrance would be blocked by means other than a gate. Meadow maintenance may be necessary approximately every 3-5 years. Local hunting groups have shown an interest in

assisting the Forest Service with these types of projects. Roads proposed for future obliteration could be adopted by local groups who would take an active role in the meadow design, creation and maintenance.

**Priorities**: Priorities for meadow conversion are listed below in order of importance:

1. Roads located along a ridge top with little to no sideslope portions.
2. Roads located in a subwatershed with less than 9% grass/forb habitat.
3. Roads that are currently gated with a wildlife gate.
4. Roads located within the Matrix.

Roads furthest away from private property have the highest priority. This is an attempt to attract elk away from private lands.

**Maintenance and Enhancement of Existing Meadows**

Meadows within the watershed provide desirable ecological diversity. Natural meadows caused by openings in the forest canopy or soils conditions, wet meadows caused by beaver activity within the riparian area, or hunting and seasonal camping sites maintained by the Native Americans were all a part of the natural landscape we are trying to recreate.

With the projected decrease in future forage levels for elk, it is important to provide as much forage as possible while still meeting the intent of the President's Forest Plan. All currently existing meadows, within all land allocations, should be maintained in their current state at least until natural forest dynamics begin to provide this component in the future. This will probably not occur for another 100 years, until the forest within the LSR reaches old growth conditions.

There are approximately 20 acres of grass/forb habitat adjacent to private pasture land that are currently being grazed by private landowners without range allotment plans within this watershed. These areas should be managed to maintain the grass/forb condition while protecting stream banks and riparian vegetation consistent with the Aquatic Conservation Strategy. This may include fencing riparian areas to protect them from damage caused by cattle. In all of these cases, a vegetative use permit and/or range allotment plan should be established and a permit issued, if feasible, or the grazing should be discontinued.

Possibilities exist to establish cooperative agreements with state and private organizations to assist in maintaining these areas as meadows. Noxious weed control within these meadows is a goal.

## OPPORTUNITIES RELATED TO ROAD MANAGEMENT

Surface erosion and risk of landslides from roads pose the largest risk to the aquatic ecosystem. Identifying opportunities to reduce the risk of erosion and landslides should be based on recommendations given in the ROD, the risk individual roads have for erosion and landslides, and the possible future needs for the road. Specific opportunities for road obliteration or rehabilitation were not listed, as many factors, such as future use, need to be considered before projects are planned and implemented. Instead, the roads with the greatest risk of erosion or failure were identified, and some possible generic restoration projects are listed. Only roads located on National Forest land were analyzed and entered into the Roads Database (Appendix S).

The ROD contains the following recommendations concerning roads:

- The amount of existing system and non-system roads within Key Watersheds should be reduced through decommissioning of roads (p. B-19).

- If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds (p. B-19).

- Priority (for decommissioning) will be given to roads that pose the greatest risks to riparian and aquatic ecosystems (p. B-19).

- (One of) the most important components of a watershed restoration program is control and prevention of road-related runoff and sediment production (p. B-31).

Some of the guidelines for meeting Aquatic Conservation Strategy objectives include:

- Minimizing disruption of natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow (p. C-32).

- New culverts, bridges and other stream crossings shall be constructed, and existing culverts, bridges and other stream crossings determined to pose a substantial risk to riparian conditions will be improved, to accommodate at least the 100-year flood (p. C-33).

A road database was created to aid managers in making decisions concerning road management and to identify roads with the greatest risk of failure (Appendix S). This database contains specific information about individual roads. The information is divided into three broad categories:

1. Landslide and erosion risk factors: This includes topographic position, soil and land form classification where the road is located, type of construction, and past failures. In order to evaluate the risk of landslides and erosion from an individual road, it was assigned a "risk score". A point was given for each of four risk factors the road possessed. The four risk factors are:

1. A mid-slope or valley bottom topographic position.

2. A soil risk classification of 100% debris torrent or 50% debris torrent potential.

3. Sidecast construction.

4. Evidence of past failures,

The greater the road's risk score, the greater the potential for adverse impacts to fish habitat and the higher the priority for treatment. Table 7 shows the roads that have the highest risk for landslides and erosion. The highest priority roads (risk score = 4) are located in the Cataract, McLeod, Porter, West Branch and Wilhelm subwatersheds.

2. Use of the road: This includes the need for the road for future thinning opportunities, access to private lands, use for recreation.

3. Present status of the road: This includes whether the road is open or closed, what work has already been done to stabilize the road, and what land allocation the road is located in.

Table 7. Highest risk roads for erosion and landslides listed by subwatershed. Lower risk roads are not shown.

| SUB WATERSHED | KEY WATERSHED | ROAD SEGMENT | RISK SCORE | PAST STABILIZATION |
|---|---|---|---|---|
| Cataract | X | 2570-772 | 4 | Waterbarred 94 |
| Cataract | X | 2570-754A | 3 | |
| Cataract | X | 2570-777 | 3 | Waterbarred |
| Cataract | X | 2570A | 3 | Waterbarred, Sidecast Pullback 94 |
| Elma | X | 2500-648 | 3 | Waterbarred |
| Elma | X | 2500-652 | 3 | Waterbarred |
| McCleod | | 2570 | 4 | Sidecast Pullback In Sec 4, 8, 9 |
| McCleod | | 2570-778 | 4 | Waterbarred |
| McCleod | | 2570-785A | 3 | |
| McCleod | | 2800-721 | 3 | |
| McCleod | | 2800-723 | 3 | |
| McLeod | | 796 (Sec 16 & 21) | 3 | |
| Porter | X | 5084-668 Sec 6 | 4 | |
| Porter | X | 5084-668A | 3 | |
| Russell | | 5070-739E | 3 | |
| Uncle | | 5070-763 | 3 | |
| Uncle | | 5841 | 3 | |
| Uncle | | 5841 Sec 15 | 3 | |
| Uncle | | 5841 sec 21,22 | 3 | |
| Uncle | | 5841-758 | 3 | |
| Sam | X | 5800-655 | 4 | Sidecast Pullback 94 |
| Sam | X | 5084, Sec 24 | 3 | |
| Wilhelm | X | 5800 | 4 | |
| Wilhelm | X | 5084-668 | 3 | |

For more complete information about a specific road, refer to Appendix S (The Roads Database).

**Priorities**: Roads with the following characteristics have the highest priority for treatment:

1. High-risk road segments within the Key Watershed area should be treated first.

2. Subwatersheds with excessive sand in the stream channels should be the next areas to be treated. These include the McLeod, Morris, and Drew subwatersheds.

Roads that have not had any stabilization work done to date should be targeted first. Previously treated roads may need additional work,but are not a high priority at this time. Specific types of projects or work needed have not been identified. The type of stabilization done on a road depends on the site-specific problems and the proposed future use of the road. Many of the roads identified for stabilization projects provide access to young stands in need of thinning. Figure 54 shows the location for potential road projects.

Possible restoration and rehabilitation projects that would reduce the risk of erosion and failure are listed below:

- *Sidecast Pullback*

  Description: Removal of the oversteepened and unstable material that was dumped over the outside fill slope when the road was built.
  Benefits: Removes the material that may fail when it becomes saturated, and cause a debris torrent.

- *Waterbars*

  Description: Cross-drains are dug diagonally across the road bed.
  Benefits: Waterbars intercept drainage that is travelling down the road bed and channels the water off the road before it has a chance to build up enough volume and velocity to erode ruts. Waterbars may also help to re-introduce water that is intercepted by roads into the subsurface, and reduce the effects of roads on increased peak flows.

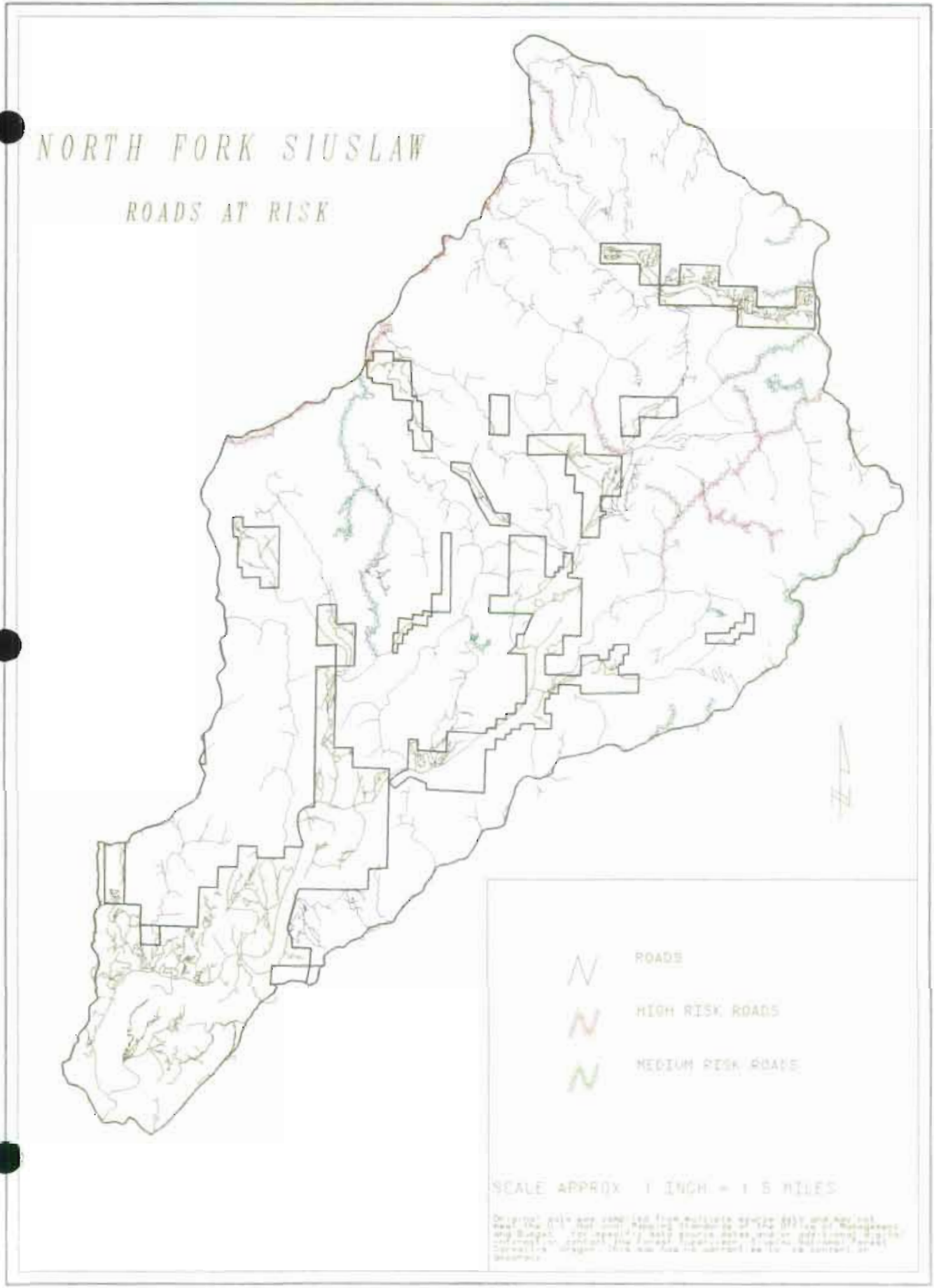
NORTH FORK SIUSLAW
ROADS AT RISK
ROADS
HIGH RISK ROADS
MEDIUM RISK ROADS
SCALE APPROX. 1 INCH = 1.5 MILES

FIGURE 54

- *Subsoiling with a winged subsoiler*

  Description: The road bed is decompacted to a maximum depth of 36 inches with a winged subsoiler. This restoration method would be appropriate on roads that are scheduled to be closed or obliterated.
  Benefits: Water infiltration into the soil is restored, and surface erosion and rutting is reduced or eliminated. The road bed is revegetated more quickly and effectively.

- *Removal of fill and culverts in stream crossings*

  Description: Fill material and culverts in intermittent or perennial stream crossings is removed, and the stream channel is restored to its original gradient and configuration.
  Benefits: The risk of culverts becoming plugged, and water overtopping the road and washing away the fill, is eliminated. Natural stream functions, such as the transport of sediment and wood, are restored.

## OPPORTUNITIES RELATED TO FISH HABITAT

Watershed restoration is an integral part of the Aquatic Conservation Strategy laid out in the President's Forest Plan. Numerous opportunities exist to help correct existing problems and to promote the desired trends described in Chapter 5.

Although we recognize that large cooperative projects on multiple land ownerships are the most effective way to restore watershed conditions, and that fish populations and fish habitat cannot be restored to their historical levels without substantial improvement to habitat on private lands, this document focuses only on the opportunities available on National Forest lands.

In general, watershed restoration activities should be accomplished first in Key Watersheds to protect and maintain these areas as refuges for declining anadromous fish stocks. Projects should be implemented in the areas which are most likely to change. These are generally the low-gradient, unconfined stream segments with a high historic fish habitat potential.

Any watershed improvement program should include both short-term and long-term approaches.

### Road Treatments

The highest priority for watershed restoration activities is to at least maintain existing habitat conditions and to prevent further degradation from occurring. Road drainage and road-related landslides have the potential to contribute large amounts of sediment into stream channels. Road treatments such as decommissioning, waterbarring, outsloping, and pulling back sidecast material will reduce the risk of catastrophic impacts due to landslides or debris torrents and chronic sedimentation from surface erosion.

### Instream Structures

Log and boulder instream structures can provide an immediate increase in habitat complexity and in the amount of deep pool habitat and cover available to fish. They are often used to create building blocks or key pieces to trap additional woody debris, to encourage deposition of substrate materials, and to promote better interaction with the adjacent floodplains.

Instream structures are strictly a short-term measure to maintain habitat conditions and fish populations until the natural watershed processes are reestablished. They are limited by the inaccessibility of many stream channels, the availability of logs and boulders to place in the streams, and by available funding.

**Priorities:** Stream segments which are the highest priority for instream structure projects have the following characteristics:

1. They are the larger anadromous streams.

2. They are stream segments with high historic habitat potential.

3. They are low-gradient, unconfined areas with a high likelihood of change due to changes in LWD inputs.

4. They currently meet less than one half of the habitat objectives for pieces of large woody debris per mile or amount of deep pool habitat.

5. They are located in relatively large contiguous blocks of federal ownership (areas of mixed ownership would also be a priority if they were part of a cooperative restoration project).

In all cases, high-priority stream segments within the Key Watershed area should be treated first. Subwatersheds with recent landslides and evidence of large quantities of sediment moving through the system should be the next areas to be treated. The additional structure would help retain the substrate materials before they are flushed from the system. McLeod Creek subwatershed is an example of this situation. Approximately 7.5 miles of potential instream opportunities were identified in the watershed. Potential instream structure opportunities are shown in Figure 55.

**Reestablish Conifers in Riparian Areas**

Reestablishing conifers in riparian zones to provide adequate inputs of large woody debris into the stream is the only way to insure the long-term sustainability of fish habitat in the North Fork Siuslaw watershed. Unfortunately, the full benefits of these activities will not be realized for at least a hundred years, until the trees grow big enough and begin falling into the streams.

Projects will generally require clearing brush and removing a portion of the alder overstory prior to planting with conifer seedlings. Intensive maintenance and brush release will be required to maintain adequate growth and survival. Release of existing conifer seedlings and/or saplings to increase growth and insure their survival may be appropriate in some areas. A diversity of conifer and hardwood species and age classes is desirable within the riparian area.

**Priorities:** Areas which are the highest priority for riparian planting have the following characteristics:

1. They are dominated by alder and/or brush with little or no conifer regeneration.

2. They are adjacent to larger anadromous streams.

3. They are within approximately 100 feet of the stream channel or the active floodplain.

4. They are adjacent to stream segments with high historic habitat potential.

5. They form relatively large contiguous blocks of federal ownership (areas with mixed ownerships would also be a priority if they were part of a cooperative restoration project).

In all cases, high-priority stream segments within the key watershed area should be treated first. Areas with a moderate priority for riparian planting have all of the above characteristics, except they would be in mixed hardwood/conifer stands. These areas may provide opportunities for existing conifer seedling/ sapling release as

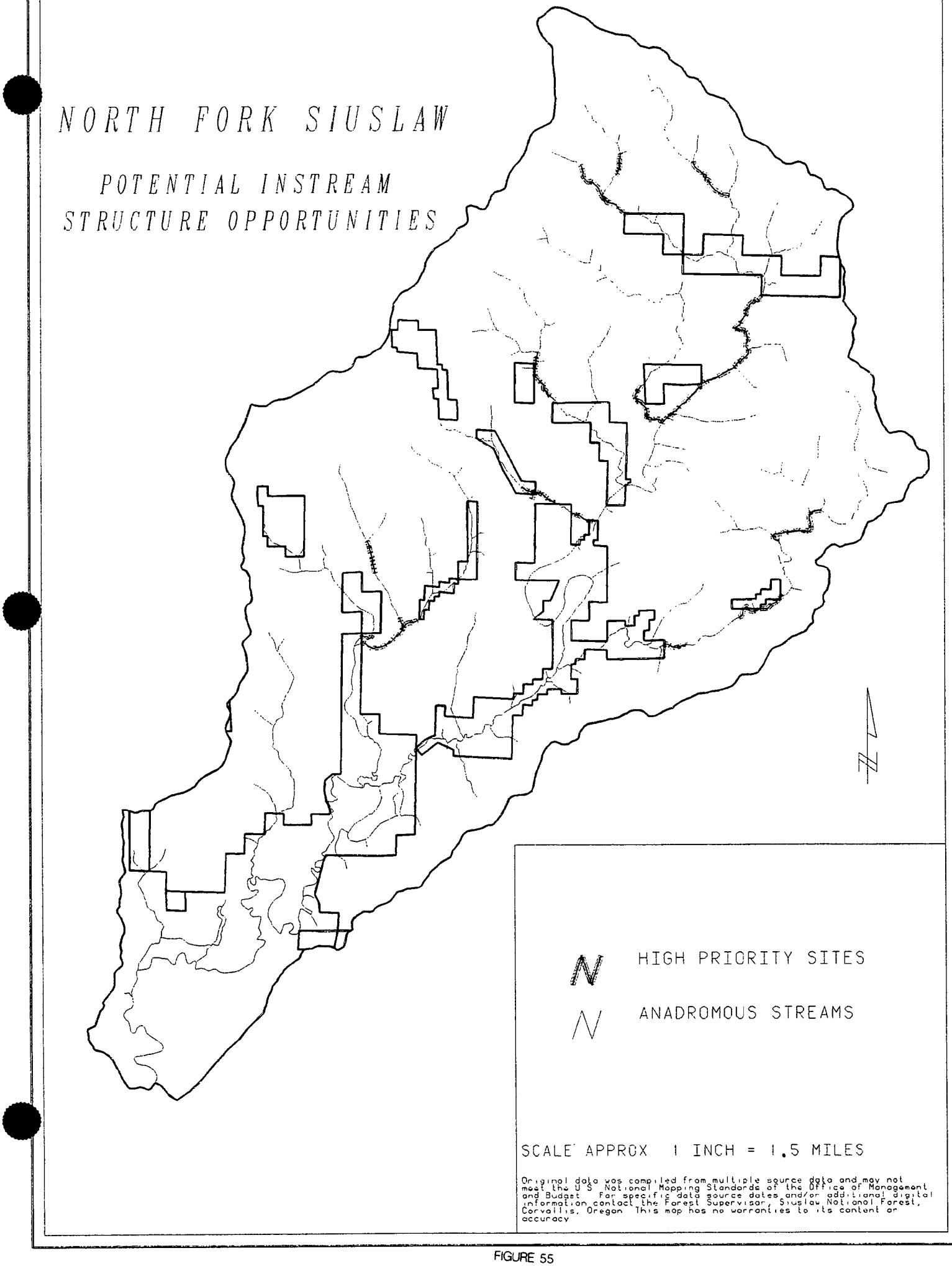
NORTH FORK SIUSLAW
POTENTIAL INSTREAM
STRUCTURE OPPORTUNITIES
N
HIGH PRIORITY SITES
ANADROMOUS STREAMS
SCALE APPROX 1 INCH = 1.5 MILES
Original data was compiled from multiple source data and may not meet the U S National Mapping Standards of the Office of Management and Budget. For specific data source dates and/or additional digital information contact the Forest Supervisor, Siuslaw National Forest, Corvallis, Oregon. This map has no warranties to its content or accuracy.

FIGURE 55

well as planting. Areas with low priority for riparian planting include alder, brush, or mixed hardwood/conifer stands adjacent to smaller anadromous streams or streams with only moderate historical habitat potential.

Riparian planting projects were initiated along portions of the mainstem North Fork Siuslaw, Porter Creek, Elma Creek, and Sam Creek in 1993-94. These projects will need intensive maintenance and brush release for several years. The project areas should be expanded over time to provide a diversity of age structure within the stands.

Another 300 acres of high to moderate priority planting areas were identified in the watershed. These areas are shown in Figure 56.

**Upland Vegetation Treatments**

Managed plantations in landslide-prone areas adjacent to streams have the potential to contribute large quantities of downed logs and woody debris into the stream channel. Precommercial thinning in these areas will increase growth rates and produce larger, more valuable woody debris more quickly.

Commercial thinning within landslide prone areas adjacent to streams may be desirable to increase growth and decrease blowdown potential in some cases. Since commercial thinning also has the potential to increase blowdown under many conditions, these projects need to be carefully evaluated on a site-by-site basis. Thinned material should generally be left on site to improve downed woody debris or should be placed in adjacent stream channels to increase LWD levels.

All of the areas within managed stands that are on headwall areas, immediately adjacent to perennial or intermittent stream channels, or are on high-risk soils which have a high likelihood of sliding into a stream should be evaluated for precommercial thinning to promote optimal growth while maintaining the stability of the stand. Priorities for treatment should be established by the silvicultural condition and the need to thin before the stand closes in and begins to lose root strength. Stands which will likely require precommercial thinning are shown in Figure 57. Timing may need to be adjusted somewhat by the need to thin all of the stands within a given area to minimize road maintenance.

Within the above constraints, key watershed areas should be treated first.

**Thinning Treatments in Riparian Areas**

With the relatively low numbers of conifers in riparian areas within 100 to 150 feet of most streams, precommercial or commercial thinning is rarely needed in these areas.

Two small plantations along the upper mainstem of the North Fork near Porter Creek are exceptions. These Douglas- fir plantations, which are about 40 years old, are densely stocked all the way down to the stream channel. Thinning these stands would maintain their growth rate and produce larger trees more quickly. Thinning would also help to encourage some species and age structure diversity within the stands.

Because of the small size and the advanced age of these stands, it is most desirable to thin the areas gradually over time and to utilize the material as a source of woody material for future instream structure projects.

**Increase Beaver Populations**

Beaver ponds provide some of the best overwintering habitat for juvenile coho salmon and cutthroat trout. Increasing beaver populations within the watershed would substantially improve fish habitat in low-gradient areas by increasing the number of complex pools, the amount of side channel habitat, the interaction between the stream and its floodplain, and the retention of detritus and food resources.

Beaver populations are managed by the Oregon Department of Fish and Wildlife. Increasing populations within the watershed would require cooperation from the department and modification of the existing trapping season and

bag limit. Transplanting "problem" beavers from other areas into areas where they would be desirable may be appropriate.

**Support a Fishing Closure for Anadromous Salmonids on the Upper North Fork**

The North Fork Siuslaw is currently open for sport fishing from the river mouth all the way up to the heads of the tributaries. It is one of the few rivers in the state on which fishing is allowed all the way to the headwaters. Since adult chinook, coho, and steelhead are all easily seen when they enter the upper mainstem North Fork and other small, shallow tributary streams to spawn, this makes them extremely vulnerable to fishing.

With the drastic declines in anadromous fish populations and the predominance of wild fish in the North Fork, it only makes sense to protect the breeding populations once they reach the spawing areas.

To protect spawning chinook, coho, and steelhead in small shallow streams where they are visible and vulnerable, the Forest should encourage a modification of the ODFW sportfishing regulations to prohibit fishing above the North Fork Campground.

## OPPORTUNITIES RELATED TO COMMODITY PRODUCTION

The President's Forest Plan greatly restricts the availability of timber for commodity use from what was available historically. The Matrix land allocation is the only portion of the landscape where harvest volumes can be scheduled over time. Matrix, however, is restricted by the Riparian Reserve allocation which is draped over all other land allocations. Any harvesting in the Riparian Reserves must be for principles outlined in the Aquatic Conservation Strategy (ROD, B-11). Any harvesting in the Late Successional Reserves must meet management goals for that LSR and needs to go through Regional approval. Stocking control of existing managed stands is an opportunity across the entire landscape. The two primary types of stocking control that will be used in the North Fork Siuslaw basin are precommercial and commercial thinning.

**Stocking Control and Diversity Enhancement (11-20 year old managed stands)**

This activity, formerly known as precommercial thinning, is normally done between ages 10 to 15 years. Normally, stocking is brought down to 16 or 18-foot spacing (135-170 trees/acre). Stands in the North Fork range between 250 and 1,100 trees per acre. The most common stocking is between 350 and 450 trees per acre.

There are a total of 4,651 acres of managed stands less than 20 years of age on National Forest System lands within this watershed. The following summarizes acreage by age class and land allocation:

**Table 8.** Breakdown of managed stands by age class and land allocation within the North Fork of the Siuslaw watershed.

| AGE CLASS (Years) | MATRIX (Acres) | LSR (Acres) |
|---|---|---|
| Unknown | 0 | 204 |
| 40+ | 12 | 173 |
| 31-40 | 627 | 1,654 |
| 21-30 | 960 | 2,753 |
| 11-20 | 345 | 2,045 |
| 0-10 | 715 | 1,546 |

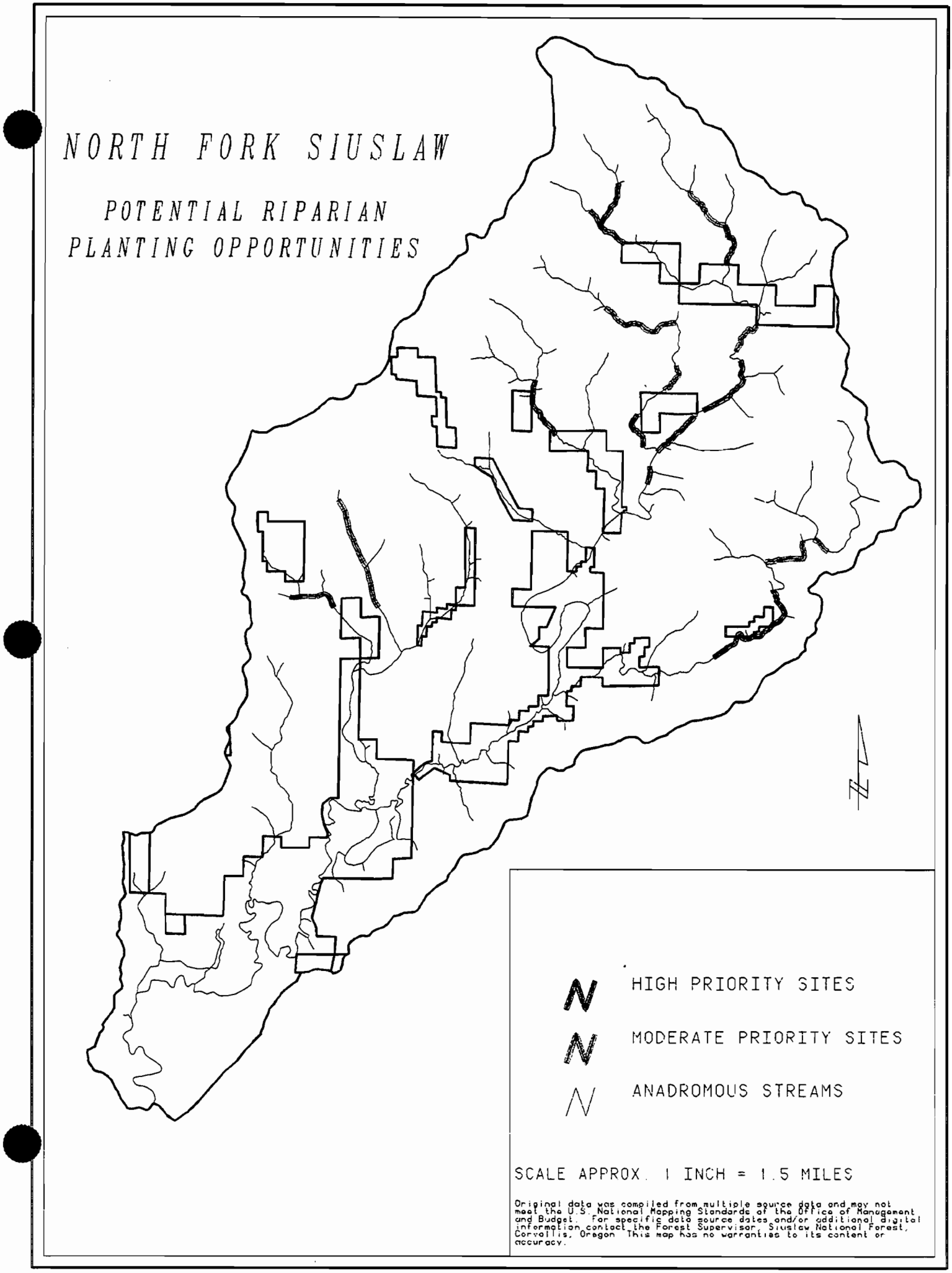
NORTH FORK SIUSLAW
POTENTIAL RIPARIAN
PLANTING OPPORTUNITIES
HIGH PRIORITY SITES
MODERATE PRIORITY SITES
ANADROMOUS STREAMS
SCALE APPROX. 1 INCH = 1.5 MILES
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FIGURE 56

**Priorities**: Areas which are the highest priority for thinning have the following characteristics:

1. High: Stands currently between 11 and 20 years old that have not been previously thinned and are also high priority thinning opportunities for **both** fish and wildlife.

2. Medium: Stands currently between 11 and 20 years old that have not been previously thinned and are also high priority thinning opportunities for **either** fish or wildlife.

3. Low: Other stands between 11 and 20 years old that have not been thinned.

All previously thinned stands should be reviewed to determine whether current objectives have been met. Additional treatments may be needed.

In all cases, stands within Key Watersheds should be treated first. We estimate approximately 167 acres of managed stands between 11-20 years of age fall within the high-priority category. There are approximately 1,004 and 885 acres of medium and low-priority stands, respectively. Figure 57 shows locations for these thinning opportunites as prioritized above.

**Stocking Control and Diversity Enhancement (>20 year old managed stands)**

Thinning stands in this age class is often referred to as commercial thinning. There are a total of 11,034 acres of managed stands on National Forest System lands within this watershed. Potential volume from thinning these stands would range from an estimated 30.2 mmbf for a 25% thinning scenario (where only 25% of the stands were thinned) to 90.6 mmbf at a 75% thinning scenario. Because of the need to leave dead and down woody material in riparian areas, it is more likely that the range of thinning will be between 25-50%. The following table summarizes the thinning potential for the North Fork Siuslaw watershed.

**Table 9.** Commercial thinning projections for the North Fork Siuslaw watershed based on three different thinning scenarios over the next 40 years.

| AGE CLASS (Years) | TOTAL ACRES | THINNING DECADE | Gross MMBF 25% Thin | 50% Thin | 75% Thin |
|---|---|---|---|---|---|
| Unknown | 145 | 1 | 0.5 | 1.0 | 1.5 |
| 40+ | 185 | 1 | 0.7 | 1.4 | 2.1 |
| 31-40 | 2,428* | 1 | 6.7 | 13.4 | 20.1 |
| 21-30 | 3,605 | 2 | 9.4 | 18.8 | 28.2 |
| 11-20 | 2,525 | 3 | 6.8 | 13.6 | 20.4 |
| 0-10 | 2,145 | 4 | 6.1 | 12.2 | 18.3 |

* Acres for age class 31-40 years are revised to 2,243 acres to reflect past thinnings, 79 acres completed (Cataract, Roger's Pole and 3 Buttes) and planned thinnings, 106 acres (McLeod Landscape Thin).

The following summarizes the estimated volumes by decade:

| Thinning Decades | 25% thin | 50% thin | 75% thin |
|---|---|---|---|
| Decade 1: 1995-2000 | 7.9MM | 15.8MM | 23.7MM |
| Decade 2: 2001-2010 | 9.4MM | 18.8MM | 28.2MM |
| Decade 3: 2011-2020 | 6.8MM | 13.6MM | 20.4MM |
| Decade 4: 2021-2030 | 6.1MM | 12.2MM | 18.3MM |

Some assumptions used for the above estimations are:

1. Decades 2,3,4 adjusted for growth 4% per decade.

2. Older trees (> 40 years old) will be given a lighter thin because of advanced age. Reduce to 80-100 trees per acre. Estimated harvest @ 15 mbf/ac.

3. Younger trees (<40 years old) will get a heavier thin depending on site conditions. Leave 60-90 trees per acre. Estimated harvest: 12 mbf/ac for age class 31-40 years and 10 mbf/ac for age class < 30 years.

Realistic estimates of potential thinning volume are hard to predict and will tend to be between the low and medium end of the above predictions for the following reasons:

1. Most of the landscape is either in LSR or Riparian Reserves and harvesting needs to follow the applicable standards and guidelines for these allocations.

2. Some of the potential harvestable volume will be left on site to meet down woody objectives, in stream needs, and snag objectives.

Material above and beyond meeting the above objectives may be available for removal from the site where harvesting can be accomplished within the established guidelines.

**Priorities**: Areas which are the highest priority for thinning have the following characteristics:

1. High: Stands currently greater than 20 years old that have not been previously thinned and are also high-priority thinning opportunities for **both** fish and wildlife.

2. Medium: Stands currently greater than 20 years old that have not been previously thinned and are also high-priority thinning opportunities for **either** fish or wildlife.

3. Low: Other stands greater than 20 years old that have not been thinned.

All previously thinned stands should be reviewed to determine whether current objectives have been met. Additional treatments may be needed.

In all cases, stands within Key Watersheds should be treated first. We estimate approximately 255 acres of managed stands greater than 20 years of age fall within the high-priority category. There are approximately 3,585 and 1,795 acres of medium and low-priority stands, respectively. Figure 58 shows locations for these thinning opportunites as prioritized above.

**Matrix Timber Harvest**

There is a total of 5,466 acres within the Matrix land allocation of the North Fork of the Siuslaw. Out of that, approximately 42% or 2,302 acres are mature conifer stands (assuming a volume of 70 mbf/acre, this equates to 161.1 mmbf). Multi-aged managed stands make up approximately 49% ( or 2,659 acres and the remaining 9% is predominantly hardwood dominated riparian stands. Some of the managed stands within the Matrix will develop into mature conifer within the next 40 years and some of the hardwood riparian areas will also be developing into conifer dominated stands.

As stated previously, within the Matrix the Riparian Reserves restrict timber harvest from all but 315 acres of the 2,302 acres of mature conifer (14% or 22.1 mmbf ). Current buffers widths are those that follow the initial recommended buffer widths as per the President's Forest Plan (two site trees or 520-foot slope distance from each side of Class 1,2,3 drainage,and one site tree or 260-foot slope distance from each side of Class 4 drainage, whichever is greater). These buffers will be referred to as "interim" buffers for the remainder of this discussion. Based on this team's proposal in chapter 6 of this document, reducing the Riparian Reserve widths by 50% for

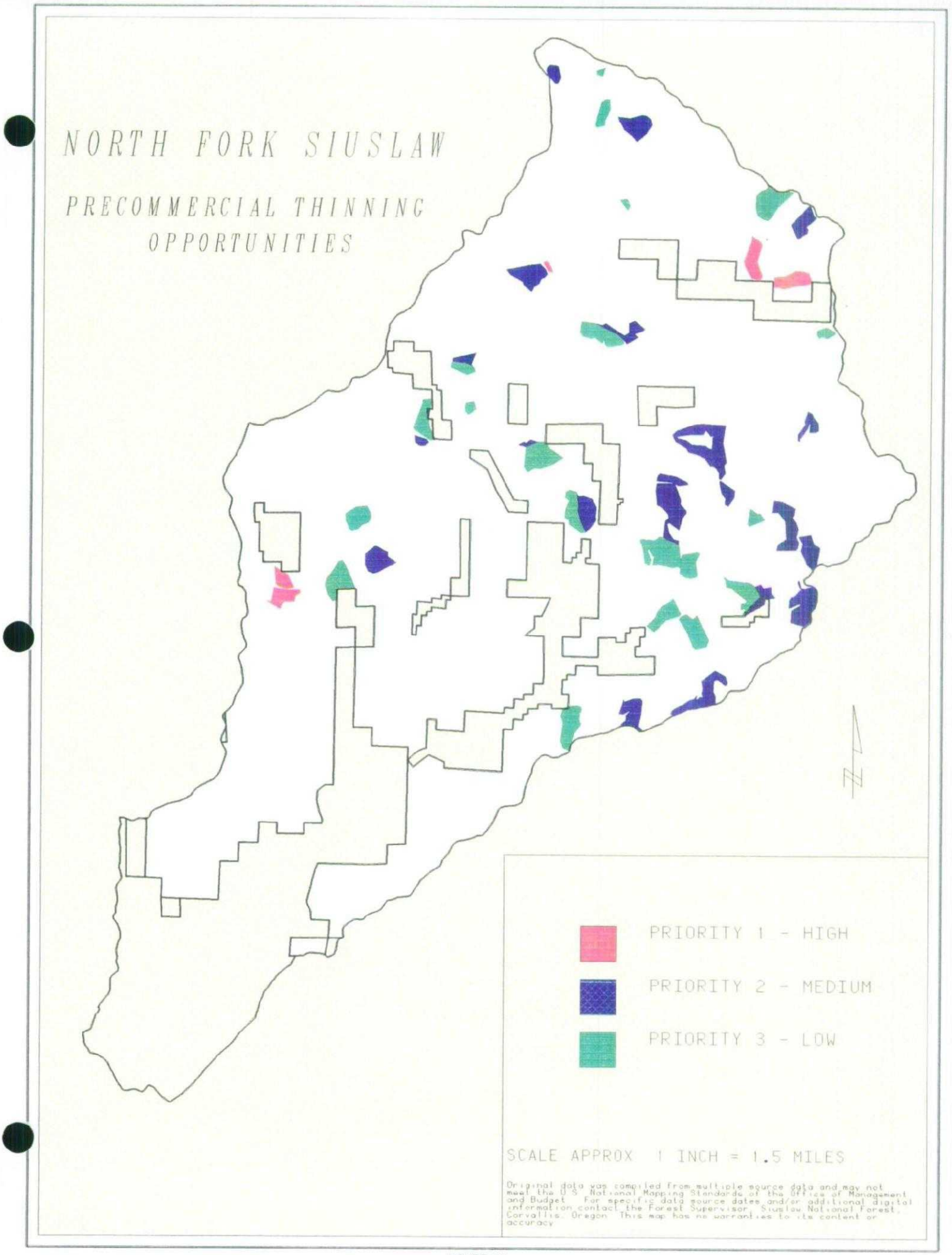
NORTH FORK SIUSLAW
PRECOMMERCIAL THINNING
OPPORTUNITIES
PRIORITY 1 - HIGH
PRIORITY 2 - MEDIUM
PRIORITY 3 - LOW
SCALE APPROX 1 INCH = 1.5 MILES
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FIGURE 57

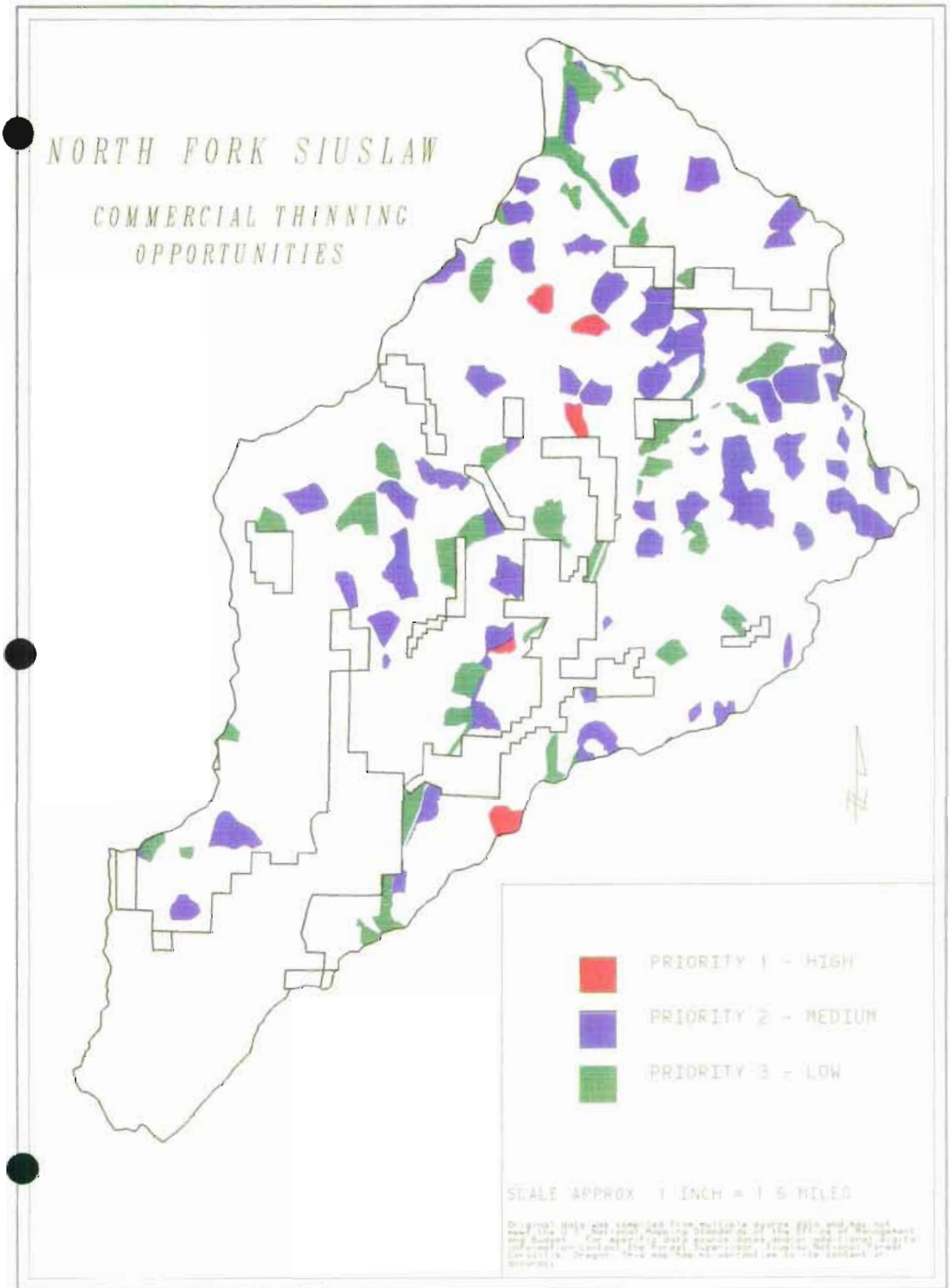
NORTH FORK SIUSLAW
COMMERCIAL THINNING
OPPORTUNITIES
PRIORITY 1 - HIGH
PRIORITY 2 - MEDIUM
PRIORITY 3 - LOW
SCALE APPROX 1 INCH = 1.5 MILES

FIGURE 58

intermittent streams (Class 4) within the Matrix will increase mature conifer acres available for harvesting to a maximum of 582 acres (25% or 40.7 mmbf ).

Realistically, due to site conditions, many of the Riparian Reserve widths along intermittent streams within the Matrix will remain unchanged. Some may even increase beyond interim widths. The following summarizes the maximum potential acreage changes between the interim and proposed Riparian Reserve widths along intermittent streams.

**Table 10.** Breakdown of forest stand acreage within the Matrix that is outside of the interim and proposed Riparian Reserves. This acreage would be available for harvesting.

| STAND TYPE | Acres with Interim Width | Acres with Proposed Width |
|---|---|---|
| Mature Conifer | 315 | 582 |
| 41-50 year old | 0 | 0 |
| 31-40 year old | 67 | 175 |
| 21-30 year old | 130 | 172 |
| 11-20 year old | 50 | 90 |
| 0-10 year old | 85 | 182 |

For managed stands (0-50 years old), 332 acres fall outside of the interim Riparian Reserves. This level may be increased to a maximum of 619 acres with modified buffer widths.

The following discussion suggests three different timber harvesting scenarios for mature conifer stands within the Matrix. Rotation age for Matrix land is assumed to be 60-150 years. Each of the three scenarios assumes a 100-year planning cycle.

Scenario 1 - Even flow

To provide an even flow of commodities from the Matrix lands over time, we assume a harvesting rate of 20 % per decade of the available mature conifer for the next 5 decades. With full buffers, this equates to approximately 63 acres per decade. With the proposed buffers, this equates to an increase to a maximum of about 116 acres per decade over the next 50 years. By the beginning of decade 6 all of the available mature conifer will have been harvested. At this point in time, most of today's current managed stands will have or are beginning to reach a mature conifer condition (80 years and older).

From decade 6 to 10 we assume a harvesting rate of 20% per decade of these current managed stands, starting with the oldest stands first (e.g., 90-100 years of age). With full buffers, this equates to approximately 66 acres (332/5) per decade. With the proposed buffers, this equates to an increase to a maximum of about 124 acres (619/5) per decade over the next 50 years. The following chart depicts the decades:

**DECADES**

| | |
|---|---|
| (1) 1995-2000 | (6) 2041-2050 |
| (2) 2001-2010 | (7) 2051-2060 |
| (3) 2011-2020 | (8) 2061-2070 |
| (4) 2021-2030 | (9) 2071-2080 |
| (5) 2031-2040 | (10) 2081-2090 |

Scenario 2 - Departure from Even Flow (back end)

Within the next 50 years it is assumed that much of the current available forage on National Forest System lands will disappear as young managed stand develop into mature conifer. To keep available forage acres within this watershed at a higher level later in the planning cycle to compensate for this effect, we assume a variable rate of harvest over the next 100 years, with lower percentages harvested earlier in the planning cycle. By decade 4 the available forage acres become more or less constant for the remainder of the planning cycle. The following summarizes this scenario.

**Table 11.** Departure from even flow harvesting regime for available mature conifer acreage within the Matrix and outside of Riparian Reserves over the next 100 years. Designed to provide big game foraging habitat in larger quantities later in the planning cycle.

| DECADE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| % Harvest | 5% | 10% | 15% | 25% | 25% | 20% | 20% | 20% | 20% | 20% |
| Acres with Interim | 16 | 32 | 47 | 79 | 79 | 80 | 80 | 80 | 80 | 80 |
| Acres with Proposed | 29 | 58 | 87 | 146 | 146 | 147 | 147 | 147 | 147 | 147 |

We assume a slowly increasing harvesting rate from 5-25% per decade of the available mature conifer for the next 5 decades. By decade 6 approximately 80% of the currently available mature conifer will have been harvested (refer to Figure 59). At this point in time, most of today's current managed stands will have or are beginning to reach a mature conifer condition (80 years and older). The remaining 20% of the mature conifer will add on to this base, providing an extra 63-116 acres depending on buffer widths.

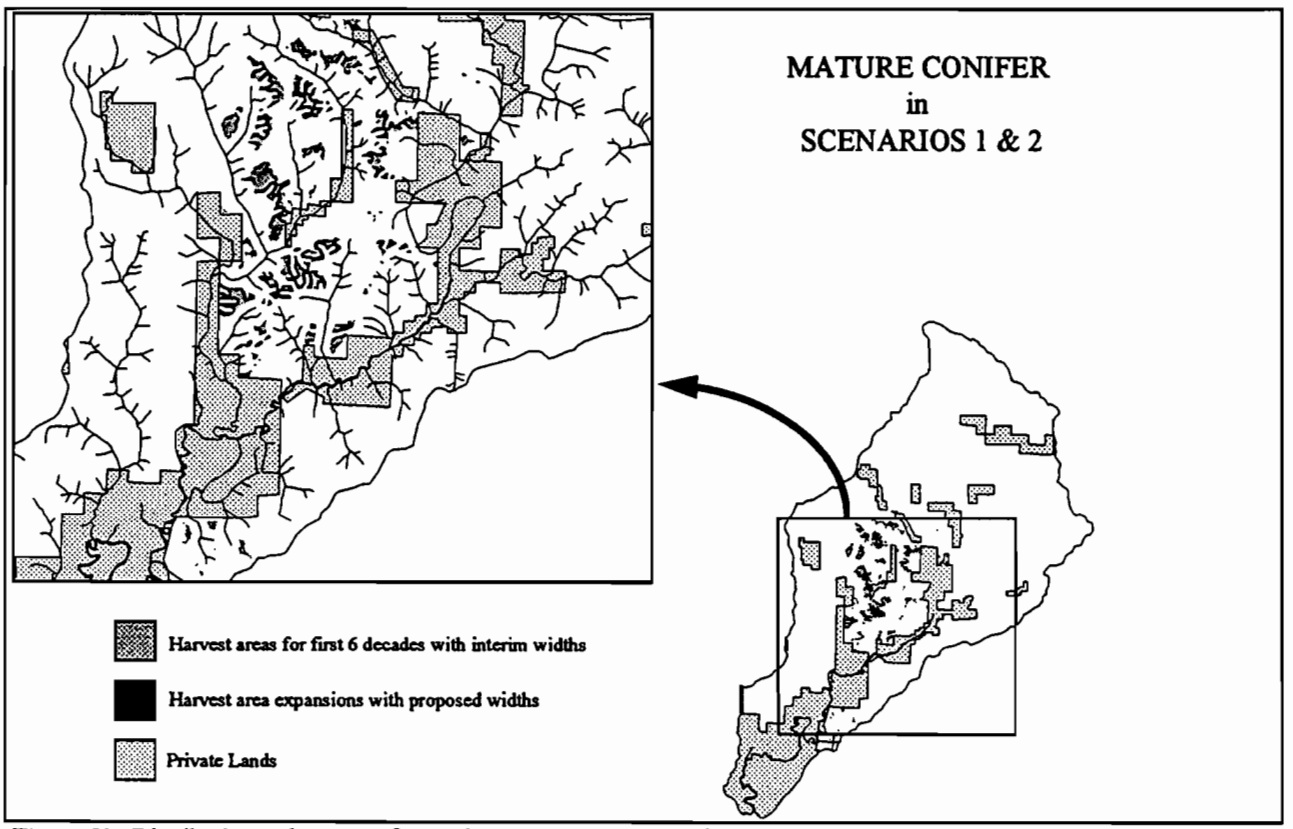


**Figure 59.** Distribution and pattern of potential harvest units within the current mature conifer stands located within the Matrix land allocation of the North Fork Siuslaw watershed. In scenario #1, these stands would be harvested within the next 60 years.

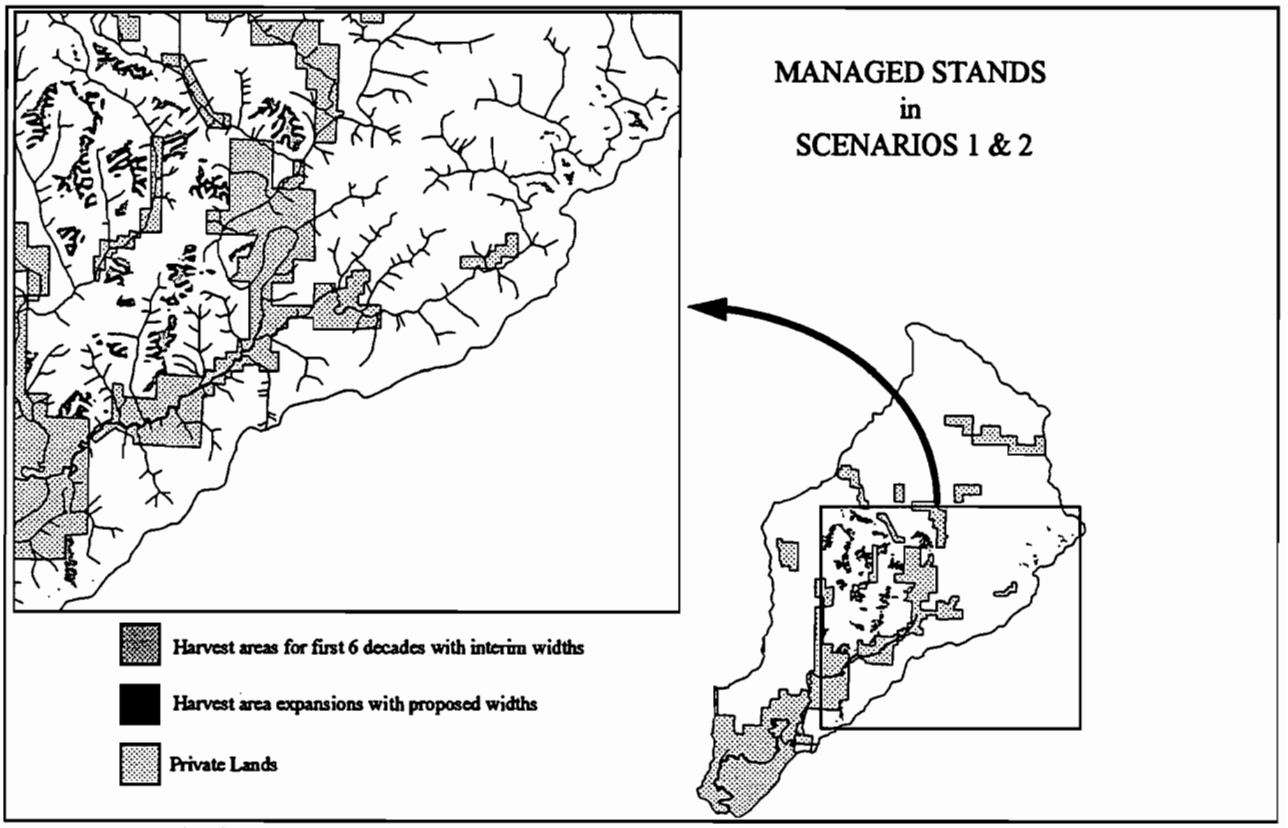


**Figure 60.** Distribution and pattern of potential harvest units within the current managed stands located within the Matrix land allocation of the North Fork Siuslaw watershed. These stands will develop into mature conifer over the next 50-100 years.

From decade 6 to 10 we assume a harvesting rate of 20% per decade of these current managed stands, starting with the oldest stands first (e.g. 90-100+ years of age). With interim buffer widths, this equates to approximately 80 acres per decade. With the proposed buffers, this equates to an increase to about 147 acres per decade over the next 50 years.

Scenario 3 - Even flow and New Forestry Concepts

To produce forage and commodities while exploring "new" techniques in harvesting and stand development. This approach would be to schedule 50% of the available mature conifer for regeneration harvesting over the 100 year planning cycle. The other 50% of the available acreage should be scheduled for partial harvesting with the idea to promote the development of "new" techniques that can be later used across the landscape.

## OTHER OPPORTUNITIES

### Miscellaneous Forest Products

The Siuslaw National Forest is currently conducting a forest-wide environmental analysis for the harvesting of special forest products. Refer to the Forest's environmental analysis for specific guidelines and regulations. This watershed analysis discusses opportunities for this activity within the North Fork Siuslaw.

#### *Cascara Bark*

Currently, levels of cascara within this watershed are below historical levels. Opportunities may exist to collect, propagate and plant cascara in openings created by commercial thinning and other timber harvesting. Cutting and peeling of cascara bark at current levels appears to be appropriate within this watershed.

*Cedar Posts, Rails and Shake Bolts*

Currently, quality western redcedar material for these products is extremely limited within this watershed. Opportunities include collection, propagation and planting of trees in appropriate areas, but especially in drainages where it has historically been most abundant. These would include Lindsey, Haring, Morris, Billie, Uncle and Condon Creeks; the western 1/2 of the watershed.

*Chanterelle mushrooms*

Picking of Chanterelle and other edible mushrooms is appropriate within the watershed. Opportunities exist to increase supply by maintaining closed canopy conditions in timbered stands. Providing large quantities of dead wood on the forest floor in these stands would further enhance growing mushrooms.

*Floral Greenery (Evergreen Huckleberry, Salal, Sword Fern)*

Picking of floral greenery is appropriate within the watershed. Opportunities exist to increase supply by thinning and opening up closed canopy stands. Supply may be affected by limited access.

*Moss*

Moss collection is generally appropriate within the watershed, subject to limitations developed in the forest-wide special use products environmental analysis.

*Burls*

Currently, the supply of burl quality bigleaf maple is limited within the watershed. Harvesting of burls is restricted and is generally not appropriate at this time. Retention of existing large bigleaf maple trees within the watershed will provide a continued supply of burls. Collection, propagation and planting of bigleaf maple will further increase the supply.

*Western redcedar and Douglas-fir boughs*

Harvesting is appropriate within the watershed. However, opportunities are limited because of inherent rust disease and climatic conditions.

*Transplant of trees and shrubs*

Removing trees and shrubs for transplanting is appropriate within the watershed, especially in overstocked areas, such as road corridors and managed stands. It is not appropriate to remove these species where they are not abundant, or where they are needed to meet the desired future condition.

**Noxious Weed Control**

In cooperation with the Oregon Department of Agriculture, noxious weed control needs to be aggressively pursued in the North Fork watershed. Botanical surveys completed in 1994 have mapped out noxious weed populations within the Key Watersheds. Road surveys for and additional riparian surveys need to be performed across the watershed to help prioritize and schedule treatments. Some noxious weeds of concern are scotch broom, tansy ragwort, Canadian thistle and blackberry.

**Recreation**

The ROD contains the following recommendations concerning recreation:

- New development proposals for recreation sites within LSR's will be reviewed on a case by case basis and may be approved when adverse effects can be minimized and mitigated (p. C-17).
- Developments will be located to avoid degradation of habitat and adverse effects on identified late-succesional species (p. C-17).
- Existing developments, such as campgrounds, within LSR's may remain as long as they are consistent with other standards and guidelines (p. C-17).
- Routine maintenance is expected to have less effect on old growth conditions than development of new facilities (p. C-17).
- Dispersed recreational uses, including hunting and fishing, generally are consistent with objectives of LSR's. Use adjustment (mitigation) measures such as education, use limitations, and increased maintenance when dispersed or developed recreation practices retard or prevent attainment of LSR objectives (p. C-18).

All recreation opportunities must comply with the standards and guidelines of the ROD and the Siuslaw Forest Plan. Potential opportunities are listed below.

- Identify and develop areas for camping with priority on group picnic and camping areas.
- Reconstruct the North Fork Campground to better meet the needs of users and the Aquatic Conservation Strategy.
- Develop high quality Discovery Route travel corridors.
- Provide opportunities for undeveloped recreation where people can have solitude and relaxation.
- Develop more hiking trails focusing on areas of natural solitude, vistas and interpretation.
- Develop horse and bicycle trails through the forest such as the Corvallis To The Sea, Tour deLane projects and the Coast Horse Trail.
- Develop ATV recreation opportunities on unmaintained roads. Cooperative partnerships with ATV groups for maintenance of roads would be encouraged.
- Develop high-quality non-motorized hunting opportunities.
- Create opportunities for viewpoints and overlooks.
- Develop interpretive opportunities to explain forest processes and human history.
- Develop alternative non-consumptive economic opportunities, such as eco-tourism .
- Provide recreation opportunities as described by the Recreation Opportunity Spectrum (ROS) with more emphasis on the roaded natural to semi-roaded and non-motorized.

Morris
- Coast Horse Trail extension
- Corvallis to the Sea trail
- Historic trail location along ridge line
- Mountain bike route along road 5842 connecting roads 5070 and 58
- Study possible tie through trail linking County 5070 with Forest roads 777 and 5842
- Elk viewing into Enchanted Valley
- Old growth stand trail or interpretation of upper Morris Creek riparian area and old growth stand

Billie
- Open historic ridgeline trail
- Historic telephone building interpretation
- Upper portion of subwatershed is easy ground suitable for mountain bike, horse or hiker trail
- Old growth stand trail or interpretation

Uncle
- Open historic ridgeline trail
- ATM Vehicle access route
- Homestead site clearing
- Historic Herman Peak fire lookout interpretation

Drew
- Open historic ridgeline trail

Wilhelm
- Open historic ridgeline trail
- Historic Saddle Mountain fire lookout site interpretation
- Interpretation of North Fork and more distant areas from vista from Three Buttes quarry site

Porter
- Old growth stand trail or interpretation
- Mountain biking
- Original Pawn post office interpretation

Sam/Elma
- ATM Vehicle access travel route
- Development of dispersed camping areas
- Hiker trails
- ATV trails
- Old growth stand trail or interpretation

Cataract
- ATM vehicle access travel route
- Old growth stand trail or interpretation
- Maintenance of Pawn Trail interpretation and trail
- Trail from North Fork Campground connecting with Pawn trail
- Reconstruct the North Fork Campground

McLeod
- Maintenance of Pioneer Trail interpretation and trail
- Old growth stand trail or interpretation

# CHAPTER 8 - *RECOMMENDATIONS FOR MONITORING*

There is a need to monitor conditions in the North Fork Siuslaw watershed to determine the effectiveness of various resource projects in meeting their objectives, to identify needed changes in project designs, and to fill in data gaps and information needs identified during the Watershed Analysis process. The following sections outline some potential monitoring questions which should be addressed and makes recommendations as to how and answer them.

Monitoring costs should be incorporated into planned project budgets and, where possible, KV funds should be collected to support monitoring efforts.

## PROJECT MONITORING

### Road Related Projects

#### *Waterbars*

Question: Do waterbars prevent water from running down tire tracks or ruts in the road, maintain road drainage, and disperse water to stable slope areas?

- Conduct visual surveys or establish photo points.

Question: Do waterbars increase erosion by causing gullying below waterbars or downcutting in the waterbars themselves?

- Conduct visual surveys or establish photo points.

Question: Are waterbars driveable?

- Conduct visual surveys or establish photo points.

Question: How long do waterbars last and do they need maintenance?

- Conduct visual surveys or establish photo points.
- Inspect a randomly selected group of waterbars annually.

Question: Is the design of waterbars adequate and can it be improved?

- Keep up with current research and experiment with different designs.

#### *Culvert Removal*

Question: Does removing culverts and fills from stream crossings increase erosion by causing downcutting or channel instability?

- Conduct visual surveys or establish photo points.

Question: Does allowing natural revegetation or seeding with native species provide adequate erosion control after removal?

- Establish monitoring plots in areas with different erosion control treatments and inspect periodically.

Question: Do sidecast pullback projects adversely affect sensitive plant populations?

- Conduct plant surveys prior to and (if sensitive plant populations are found) after project implementation.

***Sidecast Pullback***

Question: Do sidecast pullback projects maintain the stability of the road prism and fill slope?

- Establish monitoring plots inspect periodically.
- Conduct visual surveys or establish photo points.

Question: Do they increase sediment production by causing additional erosion or gullying?

- Conduct visual surveys or establish photo points.

Question: Does allowing natural revegetation or using native species provide adequate erosion control?

- Establish monitoring plots in areas with different erosion control treatments and inspect periodically.

Question: Do sidecast pullback projects adversely affect sensitive plant populations?

- Conduct plant surveys prior to and (if sensitive plant populations are found) after project implementation.

***Subsoiling***

Question: Does subsoiling a road decrease erosion and sediment production?

- Establish monitoring plots and inspect periodically.

Question: Does subsoiling a road increase vegetation establishment on the road surface?

- Establish monitoring plots inspect periodically.
- Conduct visual surveys or establish photo points.

***Road Safety and Resource Damage***

Question: Do current road management practices pose significant safety problems for the public.

- Monitor motor vehicle accident data to spot trends.

Question: Do current road management practices and Federal regulations, concerning Threatened or Endangered species, cause private landowners to build roads on private lands or otherwise operate differently to avoid dealing with these regulations. And if so, what consequences does this have on the ecosystem?

- Conduct public meeting and/or mail questionnaire to local timber industry companies.
- Review applications for road haul permits and outcomes.

## Vegetation Management Projects

### *Riparian Planting*

Question: Do alder overstory removal and brush release projects within the riparian area maintain adequate stream temperatures and retain bank stability?

- Continue temperature monitoring started in 1994, do visual surveys or establish photos points to monitor bank stability.

Question: What is the survival of conifer seedlings planted in riparian areas? Do the areas need additional brush or overstory release?

- Conduct stand survival and growth exams.

Question: Does hardwood to conifer conversion affect plant and animal populations associated with hardwood dominated habitats?

- Conduct pre and post treatment surveys for small mammals and reptiles using live trapping techniques. Coordinate with COPE study in progress (John Hayes).
- Conduct pre and post treatment botanical surveys of known populations of plant species of concern.

Question: Is the riparian planting design adequate and can it be improved?

- Keep up with current research and experiment with different designs.

### *Thinning*

Question: Do precommercial thinning and commercial thinning activities within Riparian Reserves maintain adequate stream temperatures, slope and bank stability, and windfirmness of the stands?

- Continue temperature monitoring, conduct visual surveys, establish photo points and conduct stand exams.

Question: Do thinning activities increase surface erosion?

- Establish monitoring plots within thinned stands.

Question: Does leaving large quantities of downed woody material in commercial thinning areas within Riparian Reserves increase insect infestations in adjacent stands?

- Monitor over time.

Question: Are harvest methods and design adequate and can they be improved?

- Keep up with current research and experiment with different designs.

Question: Does thinning accelerate the development of old-growth characteristics.

- Monitor over time.

*Mature Conifer Diversity*

Question: Do snag and log densities within the managed mature conifer stands differ greatly from the adjacent unmanaged stands?

- Conduct stand exams.

Question: Does creating snags and downed logs increase species diversity within the stand?

- Conduct wildlife surveys (Survey and Manage)

Question: Are methods for creating wildlife habitat adequate to meet objectives and can they be improved?

- Keep up with current research and experiment with different designs.

*Commercial Timber Harvest*

Question: Are "New Forestry" ideas being implemented?

- Keep up with current research and experiment with different designs.

**Fish Habitat Projects**

*Instream Structures*

Question: Are instream structure projects effective at improving fish habitat?

- Conduct intensive pre/post Level III habitat surveys of selected project sites to evaluate habitat change.
- Establish and maintain a series of photo points for each project.
- Complete an annual structure inventory and maintenance survey.

Question: Do instream structures have detrimental effects?

- Monitor over time.

Question: Is the design of instream structures appropriate to the stream type and location?

- Keep up with current research and experiment with different designs.

**Recreation Projects**

*Recreation Sites*

Question: Are riparian conditions adjacent to developed and dispersed recreation sites maintained or improved?

- Conduct field surveys to monitor riparian conditions over time.

Question: Are recreation facilities adequate to meet current needs?

- Conduct public meeting and/or questionnaires to distributed at established camping sites.

## ECOSYSTEM HEALTH

Question: Are fish populations increasing?

- Cooperate with ODFW to conduct spawning surveys and basin-wide surveys of juvenile fish populations.

Question: Is fish habitat condition improving?

- Conduct basin-wide Level II stream habitat inventories approximately once every 10 years to determine whether the streams better meet fish habitat objectives.

- Complete a Level II stream habitat inventory on Reaches 2-6 of McLeod Creek approximately every three years as part of the ongoing Forest Plan monitoring program.

Question: Are the high levels of sand observed in some streams reducing spawning success?

- Cooperate with ODFW to evaluate egg to fry survival.

Question: Is the amount of fine sediment in streams decreasing?

- Conduct stream surveys, establish cross-sections at critical (sensitive) locations, and/or measure Methods might include stream surveys, cross-sections at critical (sensitive) locations, or measure embeddedness of gravel beds.

Question: Does drift boat use on the upper North Fork between the campground and Meadows Bridge adversely affect spawning fish or reduce egg survival?

- Cooperate with ODFW to evaluate drift boat use and habitat impacts.

Question : Are stream temperatures within the desired range?

- Twelve automated temperature recorders were installed throughout the North Fork Siuslaw drainage during the summer of 1994. The temperature monitoring should continue for a minimum of three years to evaluate potential temperature problems and establish a baseline for future monitoring.

Question: Do peak flows appear to be changing as watershed restoration projects take effect?

- Re-install the US Geological Survey stream gage downstream from the Meadows bridge to determine what the trend of peakflows is in the future.

Question : Are spotted owl populations stable, increasing or decreasing?

- Continue to fund PNW to monitor demographics and analyze trends.

Question: Are sensitive stream reaches changing?

- Stream reaches that are unconfined with gradients of 2% or less were identified. (See map __ (sensitive reaches) for specific locations). A representative sample of these reaches should be monitored to determine whether channel morphology and substrate change over time. Monitoring techniques might include a series of permanent cross-section locations and pebble counts.

Question: Are levels of insects and disease increasing above natural rates of occurrence?

- Conduct ground and aerial surveys. Coordinate with COPE and ODA.

Question: Is soil productivity being maintained?

- Conduct post-harvest and post-thinning surveys to see if adequate amounts of large woody debris are left on the ground, and compaction and erosion affect less than 15% of the harvest area (See the Siuslaw National Forest Land and Resource Management Plan, soil and water standards and guidelines).

**For further recommendations and guidelines on monitoring, see the "Interagency Framework for Monitoring the President's Forest Ecosystem Plan" dated April 1994.**

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# APPENDICES

# *Appendix A*

## - GLOSSARY - NORTH FORK OF THE SIUSLAW WATERSHED

**AGGRADATION** - The process of building up the level or slope of a stream or river bed by the deposition of sediment.

**ANADROMOUS FISH** - Fish that are born in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and shad are examples.

**BIOLOGICAL DIVERSITY** - The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

**CLIMAX COMMUNITY** - The final, stable biotic community in a developmental series; it is self-perpetuating and in equilibrium with the physical habitat.

**CONNECTIVITY** - Condition in which the spatial arrangement of habitat types allows organisms and ecological processes (such as disturbances) to move across the landscape. Connectivity is the opposite of fragmentation.

**CONTIGUOUS** - In physical contact along all or most of one side, forming large blocks or areas.

**CORRIDOR** - Landscape elements (usually a linear strip of land) that connect similar patches of habitat through a dissimilar matrix or aggregation of patches.

**DISCOVERY ROUTE** - A designated vehicle travel route designed to allow the public to access recreational facilities and natural resources on public lands.

**DISPERSAL** - The movement, usually one way and on any time scale, of plants or animals from their point of origin to another location where they subsequently produce offspring.

**DIVERSITY** - The distribution and abundance of plant and animal species and communities in a given area.

**EARLY SUCCESSIONAL FOREST** - Forest seral stages younger than mature conifer and old growth.

**ECOSYSTEM** - The system formed by the interaction of a group of organisms and their environment. Ecosystem boundaries are designated to address specific problems, and therefore an ecosystem can be as small as the surface of a leaf or as large as the entire planet and beyond. Through movement of energy and materials across this boundary, ecosystems affect and are affected by other ecosystems. Because people directly or indirectly influence all of the earth's ecosystems, and because we obtain sustenance and make demands from the ecosystem, the framework includes people as an important part of all ecosystems and societal processes as an important ecosystem mechanism.

**ECOSYSTEM MANAGEMENT** - The use of an ecological approach in land management to sustain diverse, healthy and productive ecosystems. Ecosystem management is applied at various scales to blend long-term societal and environmental values in a dynamic manner that may be adapted as more knowledge is gained through research and experience.

**EDGE EFFECT** - The effect that adjoining habitat types (e.g. grass/forb - mature conifer) have on population structure along their edges, which often provides for greater numbers of species and higher population densities than either adjoining community. Edges may also result in negative effects; habitat along an edge is different than within the interior of the habitat, thus reducing the effective area of that habitat patch.

**ENDANGERED SPECIES** - Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.

**EXTIRPATION** - The elimination of a species from a particular area.

**FRAGMENTATION** - Breaking up of contiguous areas into progressively smaller patches of increasing degrees of isolation. The process of reducing size and connectivity of stands that compose a forest.

**GEOGRAPHIC INFORMATION SYSTEM (GIS)** - A spatial type of information management system using computers to provide entry for, storage, manipulation, retrieval and display spatially oriented data.

**GUILDS** - A group of organisms that share a common food resource, nesting habitat and other habitat requirements.

**KEY WATERSHED** - A designated watershed containing relatively good populations and/or habitat for potentially threatened stocks of anadromous salmonids.

**INTERMITTENT STREAM** - A drainage feature having a definable channel and evidence of annual scour or deposition, but which does not have flowing water year-around. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

**LANDSCAPE** - Large regional units of land that are viewed as a mosaic of habitats and communities irrespective of political or other artificial boundaries.

**LANDSCAPE MATRIX** - The most concentrated portion of the landscape, that is, the habitat type that is most contiguous.

**LARGE WOOD DEBRIS (LWD)** - Fallen trees that remain on the forest floor or end up in stream channels. Usually refers to pieces at least 24 inches in diameter and 50 feet in length.

**LATE SUCCESSIONAL FORESTS** - Forest seral stages which include mature and old growth age classes. In this area we see this stand condition beginning at approximately 80 years of age, depending on site specific conditions.

**MANAGED FOREST** - Any forest land that has been treated with silviculture practices and/or harvested.

**MATRIX** - Federal lands outside of reserves, withdrawn areas and Managed Late Successional areas.

**MULTI-STORIED** - Forest stands that contain trees in various heights and diameter classes and therefore support foliage at various heights in the vertical profile of the stand.

**OLD GROWTH FOREST** - A forest stand usually at least 150-250 years old with moderate to high canopy closure; a multi-layered, multi-species, canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground.

**PERENNIAL STREAM** - A stream that typically has running water on a year-round basis.

**REFUGIA** - Locations and habitats that support populations of organisms that are limited to smaller fragments of their previous geographic range.

**RESTORATION** - The process of restoring site conditions to (or as close as possible) historical conditions that existed prior to man-caused land disturbances which prevent the ecosystem from functioning properly.

**RIPARIAN AREA (ZONE)** - The banks and adjacent areas of water bodies, courses, seeps and springs. Terrestrial areas where the vegetation and microclimate conditions are products of the combined presence and influence of perennial and/ or intermittent water, associated high water tables, and soils that exhibit some wetland characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

**RIPARIAN RESERVES** - Federal lands adjacent to streams, lakes, and other water bodies which are managed to maintain riparian-dependent species and to provide connectivity between Late Successional habitat.

**SENSITIVE SPECIES** - A species not formally listed as endangered or threatened under the Endangered Species Act, but thought to be at risk.

**SERAL** - A biotic community which is a transitory stage in ecological succession or any community that is not a potential and will eventually be replaced by other communities.

**SILVICULTURE** - The art and science of managing forest stands to provide or maintain structures, species compositions and growth rates that contribute to forest management goals.

**SUCCESSION (ECOLOGICAL)** - A process of plant and animal community development that involves changes in species, structure, and processes over time.

**SUCCESSIONAL STAGE** - One in a series of usually transitory biotic communities or developmental stages that occur on a particular site or area over a period of time (*also see seral*).

**THREATENED SPECIES** - Those plant or animal species likely to become endangered species throughout all or a significant portion if their range within the foreseeable future. A plant or animal identified and defined accordance with the 1973 Endangered Species Act and published in the Federal Register.

**WATERSHED** - A total area of land above a given point on a waterway that contributes runoff water to the flow at that point. The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

**WATERSHED ANALYSIS** - A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis provides a basis for ecosystem management planning that is applied to watersheds of approximately 20 to 200 square miles.

**WETLANDS** - Areas that are inundated by surface water or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetation or aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990). Wetlands generally include, but are not limited to, swamps, marshes, bogs, and similar areas.

# *Appendix B*

## - PLANT ASSOCIATIONS - NORTH FORK OF THE SIUSLAW WATERSHED

The following descriptions are based on the "Plant Association and Management Guide, Siuslaw National Forest" (Hemstrom and Logan, 1986).

The interaction of climate (wind, water, and heat) on the geologic characteristics of the area (soils and bedrock) have resulted in the vegetative patterns that we see today in the North Fork watershed. The ability of plants to migrate, to propagate and dominate their environments or microsites have dictated the speed of ecological succession in the area. Major and minor disturbances (including harvesting) have been instrumental in development of current plant composition across the landscape.

Floristically, the Coast Range is not as diverse as its provincial neighbors, especially the Siskiyou province. A mostly uniform mild climate plus similar soils and also steep slopes which hinder plant migration have resulted in a landscape where dominating plants seem to have an establishment advantage that is hard to penetrate. Plant associations are quite predictable in the general sense. Figures 11, 12 of the Guide can be used to illustrate this trend. Aspect (exposure to sun) seems to be the most important variable in predicting change from one plant community to another.

Plant populations that have developed on a site over a long period of time and have developed a balance with their environment are termed plant associations. These groupings of plants are looked at over a long time frame to determine successional climax. Plant communities in the Sitka spruce climax series would eventually stabilize with a Sitka spruce dominated overstory. Plant communities in the western hemlock climax series would stabilize with an overstory dominated by western hemlock trees. In both cases, disturbances frequently prevent the attainment of the climax state. Wind most often moves the Sitka spruce areas back to an early or mid seral state. Large stand replacement fires usually reset the successional clock in the hemlock stands to a state mostly dominated by Douglas-fir.

The western edge of the North Fork analysis area is commonly the eastern boundary for the Sitka spruce zone. Nearly all of the basin is in the Douglas-fir dominated western hemlock zone. The area adjacent to the spruce zone often is transitional and has plant representation from both zones.

The following plant associations are present in the watershed:

***Sitka Spruce/Salmonberry*** **(PISI/RUSP)**

The overstory ranges from Sitka spruce, Douglas-fir, and western hemlock to nearly pure red alder. Dense salmonberry is characteristic of the shrub layer. Red huckleberry and vine maple are also common. The herbaceous community is dominated by swordfern and Oregon oxalis but also includes plants such as montia, false lily-of-the-valley and Pacific trillium.

This plant association indicates abundant soil moisture with good drainage and maritime climatic influences. Douglas-fir, Sitka spruce, western hemlock, red alder and salmonberry all grow extremely well on this site. Plant competition following clearcutting is probably more severe here than in any other plant association on the Siuslaw National Forest. Alder and salmonberry often outcompete conifers for the site unless corrective measures are taken. Once established, conifer growth is excellent. Deer and elk use is usually high. Mountain beavers (boomers) are also common to the landscape and sometimes need to be controlled in order to establish a conifer stand.

*Western Hemlock/Salmonberry* (TSHE/RUSP)

This plant association is widespread and common across the Siuslaw National Forest. Douglas-fir dominates the overstory in some stands and red alder dominates in others. In stands with multi-canopies, western hemlock is often common in the understory. Salmonberry dominates the understory with other important shrubs being evergreen huckleberry and red elderberry. The dense shrub layer inhibits development of the herbaceous plants. Sword fern is the most common plant that takes advantage of openings in the shrub dominating environment. Oxalis and montia may also be present.

The western hemlock/salmonberry association occurs on well-drained, well-watered soils that are moist most of the year. Fertility is enhanced by the large nitrogen inputs from sometimes nearly pure stands of red alder. This plant community also has high populations of mountain beaver, who contribute to the site by vast burrowing in the soils. All conifers present grow excellent. Red alder is also very productive on this site. Young conifer stands are typically dominated by salmonberry and alder unless released. These stands are normally quite resistant to fire. Deer and elk use is high. Large live trees and snags can be developed quickly in this plant zone.

*Western Hemlock/Salal* (TSHE/GASH)

Western hemlock/salal associations are common in the Cascades and the Coast Ranges of Oregon and Washington. It is a common plant community in the North Fork area also. Douglas-fir dominates the overstory canopy. Western hemlock is often common as regeneration or throughout the canopy. Some western redcedar may also be present. Other tree species that may be present include bigleaf maple and even golden chinquapin. Red alder also is present but in smaller amounts then in other plant associations. Salal is often very dense. Mobility of humans and most wildlife can be challenged in this landscape. Other shrubs commonly seen include vine maple, red huckleberry, thimbleberry, salmonberry and evergreen huckleberry. Swordfern often dominates the herb layer. Disturbances often result in understory dominance by salal. Many of the mid to upper slopes of the North Fork drainage that were partially harvested in the past usually developed extremely high levels of salal.

This plant association is common on ridges and on mid to upper portions of south and west facing slopes. Douglas-fir grows moderately well, salmonberry and alder are not nearly as aggressive. Deer and elk use in the heavy salal tends to be low.

*Western Hemlock/Swordfern* (TSHE/POMU)

Western hemlock/swordfern associations are common on moist sites from the Olympic Mountains to the Siskiyou Mountains including the Cascade and the Coast Ranges. Sites with large amounts of vine maple seem to be more productive so they have been split into another plant association, western hemlock/vine maple/swordfern. Douglas-fir usually dominates the canopy and is associated with western hemlock and western redcedar, which are common in lower levels. Red alder and bigleaf maple are the hardwoods normally present. The shrub component is usually limited but red huckleberry, salal, salmonberry and vine maple may all be present. Swordfern is the most common herb with Oregon oxalis, deerfern, Pacific trillium and bedstraw all being common.

Douglas-fir site productivity is high. Natural stands are normally well stocked. Red alder regenerates and develops well. Old growth structural development is usually fast in this plant community. Deer and elk use is moderate to high.

*Western Hemlock/Evergreen Huckleberry* **(TSHE/VAOV2)**

The western hemlock/evergreen huckleberry association is widespread on the Mapleton Ranger District. Douglas-fir again dominates the overstory canopy. Western hemlock and western redcedar are often found as subordinates beneath the Douglas-fir. Many of these stands will contain red alder. Bigleaf maple may also be present. Evergreen huckleberry is always present in the shrub layer. Other shrubs may be plentiful also: salal, red huckleberry, vine maple and small amounts of salmonberry. Swordfern is the most common herb.

Moderate to hot fires should be avoided because of the relatively poor soils. Red alder growth is generally slow. Wildlife habitat values for big game are low.

*Western Hemlock/Rhododendron-Evergreen Huckleberry* **(TSHE/RHMA-VAOV2)**

This association may be found on steep, low elevation ridges and slopes in the North Fork basin. A similar community exists in the Oregon Dunes National Recreation Area where sand dunes have stabilized. Douglas-fir most commonly dominates the overstory, with western redcedar and western hemlock present also in many of the stands. Natural regeneration of hemlock is common. Bigleaf maple is also present in many places. The dense layer of shrubs, dominated by evergreen huckleberry and sometimes rhododendron often exclude an herbaceous layer. Cascara buckthorn can be found in this community.

The Douglas-fir site index in this type is among the lowest on the Siuslaw National Forest. These stands tend to be less stocked and grow relatively slow due to the combination of droughty and fairly infertile soils. Hot burns may stimulate (*Ceanothus* spp.) from the seeds stored in the soil. Watershed values may be high as some of the headwalls on relatively thin soils are occupied by this community. Deer and elk use is generally low because of shrub density and poor quality forage.

*Western Hemlock/Rhododendron-Salal* **(TSHE/RHMA-GASH)**

Western hemlock/rhododendron-salal associations are common in the Oregon Cascades and in the southern/eastern portions of the Siuslaw National Forest. Douglas-fir dominates the overstory with western hemlock found in both the overstory and the understory. Bigleaf maple is the most common hardwood with only a few alder trees usually present. Rhododendron and salal dominate a thick shrub layer. Vine maple, evergreen huckleberry, dwarf Oregon grape and red huckleberry also may be present. Rhododendron may dominate some sites. Swordfern is normally the only significant herb present. This plant association is found on warm well-drained slopes and ridges, mostly on the Mapleton Ranger District and may be present in the North Fork basin.

Conifers tend to grow slower in this association, but when present on better soils they can still exhibit good growth. Nitrogen appears to be limiting on some sites and the canopy may be chlorotic. Some stands in the North Fork basin appear to be in this condition. Moderate to hot fires can degrade these sites and promote the establishment of (*Ceanothus* spp.). Deer and elk use is usually low.

*Others*

Other plant associations may be present on the North Fork Siuslaw also. Most likely these would be combinations of those above. Some of those could be:

- Sitka Spruce/Salmonberry-Salal (PISI/RUSP-GASH)
- Western Hemlock/Rhododendron/Swordfern (TSHE/RHMA-POMU)
- Western Hemlock/Salmonberry-Vine Maple (TSHE/RUSP-ACCI)
- Western Hemlock/Vine Maple-Salal (TSHE/ACCI-GASH)

**Summary**

The primary use of plant associations in the past have been the prediction of brush from which silviculture prescriptions and fuels treatments have been developed. Normally all managed stands will have predicted plant associations mapped to facilitate management decisions. As stand management objectives change with the concepts of Late Successional Reserves, Riparian Reserves and Matrix allocations, plant associations can be used as a tool to fine tune those prescriptions, make predictions on stand development and to prioritize treatment needs.

# *Appendix C*

## - SPECIES OF CONCERN - NORTH FORK OF THE SIUSLAW WATERSHED

The following tables summarize plant and animal species likely to be found (during all or a part of the year) within the North Fork Siuslaw watershed which are either listed Federally, Regionally or by the State as being in danger of extirpation or extinction or of some other concern. The definitions following these tables explain specifically the status as designated by each agency. Some wildlife species which winter here and are listed elsewhere as sensitive are not shown, such as the bufflehead (*Bucephala albeola*) and Barrow's goldeneye (*Bucephala islandica*) for which the breeding populations in the Cascades are only listed as being sensitive.

As of 1997, any areas proposed for ground-disturbing activities must be surveyed for red tree voles (*Phenacomys longicaudus*) in addition to Regionally listed sensitive species. As of fiscal year 1999, surveys for all species listed in Table C of the ROD must occur prior to ground disturbing activities.

**Table 1.** Sensitive animal species which do or may occur, throughout all or a part of the year, within the North Fork Siuslaw watershed.

| CLASS | COMMON NAME | SCIENTIFIC NAME | FED | STA | ONHP | R6 |
|---|---|---|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | - | U | 3 | - |
| Amphibian | Tailed Frog | *Ascaphus truei* | - | V | 3 | - |
| Amphibian | Western Toad | *Bufo boreas* | - | V | 3 | - |
| Amphibian | Red-legged Frog | *Rana aurora* | C2 | U | 4 | S |
| Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | - | V | 3 | - |
| Bird | Northern Goshawk | *Accipiter gentilis* | C2 | C | 3 | S |
| Bird | Marbled Murrelet | *Brachyramphus marmoratus* | T | C | 2 | S |
| Bird | Aleutian Canada Goose (wintering) | *Branta canadensis leucopareia* | T | T | 1 | S |
| Bird | Dusky Canada Goose (wintering) | *Branta canadensis occidentalis* | - | - | 4 | - |
| Bird | Cackling Canada Goose (wintering) | *Branta canadensis minima* | - | - | 4 | - |
| Bird | Pileated Woodpecker | *Dryocopus pileatus* | - | V | 4 | - |
| Bird | American Peregrine Falcon | *Falco peregrinus* | E | E | 1 | S |
| Bird | Common Loon | *Gavia immer* | - | - | 2 | S |
| Bird | Northern Pygmy Owl | *Glaucidium gnoma* | - | U | 3 | - |
| Bird | Northern Bald Eagle | *Haliaeetus leucocephalus* | T | T | 1 | S |
| Bird | Harlequin Duck | *Histrionicus histrionicus* | C2 | P | 2 | - |
| Bird | Long-billed Curlew | *Numenius americanus* | C2 | - | 4 | S |
| Bird | Mountain Quail | *Oreortyx picta* | C2 | - | 4 | - |
| Bird | Purple Martin | *Progne subis* | - | C | 3 | - |
| Bird | Western Bluebird | *Sialia mexicana* | - | V | 4 | - |
| Bird | Northern Spotted Owl | *Strix occidentalis caurina* | T | T | 1 | S |
| Fish | River Lamprey | *Lampetra ayresi* | - | - | 4 | - |
| Fish | Pacific Lamprey | *Lampetra tridentata* | - | V | 4 | - |
| Fish | Coastal Cutthroat Trout | *Oncorhynchus clarki clarki* | - | - | 3 | - |
| Fish | Coho Salmon | *Oncorhynchus kisuch* | - | - | 1 | - |
| Invertebrate | Foliaceous Lace Bug | *Derephysia foliacea* | - | - | 2 | - |
| Invertebrate | Mulsant's Small Water Strider | *Mesovelia mulsanti* | - | - | 3 | - |
| Invertebrate | Marsh Nabid | *Nabicula propinquua* | - | - | 3 | - |
| Invertebrate | Alsea Micro Caddisfly | *Ochrotrichia alsea* | 3C | - | 3 | S |
| Invertebrate | Montane Bog Dragonfly | *Tanypteryx hageni* | - | - | 3 | - |
| Invertebrate | Pale Teratocoris Sedge Bug | *Teratocoris paludum* | - | - | 3 | - |
| Mammal | Pine Marten | *Martes americana* | - | C | 3 | - |
| Mammal | Pacific Fisher | *Martes pennanti pacifica* | C2 | C | 2 | S |
| Mammal | Fringed myotis | *Myotis thysanodes* | - | V | 1 | - |
| Mammal | White-footed Vole | *Phenacomys albipes* | C2 | P | 3 | S |
| Mammal | Townsend's Big-eared Bat | *Plecotus townsendii* | C2 | C | 2 | S |
| Reptile | Northwestern Pond Turtle | *Clemmys marmota marmota* | C2 | C | 2 | S |

**Table 2.** Sensitive plant species which do or are likely to occur within the North Fork Siuslaw watershed.

| COMMON NAME | SCIENTIFIC NAME | FED | STA | ONHP | R6 |
|---|---|---|---|---|---|
| Ammannia | *Ammannia robusta* | - | - | 3 | - |
| Bryoria | *Bryoria subcana* | - | - | 2 | - |
| Liverwort | *Calypogeia sphagnicola* | - | - | 2 | - |
| Tall Bugbane | *Cimicifuga elata* | C2 | C | 1 | S |
| Salt-marsh Bird's Beak | *Cordylanthus maritimus ssp. palustris* | C2 | C | 1 | S |
| Shining Cyperus | *Cyperus bipartitus* | - | - | 3 | - |
| California Pitcher-plant | *Darlingtonia californica* | - | - | 4 | - |
| Frigid Shooting Star | *Dodecatheon austrofrigidum* | C2 | C | 1 | S |
| Small Spikerush | *Eleocharis parvula* | - | - | 3 | - |
| Elegant Fawn-lily | *Erythronium elegans* | C2 | C | 1 | S |
| Coast Fawn-lily | *Erythronium revolutum* | - | - | 4 | - |
| Queen-of-the-forest | *Filipendula occidentalis* | C2 | C | 1 | S |
| Water Pennywort | *Hydrocotyle verticillata* | - | - | 2 | S |
| California Globe-mallow | *Iliamna latibracteata* | - | - | 2 | - |
| Dwarf Rue-anemone | *Isopyrum stipitatum* | - | - | 3 | S |
| Mud Rush | *Juncus gerardii* | - | - | 3 | - |
| Frye's Limbella Moss | *Limbella fryei* | C2 | C | 1 | S |
| Northern Bog Club Moss | *Lycopodiella inundata* | - | - | 2 | S |
| Coast Microseris | *Microseris bigelovii* | - | - | 2 | - |
| Common Water-nymph | *Najas guadalupensis* | - | - | 3 | - |
| Loose-flowered Bluegrass | *Poa laxiflora* | - | - | 4 | S |
| Weak Bluegrass | *Poa marcida* | - | - | 4 | - |
| Pohlia Moss | *Pohlia sphagnicola* | - | - | 2 | S |
| California Swordfern | *Polystichum californicum* | - | - | 2 | - |
| Dotted Smartweed | *Polygonum punctatum* | - | - | 3 | - |
| Water Clubrush | *Scirpus subterminalis* | - | - | 3 | - |
| Creeping Chickweed | *Stellaria humifusa* | - | - | 3 | - |
| Humped Bladderwort | *Utricularia gibba* | - | - | 2 | S |
| Lesser Bladderwort | *Utricularia minor* | - | - | 2 | S |
| Columbia Water-meal | *Wolffia columbiana* | - | - | 2 | S |
| Dotted Water-meal | *Wolffia borealis* | - | - | 2 | S |

**Table 3.** ROD species (Table C-3) which occur or are likely to occur within the North Fork Siuslaw watershed and will require to be surveyed for under the "Survey and Manage" standards and guidelines.

| CATEGORY | SCIENTIFIC NAME |
|---|---|
| Mammal | *Phenacomys longicaudus* |
| Lichen | *Lobaria oregana* |
| Lichen | *Lobaria pulmonaria* |
| Lichen | *Lobaria scrobiculata* |
| Lichen | *Nephroma helveticum* |
| Lichen | *Nephroma laevigatum* |
| Lichen | *Nephroma parile* |
| Lichen | *Pannaria leucosticoides* |
| Lichen | *Pannaria saubinetii* |
| Lichen | *Peltigera collina* |
| Lichen | *Peltigera neckeri* |
| Lichen | *Platismatia lacunosa* |
| Lichen | *Pseudocyphellaria anomala* |
| Lichen | *Pseudocyphellaria anthraspis* |
| Lichen | *Pseudocyphellaria crocata* |
| Lichen | *Sticta fuliginosa* |
| Lichen | *Sticta limbata* |

Note: Refer to the Table C-3 of the ROD (pages C-49 through C-60) for the complete list of species associated with Survey and Manage guidlines.

A species is assumed to be extirpated if it has been known to have existed in the area in the past but has not been seen since 1960. Table 4 summarizes the species which have been extirpated from the North Fork Siuslaw watershed over the last 150 years.

**Table 4.** Wildlife species which have been extirpated from the watershed or the surrounding areas in the last 150 years.

| CLASS | COMMON NAME | SCIENTIFIC NAME | FED | STA | ONHP |
|---|---|---|---|---|---|
| Bird | Yellow-billed Cuckoo | *Coccyzus americanus* | 3B | C | 2 |
| Bird | California Condor | *Gymnogyps californicus* | E | - | 1 |
| Fish | Chum Salmon | *Onchorhynchus keta* | - | C | - |
| Mammal | Gray Wolf | *Canis lupus* | E | E | 2 |
| Mammal | Pacific Fisher?? | *Martes pennanti pacifica* | C2 | C | 2 |
| Mammal | Columbian White-tailed Deer | *Odocoileus virginianus leucurus* | E | E | 1 |
| Mammal | Grizzly Bear | *Ursus arctos* | T | - | 1 |

## STATUS DEFINITIONS

FEDERAL

**Endangered (E)** ——— Any species in danger of extinction throughout all or a significant portion of its range.
**Threatened (T)** ——— Any species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
**Proposed (PE/PT)** ——— Species proposed by the USFWS to be listed as endangered or threatened.
**Category 1 (C1)** ——— Candidate; Taxa for which the USFWS has sufficient information to support a proposal to list as threatened or endangered.
**Category 2 (C2)** ——— Candidate; Taxa for which additional information (further research) is needed to be able to propose the species as threatened or endangered.
**Category 3 (3A)** ——— Taxa for which the USFWS has persuasive evidence of extinction.
**Category 3 (3B)** ——— Taxa which do not meet the USFWS definition of a species.
**Category 3 (3C)** ——— Taxa which have proven to be more abundant or widespread than previously believed and/or which have no identifiable threats.

STATE

**Endangered (E)** ——— Native species determined to be in danger of extinction throughout all or any significant portion of its range or those listed as endangered on the Federal list.
**Threatened (T)** ——— Native species determined likely to become endangered within the foreseeable future throughout all or any significant portion of its range or those listed as threatened on the Federal list.
**Critical (C)** ——— Native species for which listing as threatened or endangered is pending.
**Vulnerable (V)** ——— Native species for which listing is not believed to be imminent and can be avoided with adequate protective measures.
**Peripheral (P)** ——— Peripheral or naturally rare species whose populations are on the edge of their range or are historically low in numbers due to naturally limiting factors.
**Undetermined (U)** ——— Species for which status is unclear and requires further scientific study.

OREGON NATURAL HERITAGE PROGRAM

**List 1** ——— Species that are threatened with extinction throughout their entire range or are presumed extinct. These species are in need of active protective measures to insure their survival.
**List 2** ——— Species that are threatened with extirpation throughout their entire range or are presumed extirpated from Oregon but are more common or stable elsewhere.
**List 3** ——— Species for which more information is needed before a status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
**List 4** ——— Species which are of concern but are not currently threatened or endangered. This includes species which are very rare but currently secure, as well as species which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered. They require continued monitoring.

REGIONAL FORESTER'S LIST

**Sensitive (S)** ——— Those species identified by the Regional Forester for which population viability is a concern due to significant current or predicted downward trends in population numbers, density or habitat that would reduce the species' existing distribution.

# *Appendix D*

## - DEMOGRAPHICS, EMPLOYMENT AND ECONOMY OF LANE COUNTY - (And The Area Surrounding The North Fork Siuslaw Watershed)

**Background**

Lane County spans a geographically diverse area of Western Oregon, covering over 4,600 square miles from the Pacific Ocean to the High Cascades. The North Fork Siuslaw WAA is situated in the Coast Range, in the northwestern corner of the county, just a few miles from the Pacific coast. Lane County's 30-mile Pacific coastline includes part of the Oregon Dunes National Recreation Area, which is visited by over 1.5 million people per year. The two incorporated cities along Lane County's coastal area are Florence, population 5,705 (just a few miles from the southern tip of the North Fork Siuslaw WAA), and Dunes City, population 1,185. Florence has grown in recent years, largely due to an influx of retirees and increasing popularity as a tourist destination.

The Willamette Valley, lying between the Coast Range and Cascades, is Lane County's agricultural center and contains the cities of Eugene and Springfield. The Eugene/Springfield Metropolitan Statistical Area (MSA) is the state's third most populous MSA, with a 1993 population of 165,950.

Most of Lane County is forested; 88% of its land contains, or is used for growing trees (Oregon Employment Department, 1993). Over half of the county's land is managed by the federal government; 10% by the BLM, and 44% by the Forest Service (Willamette, Umpqua, and Siuslaw National Forests). 77% of the land within the NFS WAA is managed by the Siuslaw National Forest.

Access between Lane County's coastal area and the population centers of the Willamette Valley is provided by routes 126 and 36, which skirt but do not pass through the NFS WAA. Coastal travelers also reach the area via Route 101. Route 126 joins Route 101 in Florence. Travel distance from Eugene to the Florence area is about 65 miles, about an hour and one half's drive. For most residents of coastal Lane County, this commuting distance precludes their seeking employment in the Willamette Valley. Likewise, the coastal communities are generally too far to serve as bedroom communities for people who work in the valley.

**Population Characteristics**

Over 55% of Lane County's population reside in the Eugene Springfield MSA, and 35% live in unincorporated areas. Incorporated cities in the NFS WAA vicinity are Florence and Dunes City, with populations of 5,705 and 1,185 respectively (1993 population estimates).

The U.S. Census (1990) for Lane County showed that 95.4% of the population is white. While minority populations grew rapidly (by nearly one third) between 1980 and 1990, the total number of minority residents in the county is still relatively small. In 1990, 2.4% of the population was of Hispanic origin, 2% were Asian, 1.1% were Native American, and 0.7% were black.

As of April 1990, Lane county had a population of 282,912, just a 2.8% increase from the 1980 population (275,226). Between 1990 and 1993 however, the county's population had grown by 5.3% to an estimated 298,000. Population increase is the result of two factors: natural increase (births minus deaths) and net migration (persons moving into an area minus those moving out). Two important features of Lane County's recent population growth are significantly increased net migration, and a growing number of older citizens. Detailed population data from the 1980 and 1990 Census, and 1993 population estimates (Portland State University, 1994) help reveal the following characteristics of population growth in Lane County:

- The 2.8% population growth between 1980 and 1990 compares to a 7.9% increase for the state and a 10% increase for the nation during that decade. A recession accompanied by a shortage of local job opportunities resulted in heavy out-migration in the early and middle parts of the decade. During this period, the Eugene/Springfield population center actually grew by 6.9%, while the county's unincorporated areas declined by 3.9%. This illustrates that while there was overall growth, out-migration was taking place from Lane County's small towns and rural areas.
- In the late 1980's a recovering economy increased the availability of jobs, resulting in reduced out-migration and increased in-migration. This trend has continued into the 1990's. Between 1990 and 1993, Lane County population grew 5.3%, compared to 3.7% growth for the United States and 6.9% for the state of Oregon. While timber jobs and payrolls were continuing to decline in the early 1990s, the county's overall growth was due in part to industrial diversification that occurred during the 1980s, and to massive immigration from California because of a severe recession. Of course, population growth has not occurred evenly across the county. Between 1980 and 1993, the combined populations of Eugene and Springfield grew by 12.7%; the remainder of the county grew by a much smaller 3.2%. Traditionally timber resource-dependent communities have continued to lose people or have grown much more slowly in the 1990s than the rest of the county.

- From 1990 to 1993, population growth due to net migration was 10,324, or 68% of the total, far exceeding the natural increase of 4,764. These proportions are consistent with those for the state

- Between 1990 and 1993, 20% of net migration was by residents age 65 and over, compared to 9.2% for the state. The 1993 proportion of county residents in this age class is 13.5%, up from 9.6% in 1980. There appears to be an influx of retirees to Oregon and to its coastal communities in particular. Florence grew rapidly (29.3%) between 1980 and 1993, due in part to its popularity as a retirement community. Dunes City declined 3.8% in the 1980s, but grew by 9.6% between 1990 and 1993.

Future population growth in Lane County will be governed by a host of factors operating at national, regional, and local scales. Continued influx by retirees from out of state is expected to continue (Oregon Employment Department, 1993). Retirees tend to contribute to the stability of local economies, since many have sources of income not readily affected by fluctuations in the business cycle. Resulting growth in trade and services are expected to create job opportunities in these sectors.

## Employment

To describe the employment characteristics of an area, employment statistics distinguish between agricultural and nonfarm jobs. Nonfarm jobs are further separated into manufacturing and nonmanufacturing sectors. In Lane County, nonmanufacturing employs far more workers (82.7%) than do the manufacturing (15.9%) or agricultural[1] (1.4%) sectors (OED, 1992). The major nonmanufacturing sectors are: mining; construction; transportation, communication, and utilities; wholesale trade; retail trade; finance, insurance and real estate (FIRE); services; and government.
1

Between 1982 and 1992, the number of farm jobs in Lane County increased by about a third (from 1,152 to 1,566) but remained a small proportion of the total workforce (1.4%).

Between 1982 and 1992, the total number of jobs in Lane County grew by 31%, while the number of jobs in the manufacturing sector grew only slightly (5%), falling from 19.8% to 15.9% of all employment. While manufacturing employment grew slowly in the past decade, its composition shifted markedly. Employment in the lumber and wood products sector shrunk by over 2,000 jobs between 1982 and 1992, dropping from 12.3% to 7.5% of all employment. These losses were balanced by a gain in non-timber manufacturing jobs scattered across a wide range of industries.

[1] The agricultural sector includes farm, fishing and forestry

The relative decline of the manufacturing sector, and growth in the non-manufacturing sectors (especially services) reflects a nationwide trend, caused in part by: 1) growth of manufacturing in other countries; 2)introduction by U.S. manufacturers of labor-displacing technologies; and 3) declining supplies of inexpensive and easily accessible raw materials. The substitution of technology for labor, and the declining supply of cheap natural resources have had especially important impacts on the local traditional industries of lumber and wood products, paper, and fishing. In Oregon, the recession of the early 1980s brought about the introduction of more automated production processes and the phasing out of older mills, resulting in the need for fewer workers. Although demand for wood products rose in the latter part of the decade, Lane County timber industry employment in the late 1980s remained about 3,000 below levels seen in the late 1970s at similar production levels (Oregon Employment Department, 1993). An additional 3,000 timber jobs were lost in the recession of the early 1990s due to reduced timber supplies from federal lands.

# *Appendix E*

## - STREAM CHANNEL CLASSIFICATION METHODOLOGY - NORTH FORK OF THE SIUSLAW WATERSHED

**Reason for stream classification**

1. To identify stream segments that are sensitive to changes in sediment supply, amounts of large woody debris or flow regimes.

2. To identify areas that are most appropriate for restoration projects, and what types of projects would be most beneficial.

**Methods**

Stream segments were classified using two variables, channel gradient and confinement, as described in Module E, Stream Channel Assessment in the Washington State Timber, Fish and Wildlife (TFW) Watershed Analysis Manual, version 2.0. Stream gradient serves as a surrogate for stream energy, the dominant control of channel morphology. Stream gradient is divided into 6 categories: <1%, 2-4%, 4-8%, 8-20%, and >20%. Channel confinement is described as a ratio of the valley floor width to the bankfull channel width, and is divided into 3 categories. Confinement controls aspects of potential channel response and reflects the long-term history of a valley where past climatic and geologic events, such as tectonic uplift, have left an imprint. An unconfined channel has a valley floor/stream channel width ratio greater than 4. A moderately confined channel has a ratio between 2-4, and a confined channel occupies a valley floor less than 2 channel widths wide.

Channel gradient was estimated from U.S. Geological Survey topographic maps, scale 1:24000, and was based on the spacing of topographic lines intersecting the stream channel. All Class IV streams (first order) were assumed to be greater than 20%, and were not measured from the topographic maps.

Channel confinement could not be estimated from the topographic maps, especially in the smaller tributaries, because of the scale involved. As the confinement is based on a ratio of the valley width to channel width, confinement was especially hard to estimate in the smaller tributaries. The best remote sensing data for estimating confinement are the standard aerial photos, scale 1:12000. A sample of streams were first given a confinement classification from the aerial photos, then field checked. After I had verified what the field-checked confinement classes looked like on the aerial photos, I systematically assigned confinement classes to all stream segments in the North Fork Siuslaw watershed, based on aerial photos.

Channel entrenchment was another variable that was recorded when streams were field checked. Even though the valley floor may be more than 4 stream widths wide, if the channel is entrenched, it will act as a confined channel. Entrenchment is defined as the degree a stream is incised into the valley floor. Bank and valley bottom disturbance are the most common causes of historic channel entrenchment. Channel entrenchment is defined by the relation of the current channel floodplain, as defined by the bankfull flow depth, and the topographic terrace associated with valley bottom. The channel is not entrenched when these two features are at least approximately at the same elevation. Frequent floods would inundate both the active flood plain and terrace. A moderately entrenched channel has a small active flood plain established within the larger trench cut by the channel. The terrace level would be inundated during moderately frequent (e.g. 20-year) flood events. An entrenched channel is one where a small active flood plain is effectively isolated from the terrace level during even rare flood events (TFW, version 2.0) Channel entrenchment cannot be seen from air photos, and will only be noticeable in the field.

To determine what depth of channel incision would qualify as "entrenched" in the North Fork Siuslaw, the discharge for a 20 year flood event was compared to the yearly bankfull flow using data from the USGS

stream gage station at Minerva. The 20 year flood event was approximately twice the discharge of a yearly flow; therefore, if the stream was incised twice the depth of bankfull flow, it was considered entrenched. This method assumes the width of the stream channel has not increased significantly.

In several places, short segments of "entrenched" channel alternated with short segments of channel that weren't entrenched. This pattern developed because the stream channel is cutting down through past debris torrent deposits. These areas were not recorded as entrenched. Only areas where fairly long segments of streams were entrenched were recorded on the database.

The end result is a stream classification map. Depending on the gradient and confinement, stream segments will respond differently to inputs of sediment, wood and water. These responses are summarized in the channel response matrix, Table 1, which has been modified from the Washington State Timber Fish and Wildlife (TFW) manual, version 2.0.

**References**

Standard Methodology for Conducting Watershed Analysis under Chapter 222-22 WAC, version 2.0, October 1993, Washington Forest Practices Board

# *Appendix F*

## - GEOMORPHOLOGY AND LANDSLIDE RISK METHODOLOGY - NORTH FORK OF THE SIUSLAW WATERSHED

**Reason for Landslide Risk Analysis and Geomorphic Stratification**

1. To delineate areas with a higher probability of landslides ("high-risk areas"). This information is useful in guiding watershed level management decisions pertinent to roads, Riparian Reserves and timber management.

2. To describe the "current condition" relative to mass wasting. This includes identifying which streams have been affected by past debris torrents and the relative magnitude of sediment moving downstream.

3. To help predict where effects of intense storms and management activities, such as landslides and the episodic movement of sediment downstream, are likely to occur in the future. This may influence decisions regarding road stabilization and fish habitat improvement projects.

**Methods**

The Soil Resource Inventory (SRI) (Badura, 1974) was used to stratify the North Fork Siuslaw watershed into several geomorphic categories. The Soil Resource Inventory divides the landbase of the Siuslaw National Forest into mapping units based on soil type, underlying lithology, and geomorphology landforms). An individual mapping unit contains a dominant landtype that accounts for 70% of the mapping unit. Mapping unit complexes are a combination of two mapping units that are too complex or interwoven to separate at the 1:62,500 scale (1 inch = 1 mile).

In 1982, George Bush, the Forest Soil Scientist, developed a predictive model to identify SRI mapping units that had a high risk for debris torrents. This model was revised in 1988. After the November 1975 storm, which had an 8-15 year recurrence interval, landslides on the Waldport and Mapleton Ranger Districts were inventoried. This storm event was representative of a storm with a sufficiently high rainfall intensity to cause a significant increase in landslide rates when root strength was at a critically low-level, typically in clearcuts less than 10 years old. Areas of 100% high risk were defined as having "at least 2 slides of 290 cubic yards or larger per 100 acres clearcut and burned." In general, the high-risk soils had steep slopes and moderate to highly dissected terrain. Based on the frequency of landslides occurring on Soil Resource Inventory mapping units, the units were divided into four categories: 100% high risk soils, 50% high risk and 50% low risk, 30% high risk and 70% low risk, 0% high risk and 100% low risk. The 50% high risk and 30% high risk categories accounted for mapping unit complexes that were a mixture of landtypes.

For the North Fork Siuslaw watershed, the geomorphic stratification was further refined by delineating areas prone to rotational slumps, and areas with soils derived from alluvium (sediment deposited by rivers, usually the floodplain).

Rotational slumps are deep-seated landslides that usually cover large areas. They usually move slowly, but can move continuously.

See Table 1 for the classification of individual Soil Resource Inventory Mapping Units.

**Landslide Inventory**

The existing debris torrents in the North Fork Siuslaw Watershed were identified using aerial photos. Consecutive sets of aerial photos, starting in 1953, were used to map and approximately date the occurrence

of debris torrents. Small natural slides that may occur under the forest canopy were not visible on the air photos, therefore, the slides that were inventoried were mostly related to roads and clearcuts.

## References


Bush, G., 1982 (revised 1988), Sediment Model for Forest Planning, Siuslaw National Forest, Siuslaw National Forest Headquarters, Corvallis, OR, USA, 23 p.

Badura, G.J., Legard, H.A., and Meyer, L.C., 1974, Siuslaw National Forest Soil Resource Inventory, Siuslaw National Forest Headquarters, Corvallis, OR, USA.


**Table 1.** Classification of SRI Landtypes

| LAND TYPE | SRI CODE |
|---|---|
| 100% High Risk | 31,41,44,47,51,54,80,414,417,447,541,554,41F |
| 50% High Risk / 50% Low Risk | 151,154,185,225,231,241,251,411,412,416,424,442, 511,512,525,546,552,561,651,424F |
| 30% High Risk / 70% Low Risk | 421 |
| 100% Low Risk | 1,2,3,4,5,6,7,8,16,17,18,19,21,26,34,40,42A,42S 60,61,62,70,71,72,73,80,121,122,153,186,191,216,217,218,261 426,427,452,461,462,542,562,616,617,618,626,628,642,661,662,712 |
| 100% Risk of Rotational Slumps | 22,23,42,52,53,63,523,543,43B,52 |
| 50% Risk of Rotational Slumps | 161,212,221,223,226,227,228,232,237,252,262,272 423,443,521,526,532,533,622,652,653 |
| Alluvium | 14,15 |

# *Appendix G*

## - DESCRIPTION OF SUBWATERSHEDS - NORTH FORK OF THE SIUSLAW WATERSHED

Each subwatershed is characterized by size, road density, the amount of landslide activity and types of sediment present in the streams. Existing streambed substrates are compared to historic information from stream surveys that were done between 1949 and 1952. The percentage of the subwatershed harvested includes all harvest done in this century on both private and federal lands.

The following sections also include some brief information on past stream cleaning activities, fish habitat improvement projects, and the current condition of fish habitat. For additional information on these topics, see Appendix J: Fish Habitat Condition Ratings and the Watershed Analysis file.

**Billie Creek Subwatershed** 2,767 acres

Road density:
System roads: 2.2 miles/square mile All Roads: 4.7 miles/square mile

Percent of Subwatershed Harvested: 26%

No landslides were documented in this subwatershed. The higher gradient reaches have a dominant substrate of cobbles. Gravel is the dominant substrate in the lower reaches. The types of sediment present seems to correlate well with the stream gradient.

According to an ODFW memo, the lower 0.6 miles of Billie Creek was used as a logging skid road in 1954. This completely scoured the gravels and coverted the reach from a prime spawning area to almost complete bedrock. Since that time, the amount of exposed bedrock in the reach has decreased from 100% to 25%, while the amount of gravel has increased from 0% to 60%.

Twelve new logging-related debris jams were reported within the lower 1 mile by a 1957 ODFW stream survey. This area was likely stream cleaned at some point to remove these obstructions.

The lower 0.1 miles of Billie Creek is currently is poor condition. There is a complete lack of LWD and no deep pools.

The upper 0.2 miles of Billie Creek (Reach 5) is also in poor condition. Although the amount of LWD in this section exceeds the habitat objective, the reach is predominately a shallow cobble riffle with very little pool habitat.

**Morris Creek Subwatershed** 2,252 acres

Road density:
System roads: 1.7 miles/square mile All roads: 3.2 miles/square mile

Percent of Subwatershed Harvested: 28%

No landslides were detected in the Morris subwatershed, however, all reaches of Morris Creek appear to have excessive amounts of sand. Over 40% of the habitat units had a dominant substrate of sand. In the lower 1.3 miles (Reaches 1 and 2), the amount of sand has increased from 20% in the early 1950's to 42% of the habitat units in 1991.

Lots of beaver ponds and dam pools in the upper 0.7 miles (Reach 4) of Morris Creek provide good potential rearing habitat. LWD levels meet or exceed habitat objectives throughout most of the surveyed portions of the stream. A relatively high amount of side channel habitat in reaches 1 and 3 indicate the stream has maintained its connectivity with the floodplain in these areas.

**Uncle Creek Subwatershed** 3,900 acres

Road density:
System roads: 2.2 miles/square mile All roads: 4.8 miles/square mile

Percent of Subwatershed Harvested: 33%

Although 3 landslides have directly entered the lower 3 miles of Uncle Creek, the stream appears to have a high enough gradient to flush the fine sediment. The upper most reach surveyed (Reach 3) has an 8% gradient, the lowest reach (Reach 1) has a 3% gradient. All reaches have a dominant substrate of cobbles, with gravel as a secondary component. Between 1951 and 1994, the amount of exposed bedrock in the lower 1.4 miles (Reach 1) has decreased from approximately 25% to 13%. This may be a result of sediment inputs from the landslides.

Much of Uncle Creek was stream cleaned in the early 80s. An instream structure project has been completed on the lower portion of Reach 2.

Uncle Creek is currently in poor condition throughout. There is little pool habitat, especially in the upper 2.2 miles (Reach 2,3). Although there is a low to moderate amount of LWD, the amount of deep pool habitat and habitat complexity are poor. Much of the stream is a cobble riffle.

Numerous landslides have occurred in the Condon Creek drainage. Seven landslides have directly entered the upper reaches of the stream channel. The entire stream has a dominant substrate of cobbles. Gravel is present as a secondary component in the upper, higher-gradient (4-6%) reaches. It is assumed that the gravel will be transported downstream through time. The amount of bedrock exposed in the lower section between Billie Creek and Uncle Creek (Reach 1) has increased from approximately 10% to 30% since the early 1950's. Above Uncle Creek, the amount of exposed bedrock substrate has decreased from 30% to 15% . This may be a result of the increased sediment inputs from landslides in the upper drainage.

Much of Condon Creek was stream cleaned in the 1970s and early 80s. This included removal of a debris jam that was created by a series of debris torrents coming out of an upper tributary (Reach 4). A CCS project placed instream structures from Uncle Creek upstream approximately 1.5 miles in 1992.

A 1949 ODFW stream survey report considered Condon Creek and McLeod Creek to be the best spawning tributaries within the North Fork Siuslaw watershed. Condon Creek is currently in poor condition throughout. It is predominately a cobble riffle with very little pool habitat. Amounts of LWD vary from poor in lower reach to good in the upper reach.

**Drew Creek Subwatershed** 2,010 acres

Road density:
System roads: 3.5 miles/square mile All roads: 5.2 miles/square mile

Percent of Subwatershed Harvested: 27%

No landslides have directly entered Drew Creek, however, 4 landslides have occurred in the upper slopes and intermittent stream channels. Gravel is the dominant substrate in the upper and middle reaches (Reach 6 and 4). However, 28% of the area in Reach 4 is covered with sand. The lower, less steep reach (Reach 2)

is currently a cobble-gravel substrate. The sand and gravel in the upper reaches will move downstream with time. Historically, the amount of sand present in Drew Creek has increased from 0% to 23-28% since the early 1950's.

**Elma Creek Subwatershed** 3,177 acres

Road density:
System Roads: 2.5 miles/square mile All roads: 4.8 miles/square mile

Percent of Subwatershed Harvested: 22%

Elma Creek has had 2 landslides directly enter the creek in the upper reaches. These areas have a dominant substrate of cobbles, with a secondary component of gravel or bedrock. The stream appears to have sufficient energy to flush out the fine sediment that was deposited with the landslides. Only the lowest reach of Elma Creek has a substantial component of gravel in the substrate. There is no historic survey information on substrates available for Elma Creek.

A small KV instream structure project has been completed near the upper end of Reach 3. A series of fifth acres plots within the riparian area along Reach 2 were cleared of alder and/or brush and planted with conifer seedlings in 1994.

Current habitat condition of Elma Creek is fair throughout the mainstem above private land. The amount of pool habitat is generally good although none of the pools in Reach 1 were deep enough to qualify as deep pools. The amount of LWD and the amount of habitat complexity are generally poor throughout the mainstem. Much of the cover is provided by undercut banks. A high proportion of beaver ponds in an upper tributary (Trib 7, Reach 6) created good habitat conditions in the 0.25 miles accessible to anadromous fish.

A large, road related landslide traveled down the upper part of Cedar Creek above Reach 3. The sediment from this slide may have been trapped in Reach 3, which is dominated by beaver ponds. The reach below this (Reach 2) is cobble dominated, however, sand is the dominant substrate for over 20% of the stream habitat units. One landslide has also directly entered the eastern tributary of Cedar Creek (Reach 4). This tributary has a dominant substrate of gravel and sand. Reach 1, below the confluence of the two main tributaries is dominated by a sand substrate.

**Porter Creek Subwatershed** 2,087 acres

Road density:
System roads: 3.0 miles/square mile All roads: 4.9 miles/square mile

Percent of Subwatershed Harvested: 44%

Two landslides have directly entered the mainstem of Porter Creek. Reach 3, which had 5 landslides in the upstream portion of the watershed and one slide which directly entered the stream, has a dominant substrate of gravel, however, 28% of the habitat units have a dominant substrate of sand. The gradient is 1%. The lowest 0.7 miles of Porter Creek (Reach 1) has bedrock as the dominant substrate. The tributaries which have steeper gradients (4-5%) and lack evidence of landslides have cobble-gravel substrates. Since the early 1950's the amount of exposed bedrock in the lower 0.7 miles of Porter Creek (Reach 1) has increased from 20-35%. The amount of sand has also increased from 0-20% in this area. In the section above private land (Reach 2), the proportion of sand substrate increased from 0-29%. The fine sediment from landslides in the upper basin appears to be flushing from the upper reaches and being deposited in the lower, gentle gradient reaches.

The lower 0.7 miles of Porter Creek (Reach 1) was stream cleaned to remove excess logging debris. This section is now predominately riffles and shallow straight scour pools. The abundance of both bedrock and sand and the lack of adequate quantities of LWD limits habitat complexity and provides poor fish habitat.

A series of fifth acres plots within the riparian area along Reach 1 and the lower half of Reach 3 were cleared of alder and/or brush and planted with conifer seedlings in 1994.

**Sam Creek Subwatershed** 2,467 acres

Road density:
System roads: 3.6 miles/square mile All roads: 6.4 miles/square mile

Percent of Subwatershed Harvested: 34%

The uppermost reach of Sam Creek had 4 landslides directly enter the stream. The stream appears to have sufficient energy to flush the fine sediment, however. The upper reaches have a gradient of 6%, and all of Sam Creek has a dominant substrate of cobbles. Gravel is the secondary substrate component in the upper reaches, in the lower reaches the secondary component is bedrock and sand.

The lower mile of Sam Creek is adjacent to an abandoned homestead. The riparian area is 100% alder. The stream has obvoiusly been cleaned of all large wood in the past. A fish habitat improvement project was initated in the early 1990s. Instream structure complexes have been placed in the lower 0.5 miles. Some of the alders have been removed and conifer seedlings have been planted in this section.

The West Branch of the North Fork has had 1 direct landslide into the stream, and 8 landslides in the upstream drainage area. It has a moderate gradient (3-4%), and a cobble-gravel substrate.

A series of fifth acres plots within the riparian area along Reach 1 of the West Branch were cleared of alder and/or brush and planted with conifer seedlings in 1994.

**Cataract Creek Subwatershed** 3,347 acres

Road density:
System roads: 3.1 miles/square mile All roads: 6.4 miles/square mile

Percent of Subwatershed Harvested: 55%

The unnamed tributary at river mile 22.65 on the North Fork Siuslaw has a moderate gradient of 5%. The dominant substrate is sand, with a secondary component of cobbles. A large landslide traveled down the mainstem above the surveyed reach.

Taylor Creek had 2 landslides which deposited directly into the stream and 11 landslides in the upper slopes and intermittent channels. The average gradient of Taylor Creek is 4%. Over half of the stream bed (58%) is covered with sand. Sediment from the numerous slides has obviously overwhelmed the transport capacity of the stream. Taylor Creek will likely be a continuous source of fine sediment into the North Fork Siuslaw for the forseeable future. The Elk Tie Road (Road 653), which has a history of failures and maintenance problems is on the slope directly above Taylor Creek.

Several fish habitat improvement projects have been completed on the mainstem North Fork Siuslaw between the North Fork Campground and private property boundary below Cedar Creek. The earliest efforts in 1987-88 installed a series of rock gabions and/or log weirs to slow water velocities and trap substrate materials. A 1994 project between Porter and Talor Creeks added debris complexes to the original design. Several areas have also been planted with conifer seedlings. A series of fifth acres plots

within the riparian areas between the North Fork Campground and Sam Creek were cleared of alder and/or brush and planted with conifer seedlings in 1994.

**McLeod Creek Subwatershed** 5,710 acres

Road density:
System roads: 2.5 miles/square mile All roads: 3.4 miles/square mile

Percent of Subwatershed Harvested: 43%

The McLeod Creek drainage has had numerous landslides, mostly related to road failures. The tributary at river mile 4.7 on McLeod Creek had 8 landslides in the upper slopes or intermittent stream channels, mostly related to road failures between 1968 and 1972. Sand is the dominant substrate in this tributary, with gravel as a secondary component. There is a fan of sediment and logs at the mouth of the tributary.

The tributary at river mile 5.6 only had two landslides in the upper slopes. Gravel is the dominant substrate in the upper reaches of this tributary. Sand is the dominant substrate in the lowest reaches, where the gradient is between 1-5%.

Along the mainstem of McLeod Creek, gravel and sand are the dominant substrates in the upper and middle reaches (Reach 4 and 3). Downstream from the mouth of the tributary at mile 4.7 in Reach 2, McLeod Creek has a heavy sediment load. Gravel bars are just beginning to be vegetated, and there are numerous side channels. The gravel deposition has pushed the main stream channel over into the outside of meanders, where active bank erosion and caving is occurring. Farther downstream, the channel becomes more confined. If any obstructions are present, such as fallen logs, gravels are deposited. Otherwise, the substrate is bedrock. Below the constricted reach, the substrate is dominantly sand, and pools are partially filled with sand and silt. Bedrock is the dominant substrate, with a secondary component of gravel, in the lowest reach surveyed.

Since the early 1950's, sand has increased in Reaches 3 and 4 from 0% to 25% and 48%, respectively. In Reach 4, gravel has also increased, while the amount exposed bedrock has decreased. No historical substrate data was available for the lower reaches.

The portion of McLeod Creek between the major tributaries at river mile 4.7 and river mile 5.6 was stream cleaned in the 1980s. Two small instream structure projects have been completed. One is approximately 0.5 miles above the private property boundary. The other is near river mile 5.0.

A 1949 ODFW stream survey report considered McLeod Creek and Condon Creek to be the best spawning tributaries within the North Fork Siuslaw watershed. The mainstem still has large amounts of gravel substrate, but exposed bedrock is now common in lower 4.0 miles surveyed (Reach 2,3). Sand appears to have increased dramatically and now represents the dominant substrate for between 15% and 48% of the individual habitat units in each reach.

Current fish habitat quality in McLeod Creek is generally poor with few pools and typically low amounts of LWD. Not one pool in the entire surveyed portion of the mainstem met criteria for both depth and LWD complexity. Beaver ponds in Reaches 2 and 4 provided substantial high quality rearing habitat in these sections.

**Russell Creek Subwatershed** 5,933 acres

Road density:
System roads: 2.5 miles/square mile All roads: 5.5 miles/square mile

Percent of Subwatershed Harvested: 31%

No landslides were documented in the Russell Creek drainage. However, two high gradient tributaries (10-11% gradient) in the upper basin have a dominant substrate of sand. In one of these tributaries sand covers over half of the stream bottom. The middle and lower reaches of Russell Creek have gradients of 6% and 3%, respectively, and have a dominant substrate of cobbles with a secondary component of gravel. The sand that is currently in the upper basin will eventually be transported downstream into the cobble-gravel reaches . No historical substrate data was available for Russell Creek.

Russell Creek currently provides very limited fish habitat above the private land boundary. Between 90% and 99% of the stream is a gravel/cobble riffle. Pools are extremely rare.

**South Russell Creek**

No landslides were documented in the South Russell Creek drainage. The portion of the stream above private lands has a gradient of 6%, and has a gravel dominated substrate.

# *Appendix H*

## - SEDIMENT ROUTING ANALYSIS METHODOLOGY - NORTH FORK OF THE SIUSLAW WATERSHED

**Reason for Sediment Routing Analysis**

To analyze sediment routing in streams, and the impact of past landslides to sediment type and storage.

**Methods**

The dominant and subdominant substrates from stream surveys are noted by reach. This information is compared to the landslide survey, which shows which streams and subwatersheds have been directly or indirectly affected by past landslides. Presence of beaver ponds are also noted, as they influence sediment storage. The type of sediment present is also compared to stream gradient, to see if the size of sediment present is consistent with the stream's energy to transport it. For instance, in the North Fork Siuslaw watershed, we found two high-gradient (10% and 11%) streams in the headwaters that had a dominant substrate of sand. This is probably due to past landslide activity in those drainages. The stream has not yet had time to flush the fine sediment out of these reaches. We have also noted where the gravels and bedrock reaches are within the stream system. This information will aid in recommending appropriate restoration measures. For instance, if gravels are present in the upper reaches, and the lower reaches are bedrock, structures designed to capture the gravels as they move downstream may be appropriate projects. If the stream is heavily impacted by fine sediment, we may want to wait until the stream has a chance to flush the fine sediment before we add additional structures.

Other data was collected by subwatershed that included the acres within the subwatershed, the road density (including all roads, both temporary and system roads), and the percent area of the subwatershed that has been harvested. This information is summarized in the "Description of Subwatersheds" (Appendix G). Detailed information for each stream reach is summarized in Table 2. Stream reaches with a high amount of sand present are listed in Table 1.

There is also some data available from older stream surveys, circa 1949. This data was compared to the present day surveys to determine how much the sediment picture has changed over time, and with increasing management activities.

**Table 1**: Stream reaches with high amounts of sand in their substrate.

| Stream | Reach | Percent of Habitat Units with Dominant Substrate of Sand |
|---|---|---|
| Drew | 2 | 23% |
| Drew | 4 | 28% |
| McLeod T4.7 | 1 | 34% |
| McLeod T4.7 | 2 | 51% |
| McLeod T5.6 | 1 | 44% |
| McLeod | 3 | 25% |
| McLeod | 4 | 48% |
| McLeod | 5 | 36% |
| McLeod | 6 | 31% |
| Porter | 1 | 26% |
| Porter | 3 | 29% |
| Porter | 4 | 19% |
| Lindsley | 2 | 24% |
| Morris | 1 | 42% |
| Morris | 2 | 43% |
| Morris | 3 | 44% |
| Morris | 4 | 69% (30% beaver ponds) |
| Billie | 3 | 22% |
| Condon | 2 | 16% |
| Taylor | 1 | 53% |
| Tributary 22.65 | NA | 61% |

**Table 2.** The dominant and subdominant substrates are from stream surveys completed in the early 1990's. If the number of habitat units with a sand substrate exceeded 20%, it is noted with **. Direct landslides = the number of landslides that were deposited in that reach. Indirect landslides = the number of landslides in the subwatershed that are upstream and/or upslope from the reach and have the potential to supply sediment.

| Stream | Reach | 1st Dominant Substrate | 2nd Dominant Substrate | 1st Subdominant Substrate | Gradient | Direct Landslid | Indirect landslid |
|---|---|---|---|---|---|---|---|
| Billie | 5 | cobble | sand | gravel | 7% | ¢s | ¢s |
| Billie | 3 | gravel | sand** | cobble | 4% | 0 | 0 |
| Billie | 1 | gravel | bedrock | cobble | 3% | 0 | 0 |
| Morris | 4 | sand** | bedrock | gravel | 1% | 0 | 0 |
| Morris | 3 | sand** | gravel | small boulder | 3% | 0 | 0 |
| Morris | 2 | gravel | sand** | cobble | 5% | 0 | 0 |
| Morris | 1 | gravel | sand** | sand** | 2% | 0 | 0 |
| Uncle | 3 | cobble | gravel | gravel | 8% | 0 | 0 |
| Uncle | 2 | cobble | gravel | gravel | 4% | 2 | 0 |
| Uncle | 1 | cobble | gravel | gravel | 3% | 1 | 3 |
| Condon | 3 | cobble | gravel | gravel | 6% | 0 | 0 |
| Condon | 4 | cobble | gravel | gravel | 4% | 2 | 1 |
| Condon | 2 | cobble | sand | small boulder | 2% | 0 | 9 |
| Condon | 1 | cobble | bedrock | gravel | 2% | 0 | 12 |
| Drew | 6 | gravel | | cobble | 6% | 0 | 2 |
| Drew | 4 | gravel | sand** | cobble | 5% | 0 | 4 |
| Drew | 2 | cobble | gravel | gravel | 3% | 0 | 4 |
| Elma | T7 | sand** | cobble | gravel | 4% | 0 | 0 |
| Elma | T5 | cobble | gravel | gravel | 5% | 1 | 0 |
| Elma | 4 | cobble | bedrock | gravel | 5% | 1 | 0 |
| Elma | 3 | cobble | gravel | gravel | 3% | 0 | 1 |
| Elma | 2 | gravel | cobble | cobble | 1% | 0 | 2 |
| Cedar | 3 | 100% sand | | gravel | 4% | 0 | 1 |
| Cedar | 2 | cobble | sand** | gravel | 5% | 0 | 1 |
| Cedar | 4 | gravel | sand** | cobble | 5% | 1 | 0 |
| Cedar | 1 | sand** | gravel | gravel | 2% | 0 | 2 |
| NFk Siuslaw | 3 | cobble | gravel | gravel | 1% | 0 | 17 |
| Porter | 5 | cobble | bedrock | cobble/small boulder | 15% | 0 | 0 |
| Porter | 4 | cobble | sand | gravel | 4% | 0 | 1 |
| Porter | 3 | gravel | sand** | gravel | 1% | 1 | 5 |
| Porter | T7 | cobble | gravel | gravel | 4% | | |
| Porter | T6 | gravel | cobble | small boulder | 5% | | |
| Porter | 1 | bedrock | gravel | sand** | 1% | 1 | 6 |
| Sam | 3 | cobble | gravel | gravel | 6% | 4 | 2 |
| Sam | 2 | cobble | bedrock | gravel | 6% | 0 | 6 |
| Sam | 1 | cobble | bedrock/sand | gravel/sand | 1% | 0 | 6 |
| NFk Siuslaw | 5 | cobble | gravel | gravel | 2% | | |
| W.Branch | 2 | cobble | gravel | gravel | 4% | 1 | 8 |
| W.Branch | 1 | cobble | gravel | gravel | 3% | | |
| Trib 22.65 | 1 | sand** | cobble | gravel | 5% | 0 | 0 |
| Taylor | 1 | sand** | gravel | gravel | 4% | 2 | 11 |
| NFk Siuslaw | 2 | gravel | cobble/bedrock | cobble | 1% | 0 | 32 |
| NFk Siuslaw | 1 | bedrock | gravel | | 1% | 3 | 41 |
| McLeod | 6 | gravel | sand** | sand | 3% | 0 | 3 |
| McLeod | 5 | gravel | sand** | gravel | 3% | 1 | 4 |
| McLeod | 4 | sand** | gravel | sand | 2% | 0 | 8 |
| McLeod T5.6 | 5 | gravel | cobble | cobble | 5% | 0 | 1 |
| McLeod T5.6 | 4 | gravel | sand | cobble | 5% | 0 | 1 |
| McLeod T5.6 | 3 | gravel | sand | cobble | 6% | 0 | 1 |
| McLeod T5.6 | 2 | sand** | gravel | sand | 5% | 0 | 2 |
| McLeod T5.6 | 1 | sand** | gravel | gravel | 1% | 0 | 3 |
| McLeod | 3 | gravel | sand** | gravel | 2% | 0 | 11 |
| McLeod T4.7 | 3 | sand** | gravel | sand | 4% | 0 | 2 |
| McLeod T4.7 | 2 | sand** | gravel | gravel | 4% | 0 | 8 |
| McLeod T4.7 | 1 | gravel | sand** | gravel | 3% | 0 | 8 |
| McLeod | 2 | bedrock | gravel | sand | 2% | 3 | 23 |
| McLeod T1.14 | | cobble | gravel | gravel | 8% | 1 | 1 |
| McLeod T1.14 | | gravel | cobble | cobble | 6% | 1 | 1 |
| Russell | 4 | sand** | gravel | gravel | 11% | 0 | 0 |
| Russell | 3 | cobble | gravel | gravel | 6% | 0 | 0 |
| Russell | 5 | sand** | gravel | gravel | 10% | 0 | 0 |
| Russell | 2 | cobble | gravel | gravel | 3% | 0 | 0 |
| South Russell | 2 | gravel | sand | cobble | 6% | 0 | 0 |

# *Appendix I*

## - STREAM TEMPERATURE MONITORING - NORTH FORK OF THE SIUSLAW WATERSHED

Stream temperature data was collected at twelve sites in the North Fork Siuslaw watershed between July 15 and November 1, 1994 (see Figure 34 for location of sites). Automated temperature monitors were used which consisted of a sensor and a computer chip encased in a waterproof capsule. These capsules were submerged in various shaded riffles throughout the watershed. The results are as follows:

| MONITOR LOCATION | MONITOR NUMBER | # DAYS ≥ 60° F | MAX TEMP (° F) |
|---|---|---|---|
| North Fork Siuslaw above Pawn Trail | 1921 | 37 | 66 |
| North Fork Siuslaw downstream of campground | 1925 | 59 | 71 |
| North Fork Siuslaw under Huntington Bridge | 1352 | 81 | 71 |
| Elma Creek | 1929 | 48 | 67 |
| Wilhelm Creek | 1357 | 32 | 65 |
| Porter Creek | 1930 | 53 | 65 |
| Upper Condon Creek above private land | 1354 | 32 | 64 |
| Lower Condon Creek below private land | 1356 | 57 | 65 |
| Uncle Creek | 1351 | 11 | 62 |
| Drew Creek | 1376 | 37 | 65 |
| McLeod Creek | 1353 | 56 | 67 |
| Morris Creek | 1361 | 14 | 62 |

**RESULTS**

None of these monitoring sites recorded temperatures below 60° F during the summer months. Uncle Creek was the closest to meeting Oregon's water quality standards for temperature (which calls for temperatures to be at or below 60° F). Uncle Creek is aggraded with gravels and sediment due to past landslides. The water in it probably has the ability to flow through the subsurface and, therefore, is less subject to heating from solar radiation.

The longest duration of temperatures above 60° F ,and one of the highest temperatures, was recorded in the lower mainstem of the North Fork Siuslaw River beneath the Huntington Bridge. Temperatures there were elevated substantially above 60° F for 81 days. This monitoring site is located downstream of approximately 2 miles of river that flows through private land. The water depth was approximately 3 feet at this monitoring site and with a sandy bottom.

# *Appendix J*

## - STREAM FLOW ANALYSIS METHODOLOGY - NORTH FORK OF THE SIUSLAW WATERSHED

**Reason for Stream Flow Analysis**

The purpose of the stream flow analysis is to determine if management activities have altered stream flow, such as peak flows during storms, low flows, or total discharge. The stream gage data was compared in a variety of ways that are described below.

**Methods**

***Double mass curves***

The double mass curve is based on the concept that a graph of the cumulative data of one variable versus the cumulative data of another variable is a straight line as long as the relation between the variables is a fixed ratio over time (Searcy and Hardison, 1960 cited in Gordon et al., 1992). In this case, the cumulative total of three variables over time was compared between the basins: low flow (Figure 1), total discharge (Figure 2) and peak flow (Figure 3). For peak flow, the largest peak flow event per year for each basin was selected. For low flow, the lowest flow event per year was selected for each basin. For total discharge, the daily flow was added up by year to get total discharge per year for each basin.

Both the low flow (Figure 1) and total discharge (Figure 2) curves plotted as straight lines, suggesting that these two variables have not been altered. The peak flow curve (Figure 3), however, deviates from a straight line in 1979, and shows that peak flows in the North Fork have increased.

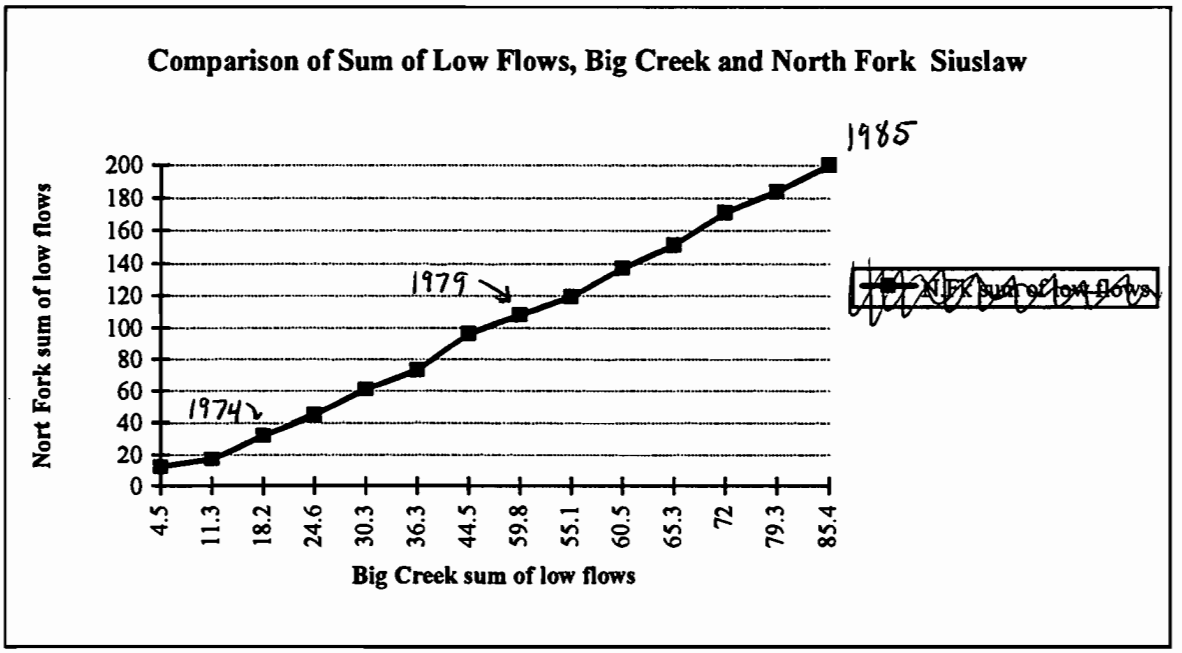



**Figure 1.** Comparison of cumulative low flows for Big Creek and the North Fork Siuslaw River. The comparison is almost a straight line, suggesting that the low flows in each basin have not been altered in relation to each other. Data is from ~~1979~~ 1972 to 1985.

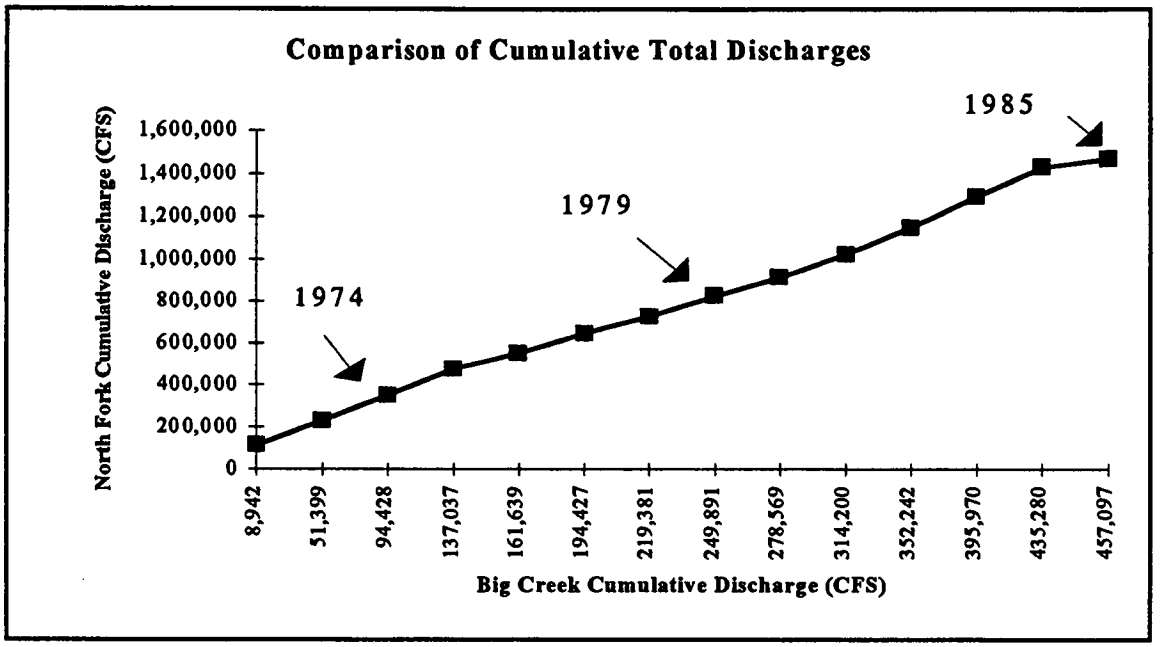



**Figure 2.** The total amount of water per year produced in each basin was calculated and graphed against each other. The curve approximates a straight line, which suggests that that amount of water produced in each basin relative to each other has not changed.

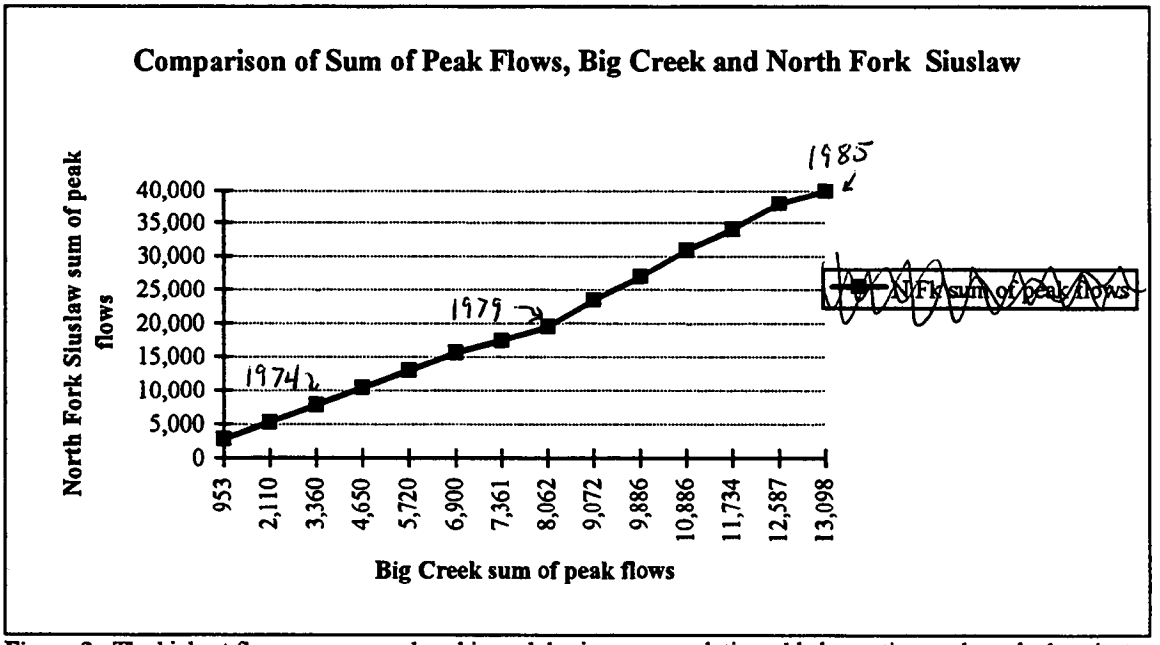



**Figure 3.** The highest flow per year produced in each basin was cumulative added over time and graphed against each other. The data is from 1972 to 1985. In 1979, the curve bends toward the North Fork Siuslaw axis, suggesting that peak flows in the North Fork increased relative to Big Creek.

### *Comparing the difference of natural logs*

Three to five peak flows per year were chosen per watershed. The natural log of the discharge was calculated for each basin, and the difference between the natural logs of the two basins was found. This method assumes that if one basin has increasing peak flows relative to another, the difference between them will increase.

The results show that although there is fluctuation between the individual storm events, the overall trend shows an increase in the difference between the natural logs through time. Again, this method suggests that peak flows have increased in the North Fork (Figure 4).

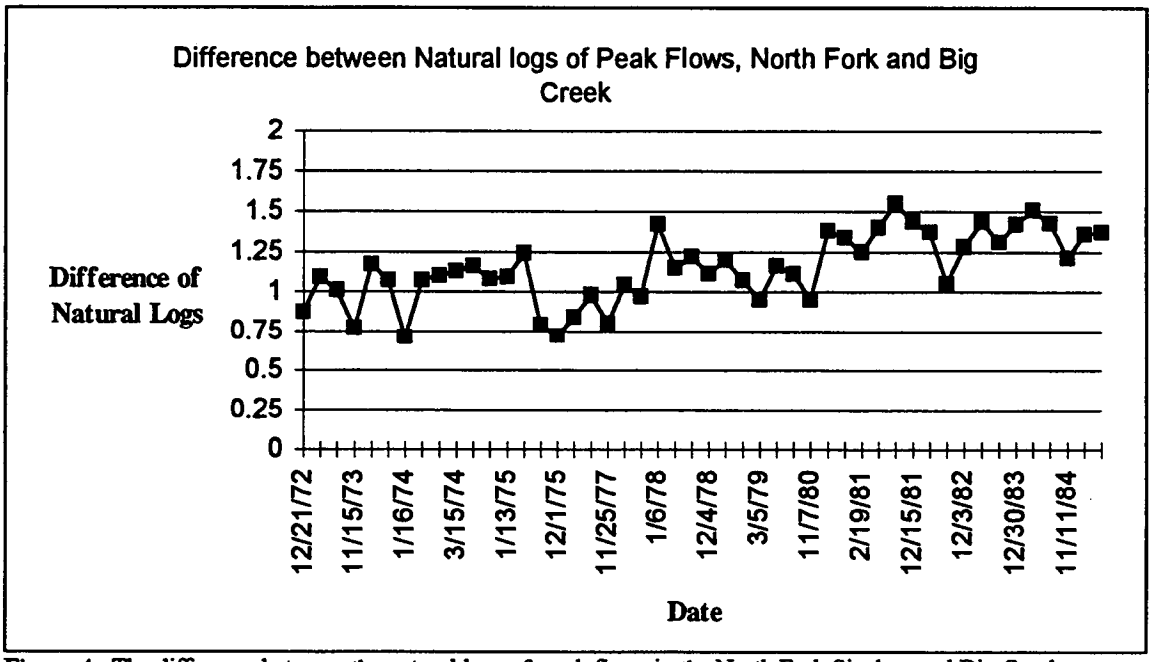



**Figure 4.** The difference between the natural logs of peak flows in the North Fork Siuslaw and Big Creek was calculated for 3-5 storms per year. There are two ways to interpret the graph. In one scenario, It can be interpreted to show a gradual increase in the difference in discharge for identical storms between the two basins. A second interpretation is that there are two time intervals, pre-1980 and post-1980, with a discreet difference in the difference in peak flows between those two time periods. In other words, in the second interpretation, the difference in peak flows is abruptly and noticeably higher after 1980.

***Comparing the number of storm events of a certain frequency in each watershed***

If peak flows have increased above the range of historic variability, more storm events should be of greater magnitude in the managed basin. I used the same data base that was compiled to compare the difference of natural logs, which included 48 storm events. The data is as follows:

**Table 1.** Comparison of Flood Magnitude and Frequency

| Flood frequency | Number of Big Creek Storms | Number of North Fork Storms |
|---|---|---|
| <1.25 year | 33 | 29 |
| 1.25-2 year | 10 | 12 |
| 2-5 year | 5 | 2 |
| 5-10 year | 0 | 5 |

The individual storm runoff was compared to flood frequency discharge which was obtained from U.S. Geological Survey Statistical Records (Wellman et al., 1992). The data is shown graphically on Figure 5.

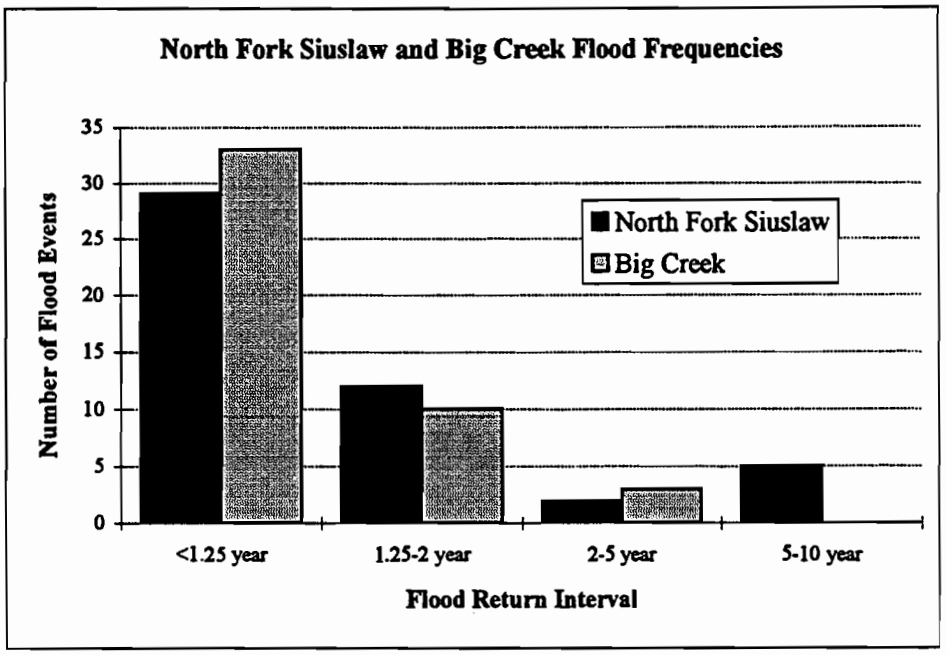



**Figure 5.** Using the same data base as was used for Figure 4, the number of flood events of a certain size were calculated for each basin. The number of flood events that were less than the 1.25 year discharge was greater in Big Creek. There were no flood events of the 5-10 year recurrence internal, however, there were five flood events of that magnitude in the North Fork. If both watersheds were behaving in a similar fashion, both should have approximately the same number of flood events of a certain recurrence interval.

***Comparing individual storm events of the 1.25 year discharge in Big Creek to the same storm's discharge in the North Fork Siuslaw***

Storm events were selected that had discharges that approximated the 1.25 year discharge (less than or equal to ±10%) in Big Creek, as a way to hold one variable as constant as possible. The same storm's discharge was compared in the North Fork Siuslaw. The data is as follows:

**Table 2.** Comparison of North Fork Siuslaw Storms to Storms of 1.25 year discharge in Big Creek

| Storm date | Big Creek Discharge | North Fork Discharge | Difference |
|---|---|---|---|
| 12/21/72 | 953 cfs | 2,280 cfs | 1,327 cfs |
| 2/19/74 | 700 cfs | 2,030 cfs | 1,330 cfs |
| 3/6/79 | 701 cfs | 1,810 cfs | 1,099 cfs |
| 12/3/80 | 681 cfs | 2,698 cfs | 2,017 cfs |
| 12/16/82 | 719 cfs | 3,040 cfs | 2,291 cfs |
| 2/12/84 | 855 cfs | 3,900 cfs | 3,045 cfs |

The data suggests that peak flows in the North Fork relative to Big Creek increased in the early 1980's as compared to the early 1970's. The increase in peak flows is most notable beginning with the 1979 storm. The data is show graphically in Figure 6.

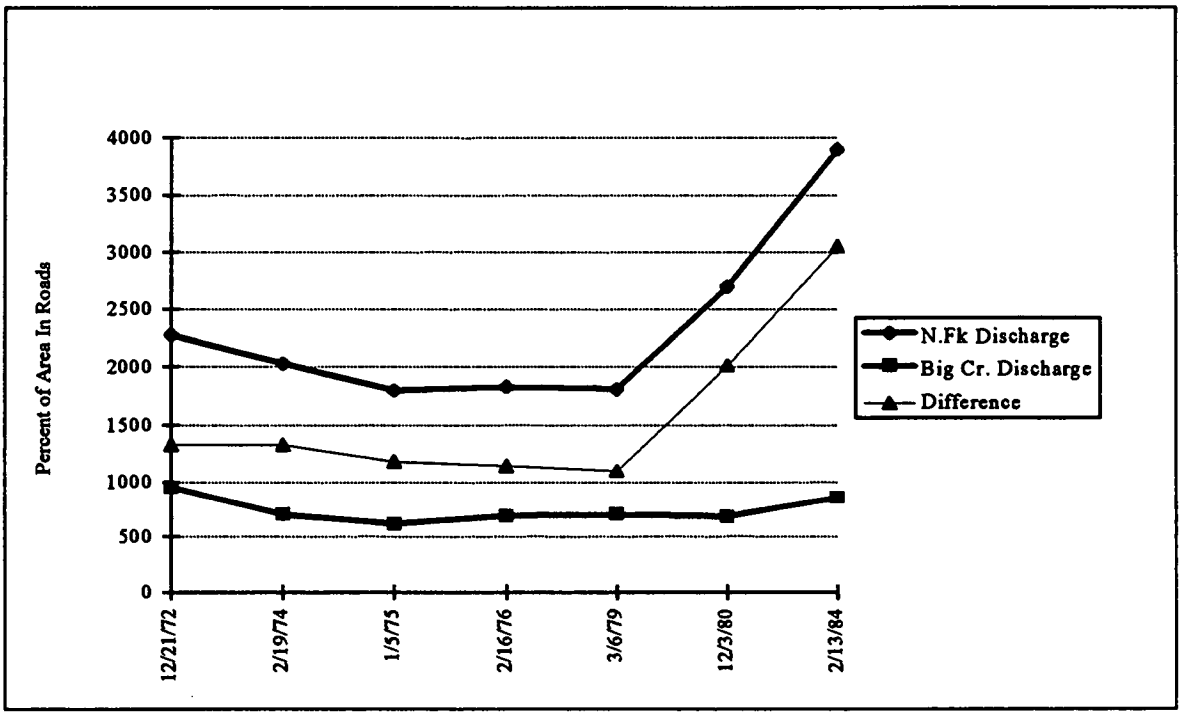



**Figure 6.** Storm events that produced a discharge within 20% of the 1.25 flood frequency discharge for Big Creek were chosen for comparison, as an attempt to hold one variable constant. The discharge in the North Fork Siuslaw for the same storm events was compared. As the graph shows, after 1979, the discharge in the North Fork Siuslaw appears to increase relative to Big Creek, and to previous storms of a similar magnitude.

Individual storm hydrographs comparing North Fork Siuslaw River discharges to Big Creek (Lane County) discharges are shown in Figures 7 through 11.

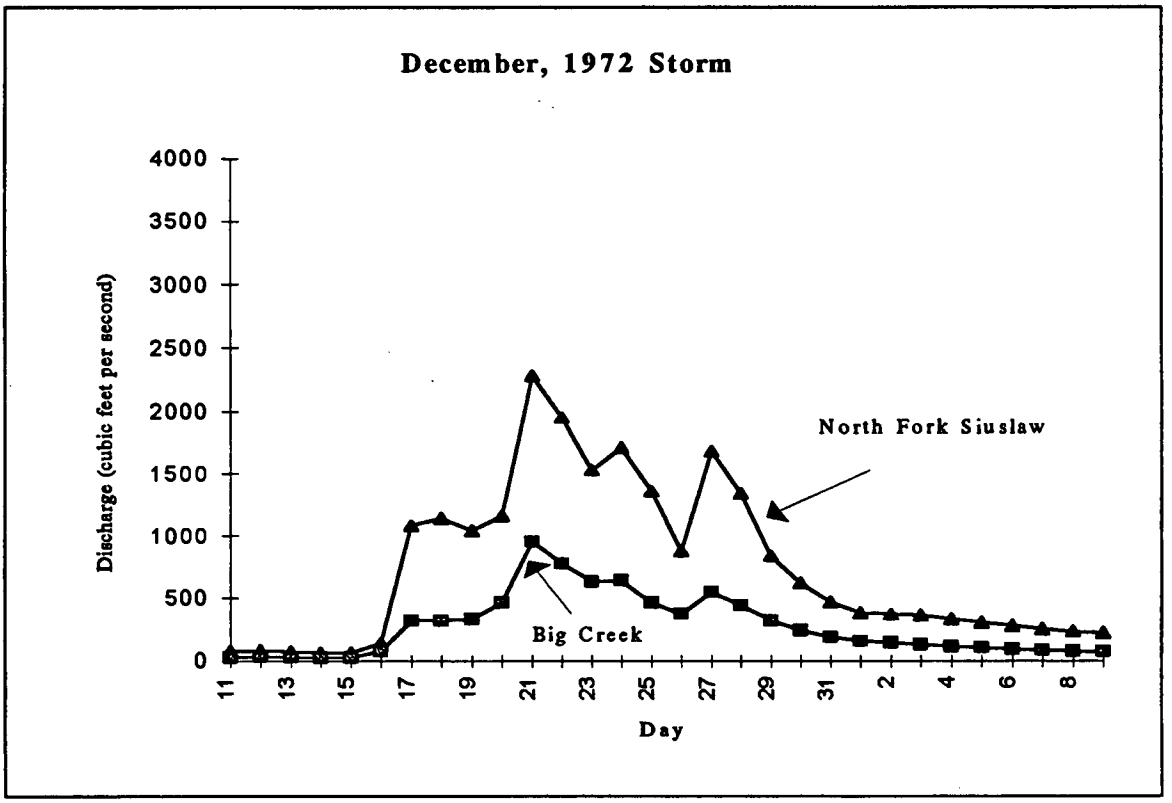



Figure 7. Storm data for December 1972 storm.

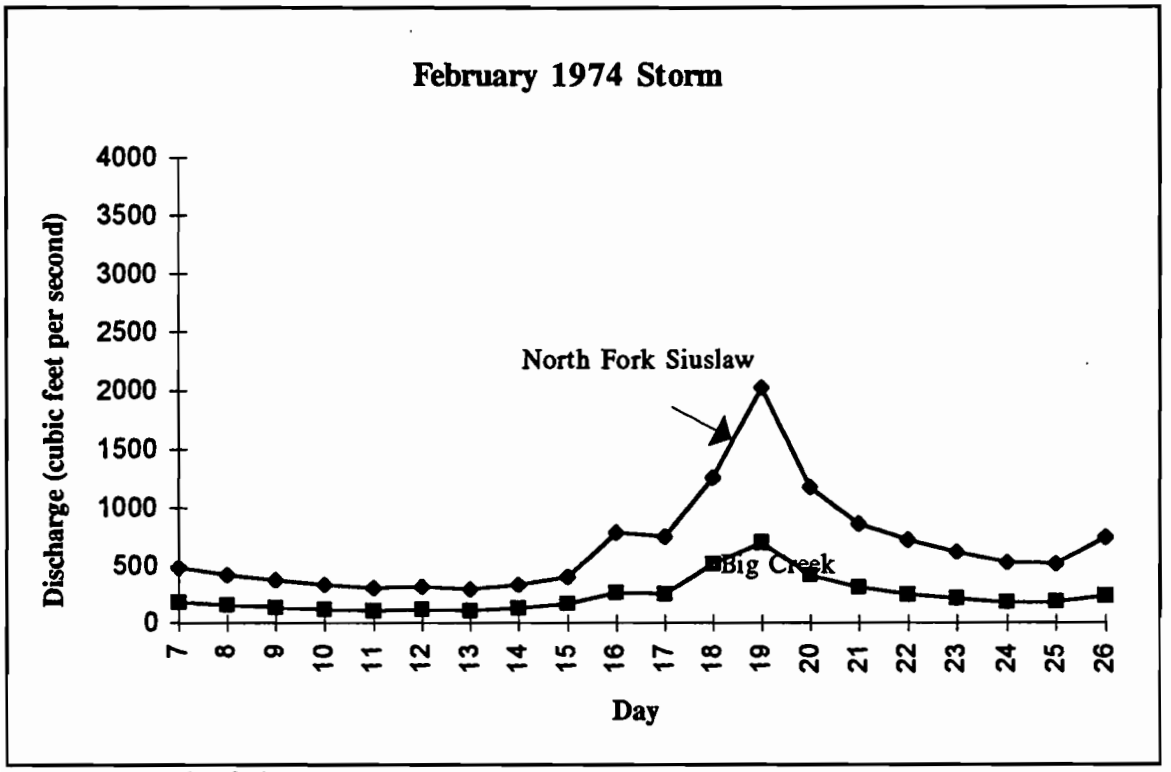



**Figure 8.** Storm data for February 1974 storm.

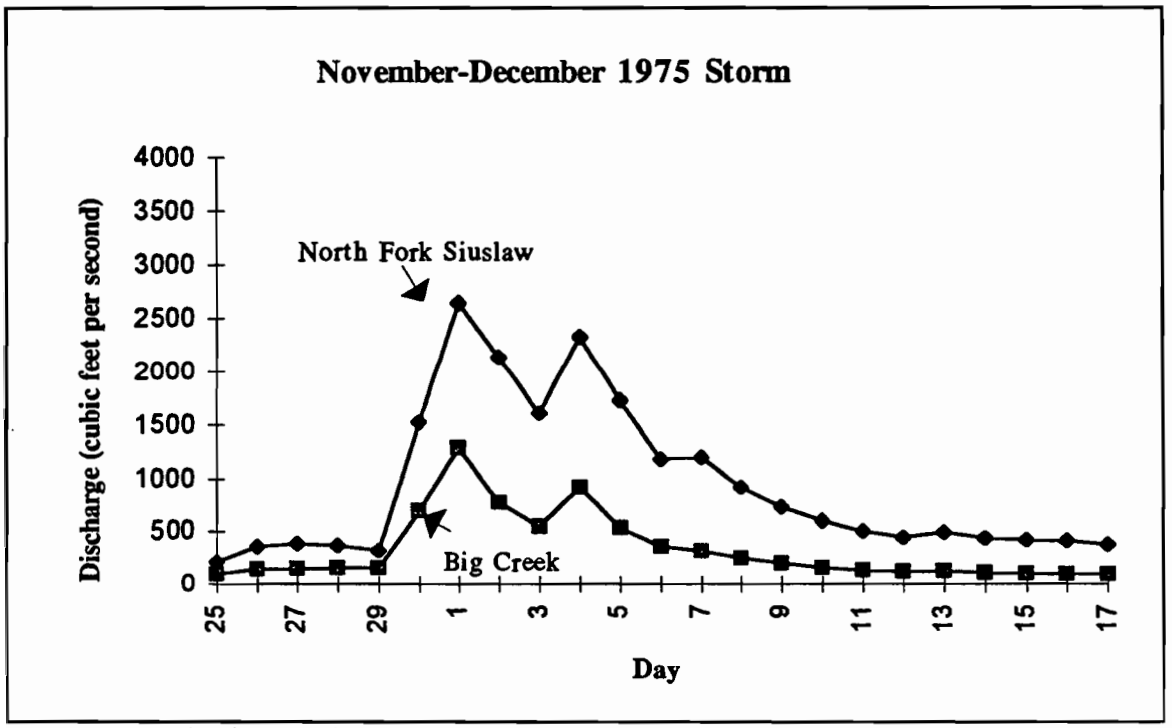



**Figure 9.** Storm data for November -December 1975 storm.

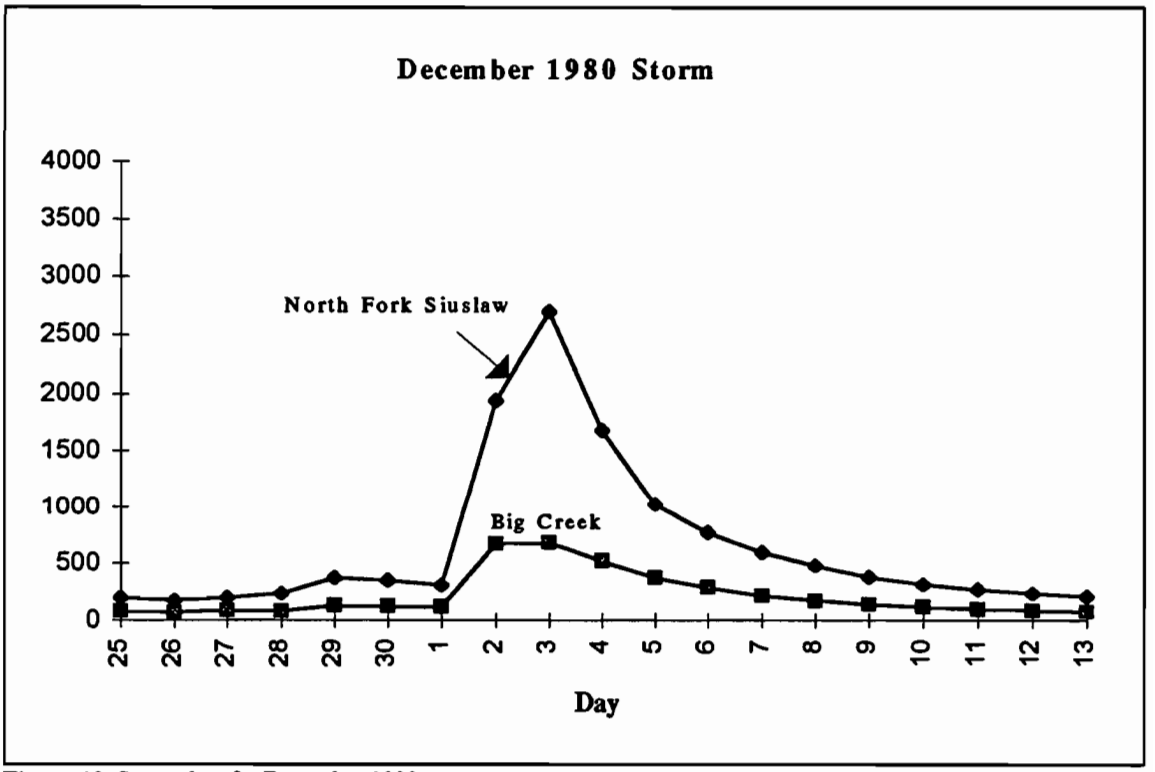



**Figure 10.** Storm data for December 1980 storm.

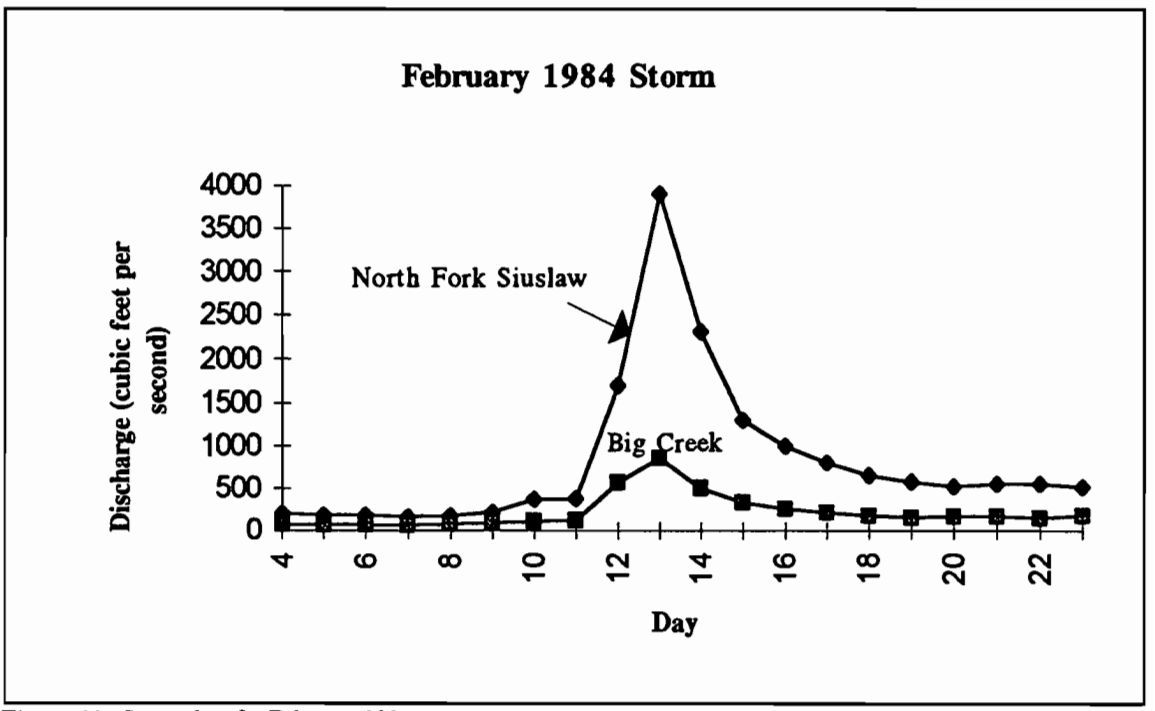



**Figure 11.** Storm data for February 1984 storm.

# *Appendix K*

## - FISH HABITAT CONDITIONS - NORTH FORK OF THE SIUSLAW WATERSHED

**Table 1.** Current fish habitat conditions within the North Fork Siuslaw watershed. G = Good, F = Fair, P = Poor, VP = Very Poor (refer to Table 2 of the main document for explanation of codes).

| STREAM | REACH | LWD | PERCENT POOLS | DEEP POOLS | COMPLEX POOLS | OVERALL RATING | COMMENTS |
|---|---|---|---|---|---|---|---|
| Billie | 1 | VP | F | – | – | P | |
| Billie | 2 | | | | | | Private land |
| Billie | 3 | F | G | P | P | F | High % sand |
| Billie | 4 | | | | | | Private land |
| Billie | 5 | G | P | G | F | P | Very few pools |
| Cedar | 1 | F | G | G | F | G | Beaver ponds |
| Cedar | 2 | P | F | F | – | P | |
| Cedar | 3 | VP | G | G | G | G | Beaver ponds |
| Cedar T4 | 4 | F | G | F | P | F | |
| Condon | 1 | P | P | G | P | P | Cobble riffle |
| Condon | 2 | F | P | – | – | P | No pools |
| Condon | 3 | G | P | G | P | P | Cobble riffle |
| Condon T11 | 4 | F | G | P | – | F | |
| Drew | 1 | | | | | | Private land |
| Drew | 2 | – | F | P | – | P | High & sand, no LWD |
| Drew | 3 | | | | | | Private land |
| Drew | 4 | VP | F | F | – | P | High & sand, no LWD |
| Drew | 5 | | | | | | Private land |
| Drew | 6 | P | P | G | – | P | Few pools |
| Elma | 1 | | | | | | Private land |
| Elma | 2 | P | G | – | – | F | |
| Elma | 3 | P | G | G | – | F | |
| Elma | 4 | F | F | F | – | F | |
| Elma T5 | 5 | P | P | F | – | P | Cobble riffle |
| Elma T7 | 6 | P | G | G | – | G | Beaver ponds |
| Fosback Marsh | 1 | G | P | – | – | P | No pools |
| Hanson | 1 | P | P | P | – | P | |
| Haring | 1 | | | | | | Private land |
| Haring | 2 | F | P | P | – | P | |
| Haring | 3 | G | P | – | – | P | |
| Lindlsey | 1 | | | | | | Private land |
| Lindlsey | 2 | G | G | P | – | F | |
| Russell | 1 | | | | | | Private land |
| Russell | 2 | P | P | G | – | P | |
| Russell | 3 | F | P | G | – | P | |
| Russell | 4 | | | | | | Private land |
| Russell T4 | 5 | | | | | | Private land |
| Sam | 1 | G | F | – | – | G | Enhanced reach |
| Sam | 2 | VP | G | – | – | P | |
| Sam | 3 | P | G | G | – | F | |
| South Russell | 1 | | | | | | Private land |
| South Russell | 2 | P | F | P | – | P | |
| Taylor | 1 | F | G | P | P | P | |
| Uncle | 1 | F | G | P | P | P | |
| Uncle | 2 | F | P | G | – | P | |
| Uncle | 3 | P | P | F | – | P | |
| W Br NFK Siuslaw | 1 | P | G | G | P | F | |
| W Br NFK Siuslaw | 2 | VP | P | P | – | P | |
| Wilhelm | 1 | VP | G | G | P | P | Bedrock, no LWD |
| Wilhelm | 2 | VP | G | G | G | F | |
| Wilhelm | 3 | P | G | G | F | F | |
| Wilhelm | 4 | VP | G | P | P | P | |
| Wilhelm Left Branch | 1 | VP | F | F | – | P | |

# *Appendix L*

## - WILDLIFE HABITAT RELATIONSHIPS - NORTH FORK OF THE SIUSLAW WATERSHED

Estimates of wildlife relationships to the different habitat types, discussed in Appendix N and old growth habitat, were formed using a wildlife habitat relational database compiled from information in Brown (1985) and other wildlife literature and field guides. Eight habitat guilds were created to incorporate the 297 terrestrial vertebrate species which currently occur in this area. Primary breeding and feeding habitat preferences were used to group the species into these habitat guilds. The wildlife discussed in this analysis may utilize a wider variety of habitat types for resting or as secondary feeding and breeding habitat. Wildlife species which would benefit from having snags or logs within their primary feeding or breeding habitat are displayed in table 17.

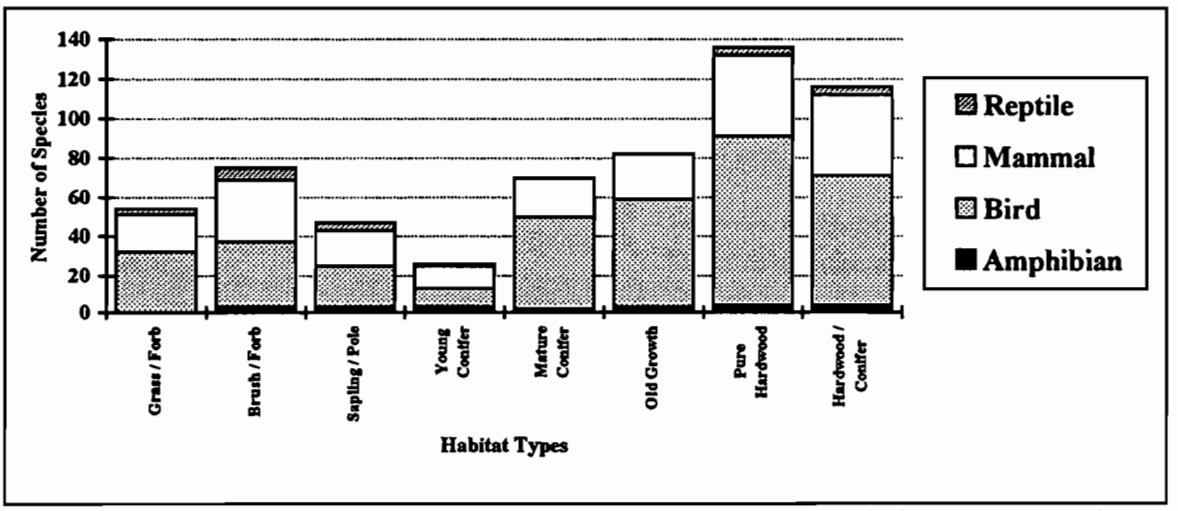



**Figure 1.** Number of wildlife species that may occur in the North Fork of the Siuslaw watershed and use various habitat types for breeding.

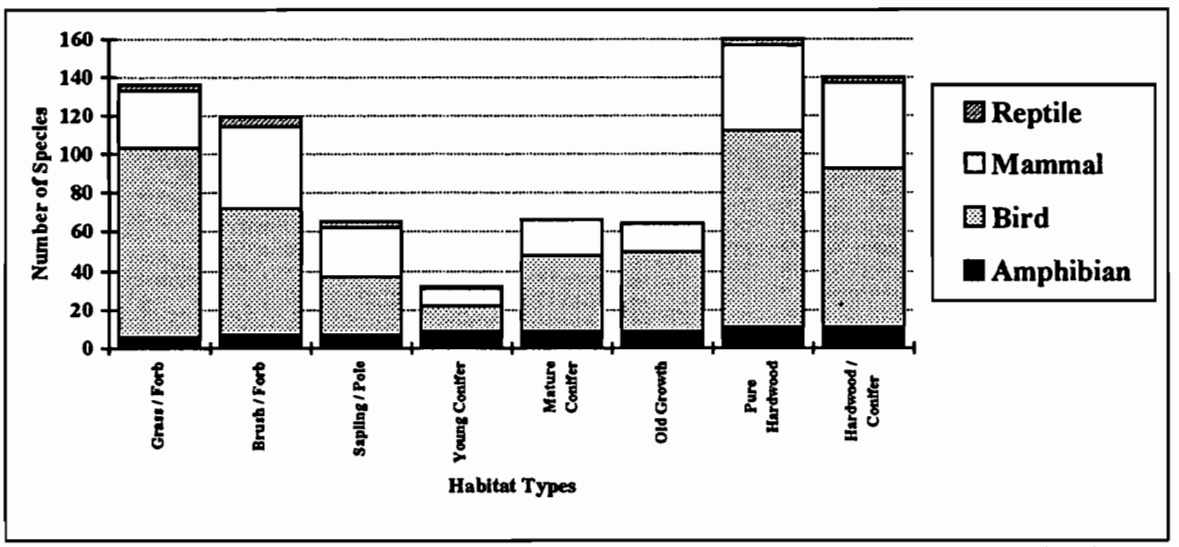



**Figure 2.** Number of wildlife species that may occur in the North Fork of the Siuslaw watershed and use various habitat types for foraging.

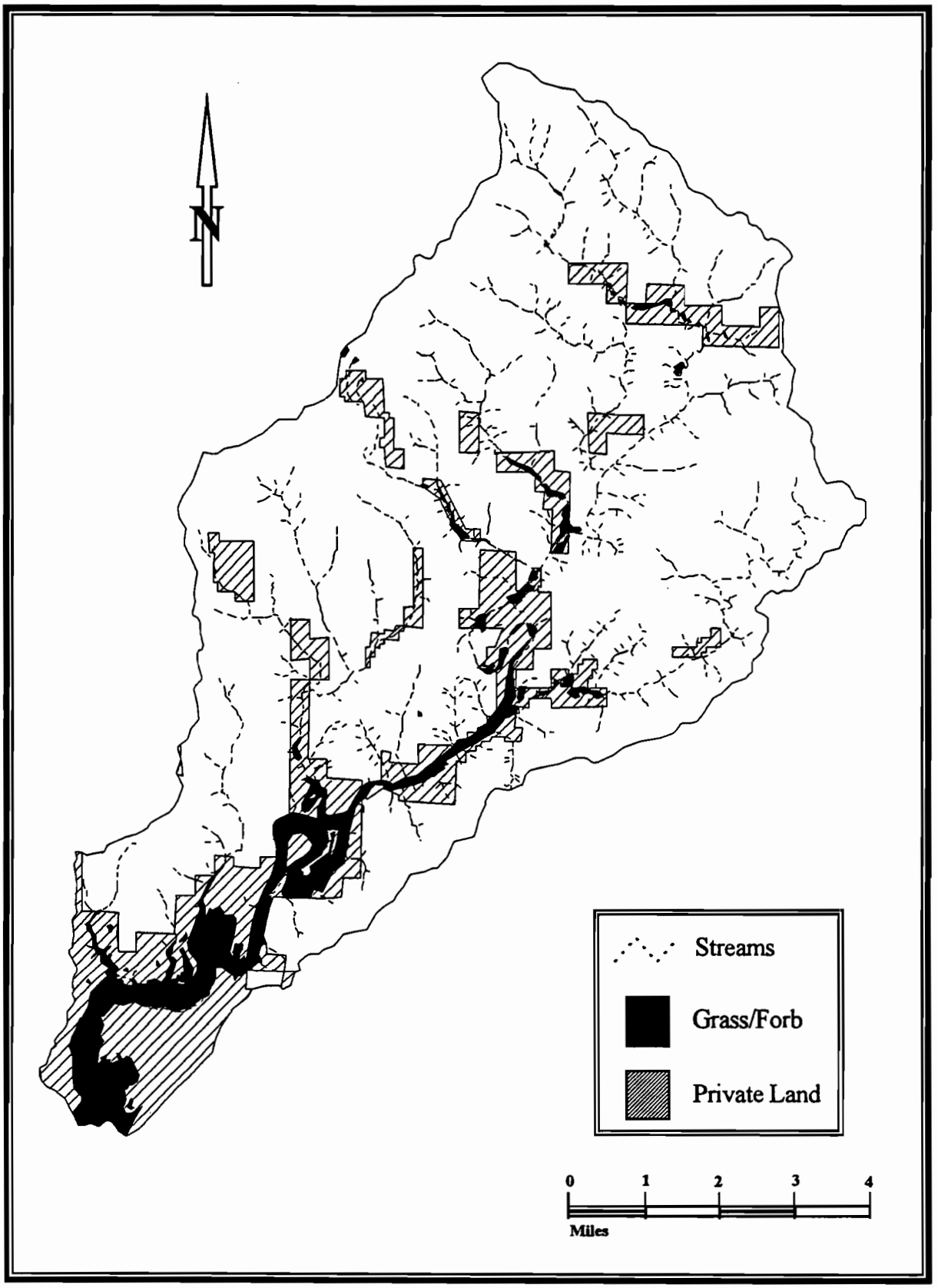



Figure 3. Grass/forb habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 1. Wildlife species which may breed within the grass/forb habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | Spotted Sandpiper | *Actitis macularia* | Damp patches in meadows, forest streams, pools, ocean surf |
| *Bird | Red-winged Blackbird | *Agelaius phoeniceus* | Marshes, wetlands with cattails, rushes/sedges |
| *Bird | Northern Pintail | *Anas acuta* | Second or third most abundant duck, found in shallow lakes and marshes |
| *Bird | American Wigeon | *Anas americana* | Ponds and marshes |
| *Bird | Northern Shoveler | *Anas clypeata* | Feed in shallow water, lakes, marshes |
| *Bird | Green-winged Teal | *Anas crecca* | Prefers feeding on mud flats, shallow marshes, flooded grain fields |
| *Bird | Cinnamon Teal | *Anas cyanoptera* | Marshes and other wetlands |
| *Bird | Blue-winged Teal | *Anas discors* | First duck to migrate south, feeds in shallow marshes, mud flats |
| *Bird | Mallard | *Anas platyrhynchos* | Most abundant duck, found on pasturelands, lakes, marshes, swamps |
| *Bird | Gadwall | *Anas strepera* | Found on pasturelands, lakes, marshes, swamps |
| *Bird | Short-eared Owl | *Asio flammeus* | Meadows, marshes, pastureland (ungrazed or unmowed), nest on ground |
| *Bird | Canada Goose | *Branta canadensis* | Pasturelands, shallow water |
| *Bird | Lapland Longspur | *Calcarius lapponicus* | Found in coastal grass fields, open fields with short grass or bare ground |
| Bird | California Quail | *Callipepla californica* | Brushy areas with open ground, roosts low in trees and bushes |
| *Bird | Killdeer | *Charadrius vociferus* | Highly adaptable, found in open habitats, pastures, plowed fields, mud flats |
| *Bird | Lark Sparrow | *Chondestes grammacus* | Open areas, sparsely vegetated with scattered trees and shrubs, pastureland |
| Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| *Bird | Marsh Wren | *Cistothorus palustris* | Fresh to brackish water marshes, cattails, rushes/sedges |
| *Bird | Yellow Rail | *Coturnicops noveboracensis* | Grassy marshes and wet meadows, grainfields and pastureland |
| *Bird | Horned Lark | *Eremophila alpestris* | Stocky ground bird, occurs in wide variety of open habitats |
| *Bird | American Coot | *Fulica americana* | Freshwater lakes, rivers, saltwater bodies also in winter |
| *Bird | Common Snipe | *Gallinago gallinago* | Peat bogs, marshes and sodden fields |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| *Bird | Lincoln's Sparrow | *Melospiza lincolnii* | Cool bogs, brushy wet meadows, pasturelands with dense brush and grass |
| *Bird | Savannah Sparrow | *Passerculus sandwichensis* | Dense grasslands, nest in grass, wet meadows, salt spray meadows |
| *Bird | Wilson's Phalarope | *Phalaropus tricolor* | Migrates overland, winters in fresh and salwater marshes, lakes, coastal bays |
| *Bird | Vesper Sparrow | *Pooecetes gramineus* | Grasslands and agricultural areas, open grassy areas |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| Bird | Virginia Rail | *Rallus limicola* | Mostly in freshwater and brackish marshes, but occasionally in saltwater marsh |
| *Bird | Western Meadowlark | *Sturnella neglecta* | Prefer dry grasslands and uplands |
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |

## Table 1 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| *Mammal | House Mouse | *Mus musculus* | Localized around human abodes |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| *Mammal | Mink | *Mustela vison* | Alder patches, willow/sedge marsh, cedar marsh, coastal lakes, estuaries |
| *Mammal | Nutria | *Myocastor coypus* | Wetland habitat, herbivorous, introduced from South America |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| *Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| *Mammal | Townsend Mole | *Scapanus townsendi* | Wet pastureland, occasionally found in headland prairie and shrub habitat |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| *Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |
| Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |
| *Reptile | Northwestern Garter Snake | *Thamnophis ordinoides* | Meadows, along forest edges in brushy areas and talus |
| *Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

**Table 2. Wildlife species which may feed within the grass/forb habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Northwestern Salamander | *Abystoma gracile* | Uses underground burrows, rotting logs, moist crevices, lay eggs in slow water |
| Amphibian | Western Toad | *Bufo boreas* | Favor freshwater ponds in dunes on the coast during breeding season |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| Amphibian | Red-legged Frog | *Rana aurora* | Often in dense hardwood stands w/dense ground cover, streams and ponds |
| *Amphibian | Bullfrog | *Rana catesbeiana* | Highly aquatic, found in lakes, ponds, sloughs, expanding its range |
| Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| *Bird | Spotted Sandpiper | *Actitis macularia* | Damp patches in meadows, forest streams, pools, ocean surf |
| *Bird | Red-winged Blackbird | *Agelaius phoeniceus* | Marshes, wetlands with cattails, rushes/sedges |
| Bird | Wood Duck | *Aix sponsa* | Nests in hollow cavities of large living or dead trees |
| *Bird | Northern Pintail | *Anas acuta* | Second or third most abundant duck, found in shallow lakes and marshes |
| *Bird | American Wigeon | *Anas americana* | Ponds and marshes |
| *Bird | Northern Shoveler | *Anas clypeata* | Feed in shallow water, lakes, marshes |
| *Bird | Green-winged Teal | *Anas crecca* | Prefers feeding on mud flats, shallow marshes, flooded grain fields |
| *Bird | Cinnamon Teal | *Anas cyanoptera* | Marshes and other wetlands |
| *Bird | Blue-winged Teal | *Anas discors* | First duck to migrate south, feeds in shallow marshes, mud flats |
| *Bird | Eurasian Wigeon | *Anas penelope* | Usually seen alone in flock of other waterfowl in ponds and marshes |
| *Bird | Mallard | *Anas platyrhynchos* | Most abundant duck, found on pasturelands, lakes, marshes, swamps |
| *Bird | Gadwall | *Anas strepera* | Found on pasturelands, lakes, marshes, swamps |
| Bird | Golden Eagle | *Aquila chrysaetos* | Usually nests on cliff ledges but occasionally in large trees |
| *Bird | Great Blue Heron | *Ardea herodias* | Shallow water, river banks, lake shores, streams, ponds, flooded pasture |
| *Bird | Short-eared Owl | *Asio flammeus* | Meadows, marshes, pastureland (ungrazed or unmowed), nest on ground |
| Bird | Long-eared Owl | *Asio otus* | Breeds in hardwood and conifer, feeds in same and wet meadows and edges |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| *Bird | American Bittern | *Botaurus lentiginosus* | Fresh or brackish marshes among cattails and rushes |
| *Bird | Canada Goose | *Branta canadensis* | Pasturelands, shallow water |
| *Bird | Dusky Canada Goose | *Branta canadensis occidentalis* | Feeds in pastures, close to edges |
| Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| Bird | Red-tailed Hawk | *Buteo jamaicensis* | Needs open areas to forage, usually nests along edges in large tree or cliff |
| Bird | Rough-legged Hawk | *Buteo lagopus* | Frequents open areas, nests on rock ledges, hillsides or short trees |
| *Bird | Lapland Longspur | *Calcarius lapponicus* | Found in coastal grass fields, open fields with short grass or bare ground |
| *Bird | Pectoral Sandpiper | *Calidris melanotos* | Favors wet grassy areas bordering water, salt marshes, rarely mud flats |
| *Bird | Dunlin | *Calidris alpina* | Favors coastal mud flats, tidal mud flats, lagoons and beaches |
| *Bird | Baird's Sandpiper | *Calidris bairdii* | Prefers muddy, sandy or grassy areas in migrations, often seen away from water |
| *Bird | Stilt Sandpiper | *Calidris himantopus* | Ponds, pools and lagoons, avoids mud flats and beaches |
| *Bird | Western Sandpiper | *Calidris mauri* | Tidal flats, lagoons, ponds |
| *Bird | Least Sandpiper | *Calidris minutilla* | Favors wet, muddy or grassy areas and salt marshes |

## Table 2 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | California Quail | *Callipepla californica* | Brushy areas with open ground, roosts low in trees and bushes |
| Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | American Goldfinch | *Carduelis tristis* | Open country, forest openings, shrub stage in deciduous riparian areas |
| Bird | Turkey Vulture | *Cathartes aura* | Communal roosters, sometimes nest on ground |
| *Bird | Vaux's Swift | *Chaetura vauxi* | Cavity nester, needs large snags, forages over open waters and meadows |
| *Bird | Killdeer | *Charadrius vociferus* | Highly adaptable, found in open habitats, pastures, plowed fields, mud flats |
| *Bird | Snow Goose | *Chen caerulescens* | Pasturelands, marshes, wet meadows |
| *Bird | Lark Sparrow | *Chondestes grammacus* | Open areas, sparsely vegetated with scattered trees and shrubs, pastureland |
| Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| *Bird | Marsh Wren | *Cistothorus palustris* | Fresh to brackish water marshes, cattails, rushes/sedges |
| Bird | American Crow | *Corvis brachyryhnchos* | More common around riparian areas and forest edges |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| *Bird | Yellow Rail | *Coturnicops noveboracensis* | Grassy marshes and wet meadows, grainfields and pastureland |
| *Bird | Trumpeter Swan | *Cygnus buccinator* | Pasturelands, marshes, wet meadows |
| *Bird | Tundra Swan | *Cygnus columbianus* | Pasturelands, marshes, wet meadows |
| Bird | Black-shouldered Kite | *Elanus caeruleus* | Prefer river valleys, wet meadows, hunt from perch or air |
| *Bird | Willow Flycatcher | *Empidonax traillii* | Deciduous thickets, shrubby component, clearcuts with willow/vine maple |
| *Bird | Horned Lark | *Eremophila alpestris* | Stocky ground bird, occurs in wide variety of open habitats |
| Bird | Brewer's Blackbird | *Euphagus cyanocephalus* | Meadows, mesic areas, ranches, riparian areas, thickets |
| Bird | Merlin | *Falco columbarius* | Forages open habitats, salt marshes, estuaries, nests in conifer |
| *Bird | American Peregrine Falcon | *Falco peregrinus* | Often near large body of water, hunts shorelines and over open water |
| Bird | American Kestrel | *Falco sparverius* | Nests in cavities, forages in clearings |
| *Bird | American Coot | *Fulica americana* | Freshwater lakes, rivers, saltwater bodies also in winter |
| *Bird | Common Snipe | *Gallinago gallinago* | Peat bogs, marshes and sodden fields |
| Bird | Cliff Swallow | *Hirundo pyrrhonota* | Bridges, cliffs or man-made structures for nesting |
| Bird | Barn Swallow | *Hirundo rustica* | Open forests, farmlands, rural areas, nest only in man-made structures |
| *Bird | Northern Shrike | *Lanius excubitor* | Winters in this area only, nests in Alaska/Canada, hunts the edges |
| *Bird | Loggerhead Shrike | *Lanius ludovicianus* | Prefers open country, meadows, pastureland, thinnly wooded areas |
| *Bird | Lincoln's Sparrow | *Melospiza lincolnii* | Cool bogs, brushy wet meadows, pasturelands with dense brush and grass |
| Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| *Bird | Long-billed Curlew | *Numenius americanus* | Largest shorebird, frequents marshes, mud flats, sandbars, shorelines |
| *Bird | Whimbrel | *Numenius phaeopus* | Mud flats, lake shores, beaches, plowed fields |
| Bird | Mountain Quail | *Oreortyx pictus* | Brushy areas with open ground, roadsides |
| Bird | Western Screech-owl | *Otis kennicottii* | Primarily riparian dweller, nests in large trees or tree cavities |
| *Bird | Savannah Sparrow | *Passerculus sandwichensis* | Dense grasslands, nest in grass, wet meadows, salt spray meadows |
| *Bird | Wilson's Phalarope | *Phalaropus tricolor* | Migrates overland, winters in fresh and salwater marshes, lakes, coastal bays |
| *Bird | Ruff | *Philomachus pugnax* | Muddy borders of ponds, short-grass marshes, tidal mud flats |

## Table 2 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | Black-billed Magpie | *Pica pica* | Open country, found more commonly to the east |
| *Bird | Lesser Golden-plover | *Pluvialis dominica* | Favors plowed fields and short-grass pastures during migration |
| *Bird | Black-bellied Plover | *Pluvialis squatarola* | Salt marshes, tidal flats, plowed fields, wet grassy pastures during migration |
| *Bird | Vesper Sparrow | *Pooecetes gramineus* | Grasslands and agricultural areas, open grassy areas |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| *Bird | Purple Martin | *Progne subis* | Along rivers, estuaries, nests in cavities in forest edges or openings |
| Bird | Virginia Rail | *Rallus limicola* | Mostly in freshwater and brackish marshes, but occasionally in saltwater marsh |
| *Bird | Bank Swallow | *Riparia riparia* | Need bare perpendicular banks with sandy or loam soils for nesting |
| *Bird | Rock Wren | *Salpinctes obsoletus* | Open, rocky areas, found more commonly to the east |
| *Bird | Black Phoebe | *Sayornis nigricans* | Always associated with water |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| Bird | Western Bluebird | *Sialia mexicana* | Forest edges and open hardwood or coniferous forests, nest in cavities |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| *Bird | Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | Decidous riparian habitat, nests in bare river banks |
| *Bird | Calliope Hummingbird | *Stellula calliope* | Feeds in mountainous meadows, riparian areas, nests in decid/conifer trees |
| *Bird | Western Meadowlark | *Sturnella neglecta* | Prefer dry grasslands and uplands |
| Bird | European Starling | *Sturnus vulgaris* | Cavities or crevices for nesting, farmlands, cities, widespread |
| Bird | Tree Swallow | *Tachycineta bicolor* | Requires snags for nesting (away from forest edges), associated with water |
| *Bird | Violet-green Swallow | *Tachycineta thalassina* | Needs snags for nesting/perching , usu. near water, forages in open habitat |
| *Bird | Lesser Yellowlegs | *Tringa flavipes* | Feeds in shallow pools, lakes, or along edges of tidal creeks or marshes |
| *Bird | Greater Yellowlegs | *Tringa melanoleuca* | Feeds in shallow pools, lakes, or along edges of tidal creeks or marshes |
| *Bird | Solitary Sandpiper | *Tringa solitaria* | Stalks shores or wades in shallow, slow-moving streams, ponds, marshes |
| *Bird | Buff-breasted Sandpiper | *Tryngites subruficollis* | Frequents grassy areas away from breeding grounds in tundra |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Barn Owl | *Tyto alba* | Farmlands and marshlands, rural areas, nests in cavities, caves, structures |
| *Bird | Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | Marshes, sloughs, sedges/rushes, wet meadows |
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| *Mammal | House Mouse | *Mus musculus* | Localized around human abodes |

## Table 2 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| *Mammal | Mink | *Mustela vison* | Alder patches, willow/sedge marsh, cedar marsh, coastal lakes, estuaries |
| *Mammal | Nutria | *Myocastor coypus* | Wetland habitat, herbivorous, introduced from South America |
| Mammal | Long-eared Bat | *Myotis evotis* | Mature to immature conifer, salal |
| Mammal | Little Brown Bat | *Myotis lucifugus* | Appear in all habitat types but affinity for conifer forests |
| Mammal | Fringed Myotis | *Myotis thysanodes* | Roosts in caves, buildings, crevices |
| Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| Mammal | Townsend's Big-eared Bat | *Plecotus townsendii* | Roosts in caves or abandoned buldings |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| *Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| *Mammal | Townsend Mole | *Scapanus townsendi* | Wet pastureland, occasionally found in headland prairie and shrub habitat |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| *Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |
| Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |
| *Reptile | Northwestern Garter Snake | *Thamnophis ordinoides* | Meadows, along forest edges in brushy areas and talus |
| *Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

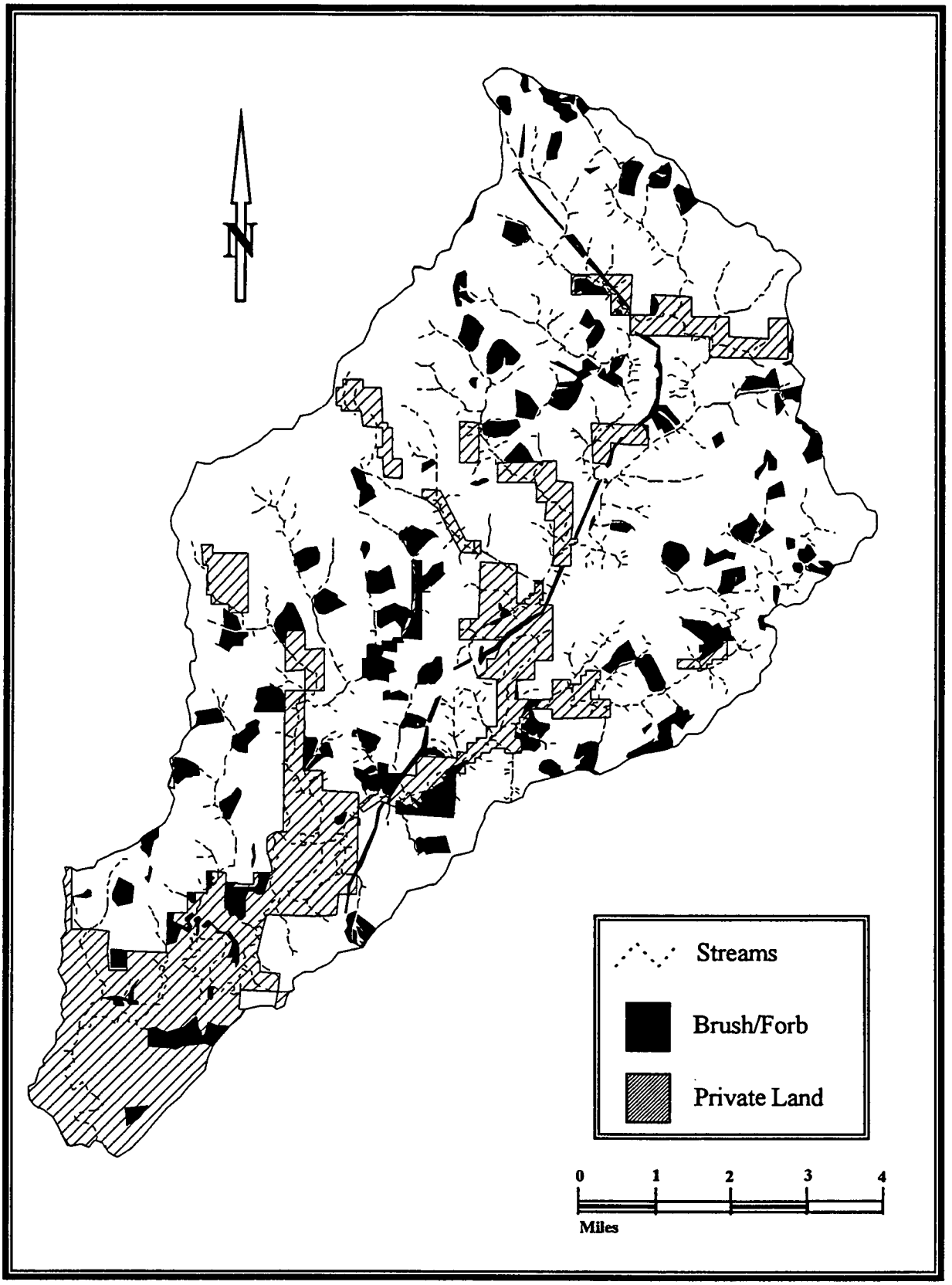



Figure 4. Brush/forb habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 3. Wildlife species which may breed within the brush/forb habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Western Toad | *Bufo boreas* | Favor freshwater ponds in dunes on the coast during breeding season |
| Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Bird | Cedar Waxwing | *Bombycilla cedrorum* | Prefers deciduous but found in brush stages of conifer in breeding season |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Green-backed Heron | *Butorides striatus* | Wet woodlands, streams, lake shores, coastal marsh and wetlands |
| *Bird | California Quail | *Callipepla californica* | Brushy areas with open ground, roosts low in trees and bushes |
| Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | American Goldfinch | *Carduelis tristis* | Open country, forest openings, shrub stage in deciduous riparian areas |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| *Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| *Bird | Blue Grouse | *Dendragapus obscurus* | Prefer open forests, along edges and ridges with scattered trees and shrubs |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Yellow Warbler | *Dendroica petechia* | Most widespread warbler, found in riparian alder thickets, also clear cuts |
| *Bird | Brewer's Blackbird | *Euphagus cyanocephalus* | Meadows, mesic areas, ranches, riparian areas, thickets |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| *Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |
| *Bird | Mountain Quail | *Oreortyx pictus* | Brushy areas with open ground, roadsides |
| Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |
| Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| Bird | Bushtit | *Psaltriparus minimus* | Shrub/forest edges, deciduous habitats, flock from shrub to shrub |
| Bird | Virginia Rail | *Rallus limicola* | Mostly in freshwater and brackish marshes, but occasionally in saltwater marsh |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| *Bird | Western Bluebird | *Sialia mexicana* | Forest edges and open hardwood or coniferous forests, nest in cavities |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| Bird | Bewick's Wren | *Thryomanes bewickii* | Cavity nester, shrubby habitat, riparian alder/salmonberry |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Nashville Warbler | *Vermivora ruficapilla* | Occurs mostly in second growth woodlands, brushy wetlands, managed stands |
| Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |

## Table 3 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |
| Mammal | Western Red-backed Vole | *Clethrionomys californicus* | Need rotting/punky logs, little ground vegetation, closed canopy conifer |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Mountain Lion | *Felis concolor* | Breed in mature forest, shrub, open sapling pole, caves, talus, cliffs |
| *Mammal | Snowshoe Hare | *Lepus americanus* | Cedar swamps to old growth, immature to mature conifer |
| Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| *Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| *Mammal | Townsend Mole | *Scapanus townsendi* | Wet pastureland, occasionally found in headland prairie and shrub habitat |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| *Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |
| *Mammal | Brush Rabbit | *Sylvilagus bachmani* | All habitats along brushy edges |
| *Mammal | Mazama Pocket Gopher | *Thomomys mazama* | Usually only in open to semi-shrubby areas |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |
| Reptile | Rubber Boa | *Charina bottae* | Common in clearings, utilize dead and down woody material |
| Reptile | Western Pond Turtle | *Clemmys marmota marmota* | Marshes, ponds, sloughs, slow moving water |
| *Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| Reptile | Northwestern Garter Snake | *Thamnophis ordinoides* | Meadows, along forest edges in brushy areas and talus |
| Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

**Table 4. Wildlife species which may feed within the brush/forb habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Northwestern Salamander | *Abystoma gracile* | Uses underground burrows, rotting logs, moist crevices, lay eggs in slow water |
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Western Toad | *Bufo boreas* | Favor freshwater ponds in dunes on the coast during breeding season |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| Amphibian | Red-legged Frog | *Rana aurora* | Often in dense hardwood stands w/dense ground cover, streams and ponds |
| Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| *Bird | Golden Eagle | *Aquila chrysaetos* | Usually nests on cliff ledges but occasionally in large trees |
| Bird | Long-eared Owl | *Asio otus* | Breeds in hardwood and conifer, feeds in same and wet meadows and edges |
| Bird | Cedar Waxwing | *Bombycilla cedrorum* | Prefers deciduous but found in brush stages of conifer in breeding season |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| *Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| *Bird | Red-tailed Hawk | *Buteo jamaicensis* | Needs open areas to forage, usually nests along edges in large tree or cliff |
| Bird | Rough-legged Hawk | *Buteo lagopus* | Frequents open areas, nests on rock ledges, hillsides or short trees |
| *Bird | California Quail | *Callipepla californica* | Brushy areas with open ground, roosts low in trees and bushes |
| Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | American Goldfinch | *Carduelis tristis* | Open country, forest openings, shrub stage in deciduous riparian areas |
| *Bird | House Finch | *Carpodacus mexicanus* | Abundant near areas inhabited by humans, avoids brush and tall grass |
| *Bird | Turkey Vulture | *Cathartes aura* | Communal roosters, sometimes nest on ground |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| *Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| Bird | Evening Grosbeak | *Coccothraustes vespertina* | Mostly coniferous forest, sometimes mixed or deciduous |
| *Bird | Northern Flicker | *Colaptes auratus* | Cavity nesters, found near large trees in open woodlands, clearings |
| Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| Bird | American Crow | *Corvis brachyryhnchos* | More common around riparian areas and forest edges |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| *Bird | Blue Grouse | *Dendragapus obscurus* | Prefer open forests, along edges and ridges with scattered trees and shrubs |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| Bird | Yellow Warbler | *Dendroica petechia* | Most widespread warbler, found in riparian alder thickets, also clear cuts |
| *Bird | Black-shouldered Kite | *Elanus caeruleus* | Prefer river valleys, wet meadows, hunt from perch or air |
| *Bird | Brewer's Blackbird | *Euphagus cyanocephalus* | Meadows, mesic areas, ranches, riparian areas, thickets |

## Table 4 (Cont.)

| Class | Common Name | Sclentific Name | Comments |
|---|---|---|---|
| *Bird | Merlin | *Falco columbarius* | Forages open habitats, salt marshes, estuaries, nests in conifer |
| *Bird | American Kestrel | *Falco sparverius* | Nests in cavities, forages in clearings |
| *Bird | Cliff Swallow | *Hirundo pyrrhonota* | Bridges, cliffs or man-made structures for nesting |
| Bird | Barn Swallow | *Hirundo rustica* | Open forests, farmlands, rural areas, nest only in man-made structures |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| *Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |
| *Bird | Mountain Quail | *Oreortyx pictus* | Brushy areas with open ground, roadsides |
| Bird | Western Screech-owl | *Otis kennicottii* | Primarily riparian dweller, nests in large trees or tree cavities |
| Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |
| Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Western Tanager | *Piranga ludoviciana* | Prefer open forest, nest in mature conifer, forages in shrubs, eats berries |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| Bird | Bushtit | *Psaltriparus minimus* | Shrub/forest edges, deciduous habitats, flock from shrub to shrub |
| Bird | Virginia Rail | *Rallus limicola* | Mostly in freshwater and brackish marshes, but occasionally in saltwater marsh |
| Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| *Bird | Western Bluebird | *Sialia mexicana* | Forest edges and open hardwood or coniferous forests, nest in cavities |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| *Bird | European Starling | *Sturnus vulgaris* | Cavities or crevices for nesting, farmlands, cities, widespread |
| *Bird | Tree Swallow | *Tachycineta bicolor* | Requires snags for nesting (away from forest edges), associated with water |
| Bird | Bewick's Wren | *Thryomanes bewickii* | Cavity nester, shrubby habitat, riparian alder/salmonberry |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| *Bird | Barn Owl | *Tyto alba* | Farmlands and marshlands, rural areas, nests in cavities, caves, structures |
| Bird | Orange-crowned Warbler | *Vermivora celata* | Mesic, north-facing slopes, brushy tangles, openings in forest |
| Bird | Nashville Warbler | *Vermivora ruficapilla* | Occurs mostly in second growth woodlands, brushy wetlands, managed stands |
| Bird | Warbling Vireo | *Vireo gilvus* | Open deciduous stands, riparian alder thickets |
| Bird | Red-eyed Vireo | *Vireo olivaceus* | Mixed and deciduous forests, also suburban shade trees |
| Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| *Bird | Golden-crowned Sparrow | *Zonotrichia atricapilla* | Shrub thickets along the coast |
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |

## Table 4 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Western Red-backed Vole | *Clethrionomys californicus* | Need rotting/punky logs, little ground vegetation, closed canopy conifer |
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Mountain Lion | *Felis concolor* | Breed in mature forest, shrub, open sapling pole, caves, talus, cliffs |
| Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| Mammal | Hoary Bat | *Lasiurus cinereus* | Primarily conifer or mixed conifer/deciduous |
| *Mammal | Snowshoe Hare | *Lepus americanus* | Cedar swamps to old growth, immature to mature conifer |
| Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| *Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| Mammal | Little Brown Bat | *Myotis lucifugus* | Appear in all habitat types but affinity for conifer forests |
| *Mammal | Fringed Myotis | *Myotis thysanodes* | Roosts in caves, buildings, crevices |
| Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Yuma Bat | *Myotis yumanensis* | Large streams/rivers, ponds and lakes, feed close to water's surface |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| *Mammal | Townsend Mole | *Scapanus townsendi* | Wet pastureland, occasionally found in headland prairie and shrub habitat |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| *Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |
| *Mammal | Brush Rabbit | *Sylvilagus bachmani* | All habitats along brushy edges |
| *Mammal | Mazama Pocket Gopher | *Thomomys mazama* | Usually only in open to semi-shrubby areas |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |

## Table 4 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Reptile | Rubber Boa | *Charina bottae* | Common in clearings, utilize dead and down woody material |
| *Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| Reptile | Northwestern Garter Snake | *Thamnophis ordinoides* | Meadows, along forest edges in brushy areas and talus |
| Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

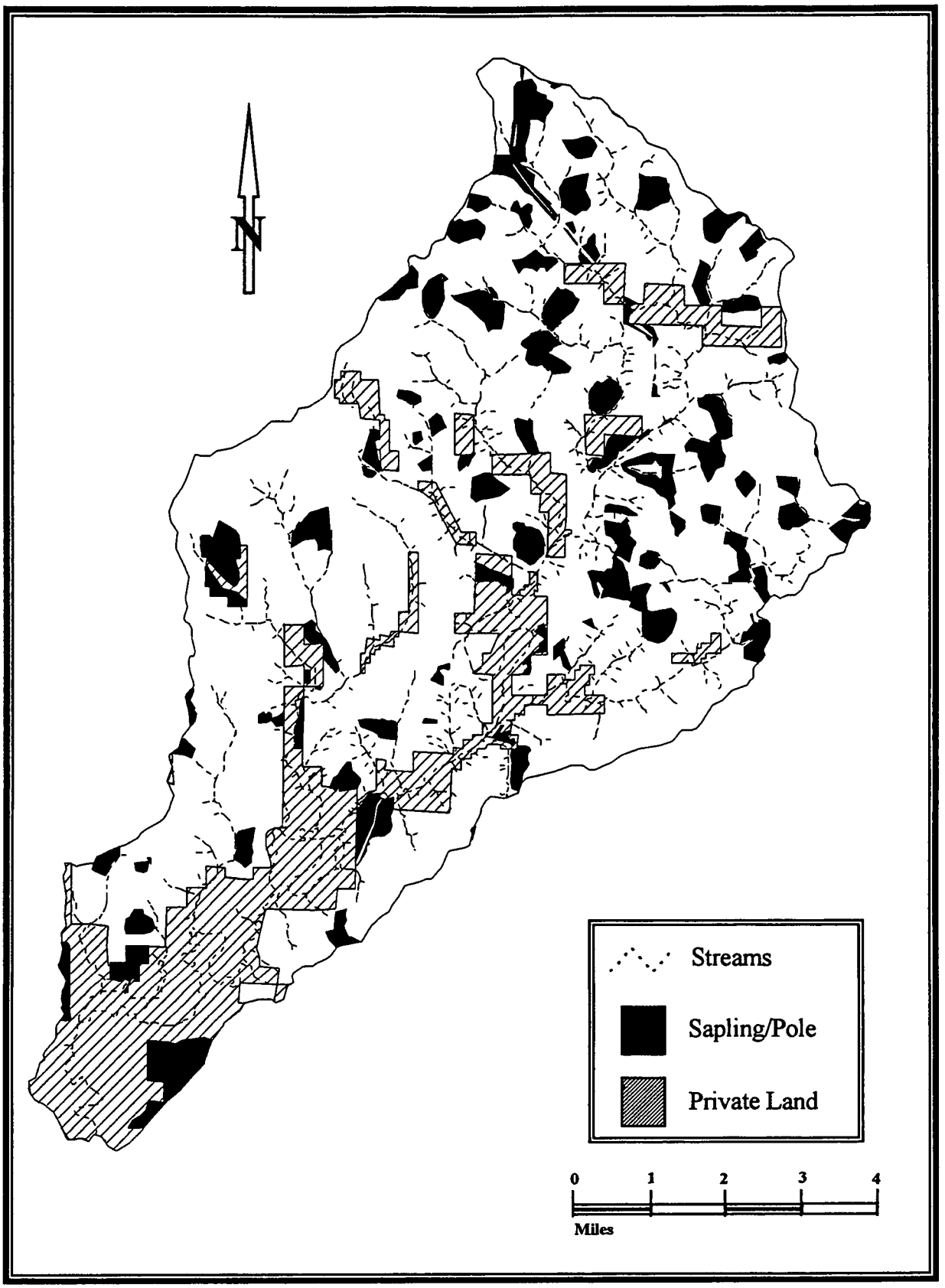



Figure 5. Sapling/pole habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 5. Wildlife species which may breed within the sapling/pole habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| *Bird | Blue Grouse | *Dendragapus obscurus* | Prefer open forests, along edges and ridges with scattered trees and shrubs |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |
| *Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |
| Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| *Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Orange-crowned Warbler | *Vermivora celata* | Mesic, north-facing slopes, brushy tangles, openings in forest |
| *Bird | Nashville Warbler | *Vermivora ruficapilla* | Occurs mostly in second growth woodlands, brushy wetlands, managed stands |
| Bird | Solitary Vireo | *Vireo solitarius* | Nests in riparian deciduous trees, avoids grass/forb and brushy areas |
| Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| *Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |
| Mammal | Western Red-backed Vole | *Clethrionomys californicus* | Need rotting/punky logs, little ground vegetation, closed canopy conifer |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| *Mammal | Mountain Lion | *Felis concolor* | Breed in mature forest, shrub, open sapling pole, caves, talus, cliffs |
| *Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |

## Table 5 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |
| Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Reptile | Rubber Boa | *Charina bottae* | Common in clearings, utilize dead and down woody material |
| Reptile | Western Pond Turtle | *Clemmys marmota marmota* | Marshes, ponds, sloughs, slow moving water |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

**Table 6. Wildlife species which may feed within the sapling/pole habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Tailed Frog | *Ascaphus truei* | Cold, fast-moving permanent forest streams, hides under rocks |
| Amphibian | Western Toad | *Bufo boreas* | Favor freshwater ponds in dunes on the coast during breeding season |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| Bird | Evening Grosbeak | *Coccothraustes vespertina* | Mostly coniferous forest, sometimes mixed or deciduous |
| Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Steller's Jay | *Cyanocitta stelleri* | Dense coniferous forests at nesting time, attracted to campsites |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |
| Bird | Chestnut-backed Chickadee | *Parus rufescens* | Cavity nester in snags, feed along shrubby edges |
| *Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |
| Bird | Gray Jay | *Perisoreus canadensis* | Dense coniferous forests, attracted to campsites |
| Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| *Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| Bird | Western Bluebird | *Sialia mexicana* | Forest edges and open hardwood or coniferous forests, nest in cavities |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Orange-crowned Warbler | *Vermivora celata* | Mesic, north-facing slopes, brushy tangles, openings in forest |
| *Bird | Nashville Warbler | *Vermivora ruficapilla* | Occurs mostly in second growth woodlands, brushy wetlands, managed stands |
| Bird | Solitary Vireo | *Vireo solitarius* | Nests in riparian deciduous trees, avoids grass/forb and brushy areas |

## Table 6 (Cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Western Red-backed Vole | *Clethrionomys californicus* | Need rotting/punky logs, little ground vegetation, closed canopy conifer |
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| *Mammal | Mountain Lion | *Felis concolor* | Breed in mature forest, shrub, open sapling pole, caves, talus, cliffs |
| Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| Mammal | Hoary Bat | *Lasiurus cinereus* | Primarily conifer or mixed conifer/deciduous |
| *Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| *Mammal | Townsend's Big-eared Bat | *Plecotus townsendii* | Roosts in caves or abandoned buldings |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |
| Mammal | Brush Rabbit | *Sylvilagus bachmani* | All habitats along brushy edges |
| Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |
| Reptile | Rubber Boa | *Charina bottae* | Common in clearings, utilize dead and down woody material |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

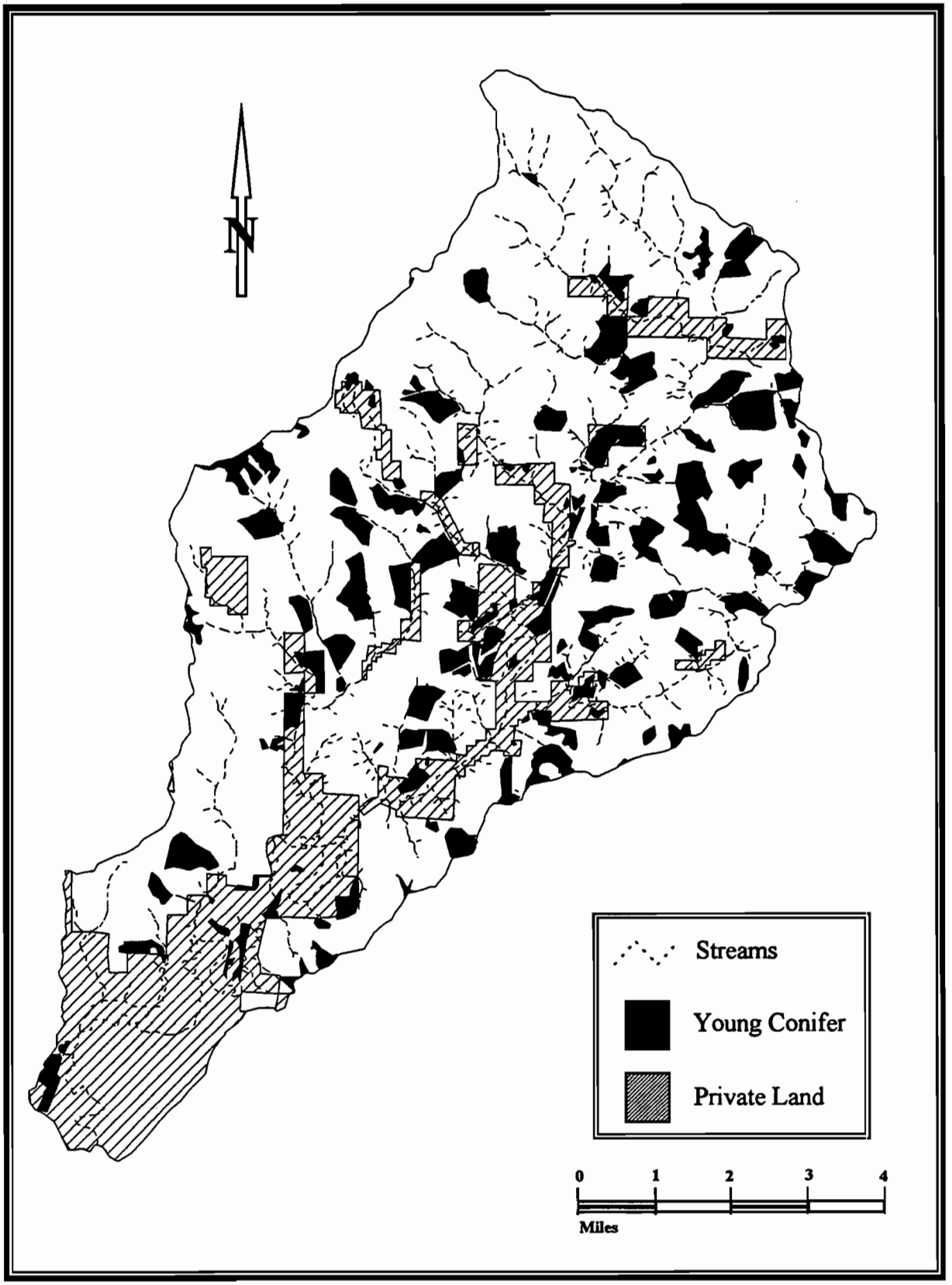



Figure 6. Young conifer habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 7. Wildlife species which may breed within the young conifer habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| Bird | Sharp-shinned Hawk | *Accipiter striatus* | Usually nest in even-aged young conifer stands |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| Bird | Evening Grosbeak | *Coccothraustes vespertina* | Mostly coniferous forest, sometimes mixed or deciduous |
| Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| Bird | Harlequin Duck | *Histrionicus histrionicus* | Associated with forested streams, can be seen in estuaries, bays |
| Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Red Tree Vole | *Phenacomys longicaudus* | Nocturnal, highly dependent on Douglas-fir but utilize Sitka spruce and hemlock |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |
| Reptile | Rubber Boa | *Charina bottae* | Common in clearings, utilize dead and down woody material |

**Table 8. Wildlife species which may feed within the young conifer habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Tailed Frog | *Ascaphus truei* | Cold, fast-moving permanent forest streams, hides under rocks |
| Amphibian | Pacific Giant Salamander | *Dicamptodon ensatus* | In streams during breeding season, can be found in moist forests |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Dunn's Salamander | *Plethodon dunni* | Lungless, moist, shadey, mossy rock areas, seeps, along perrenial streams |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| Amphibian | Red-legged Frog | *Rana aurora* | Often in dense hardwood stands w/dense ground cover, streams and ponds |
| Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| Bird | Sharp-shinned Hawk | *Accipiter striatus* | Usually nest in even-aged young conifer stands |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| Bird | Evening Grosbeak | *Coccothraustes vespertina* | Mostly coniferous forest, sometimes mixed or deciduous |
| Bird | Steller's Jay | *Cyanocitta stelleri* | Dense coniferous forests at nesting time, attracted to campsites |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| Bird | Hermit Warbler | *Dendroica occidentalis* | Common in all age conifer stands, prefers stands with large trees |
| Bird | Chestnut-backed Chickadee | *Parus rufescens* | Cavity nester in snags, feed along shrubby edges |
| Bird | Gray Jay | *Perisoreus canadensis* | Dense coniferous forests, attracted to campsites |
| Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Red Tree Vole | *Phenacomys longicaudus* | Nocturnal, highly dependent on Douglas-fir but utilize Sitka spruce and hemlock |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Reptile | Rubber Boa | *Charina bottae* | Common in clearings, utilize dead and down woody material |

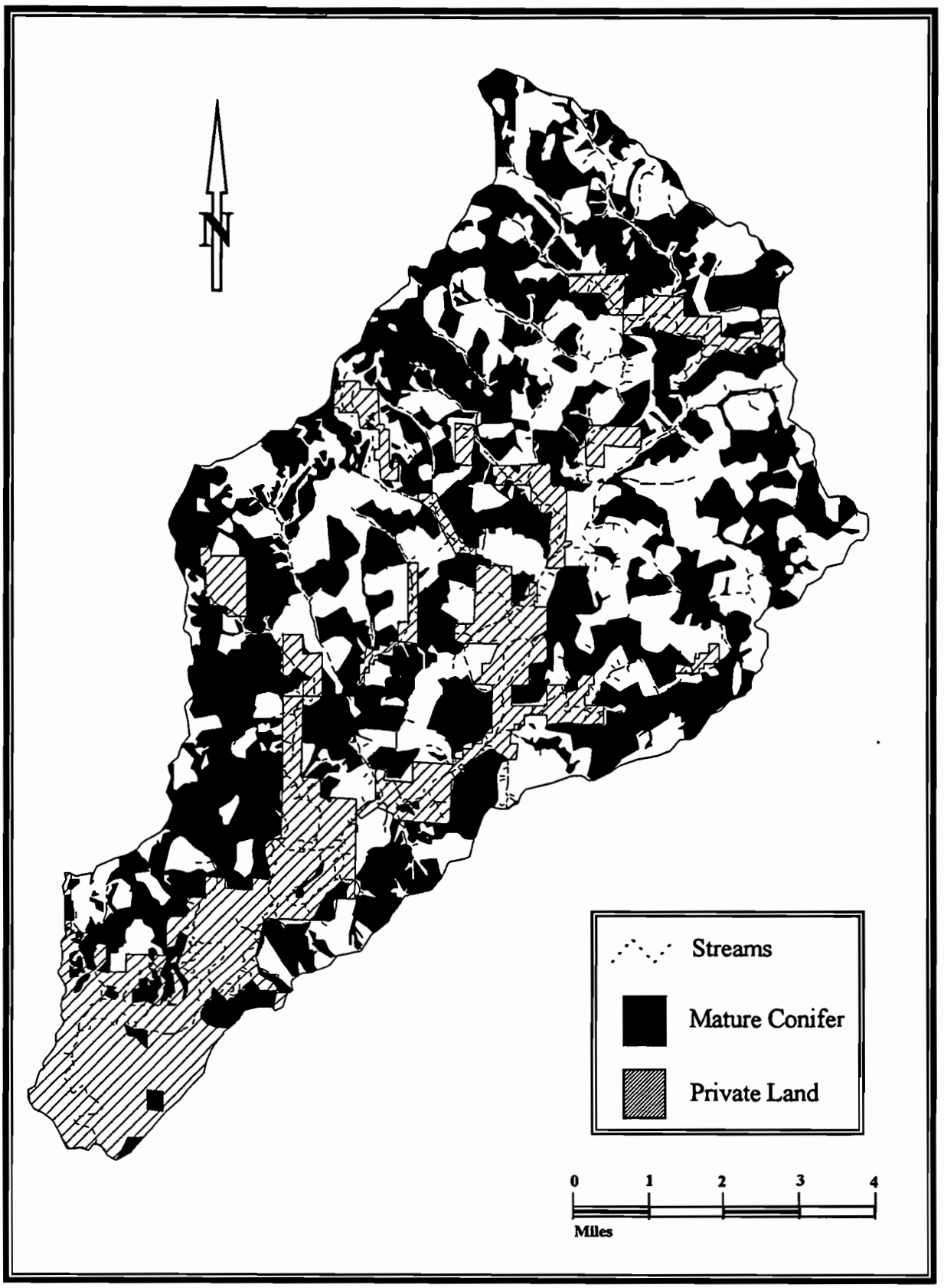



Figure 7. Mature conifer habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 9. Wildlife species which may breed within the mature conifer habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| *Bird | Northern Goshawk | *Accipiter gentilis* | Primarily forest dwellers, hunt from perch or while flying through forest |
| Bird | Sharp-shinned Hawk | *Accipiter striatus* | Usually nest in even-aged young conifer stands |
| *Bird | Wood Duck | *Aix sponsa* | Nests in hollow cavities of large living or dead trees |
| Bird | Great Blue Heron | *Ardea herodias* | Shallow water, river banks, lake shores, streams, ponds, flooded pasture |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| *Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| *Bird | Bufflehead | *Bucephala albeola* | Prefers forested water edges for breeding, nests in cavity in snags |
| *Bird | Barrow's Goldeneye | *Bucephala islandica* | Lakes and ponds with forested edges, nests in tree cavities |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| *Bird | Brown Creeper | *Certhia americana* | Cavity nester, feeds on bark insects |
| Bird | Evening Grosbeak | *Coccothraustes vespertina* | Mostly coniferous forest, sometimes mixed or deciduous |
| *Bird | Northern Flicker | *Colaptes auratus* | Cavity nesters, found near large trees in open woodlands, clearings |
| Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| *Bird | Olive-sided Flycatcher | *Contopus borealis* | Open conifer stands, likes high perching trees/snags, usually nests in conifer |
| *Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| *Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Steller's Jay | *Cyanocitta stelleri* | Dense coniferous forests at nesting time, attracted to campsites |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| *Bird | Hermit Warbler | *Dendroica occidentalis* | Common in all age conifer stands, prefers stands with large trees |
| *Bird | Hammond's Flycatcher | *Empidonax hammondii* | Usually drier habitats, stream bottoms with deciduous trees, edges |
| *Bird | Northern Pygmy Owl | *Glaucidium gnoma* | Cavity nester, prefers edges/ecotones |
| Bird | Harlequin Duck | *Histrionicus histrionicus* | Associated with forested streams, can be seen in estuaries, bays |
| *Bird | Varied Thrush | *Ixoreus naevius* | Dense, moist coniferous forests |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| *Bird | Hooded Merganser | *Lophodytes cucullatus* | Wooded lakes,ponds,rivers,streams, nests in large tree cavities |
| Bird | Red Crossbill | *Loxia curvirostra* | Mature coniferous forests only |
| *Bird | Common Merganser | *Mergus merganser* | Rarely coastal bays, usually wooded lakes,ponds,rivers,streams, cavity nester |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |
| Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |

**Table 9 (Cont.)**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | Chestnut-backed Chickadee | *Parus rufescens* | Cavity nester in snags, feed along shrubby edges |
| *Bird | Gray Jay | *Perisoreus canadensis* | Dense coniferous forests, attracted to campsites |
| *Bird | Hairy Woodpecker | *Picoides villosus* | Nest in large live trees in open conifer forests |
| *Bird | Western Tanager | *Piranga ludoviciana* | Prefer open forest, nest in mature conifer, forages in shrubs, eats berries |
| *Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| *Bird | Red-breasted Nuthatch | *Sitta canadensis* | Coniferous to mixed coniferous forests, eats bark insects and conifer seed |
| *Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| *Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| *Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | Solitary Vireo | *Vireo solitarius* | Nests in riparian deciduous trees, avoids grass/forb and brushy areas |
| Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| *Mammal | Northern Flying Squirrel | *Glaucomys sabrinus* | Conifer forests, occasionally in riparian hardwoods |
| *Mammal | Hoary Bat | *Lasiurus cinereus* | Primarily conifer or mixed conifer/deciduous |
| *Mammal | Pine Marten | *Martes americana* | Need large amount of standing and down dead woody material near streams |
| *Mammal | Pacific Fisher | *Martes pennanti pacifica* | Prefer mostly dense conifer stands with some hardwood, require dense cover |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| *Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| Mammal | Long-eared Bat | *Myotis evotis* | Mature to immature conifer, salal |
| *Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| *Mammal | Yuma Bat | *Myotis yumanensis* | Large streams/rivers, ponds and lakes, feed close to water's surface |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| *Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| Mammal | Red Tree Vole | *Phenacomys longicaudus* | Nocturnal, highly dependent on Douglas-fir but utilize Sitka spruce and hemlock |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |

**Table 10. Wildlife species which may feed within the mature conifer habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Northwestern Salamander | *Abystoma gracile* | Uses underground burrows, rotting logs, moist crevices, lay eggs in slow water |
| Amphibian | Tailed Frog | *Ascaphus truei* | Cold, fast-moving permanent forest streams, hides under rocks |
| Amphibian | Pacific Giant Salamander | *Dicamptodon ensatus* | In streams during breeding season, can be found in moist forests |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Dunn's Salamander | *Plethodon dunni* | Lungless, moist, shadey, mossy rock areas, seeps, along perrenial streams |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| *Bird | Northern Goshawk | *Accipiter gentilis* | Primarily forest dwellers, hunt from perch or while flying through forest |
| Bird | Sharp-shinned Hawk | *Accipiter striatus* | Usually nest in even-aged young conifer stands |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| *Bird | Wood Duck | *Aix sponsa* | Nests in hollow cavities of large living or dead trees |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| *Bird | Brown Creeper | *Certhia americana* | Cavity nester, feeds on bark insects |
| Bird | Evening Grosbeak | *Coccothraustes vespertina* | Mostly coniferous forest, sometimes mixed or deciduous |
| *Bird | Olive-sided Flycatcher | *Contopus borealis* | Open conifer stands, likes high perching trees/snags, usually nests in conifer |
| *Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| *Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Steller's Jay | *Cyanocitta stelleri* | Dense coniferous forests at nesting time, attracted to campsites |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| *Bird | Hermit Warbler | *Dendroica occidentalis* | Common in all age conifer stands, prefers stands with large trees |
| *Bird | Townsend's Warbler | *Dendroica townsendi* | Coniferous forest, usually high in trees |
| *Bird | Hammond's Flycatcher | *Empidonax hammondii* | Usually drier habitats, stream bottoms with deciduous trees, edges |
| *Bird | Northern Pygmy Owl | *Glaucidium gnoma* | Cavity nester, prefers edges/ecotones |
| *Bird | Varied Thrush | *Ixoreus naevius* | Dense, moist coniferous forests |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| Bird | Red Crossbill | *Loxia curvirostra* | Mature coniferous forests only |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |
| Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| *Bird | Chestnut-backed Chickadee | *Parus rufescens* | Cavity nester in snags, feed along shrubby edges |

Table 10 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | Gray Jay | *Perisoreus canadensis* | Dense coniferous forests, attracted to campsites |
| *Bird | Hairy Woodpecker | *Picoides villosus* | Nest in large live trees in open conifer forests |
| *Bird | Western Tanager | *Piranga ludoviciana* | Prefer open forest, nest in mature conifer, forages in shrubs, eats berries |
| *Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| *Bird | Red-breasted Nuthatch | *Sitta canadensis* | Coniferous to mixed coniferous forests, eats bark insects and conifer seed |
| *Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| *Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| *Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | Solitary Vireo | *Vireo solitarius* | Nests in riparian deciduous trees, avoids grass/forb and brushy areas |
| Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| Mammal | Mountain Lion | *Felis concolor* | Breed in mature forest, shrub, open sapling pole, caves, talus, cliffs |
| *Mammal | Northern Flying Squirrel | *Glaucomys sabrinus* | Conifer forests, occasionally in riparian hardwoods |
| Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| *Mammal | Hoary Bat | *Lasiurus cinereus* | Primarily conifer or mixed conifer/deciduous |
| *Mammal | Pine Marten | *Martes americana* | Need large amount of standing and down dead woody material near streams |
| *Mammal | Pacific Fisher | *Martes pennanti pacifica* | Prefer mostly dense conifer stands with some hardwood, require dense cover |
| Mammal | Long-eared Bat | *Myotis evotis* | Mature to immature conifer, salal |
| *Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| *Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| Mammal | Red Tree Vole | *Phenacomys longicaudus* | Nocturnal, highly dependent on Douglas-fir but utilize Sitka spruce and hemlock |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |

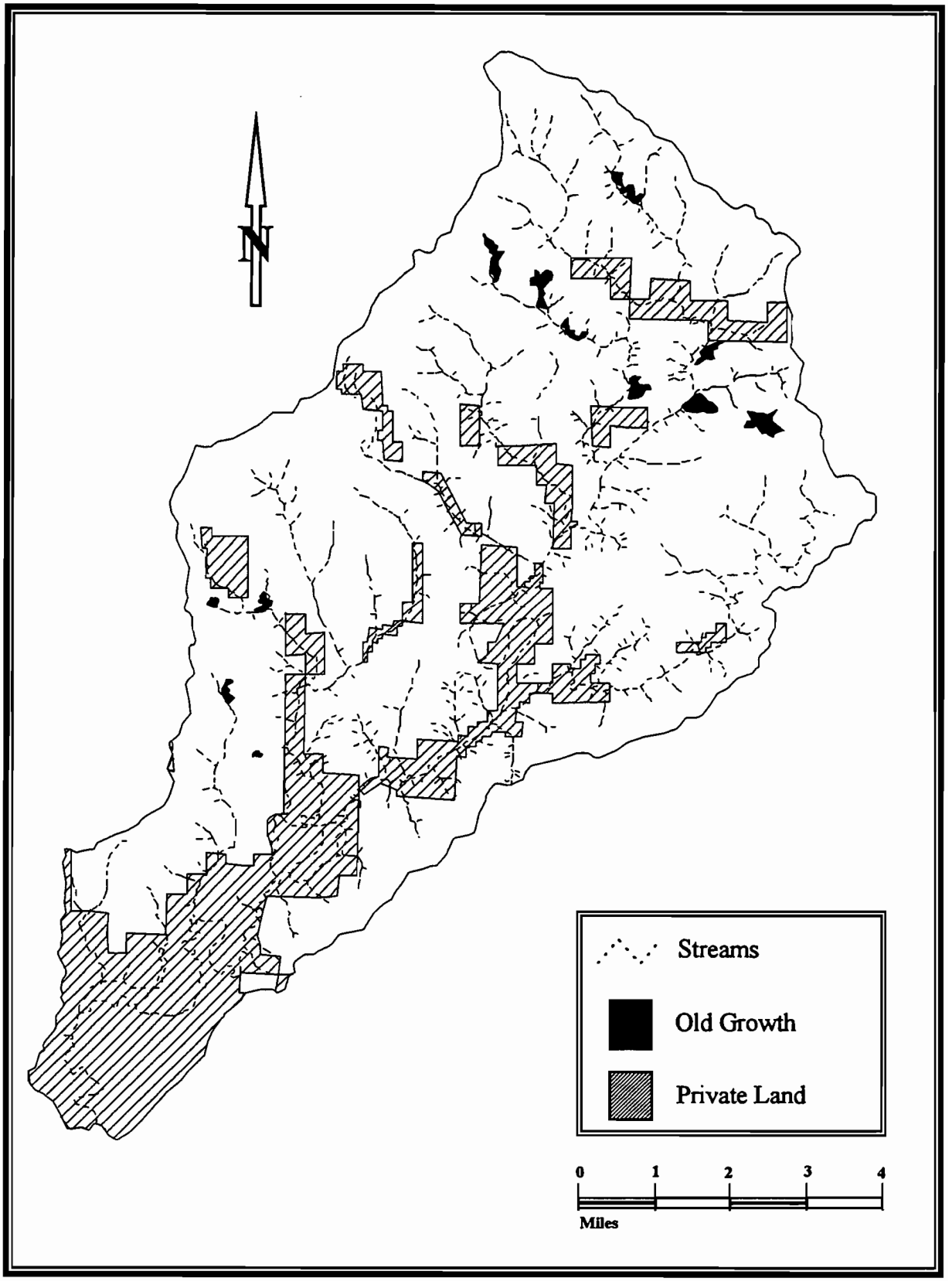



Figure 8. Old growth habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 11. Wildlife species which may breed within the old growth habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| *Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| *Bird | Northern Goshawk | *Accipiter gentilis* | Primarily forest dwellers, hunt from perch or while flying through forest |
| Bird | Sharp-shinned Hawk | *Accipiter striatus* | Usually nest in even-aged young conifer stands |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| *Bird | Wood Duck | *Aix sponsa* | Nests in hollow cavities of large living or dead trees |
| Bird | Golden Eagle | *Aquila chrysaetos* | Usually nests on cliff ledges but occasionally in large trees |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| *Bird | Marbled Murrelet | *Brachyramphus marmoratus* | Prefer large conifer nest tree with large limbs/deformities, feeds in ocean |
| Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| *Bird | Bufflehead | *Bucephala albeola* | Prefers forested water edges for breeding, nests in cavity in snags |
| *Bird | Barrow's Goldeneye | *Bucephala islandica* | Lakes and ponds with forested edges, nests in tree cavities |
| Bird | Red-tailed Hawk | *Buteo jamaicensis* | Needs open areas to forage, usually nests along edges in large tree or cliff |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| *Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| *Bird | Brown Creeper | *Certhia americana* | Cavity nester, feeds on bark insects |
| *Bird | Vaux's Swift | *Chaetura vauxi* | Cavity nester, needs large snags, forages over open waters and meadows |
| *Bird | Northern Flicker | *Colaptes auratus* | Cavity nesters, found near large trees in open woodlands, clearings |
| Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| Bird | Olive-sided Flycatcher | *Contopus borealis* | Open conifer stands, likes high perching trees/snags, usually nests in conifer |
| Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Steller's Jay | *Cyanocitta stelleri* | Dense coniferous forests at nesting time, attracted to campsites |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| *Bird | Hermit Warbler | *Dendroica occidentalis* | Common in all age conifer stands, prefers stands with large trees |
| *Bird | Pileated Woodpecker | *Dryocopus pileatus* | Feeds in younger forests also, if large snag component present |
| *Bird | Pacific-slope Flycatcher | *Empidonax difficilis* | Well shaded forests, canyon bottoms w/flowing water, forages in openings |
| *Bird | Hammond's Flycatcher | *Empidonax hammondii* | Usually drier habitats, stream bottoms with deciduous trees, edges |
| *Bird | Northern Pygmy Owl | *Glaucidium gnoma* | Cavity nester, prefers edges/ecotones |
| *Bird | Northern Bald Eagle | *Haliaeetus leucocephalus* | Nest in large douglas fir, north slopes, close proximity to water |
| *Bird | Harlequin Duck | *Histrionicus histrionicus* | Associated with forested streams, can be seen in estuaries, bays |

Table 11 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | Varied Thrush | *Ixoreus naevius* | Dense, moist coniferous forests |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| *Bird | Hooded Merganser | *Lophodytes cucullatus* | Wooded lakes,ponds,rivers,streams, nests in large tree cavities |
| *Bird | Red Crossbill | *Loxia curvirostra* | Mature coniferous forests only |
| *Bird | Common Merganser | *Mergus merganser* | Rarely coastal bays, usually wooded lakes,ponds,rivers,streams, cavity nester |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |
| Bird | Western Screech-owl | *Otis kennicottii* | Primarily riparian dweller, nests in large trees or tree cavities |
| Bird | Osprey | *Pandion haliaetus* | Nests near water in dead trees |
| Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| *Bird | Chestnut-backed Chickadee | *Parus rufescens* | Cavity nester in snags, feed along shrubby edges |
| Bird | Gray Jay | *Perisoreus canadensis* | Dense coniferous forests, attracted to campsites |
| *Bird | Hairy Woodpecker | *Picoides villosus* | Nest in large live trees in open conifer forests |
| Bird | Western Tanager | *Piranga ludoviciana* | Prefer open forest, nest in mature conifer, forages in shrubs, eats berries |
| Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| *Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| *Bird | Red-breasted Nuthatch | *Sitta canadensis* | Coniferous to mixed coniferous forests, eats bark insects and conifer seed |
| *Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| *Bird | Northern Spotted Owl | *Strix occidentalis caurina* | Nests in cavities or sheltered platforms, snags or broken top trees |
| *Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| Bird | Tree Swallow | *Tachycineta bicolor* | Requires snags for nesting (away from forest edges), associated with water |
| *Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | Solitary Vireo | *Vireo solitarius* | Nests in riparian deciduous trees, avoids grass/forb and brushy areas |
| *Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| *Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| *Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| *Mammal | Northern Flying Squirrel | *Glaucomys sabrinus* | Conifer forests, occasionally in riparian hardwoods |
| *Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| *Mammal | Hoary Bat | *Lasiurus cinereus* | Primarily conifer or mixed conifer/deciduous |
| *Mammal | Pine Marten | *Martes americana* | Need large amount of standing and down dead woody material near streams |
| *Mammal | Pacific Fisher | *Martes pennanti pacifica* | Prefer mostly dense conifer stands with some hardwood, require dense cover |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| *Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| *Mammal | Long-eared Bat | *Myotis evotis* | Mature to immature conifer, salal |
| *Mammal | Little Brown Bat | *Myotis lucifugus* | Appear in all habitat types but affinity for conifer forests |
| *Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| *Mammal | Yuma Bat | *Myotis yumanensis* | Large streams/rivers, ponds and lakes, feed close to water's surface |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| *Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |

Table 11 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| *Mammal | Red Tree Vole | *Phenacomys longicaudus* | Nocturnal, highly dependent on Douglas-fir but utilize Sitka spruce and hemlock |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| *Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |

**Table 12. Wildlife species which may feed within the old growth habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Amphibian | Northwestern Salamander | *Abystoma gracile* | Uses underground burrows, rotting logs, moist crevices, lay eggs in slow water |
| *Amphibian | Tailed Frog | *Ascaphus truei* | Cold, fast-moving permanent forest streams, hides under rocks |
| *Amphibian | Pacific Giant Salamander | *Dicamptodon ensatus* | In streams during breeding season, can be found in moist forests |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| *Amphibian | Dunn's Salamander | *Plethodon dunni* | Lungless, moist, shadey, mossy rock areas, seeps, along perrenial streams |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| *Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| *Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| *Bird | Northern Goshawk | *Accipiter gentilis* | Primarily forest dwellers, hunt from perch or while flying through forest |
| Bird | Sharp-shinned Hawk | *Accipiter striatus* | Usually nest in even-aged young conifer stands |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| *Bird | Wood Duck | *Aix sponsa* | Nests in hollow cavities of large living or dead trees |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| *Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| *Bird | Brown Creeper | *Certhia americana* | Cavity nester, feeds on bark insects |
| Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| Bird | Olive-sided Flycatcher | *Contopus borealis* | Open conifer stands, likes high perching trees/snags, usually nests in conifer |
| Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Steller's Jay | *Cyanocitta stelleri* | Dense coniferous forests at nesting time, attracted to campsites |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| *Bird | Hermit Warbler | *Dendroica occidentalis* | Common in all age conifer stands, prefers stands with large trees |
| Bird | Townsend's Warbler | *Dendroica townsendi* | Coniferous forest, usually high in trees |
| *Bird | Pileated Woodpecker | *Dryocopus pileatus* | Feeds in younger forests also, if large snag component present |
| *Bird | Pacific-slope Flycatcher | *Empidonax difficilis* | Well shaded forests, canyon bottoms w/flowing water, forages in openings |
| *Bird | Hammond's Flycatcher | *Empidonax hammondii* | Usually drier habitats, stream bottoms with deciduous trees, edges |
| *Bird | Northern Pygmy Owl | *Glaucidium gnoma* | Cavity nester, prefers edges/ecotones |
| *Bird | Varied Thrush | *Ixoreus naevius* | Dense, moist coniferous forests |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| *Bird | Red Crossbill | *Loxia curvirostra* | Mature coniferous forests only |
| Bird | Townsend's Solitaire | *Myadestes townsendi* | Occurs in small groups in coniferous forests, rocky cliffs, wooded streams |

Table 12 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| *Bird | Chestnut-backed Chickadee | *Parus rufescens* | Cavity nester in snags, feed along shrubby edges |
| Bird | Gray Jay | *Perisoreus canadensis* | Dense coniferous forests, attracted to campsites |
| *Bird | Hairy Woodpecker | *Picoides villosus* | Nest in large live trees in open conifer forests |
| Bird | Western Tanager | *Piranga ludoviciana* | Prefer open forest, nest in mature conifer, forages in shrubs, eats berries |
| Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| *Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| *Bird | Red-breasted Nuthatch | *Sitta canadensis* | Coniferous to mixed coniferous forests, eats bark insects and conifer seed |
| *Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| *Bird | Northern Spotted Owl | *Strix occidentalis caurina* | Nests in cavities or sheltered platforms, snags or broken top trees |
| *Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| *Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | Solitary Vireo | *Vireo solitarius* | Nests in riparian deciduous trees, avoids grass/forb and brushy areas |
| *Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| *Mammal | Townsend Chipmunk | *Eutamias townsendi* | Mostly riparian alder but upland conifer habitat as well |
| *Mammal | Northern Flying Squirrel | *Glaucomys sabrinus* | Conifer forests, occasionally in riparian hardwoods |
| *Mammal | Pine Marten | *Martes americana* | Need large amount of standing and down dead woody material near streams |
| *Mammal | Pacific Fisher | *Martes pennanti pacifica* | Prefer mostly dense conifer stands with some hardwood, require dense cover |
| *Mammal | Long-eared Bat | *Myotis evotis* | Mature to immature conifer, salal |
| *Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| *Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| *Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| *Mammal | Red Tree Vole | *Phenacomys longicaudus* | Nocturnal, highly dependent on Douglas-fir but utilize Sitka spruce and hemlock |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| *Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | Conifer, sometimes riparian hardwoods, spruce/salal habitat |

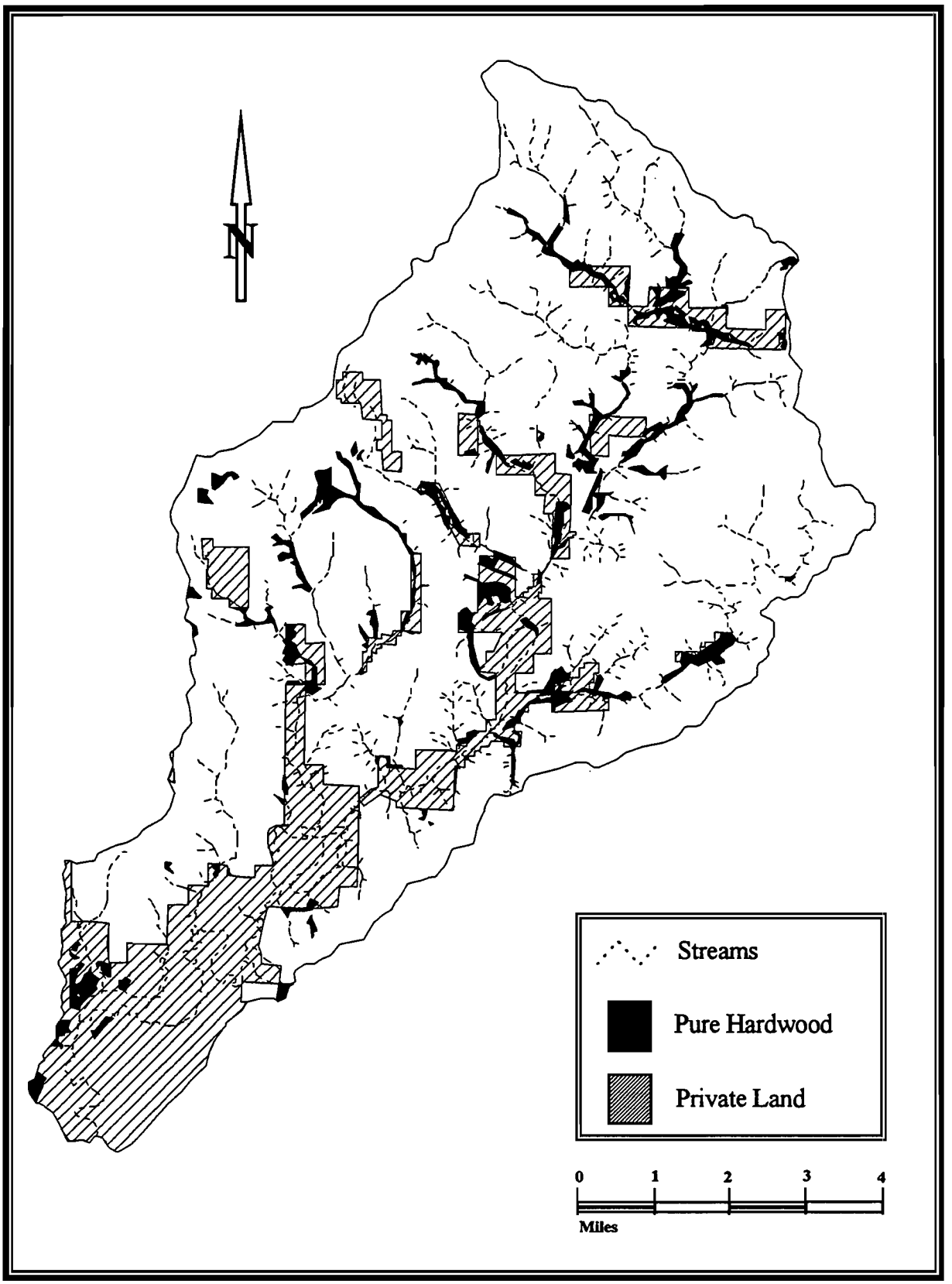



Figure 9. Pure hardwood habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 13. Wildlife species which may breed within the pure hardwood habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| Bird | Red-winged Blackbird | *Agelaius phoeniceus* | Marshes, wetlands with cattails, rushes/sedges |
| Bird | Wood Duck | *Aix sponsa* | Nests in hollow cavities of large living or dead trees |
| Bird | Northern Pintail | *Anas acuta* | Second or third most abundant duck, found in shallow lakes and marshes |
| Bird | American Wigeon | *Anas americana* | Ponds and marshes |
| Bird | Northern Shoveler | *Anas clypeata* | Feed in shallow water, lakes, marshes |
| Bird | Green-winged Teal | *Anas crecca* | Prefers feeding on mud flats, shallow marshes, flooded grain fields |
| Bird | Blue-winged Teal | *Anas discors* | First duck to migrate south, feeds in shallow marshes, mud flats |
| Bird | Mallard | *Anas platyrhynchos* | Most abundant duck, found on pasturelands, lakes, marshes, swamps |
| Bird | Gadwall | *Anas strepera* | Found on pasturelands, lakes, marshes, swamps |
| Bird | Great Blue Heron | *Ardea herodias* | Shallow water, river banks, lake shores, streams, ponds, flooded pasture |
| Bird | Long-eared Owl | *Asio otus* | Breeds in hardwood and conifer, feeds in same and wet meadows and edges |
| *Bird | Cedar Waxwing | *Bombycilla cedrorum* | Prefers deciduous but found in brush stages of conifer in breeding season |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Canada Goose | *Branta canadensis* | Pasturelands, shallow water |
| Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| Bird | Bufflehead | *Bucephala albeola* | Prefers forested water edges for breeding, nests in cavity in snags |
| Bird | Barrow's Goldeneye | *Bucephala islandica* | Lakes and ponds with forested edges, nests in tree cavities |
| Bird | Red-tailed Hawk | *Buteo jamaicensis* | Needs open areas to forage, usually nests along edges in large tree or cliff |
| *Bird | Green-backed Heron | *Butorides striatus* | Wet woodlands, streams, lake shores, coastal marsh and wetlands |
| *Bird | California Quail | *Callipepla californica* | Brushy areas with open ground, roosts low in trees and bushes |
| Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| *Bird | Lesser Goldfinch | *Carduelis psaltria* | Open, brushy country with scattered trees and weedy streambanks |
| *Bird | American Goldfinch | *Carduelis tristis* | Open country, forest openings, shrub stage in deciduous riparian areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| Bird | Northern Flicker | *Colaptes auratus* | Cavity nesters, found near large trees in open woodlands, clearings |
| Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |

Table 13 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| Bird | American Crow | *Corvis brachyryhnchos* | More common around riparian areas and forest edges |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| *Bird | Yellow Warbler | *Dendroica petechia* | Most widespread warbler, found in riparian alder thickets, also clear cuts |
| *Bird | Black-shouldered Kite | *Elanus caeruleus* | Prefer river valleys, wet meadows, hunt from perch or air |
| Bird | Pacific-slope Flycatcher | *Empidonax difficilis* | Well shaded forests, canyon bottoms w/flowing water, forages in openings |
| *Bird | Willow Flycatcher | *Empidonax traillii* | Deciduous thickets, shrubby component, clearcuts with willow/vine maple |
| Bird | Brewer's Blackbird | *Euphagus cyanocephalus* | Meadows, mesic areas, ranches, riparian areas, thickets |
| *Bird | American Kestrel | *Falco sparverius* | Nests in cavities, forages in clearings |
| Bird | American Coot | *Fulica americana* | Freshwater lakes, rivers, saltwater bodies also in winter |
| Bird | Common Snipe | *Gallinago gallinago* | Peat bogs, marshes and sodden fields |
| *Bird | Common Yellowthroat | *Geothlypis trichas* | Dense understory prefered |
| *Bird | Yellow-breasted Chat | *Icteria virens* | Tangled thickets along riparian areas, upland deciduous scrub |
| *Bird | Northern Oriole | *Icterus galbula* | Open deciduous woodlands, residential neighborhoods |
| Bird | Hooded Merganser | *Lophodytes cucullatus* | Wooded lakes,ponds,rivers,streams, nests in large tree cavities |
| Bird | Lincoln's Sparrow | *Melospiza lincolnii* | Cool bogs, brushy wet meadows, pasturelands with dense brush and grass |
| Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| Bird | Common Merganser | *Mergus merganser* | Rarely coastal bays, usually wooded lakes,ponds,rivers,streams, cavity nester |
| Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| Bird | MacGillivray's Warbler | *Oporornis tolmiei* | Coniferous forest edges, small clearings |
| Bird | Western Screech-owl | *Otis kennicottii* | Primarily riparian dweller, nests in large trees or tree cavities |
| Bird | Osprey | *Pandion haliaetus* | Nests near water in dead trees |
| Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| Bird | Savannah Sparrow | *Passerculus sandwichensis* | Dense grasslands, nest in grass, wet meadows, salt spray meadows |
| Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |
| *Bird | Lazuli Bunting | *Passerina amoena* | Often found in riparian areas and early seral stages of deciduous stands |
| Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| *Bird | Downy Woodpecker | *Picoides pubescens* | Deciduous forests, alder in riparian areas, cavity nester in snags |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| Bird | Purple Martin | *Progne subis* | Along rivers, estuaries, nests in cavities in forest edges or openings |
| *Bird | Bushtit | *Psaltriparus minimus* | Shrub/forest edges, deciduous habitats, flock from shrub to shrub |
| *Bird | Virginia Rail | *Rallus limicola* | Mostly in freshwater and brackish marshes, but occasionally in saltwater marsh |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| Bird | Red-breasted Sapsucker | *Sphyrapicus ruber* | Feeds on sap from live deciduous trees and insects, nest in cavity |

Table 13 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| Bird | European Starling | *Sturnus vulgaris* | Cavities or crevices for nesting, farmlands, cities, widespread |
| Bird | Tree Swallow | *Tachycineta bicolor* | Requires snags for nesting (away from forest edges), associated with water |
| Bird | Violet-green Swallow | *Tachycineta thalassina* | Needs snags for nesting/perching , usu. near water, forages in open habitat |
| *Bird | Bewick's Wren | *Thryomanes bewickii* | Cavity nester, shrubby habitat, riparian alder/salmonberry |
| *Bird | House Wren | *Troglodytes aedon* | Nest cavities in low trees <3m from ground |
| Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Orange-crowned Warbler | *Vermivora celata* | Mesic, north-facing slopes, brushy tangles, openings in forest |
| *Bird | Warbling Vireo | *Vireo gilvus* | Open deciduous stands, riparian alder thickets |
| Bird | Hutton's Vireo | *Vireo huttoni* | Deciduous shrubs and trees, riparian areas |
| *Bird | Red-eyed Vireo | *Vireo olivaceus* | Mixed and deciduous forests, also suburban shade trees |
| Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Beaver | *Castor canadensis* | Riparian dwellers |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| Mammal | Snowshoe Hare | *Lepus americanus* | Cedar swamps to old growth, immature to mature conifer |
| Mammal | River Otter | *Lutra canadensis* | Mainly around tidewater and lower reaches, occassionly in upper reaches |
| Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| Mammal | Mink | *Mustela vison* | Alder patches, willow/sedge marsh, cedar marsh, coastal lakes, estuaries |
| Mammal | Nutria | *Myocastor coypus* | Wetland habitat, herbivorous, introduced from South America |
| Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| Mammal | Little Brown Bat | *Myotis lucifugus* | Appear in all habitat types but affinity for conifer forests |
| Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Yuma Bat | *Myotis yumanensis* | Large streams/rivers, ponds and lakes, feed close to water's surface |

Table 13 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| Mammal | Marsh Shrew | *Sorex bendirei* | Disperse to uplands in wet winters, skunkcabbage marshes small alder stream |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |
| Mammal | Brush Rabbit | *Sylvilagus bachmani* | All habitats along brushy edges |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |
| Reptile | Western Pond Turtle | *Clemmys marmota marmota* | Marshes, ponds, sloughs, slow moving water |
| Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

**Table 14. Wildlife species which may feed within the pure hardwood habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Tailed Frog | *Ascaphus truei* | Cold, fast-moving permanent forest streams, hides under rocks |
| Amphibian | Western Toad | *Bufo boreas* | Favor freshwater ponds in dunes on the coast during breeding season |
| Amphibian | Pacific Giant Salamander | *Dicamptodon ensatus* | In streams during breeding season, can be found in moist forests |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Dunn's Salamander | *Plethodon dunni* | Lungless, moist, shadey, mossy rock areas, seeps, along perrenial streams |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| Amphibian | Red-legged Frog | *Rana aurora* | Often in dense hardwood stands w/dense ground cover, streams and ponds |
| Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| Bird | Red-winged Blackbird | *Agelaius phoeniceus* | Marshes, wetlands with cattails, rushes/sedges |
| Bird | Northern Pintail | *Anas acuta* | Second or third most abundant duck, found in shallow lakes and marshes |
| Bird | American Wigeon | *Anas americana* | Ponds and marshes |
| Bird | Northern Shoveler | *Anas clypeata* | Feed in shallow water, lakes, marshes |
| Bird | Green-winged Teal | *Anas crecca* | Prefers feeding on mud flats, shallow marshes, flooded grain fields |
| Bird | Blue-winged Teal | *Anas discors* | First duck to migrate south, feeds in shallow marshes, mud flats |
| Bird | Eurasian Wigeon | *Anas penelope* | Usually seen alone in flock of other waterfowl in ponds and marshes |
| Bird | Mallard | *Anas platyrhynchos* | Most abundant duck, found on pasturelands, lakes, marshes, swamps |
| Bird | Gadwall | *Anas strepera* | Found on pasturelands, lakes, marshes, swamps |
| Bird | Great Blue Heron | *Ardea herodias* | Shallow water, river banks, lake shores, streams, ponds, flooded pasture |
| Bird | Long-eared Owl | *Asio otus* | Breeds in hardwood and conifer, feeds in same and wet meadows and edges |
| *Bird | Cedar Waxwing | *Bombycilla cedrorum* | Prefers deciduous but found in brush stages of conifer in breeding season |
| *Bird | Bohemian Waxwing | *Bombycilla garrulus* | Winters in this area only, nests up North |
| Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | American Bittern | *Botaurus lentiginosus* | Fresh or brackish marshes among cattails and rushes |
| Bird | Canada Goose | *Branta canadensis* | Pasturelands, shallow water |
| Bird | Dusky Canada Goose | *Branta canadensis occidentalis* | Feeds in pastures, close to edges |
| Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| Bird | Red-tailed Hawk | *Buteo jamaicensis* | Needs open areas to forage, usually nests along edges in large tree or cliff |
| Bird | Rough-legged Hawk | *Buteo lagopus* | Frequents open areas, nests on rock ledges, hillsides or short trees |
| *Bird | California Quail | *Callipepla californica* | Brushy areas with open ground, roosts low in trees and bushes |
| Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |

Table 14 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | Lesser Goldfinch | *Carduelis psaltria* | Open, brushy country with scattered trees and weedy streambanks |
| *Bird | American Goldfinch | *Carduelis tristis* | Open country, forest openings, shrub stage in deciduous riparian areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Turkey Vulture | *Cathartes aura* | Communal roosters, sometimes nest on ground |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| Bird | Northern Flicker | *Colaptes auratus* | Cavity nesters, found near large trees in open woodlands, clearings |
| Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| Bird | American Crow | *Corvis brachyryhnchos* | More common around riparian areas and forest edges |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| *Bird | Yellow Warbler | *Dendroica petechia* | Most widespread warbler, found in riparian alder thickets, also clear cuts |
| *Bird | Black-shouldered Kite | *Elanus caeruleus* | Prefer river valleys, wet meadows, hunt from perch or air |
| Bird | Pacific-slope Flycatcher | *Empidonax difficilis* | Well shaded forests, canyon bottoms w/flowing water, forages in openings |
| *Bird | Willow Flycatcher | *Empidonax traillii* | Deciduous thickets, shrubby component, clearcuts with willow/vine maple |
| Bird | Brewer's Blackbird | *Euphagus cyanocephalus* | Meadows, mesic areas, ranches, riparian areas, thickets |
| Bird | Merlin | *Falco columbarius* | Forages open habitats, salt marshes, estuaries, nests in conifer |
| *Bird | American Kestrel | *Falco sparverius* | Nests in cavities, forages in clearings |
| Bird | American Coot | *Fulica americana* | Freshwater lakes, rivers, saltwater bodies also in winter |
| Bird | Common Snipe | *Gallinago gallinago* | Peat bogs, marshes and sodden fields |
| *Bird | Common Yellowthroat | *Geothlypis trichas* | Dense understory prefered |
| Bird | Cliff Swallow | *Hirundo pyrrhonota* | Bridges, cliffs or man-made structures for nesting |
| Bird | Barn Swallow | *Hirundo rustica* | Open forests, farmlands, rural areas, nest only in man-made structures |
| *Bird | Yellow-breasted Chat | *Icteria virens* | Tangled thickets along riparian areas, upland deciduous scrub |
| *Bird | Northern Oriole | *Icterus galbula* | Open deciduous woodlands, residential neighborhoods |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| Bird | Northern Shrike | *Lanius excubitor* | Winters in this area only, nests in Alaska/Canada, hunts the edges |
| Bird | Lincoln's Sparrow | *Melospiza lincolnii* | Cool bogs, brushy wet meadows, pasturelands with dense brush and grass |
| Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| Bird | MacGillivray's Warbler | *Oporornis tolmiei* | Coniferous forest edges, small clearings |
| Bird | Western Screech-owl | *Otis kennicottii* | Primarily riparian dweller, nests in large trees or tree cavities |
| Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| Bird | Savannah Sparrow | *Passerculus sandwichensis* | Dense grasslands, nest in grass, wet meadows, salt spray meadows |
| Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |

Table 14 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | Lazuli Bunting | *Passerina amoena* | Often found in riparian areas and early seral stages of deciduous stands |
| Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| *Bird | Downy Woodpecker | *Picoides pubescens* | Deciduous forests, alder in riparian areas, cavity nester in snags |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Western Tanager | *Piranga ludoviciana* | Prefer open forest, nest in mature conifer, forages in shrubs, eats berries |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| Bird | Purple Martin | *Progne subis* | Along rivers, estuaries, nests in cavities in forest edges or openings |
| *Bird | Bushtit | *Psaltriparus minimus* | Shrub/forest edges, deciduous habitats, flock from shrub to shrub |
| *Bird | Virginia Rail | *Rallus limicola* | Mostly in freshwater and brackish marshes, but occasionally in saltwater marsh |
| Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| Bird | Black Phoebe | *Sayornis nigricans* | Always associated with water |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| Bird | Western Bluebird | *Sialia mexicana* | Forest edges and open hardwood or coniferous forests, nest in cavities |
| Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| Bird | Red-breasted Sapsucker | *Sphyrapicus ruber* | Feeds on sap from live deciduous trees and insects, nest in cavity |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| Bird | Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | Decidous riparian habitat, nests in bare river banks |
| Bird | Calliope Hummingbird | *Stellula calliope* | Feeds in mountainous meadows, riparian areas, nests in decid/conifer trees |
| Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| Bird | European Starling | *Sturnus vulgaris* | Cavities or crevices for nesting, farmlands, cities, widespread |
| Bird | Tree Swallow | *Tachycineta bicolor* | Requires snags for nesting (away from forest edges), associated with water |
| Bird | Violet-green Swallow | *Tachycineta thalassina* | Needs snags for nesting/perching , usu. near water, forages in open habitat |
| *Bird | Bewick's Wren | *Thryomanes bewickii* | Cavity nester, shrubby habitat, riparian alder/salmonberry |
| *Bird | House Wren | *Troglodytes aedon* | Nest cavities in low trees <3m from ground |
| Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Barn Owl | *Tyto alba* | Farmlands and marshlands, rural areas, nests in cavities, caves, structures |
| Bird | Orange-crowned Warbler | *Vermivora celata* | Mesic, north-facing slopes, brushy tangles, openings in forest |
| *Bird | Warbling Vireo | *Vireo gilvus* | Open deciduous stands, riparian alder thickets |
| Bird | Hutton's Vireo | *Vireo huttoni* | Deciduous shrubs and trees, riparian areas |
| *Bird | Red-eyed Vireo | *Vireo olivaceus* | Mixed and deciduous forests, also suburban shade trees |
| Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| *Bird | Golden-crowned Sparrow | *Zonotrichia atricapilla* | Shrub thickets along the coast |
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |

Table 14 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Beaver | *Castor canadensis* | Riparian dwellers |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| Mammal | Hoary Bat | *Lasiurus cinereus* | Primarily conifer or mixed conifer/deciduous |
| Mammal | Snowshoe Hare | *Lepus americanus* | Cedar swamps to old growth, immature to mature conifer |
| Mammal | River Otter | *Lutra canadensis* | Mainly around tidewater and lower reaches, occassionly in upper reaches |
| Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| Mammal | Mink | *Mustela vison* | Alder patches, willow/sedge marsh, cedar marsh, coastal lakes, estuaries |
| Mammal | Nutria | *Myocastor coypus* | Wetland habitat, herbivorous, introduced from South America |
| Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| Mammal | Little Brown Bat | *Myotis lucifugus* | Appear in all habitat types but affinity for conifer forests |
| Mammal | Fringed Myotis | *Myotis thysanodes* | Roosts in caves, buildings, crevices |
| Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Yuma Bat | *Myotis yumanensis* | Large streams/rivers, ponds and lakes, feed close to water's surface |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| Mammal | Townsend's Big-eared Bat | *Plecotus townsendii* | Roosts in caves or abandoned buldings |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| Mammal | Marsh Shrew | *Sorex bendirei* | Disperse to uplands in wet winters, skunkcabbage marshes small alder stream |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |

Table 14 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Brush Rabbit | *Sylvilagus bachmani* | All habitats along brushy edges |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |
| Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

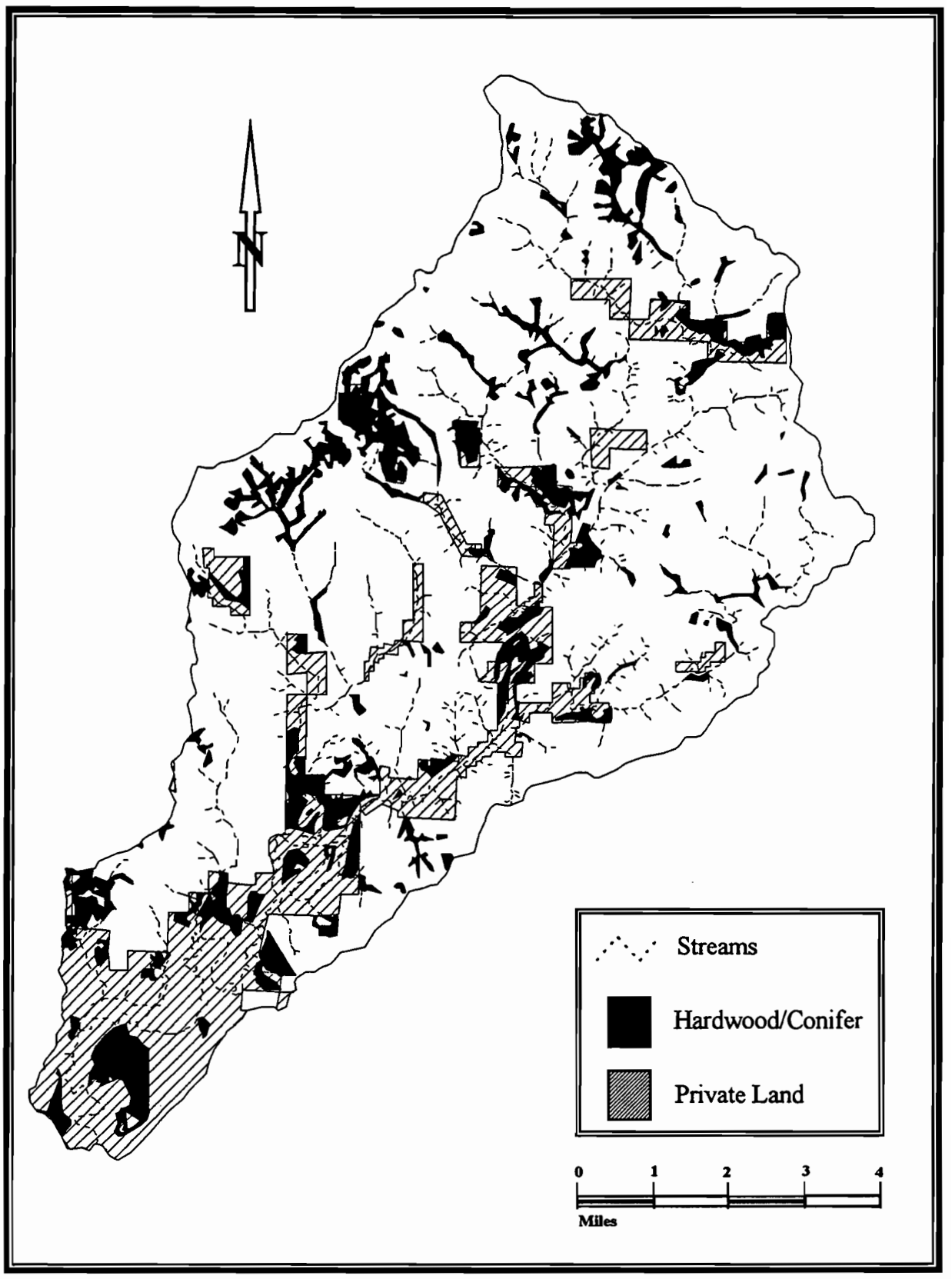



Figure 10. Hardwood/conifer habitat within the North Fork of the Siuslaw watershed as of September 1994.

**Table 15. Wildlife species which may breed within the hardwood/conifer habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| *Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| Bird | Red-winged Blackbird | *Agelaius phoeniceus* | Marshes, wetlands with cattails, rushes/sedges |
| Bird | Wood Duck | *Aix sponsa* | Nests in hollow cavities of large living or dead trees |
| Bird | Northern Pintail | *Anas acuta* | Second or third most abundant duck, found in shallow lakes and marshes |
| Bird | American Wigeon | *Anas americana* | Ponds and marshes |
| Bird | Northern Shoveler | *Anas clypeata* | Feed in shallow water, lakes, marshes |
| Bird | Green-winged Teal | *Anas crecca* | Prefers feeding on mud flats, shallow marshes, flooded grain fields |
| Bird | Blue-winged Teal | *Anas discors* | First duck to migrate south, feeds in shallow marshes, mud flats |
| Bird | Mallard | *Anas platyrhynchos* | Most abundant duck, found on pasturelands, lakes, marshes, swamps |
| Bird | Gadwall | *Anas strepera* | Found on pasturelands, lakes, marshes, swamps |
| Bird | Great Blue Heron | *Ardea herodias* | Shallow water, river banks, lake shores, streams, ponds, flooded pasture |
| *Bird | Long-eared Owl | *Asio otus* | Breeds in hardwood and conifer, feeds in same and wet meadows and edges |
| *Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| Bird | Canada Goose | *Branta canadensis* | Pasturelands, shallow water |
| Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| Bird | Bufflehead | *Bucephala albeola* | Prefers forested water edges for breeding, nests in cavity in snags |
| Bird | Barrow's Goldeneye | *Bucephala islandica* | Lakes and ponds with forested edges, nests in tree cavities |
| Bird | Red-tailed Hawk | *Buteo jamaicensis* | Needs open areas to forage, usually nests along edges in large tree or cliff |
| *Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| Bird | Northern Flicker | *Colaptes auratus* | Cavity nesters, found near large trees in open woodlands, clearings |
| *Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| *Bird | American Crow | *Corvis brachyryhnchos* | More common around riparian areas and forest edges |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |

Table 15 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | Pacific-slope Flycatcher | *Empidonax difficilis* | Well shaded forests, canyon bottoms w/flowing water, forages in openings |
| Bird | Brewer's Blackbird | *Euphagus cyanocephalus* | Meadows, mesic areas, ranches, riparian areas, thickets |
| Bird | American Coot | *Fulica americana* | Freshwater lakes, rivers, saltwater bodies also in winter |
| Bird | Common Snipe | *Gallinago gallinago* | Peat bogs, marshes and sodden fields |
| Bird | Hooded Merganser | *Lophodytes cucullatus* | Wooded lakes,ponds,rivers,streams, nests in large tree cavities |
| *Bird | Lincoln's Sparrow | *Melospiza lincolnii* | Cool bogs, brushy wet meadows, pasturelands with dense brush and grass |
| *Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| Bird | Common Merganser | *Mergus merganser* | Rarely coastal bays, usually wooded lakes,ponds,rivers,streams, cavity nester |
| *Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| *Bird | MacGillivray's Warbler | *Oporornis tolmiei* | Coniferous forest edges, small clearings |
| *Bird | Western Screech-owl | *Otis kennicottii* | Primarily riparian dweller, nests in large trees or tree cavities |
| *Bird | Osprey | *Pandion haliaetus* | Nests near water in dead trees |
| *Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| *Bird | Savannah Sparrow | *Passerculus sandwichensis* | Dense grasslands, nest in grass, wet meadows, salt spray meadows |
| *Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |
| *Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| *Bird | Purple Martin | *Progne subis* | Along rivers, estuaries, nests in cavities in forest edges or openings |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| *Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| *Bird | Red-breasted Sapsucker | *Sphyrapicus ruber* | Feeds on sap from live deciduous trees and insects, nest in cavity |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| *Bird | European Starling | *Sturnus vulgaris* | Cavities or crevices for nesting, farmlands, cities, widespread |
| Bird | Tree Swallow | *Tachycineta bicolor* | Requires snags for nesting (away from forest edges), associated with water |
| *Bird | Violet-green Swallow | *Tachycineta thalassina* | Needs snags for nesting/perching , usu. near water, forages in open habitat |
| Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Orange-crowned Warbler | *Vermivora celata* | Mesic, north-facing slopes, brushy tangles, openings in forest |
| *Bird | Hutton's Vireo | *Vireo huttoni* | Deciduous shrubs and trees, riparian areas |
| *Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| *Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Beaver | *Castor canadensis* | Riparian dwellers |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |

Table 15 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| *Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| Mammal | Snowshoe Hare | *Lepus americanus* | Cedar swamps to old growth, immature to mature conifer |
| Mammal | River Otter | *Lutra canadensis* | Mainly around tidewater and lower reaches, occassionly in upper reaches |
| Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| Mammal | Mink | *Mustela vison* | Alder patches, willow/sedge marsh, cedar marsh, coastal lakes, estuaries |
| Mammal | Nutria | *Myocastor coypus* | Wetland habitat, herbivorous, introduced from South America |
| Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| Mammal | Little Brown Bat | *Myotis lucifugus* | Appear in all habitat types but affinity for conifer forests |
| Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Yuma Bat | *Myotis yumanensis* | Large streams/rivers, ponds and lakes, feed close to water's surface |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| *Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| Mammal | Marsh Shrew | *Sorex bendirei* | Disperse to uplands in wet winters, skunkcabbage marshes small alder stream |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |
| *Mammal | Brush Rabbit | *Sylvilagus bachmani* | All habitats along brushy edges |
| *Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |
| Reptile | Western Pond Turtle | *Clemmys marmota marmota* | Marshes, ponds, sloughs, slow moving water |
| Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |

Table 15 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| *Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

**Table 16. Wildlife species which may feed within the hardwood/conifer habitat areas within the North Fork of the Siuslaw watershed (those with an asterix '*' are strongly associated with this habitat type).**

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Amphibian | Clouded Salamander | *Aneides ferreus* | Edges, clearings created by fire, found under ground litter |
| Amphibian | Tailed Frog | *Ascaphus truei* | Cold, fast-moving permanent forest streams, hides under rocks |
| Amphibian | Western Toad | *Bufo boreas* | Favor freshwater ponds in dunes on the coast during breeding season |
| Amphibian | Pacific Giant Salamander | *Dicamptodon ensatus* | In streams during breeding season, can be found in moist forests |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | Lungless, wide-ranging, under rocks, debris, bark, animal burrows |
| Amphibian | Dunn's Salamander | *Plethodon dunni* | Lungless, moist, shadey, mossy rock areas, seeps, along perrenial streams |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | Under leaf litter, bark and other forest floor debris, talus slopes |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | Terrestrial during non-breeding season, near water edges |
| Amphibian | Red-legged Frog | *Rana aurora* | Often in dense hardwood stands w/dense ground cover, streams and ponds |
| *Amphibian | Southern Torrent Salamander | *Rhyacotriton olympicus* | Always in moist areas near flowing water (46-54 degrees F), mossy gravel |
| Amphibian | Rough-skinned Newt | *Taricha granulosa* | Most commonly found in moist forests |
| Bird | Cooper's Hawk | *Accipiter cooperii* | Prefers mosaic of hardwood/conifer with small clearings |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | Forages in a wide variety of habitats but seems to prefer clearings/edges |
| Bird | Red-winged Blackbird | *Agelaius phoeniceus* | Marshes, wetlands with cattails, rushes/sedges |
| Bird | Northern Pintail | *Anas acuta* | Second or third most abundant duck, found in shallow lakes and marshes |
| Bird | American Wigeon | *Anas americana* | Ponds and marshes |
| Bird | Northern Shoveler | *Anas clypeata* | Feed in shallow water, lakes, marshes |
| Bird | Green-winged Teal | *Anas crecca* | Prefers feeding on mud flats, shallow marshes, flooded grain fields |
| Bird | Blue-winged Teal | *Anas discors* | First duck to migrate south, feeds in shallow marshes, mud flats |
| Bird | Eurasian Wigeon | *Anas penelope* | Usually seen alone in flock of other waterfowl in ponds and marshes |
| Bird | Mallard | *Anas platyrhynchos* | Most abundant duck, found on pasturelands, lakes, marshes, swamps |
| Bird | Gadwall | *Anas strepera* | Found on pasturelands, lakes, marshes, swamps |
| Bird | Great Blue Heron | *Ardea herodias* | Shallow water, river banks, lake shores, streams, ponds, flooded pasture |
| *Bird | Long-eared Owl | *Asio otus* | Breeds in hardwood and conifer, feeds in same and wet meadows and edges |
| *Bird | Ruffed Grouse | *Bonasa umbellus* | High degree of diversity, dense stands of deciduous trees in riparian areas |
| *Bird | American Bittern | *Botaurus lentiginosus* | Fresh or brackish marshes among cattails and rushes |
| Bird | Canada Goose | *Branta canadensis* | Pasturelands, shallow water |
| Bird | Dusky Canada Goose | *Branta canadensis occidentalis* | Feeds in pastures, close to edges |
| Bird | Great Horned Owl | *Bubo virginianus* | Forages along edges and clearings |
| Bird | Red-tailed Hawk | *Buteo jamaicensis* | Needs open areas to forage, usually nests along edges in large tree or cliff |
| Bird | Rough-legged Hawk | *Buteo lagopus* | Frequents open areas, nests on rock ledges, hillsides or short trees |
| *Bird | Anna's Hummingbird | *Calypte anna* | Gardens, open woodlands, more common in California |
| Bird | Pine Siskin | *Carduelis pinus* | Conifers, mixed woods, alders, shrubby areas |
| Bird | Purple Finch | *Carpodacus purpureus* | Small flocks among tree tops, mostly wooded areas |
| Bird | Turkey Vulture | *Cathartes aura* | Communal roosters, sometimes nest on ground |
| Bird | Hermit Thrush | *Catharus guttatus* | Dense conifer stands with brushy understory, found in younger stands also |

Table 16 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Bird | Swainson's Thrush | *Catharus ustulatus* | More common in younger stands, likes riparian thickets, mesic areas |
| Bird | Common Nighthawk | *Chordeiles minor* | Nests on dry ground in clearings, forages over clearings and riparian areas |
| Bird | Northern Harrier | *Circus cyaneus* | Often near marshes or dunes |
| Bird | Northern Flicker | *Colaptes auratus* | Cavity nesters, found near large trees in open woodlands, clearings |
| *Bird | Band-tailed Pigeon | *Columba fasciata* | Mixed conifer/hardwood, mineral springs, more common in mature conifer |
| Bird | Western Wood-pewee | *Contopus sordidulus* | Semi-open conifer or hardwood/conifer stands, shuns steep slopes |
| *Bird | American Crow | *Corvis brachyryhnchos* | More common around riparian areas and forest edges |
| Bird | Common Raven | *Corvus corax* | General predator and opportunistic feeder, edge forager |
| Bird | Yellow-rumped Warbler | *Dendroica coronata* | Conifer to mixed stands, avoids closed-canopy pure conifer, nest in conifer |
| Bird | Black-throated Gray Warbler | *Dendroica nigrescens* | Avoids pure stands of conifer, prefers open forest with shrub layer |
| Bird | Pacific-slope Flycatcher | *Empidonax difficilis* | Well shaded forests, canyon bottoms w/flowing water, forages in openings |
| Bird | Brewer's Blackbird | *Euphagus cyanocephalus* | Meadows, mesic areas, ranches, riparian areas, thickets |
| Bird | Merlin | *Falco columbarius* | Forages open habitats, salt marshes, estuaries, nests in conifer |
| Bird | American Kestrel | *Falco sparverius* | Nests in cavities, forages in clearings |
| Bird | American Coot | *Fulica americana* | Freshwater lakes, rivers, saltwater bodies also in winter |
| Bird | Common Snipe | *Gallinago gallinago* | Peat bogs, marshes and sodden fields |
| *Bird | Cliff Swallow | *Hirundo pyrrhonota* | Bridges, cliffs or man-made structures for nesting |
| Bird | Barn Swallow | *Hirundo rustica* | Open forests, farmlands, rural areas, nest only in man-made structures |
| Bird | Dark-eyed Junco | *Junco hyemalis* | Shrubby edges, along roads, clearings, recent clear cuts |
| *Bird | Northern Shrike | *Lanius excubitor* | Winters in this area only, nests in Alaska/Canada, hunts the edges |
| *Bird | Lincoln's Sparrow | *Melospiza lincolnii* | Cool bogs, brushy wet meadows, pasturelands with dense brush and grass |
| *Bird | Song Sparrow | *Melospiza melodia* | Shrubby habitat throughout forest, riparian areas |
| *Bird | Brown-headed Cowbird | *Molothrus ater* | Rural and agricultural areas, favors riparian areas, parasitic nester |
| *Bird | MacGillivray's Warbler | *Oporornis tolmiei* | Coniferous forest edges, small clearings |
| *Bird | Western Screech-owl | *Otis kennicottii* | Primarily riparian dweller, nests in large trees or tree cavities |
| *Bird | Black-capped Chickadee | *Parus atricapillus* | Mixed and deciduous woodlands, riparian areas, cavity nester in large snags |
| *Bird | Savannah Sparrow | *Passerculus sandwichensis* | Dense grasslands, nest in grass, wet meadows, salt spray meadows |
| *Bird | Fox Sparrow | *Passerella iliaca* | Mixed and coniferous forest, shrubby areas |
| *Bird | Black-headed Grosbeak | *Pheucticus melanocephalus* | Deciduous stands in conifer forests, common in young stands of conifer |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | Mixed conifer and deciduous forests |
| Bird | Western Tanager | *Piranga ludoviciana* | Prefer open forest, nest in mature conifer, forages in shrubs, eats berries |
| Bird | Sora | *Porzana carolina* | Densley vegetated freshwater and saltwater marshes, also wet meadows |
| *Bird | Purple Martin | *Progne subis* | Along rivers, estuaries, nests in cavities in forest edges or openings |
| Bird | Ruby-crowned Kinglet | *Regulus calendula* | Conifer forests, moderate to high elevations |
| Bird | Golden-crowned Kinglet | *Regulus satrapa* | Closed canopy stands of conifer to mix conifer/hardwood |
| Bird | Black Phoebe | *Sayornis nigricans* | Always associated with water |
| Bird | Rufous Hummingbird | *Selasphorus rufus* | Nest in shrubs or low tree branches, forages along edges and clearings |
| Bird | Allen's Hummingbird | *Selasphorus sasin* | Seems to prefer conifer to hardwood, abundant in unmanaged old growth |
| *Bird | Western Bluebird | *Sialia mexicana* | Forest edges and open hardwood or coniferous forests, nest in cavities |

Table 16 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| *Bird | White-breasted Nuthatch | *Sitta carolinensis* | Forests, woodlots, groves, shade trees, visits feeders |
| *Bird | Red-breasted Sapsucker | *Sphyrapicus ruber* | Feeds on sap from live deciduous trees and insects, nest in cavity |
| Bird | Chipping Sparrow | *Spizella passerina* | Common in gardens, forest edges and open woodlands and meadows |
| *Bird | Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | Decidous riparian habitat, nests in bare river banks |
| *Bird | Calliope Hummingbird | *Stellula calliope* | Feeds in mountainous meadows, riparian areas, nests in decid/conifer trees |
| Bird | Barred Owl | *Strix varia* | Increasing their range, prefer much the same habitat as the spotted owl |
| *Bird | European Starling | *Sturnus vulgaris* | Cavities or crevices for nesting, farmlands, cities, widespread |
| Bird | Tree Swallow | *Tachycineta bicolor* | Requires snags for nesting (away from forest edges), associated with water |
| *Bird | Violet-green Swallow | *Tachycineta thalassina* | Needs snags for nesting/perching , usu. near water, forages in open habitat |
| Bird | Winter Wren | *Troglodytes troglodytes* | Coniferous forests, cavity nesters |
| Bird | American Robin | *Turdus migratorius* | Open woodlands, rural areas, farmlands |
| Bird | Barn Owl | *Tyto alba* | Farmlands and marshlands, rural areas, nests in cavities, caves, structures |
| Bird | Orange-crowned Warbler | *Vermivora celata* | Mesic, north-facing slopes, brushy tangles, openings in forest |
| *Bird | Hutton's Vireo | *Vireo huttoni* | Deciduous shrubs and trees, riparian areas |
| *Bird | Wilson's Warbler | *Wilsonia pusilla* | Mesic sites, along streams, deciduous woodlands |
| *Bird | Mourning Dove | *Zenaida macroura* | Open hardwood/conifer forests, dependent on pastures and meadows |
| Bird | White-crowned Sparrow | *Zonotrichia leucophrys* | Edges, riparian areas, open forests, clearings |
| Mammal | Mountain Beaver | *Aplodontia rufa* | Burrowing, eats swordfern and bracken fern primarily |
| Mammal | Coyote | *Canis latrans* | Versatile animal, found in every habitat type |
| Mammal | Beaver | *Castor canadensis* | Riparian dwellers |
| Mammal | Elk | *Cervus elaphus* | Use all seral stages, need forage, hiding and thermal cover, water |
| Mammal | Opossum | *Didelphis virginianus* | All habitats, nests in burrows, dead and down logs |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | Roosts in cavities made by other animals, crevices |
| Mammal | Porcupine | *Erethizon dorsatum* | Wander throughout, nocturnal, solitary, excellent climbers, herbivorous |
| *Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | Coniferous forests, rest under loose bark and in cavities |
| Mammal | Hoary Bat | *Lasiurus cinereus* | Primarily conifer or mixed conifer/deciduous |
| Mammal | Snowshoe Hare | *Lepus americanus* | Cedar swamps to old growth, immature to mature conifer |
| Mammal | River Otter | *Lutra canadensis* | Mainly around tidewater and lower reaches, occassionly in upper reaches |
| Mammal | Bobcat | *Lynx rufus* | Main prey is brush rabbit therefore brushy/edge habitat |
| Mammal | Striped Skunk | *Mephitis mephitis* | Most common in foredunes and deflation plains, wet pasture, shrub habitat |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | Most common in riparian alder and willow/sedge marsh habitats |
| Mammal | Creeping Vole | *Microtis oregoni* | Mature and immature conifer, alder/salmonberry riparian and wet pastureland |
| Mammal | Townsend's Vole | *Microtus townsendii* | Deflation plains, willow/sedge marsh, wet pastureland, and tideland rivers |
| Mammal | Short-tailed Weasel | *Mustela erminea* | Mostly riparian alder/salmonberry, but found in other habitat types |
| Mammal | Long-tailed Weasel | *Mustela frenata* | Riparian habitat, active during day even in clearings |
| Mammal | Mink | *Mustela vison* | Alder patches, willow/sedge marsh, cedar marsh, coastal lakes, estuaries |
| Mammal | Nutria | *Myocastor coypus* | Wetland habitat, herbivorous, introduced from South America |
| Mammal | California Bat | *Myotis californicus* | Mature conifer to grasslands, riparian areas |
| Mammal | Little Brown Bat | *Myotis lucifugus* | Appear in all habitat types but affinity for conifer forests |

Table 16 (cont.)

| Class | Common Name | Scientific Name | Comments |
|---|---|---|---|
| Mammal | Fringed Myotis | *Myotis thysanodes* | Roosts in caves, buildings, crevices |
| Mammal | Long-legged Bat | *Myotis volans* | Mature to immature conifer and sometimes in riparian alder/salmonberry |
| Mammal | Yuma Bat | *Myotis yumanensis* | Large streams/rivers, ponds and lakes, feed close to water's surface |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | Coniferous forests, associated with talus, cliffs, outcroppings |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | Build conical nests out of forest litter, nests from ground to trees |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | Most common in alder/salmonberry but upland forests and meadows also |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | Seem to utilize upland areas away from riparian areas more than elk |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | Shrub to open young stands, also other habitat types |
| *Mammal | White-footed Vole | *Phenacomys albipes* | Prefers large amount of dead and down woody material |
| Mammal | Townsend's Big-eared Bat | *Plecotus townsendii* | Roosts in caves or abandoned buldings |
| Mammal | Raccoon | *Procyon lotor* | Found in wide variety of habitats, feeding in riparian areas important |
| Mammal | Coast Mole | *Scapanus orarius* | Meadows to forest stands |
| Mammal | Marsh Shrew | *Sorex bendirei* | Disperse to uplands in wet winters, skunkcabbage marshes small alder stream |
| Mammal | Pacific Shrew | *Sorex pacificus* | Alder/salmonberry, skunkcabbage marsh, less often in Douglas-fir stands |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | Associated with low lying cover such as logs and thick brush |
| Mammal | Vagrant Shrew | *Sorex vagrans* | Deflation plains, wet pastureland, tideland rivers, and headland shrub |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | Also skunkcabbage marsh, primarily in alder/salmonberry thickets |
| Mammal | Beechey Ground Squirrel | *Spermophilus beecheyi* | Open areas, riparian hardwoods, pasturelands |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | Use all habitats, common in riparian alder/salmonberry |
| *Mammal | Brush Rabbit | *Sylvilagus bachmani* | All habitats along brushy edges |
| *Mammal | Gray Fox | *Urocyon cinereoargenteus* | Found in riparian hardwoods, headland shrub, den in hollow log or tree |
| Mammal | Black Bear | *Ursus americanus* | Wide range, occurs in all types of habitat, prefers dense forest/brush |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | Requires dense ground vegetation, hibernates from October-Spring |
| Reptile | Racer | *Coluber constrictor* | Open to brushy areas away from dense forests |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | Can be found in clear cuts, old buildings, under logs, rocks, moist areas |
| *Reptile | Common Garter Snake | *Thamnophis sirtalis* | Wet meadows, along water course, can be found in upland areas |

**Table 17. Wildlife species in the North Fork of the Siuslaw which benefit from dead woody material (snags or logs).**

| CLASS | COMMON NAME | SCIENTIFIC NAME | LOG | SNAG |
|---|---|---|---|---|
| Amphibian | Northwestern Salamander | *Abystoma gracile* | * | |
| Amphibian | Clouded Salamander | *Aneides ferreus* | * | |
| Amphibian | Tailed Frog | *Ascaphus truei* | * | |
| Amphibian | Western Toad | *Bufo boreas* | * | |
| Amphibian | Pacific Giant Salamander | *Dicamptodon ensatus* | * | |
| Amphibian | Ensatina | *Ensatina eschscholtzi* | * | |
| Amphibian | Dunn's Salamander | *Plethodon dunni* | * | |
| Amphibian | Western Redback Salamander | *Plethodon vehiculum* | * | |
| Amphibian | Pacific Treefrog | *Pseudacris regilla* | * | |
| Bird | Cooper's Hawk | *Accipiter cooperii* | * | |
| Bird | Northern Goshawk | *Accipiter gentilis* | * | |
| Bird | Sharp-shinned Hawk | *Accipiter striatus* | * | |
| Bird | Northern Saw-whet Owl | *Aegolius acadicus* | | * |
| Bird | Wood Duck | *Aix sponsa* | * | * |
| Bird | Ruffed Grouse | *Bonasa umbellus* | * | |
| Bird | Great Horned Owl | *Bubo virginianus* | | * |
| Bird | Bufflehead | *Bucephala albeola* | | * |
| Bird | Barrow's Goldeneye | *Bucephala islandica* | * | * |
| Bird | California Quail | *Callipepla californica* | * | |
| Bird | House Finch | *Carpodacus mexicanus* | | * |
| Bird | Turkey Vulture | *Cathartes aura* | * | |
| Bird | Brown Creeper | *Certhia americana* | | * |
| Bird | Vaux's Swift | *Chaetura vauxi* | | * |
| Bird | Northern Flicker | *Colaptes auratus* | * | * |
| Bird | Steller's Jay | *Cyanocitta stelleri* | * | |
| Bird | Pileated Woodpecker | *Dryocopus pileatus* | * | * |
| Bird | American Kestrel | *Falco sparverius* | | * |
| Bird | Northern Pygmy Owl | *Glaucidium gnoma* | | * |
| Bird | Dark-eyed Junco | *Junco hyemalis* | * | |
| Bird | Hooded Merganser | *Lophodytes cucullatus* | | * |
| Bird | Song Sparrow | *Melospiza melodia* | * | |
| Bird | Common Merganser | *Mergus merganser* | * | * |
| Bird | Western Screech-owl | *Otis kennicottii* | | * |
| Bird | Black-capped Chickadee | *Parus atricapillus* | | * |
| Bird | Chestnut-backed Chickadee | *Parus rufescens* | | * |
| Bird | Downy Woodpecker | *Picoides pubescens* | | * |
| Bird | Hairy Woodpecker | *Picoides villosus* | * | * |
| Bird | Rufous-sided Towhee | *Pipilo erythrophtalmus* | * | |
| Bird | Purple Martin | *Progne subis* | | * |
| Bird | Western Bluebird | *Sialia mexicana* | | * |
| Bird | Red-breasted Nuthatch | *Sitta canadensis* | * | * |
| Bird | White-breasted Nuthatch | *Sitta carolinensis* | * | * |
| Bird | Red-breasted Sapsucker | *Sphyrapicus ruber* | | * |
| Bird | Northern Spotted Owl | *Strix occidentalis caurina* | | * |
| Bird | Barred Owl | *Strix varia* | * | * |
| Bird | European Starling | *Sturnus vulgaris* | | * |
| Bird | Tree Swallow | *Tachycineta bicolor* | | * |
| Bird | Violet-green Swallow | *Tachycineta thalassina* | | * |
| Bird | Bewick's Wren | *Thryomanes bewickii* | * | |
| Bird | House Wren | *Troglodytes aedon* | * | * |

Table 17 (cont.)

| CLASS | COMMON NAME | SCIENTIFIC NAME | LOG | SNAG |
|---|---|---|---|---|
| Bird | Winter Wren | *Troglodytes troglodytes* | * | |
| Bird | Barn Owl | *Tyto alba* | | * |
| Mammal | Mountain Beaver | *Aplodontia rufa* | * | |
| Mammal | Coyote | *Canis latrans* | * | |
| Mammal | Western Red-backed Vole | *Clethrionomys californicus* | * | |
| Mammal | Opossum | *Didelphis virginianus* | * | * |
| Mammal | Big Brown Bat | *Eptesicus fuscus* | | * |
| Mammal | Porcupine | *Erethizon dorsatum* | * | * |
| Mammal | Townsend Chipmunk | *Eutamias townsendi* | * | |
| Mammal | Mountain Lion | *Felis concolor* | * | |
| Mammal | Northern Flying Squirrel | *Glaucomys sabrinus* | * | * |
| Mammal | Silver-haired Bat | *Lasionycteris noctivagans* | | * |
| Mammal | Snowshoe Hare | *Lepus americanus* | * | |
| Mammal | River Otter | *Lutra canadensis* | * | |
| Mammal | Bobcat | *Lynx rufus* | * | * |
| Mammal | Pine Marten | *Martes americana* | * | * |
| Mammal | Pacific Fisher | *Martes pennanti pacifica* | * | * |
| Mammal | Striped Skunk | *Mephitis mephitis* | * | |
| Mammal | Long-tailed Vole | *Microtis longicaudus abditus* | * | |
| Mammal | Creeping Vole | *Microtis oregoni* | * | |
| Mammal | Short-tailed Weasel | *Mustela erminea* | * | * |
| Mammal | Long-tailed Weasel | *Mustela frenata* | * | * |
| Mammal | Mink | *Mustela vison* | * | |
| Mammal | California Bat | *Myotis californicus* | | * |
| Mammal | Long-eared Bat | *Myotis evotis* | | * |
| Mammal | Little Brown Bat | *Myotis lucifugus* | | * |
| Mammal | Fringed Myotis | *Myotis thysanodes* | | * |
| Mammal | Yuma Bat | *Myotis yumanensis* | | * |
| Mammal | Bushy-tailed Woodrat | *Neotoma cinerea* | * | * |
| Mammal | Dusky-footed Woodrat | *Neotoma fuscipes* | * | |
| Mammal | Shrew-Mole | *Neurotrichus gibbsi* | * | |
| Mammal | Black-tailed Deer | *Odocoileus hemionus* | * | |
| Mammal | Deer Mouse | *Peromyscus maniculatus* | * | * |
| Mammal | White-footed Vole | *Phenacomys albipes* | * | |
| Mammal | Raccoon | *Procyon lotor* | * | * |
| Mammal | Coast Mole | *Scapanus orarius* | * | |
| Mammal | Townsend Mole | *Scapanus townsendi* | * | |
| Mammal | Marsh Shrew | *Sorex bendirei* | * | |
| Mammal | Pacific Shrew | *Sorex pacificus* | * | |
| Mammal | Trowbridge's Shrew | *Sorex trowbridgei* | * | |
| Mammal | Yaquina Shrew | *Sorex yaquinae* | * | |
| Mammal | Western Spotted Skunk | *Spilogale gracilis* | * | * |
| Mammal | Douglas' Squirrel | *Tamiascirius douglasi* | * | * |
| Mammal | Gray Fox | *Urocyon cinereoargenteus* | * | * |
| Mammal | Black Bear | *Ursus americanus* | * | * |
| Mammal | Pacific Jumping Mouse | *Zapus trinotatus* | * | |
| Reptile | Rubber Boa | *Charina bottae* | * | |
| Reptile | Northern Alligator Lizard | *Elgaria coerulea* | * | |
| Reptile | Northwestern Garter Snake | *Thamnophis ordinoides* | * | |
| Reptile | Common Garter Snake | *Thamnophis sirtalis* | * | |

# *Appendix M*

## - T&E SURVEYS - NORTH FORK OF THE SIUSLAW WATERSHED

Part of project planning includes conducting surveys for threatened, endangered or otherwise sensitive plant and animal species. These surveys are required if the project does not qualify for categorical exclusions and the activity will be ground disturbing or may effect in some way the species. In some cases. surveys may be omitted if the assumption is made that the species of concern is present and proper mitigation and precautions are taken. In some instances, this may include seasonal restrictions or buffering special habitats.

Currently, portions of the North Fork Siuslaw watershed have been surveyed for spotted owls, marbled murrelets and sensitive plant species. Most of this survey data is stored in various maps and paper files. Some of the data is currently recorded on GIS databases or is currently being transferred into this format. Having this information readily available is invaluable when it comes to project planning and preparation of biological evaluations.

The following figures and tables summarize the survey status of T&E surveys within this watershed. Most of the watershed has been surveyed for spotted owls since 1990. A small portion of public land in the northeastern portion of the watershed has not been surveyed. Only a small portion of National Forest System lands have been surveyed for marbled murrelets. Maps are provided in this appendix to show the general areas that have been surveyed for these Federally listed birds. For specific information on these surveys, contact the Mapleton Ranger District Wildlife Biologist.

Plant and bird surveys were primarily conducted for timber sale planning. Most survey areas are associated with planned or sold timber sales. In addition, a botanical survey was conducted in 1994 across the southern portion of the Forest and covered all of the key watersheds located within the North Fork Siuslaw watershed. This survey focused on riparian areas and was designed to provide information on sensitive plant occurrence within these areas. It also focused on noxious weed occurrence and distribution. These surveys can be used for future project planning of riparian projects.

Approximately 24 miles of riparian area were surveyed in 1994 by professional botanists for sensitive and rare plants within the Key Watersheds of the North Fork Siuslaw watershed. The following figure and table summarizes the areas surveyed and the results. Summary reports for the survey are also included.

**Table 1.** Summary of 1994 botany survey within the North Fork Siuslaw watershed.

| Subwatershed Name | Dates Surveyed | Riparian Miles Surveyed | # Sensitive Plant Sites | # Noxious Plant Sites |
|---|---|---|---|---|
| Cataract | 7/6,7/7,7/14,7/19,7/26 | 5.1 | 0 | 50 |
| Elma | 7/12,7/14,7/26 | 6.9 | 6 | 33 |
| Porter | 7/15,8/15 | 4.5 | 13 | 9 |
| Sam | 7/5 | 2.8 | 0 | 5 |
| Wilhelm | 7/18,7/25 | 4.3 | 6 | 22 |

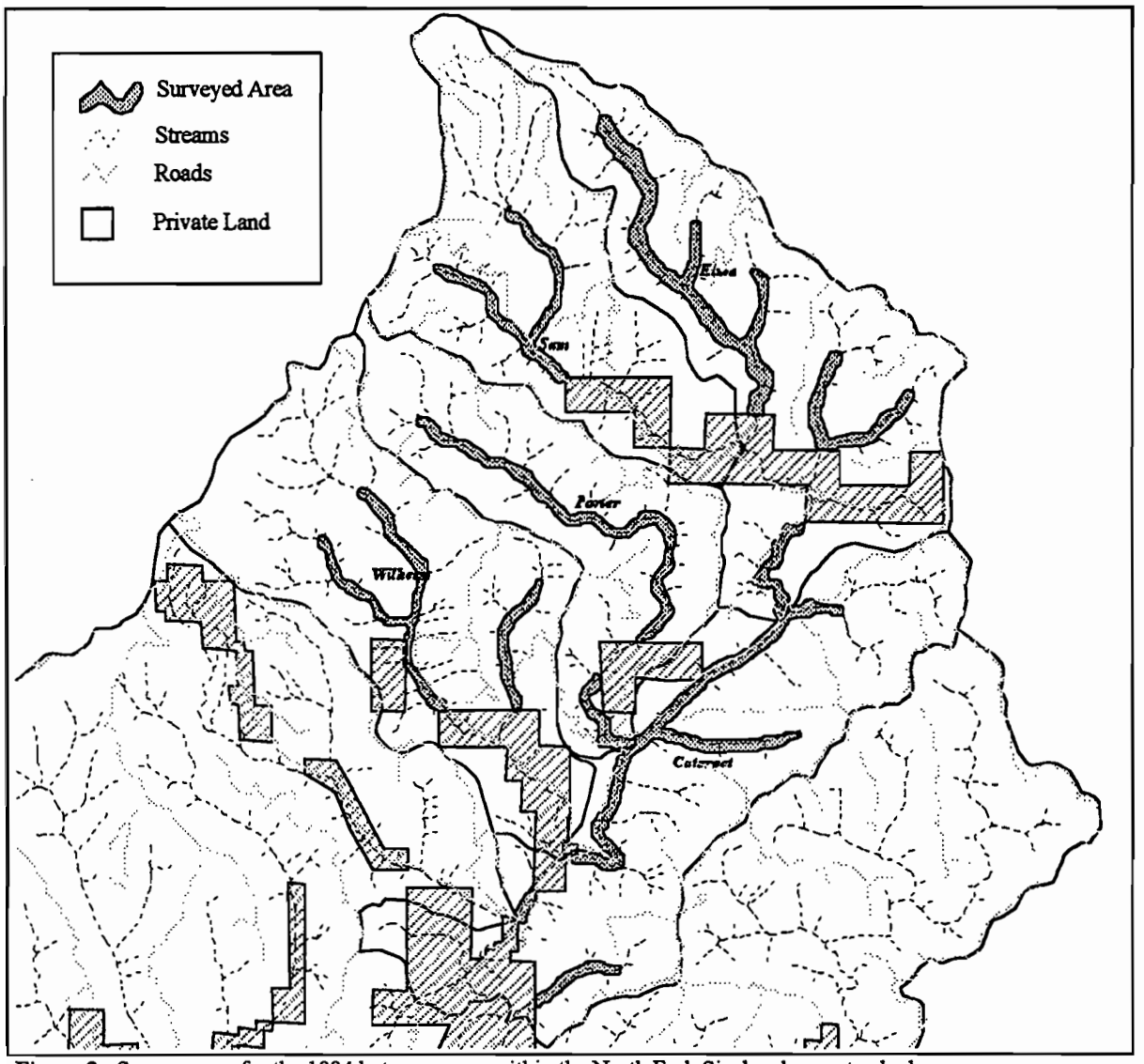
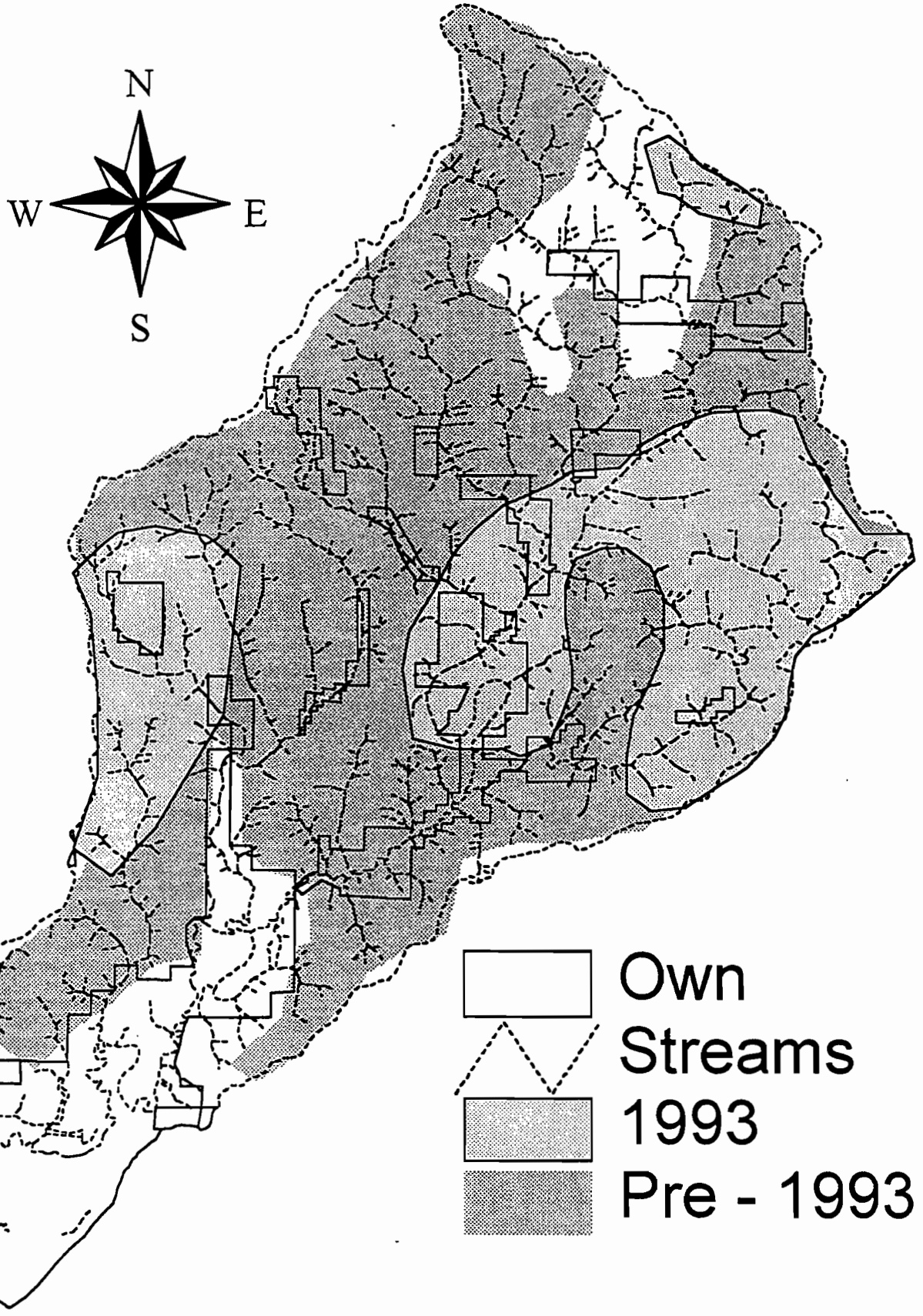


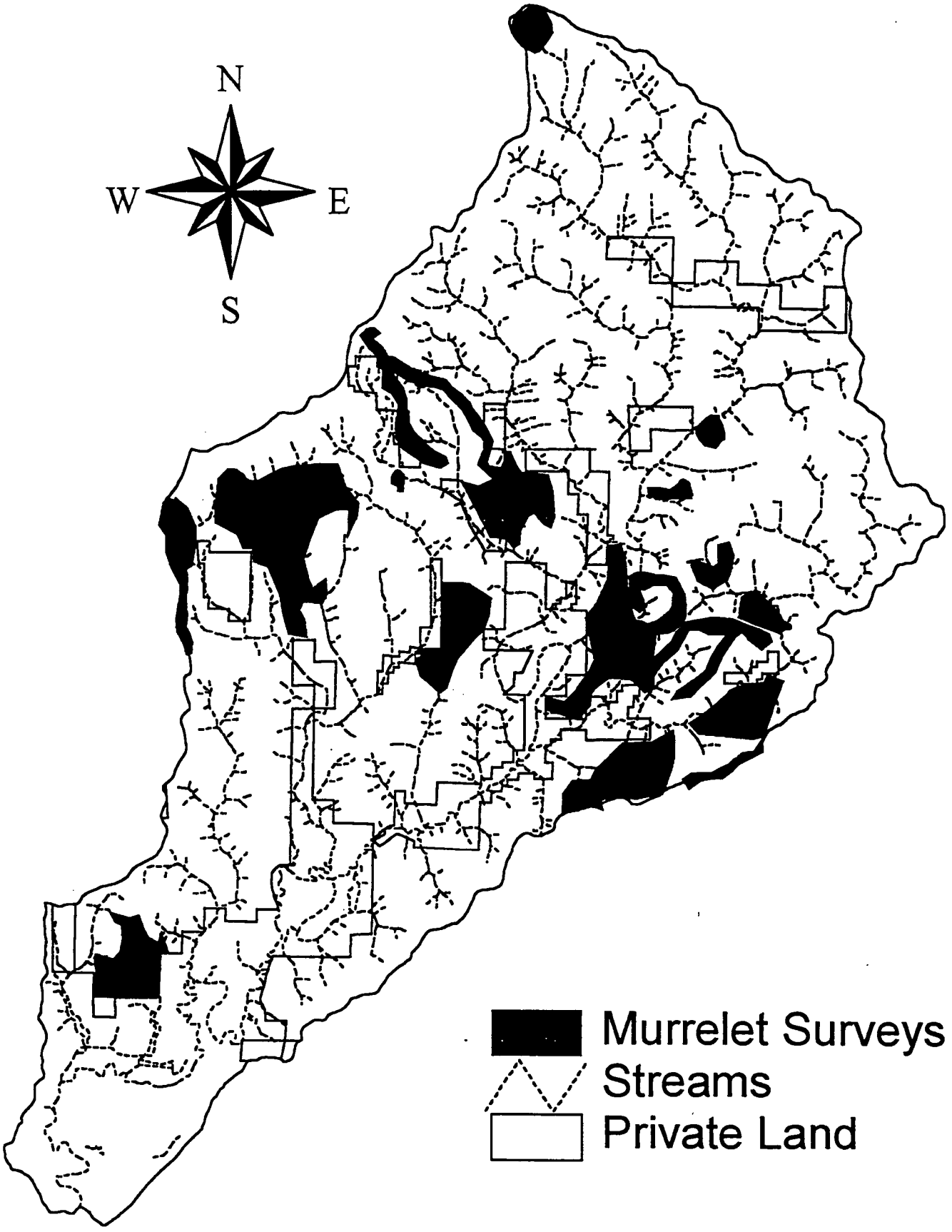

**Figure 3**. Survey areas for the 1994 botany survey within the North Fork Siuslaw key watersheds.

FOR ADDITIONAL BOTANY SURVEY INFORMATION REFER TO ANALYSIS FILES OR CONTACT THE MAPLETON RANGER DISTRICT WILDLIFE BIOLOGIST.

# USFS Spotted Owl Surveys



# Marbled Murrelet Surveys



BOTANICAL SURVEY
WATERSHED SUMMARY
Siuslaw National Forest

SURVEY AREA: North Fork Siuslaw
WATERSHED: Cataract
SURVEYORS: Mockler/Newhouse
DATES SURVEYED: 6, 7, 14, 19, 26 July 1994

SURVEY METHOD:

Intuitive controlled (perimeter not walked).

HABITATS PRESENT:

**Cataract Creek:**

General: Stream reach generally is flanked by second growth PSEMEN on both sides. The uppermost section is more open along the creek, whereas RUBSPE becomes very thick in the lower sections. The creek averages about 2' wide at the upper end of the surveyed area, and widens to about 4' average width at the lower end. The sides of the canyon are very steep and densely vegetated (mostly with RUBSPE), and are difficult to access from above or below. Probably because of this (and the dense vegetation in the creek bottom itself), deer and elk trails are nearly non-existent. This is in contrast to most other creeks in the survey area which have moderate to heavy deer and elk use.

Special habitats: No special habitats were located.

Potential habitats: Some northerly-facing banks may have potential CIMELA habitat -- the most likely of these was searched on the route taken down into the creek. Other north-facing slopes were too difficult to access from the creek below, but were scanned with binoculars where openings in the RUBSPE occurred. No CIMELA was found. Potential habitat for POALAX exists only in a few small areas along the middle section of the survey area. No potential habitats were identified for revisits.

**North Fork Siuslaw River**

General: This area includes Taylor Creek at the upper end, and an unnamed tributary flowing west into the N. Fk. Siuslaw approximately in the middle of the surveyed section. Beginning at the upper end, Taylor Creek has silty terraces, banks, and marsh edges with scattered SENJAC and CIRVUL along them. PHAARU *(Phalaris arundinacea)* becomes dominant, and remains so until the downstream end of the survey area. Many terraces along the west banks of the North Fork had been stocked prior to the time of the survey with PSEMEN, PICSIT, and THUPLI seedlings. Seedlings of another species of conifer (difficult to identify, resembling coast redwood or grand fir with sharp needles in two, flat rows) also have been introduced in the area. Although some of the thick vegetation on banks and adjacent terraces is native (e.g., RUBSPE), it is mostly comprised of weedy species such as *Phalaris arundinacea* (reed canarygrass), *Digitalis purpurea* (foxglove), *Ranunculus repens* (creeping buttercup), *Poa trivialis* (roughstalk bluegrass), *Agrostis tenuis* (creeping bentgrass) and *Holcus lanatus* (velvetgrass).

Two areas just north of the North Fork Campground are comprised of dense PICSIT o-story, and a sparse u-story. Both of these areas (and several other spots between the road and the river in this area) have been used as campsites. The river edge along the North Fork Campground is regularly disturbed by trampling, digging, and other human activities.

Special habitats:

1 Beaver marsh/pond complexes along Taylor Creek.

2 Old river channel very close to and paralleling the N. Fk. road – o-story of ALNRUB and u-story of LYSAME (standing water likely in this area in winter and spring).

3 Small marsh with open water, *Sparganium* cf. *emersum, Phalaris arundinacea, Lysichiton americanum, Juncus effusus,* many weedy species, and ALNRUB, *Salix* spp., and SAMRAC on the perimeter.

4 & 6 Meadows, possibly being managed for elk – evidence of heavy elk use. Dominated by weedy pasture grasses such as *Agrostis tenuis, Lolium perenne, Holcus lanatus,* and *Dactylis glomerata.*

5 Swamp, with o-story of ALNRUB and u-story of CAROBN. Site is adjacent to habitat #6.

7 Probable former beaver activity area, residual sediments colonized by *Scirpus microcarpus* and *Equisetum telemateia*; small ALNRUB beginning to establish.

8 Smaller area of beaver activity which is now drained. *Scirpus microcarpus* becoming established.

Potential habitats: Two potential CIMELA habitats were identified, however no plants were located. No areas were identified for revisits.

SENSITIVE/RARE PLANTS LOCATED:

No sensitive or rare plants were located within the survey areas.

NOXIOUS PLANTS LOCATED:

Species: SENJAC, CIRVUL, CIRARV, and CYTSCO were located within the project area.

Distribution: Most populations generally are between 1 and 12 plants and are scattered along creek banks and on fallen logs. Most small populations were pulled (SENJAC) or whacked off (CIRVUL) during this survey. Two relatively large populations of CIRVUL, #19 and #23 (about 100 stems each) are located near the center of the surveyed area.

RECOMMENDATIONS/COMMENTS

Regular periodic hand pulling would be feasible as a control method for most of the noxious weed populations. Other weeds (not listed as noxious) may need biocontrol or other types of control to address their large scale invasion. Disturbance should be minimized to avoid creating new weed invasion opportunities.

BOTANICAL SURVEY
WATERSHED SUMMARY
Siuslaw National Forest

SURVEY AREA: North Fork Siuslaw
WATERSHED: Elma
SURVEYORS: Brainerd, Newhouse, Wickham
DATES SURVEYED: 12, 14, 26 July 1994

SURVEY METHOD:

Intuitive controlled (perimeter not walked).

HABITATS PRESENT:

**Cedar Creek**

General: Cedar Creek contains a number of beaver dams with associated marshy areas on the western branch. Because harvesting occurred along the majority of the west side, and because of the continued beaver activity, a fairly high concentration of noxious weeds occur in this area.

Special habitats:

2 Beaver ponds and marshes.

Potential habitats: In addition to the sighted populations of POALAX, additional habitat exists scattered throughout the area surveyed. No areas were identified for revisits.

**Elma Creek**

General: Upper Elma Creek is deeply incised, and has densely-vegetated slopes on both sides. An ALNRUB o-story dominates most of the creek. The northernmost surveyed tributary also is in a steep, narrow, brushy ravine, with ALNRUB and a more open u-story adjacent to the creek. The slopes to the west are dominated by ALNRUB and ACEMAC, and to the east by 2nd growth conifers. The ALNRUB near the mouth of the tributary are quite large. At the confluence, (and several other places downstream on Elma Creek) the ALNRUB have been slashed, and THUPLI and TSUHET seedlings planted. A large beaver dam and associated disturbance have created habitat for a large weed invasion on Elma Creek just below the northernmost tributary. The middle and lower sections of the creek have many terraces with fairly open understories: ALNRUB/RANREP-POATRI. The lower surveyed tributary is in fairly good (undisturbed) condition, except for heavy elk use. Elk trails criss-cross back and forth through the water. *Digitalis purpurea, Ranunculus repens,* and *Poa trivialis* are present in large numbers, however, only 4 plants identified on the "noxious" weeds list were noted (in the lower section).

Special habitats:

1 Beaver pond and marsh, dominated by *Scirpus microcarpus, Equisetum telemateia, Rumex obtusifolius,* and *Oenanthe sarmentosa.* Small ALNRUB and SAMRAC mostly around edges.

Potential habitats: In addition to the sighted populations of POALAX, additional habitat exists scattered throughout the area surveyed. No areas were identified for revisits.

**North Fork Siuslaw**

General: This is a short section of the North Fork just above the Pawn old growth trail. Just above the trail area, the valley bottom is very broad and flat, with alternating young 2nd growth and ALNRUB stands. The slope east of the River is very brushy beneath ALNRUB stands. The River is meanders in the middle of this reach, and there are large meadows on the west side. On the east side, some ALNRUB has been slashed, and areas replanted with conifer seedlings (PICSIT, PSEMEN, and THUPLI).

Special habitats:

3 Deep pool in River, with tributary entering from west.

4 Meadow dominated by *Holcus lanatus, Agrostis tenuis,* and *Achillea millefolia.*

5 Rock cliff, about 75′ high by 50′ wide. Probably an old quarry. Dominant plants: POLMUN, ALNRUB, PSEMEN. Does not appear wet. Evidence of recent sliding near top.

SENSITIVE/RARE PLANTS LOCATED:

Six POALAX sightings were recorded on the upper reaches of Elma Creek and the northernmost surveyed tributary of Elma Creek. Two of these populations are sizeable: #1 with about 140 stems, and #5, with about 75 stems. No other sensitive or rare species were sighted.

NOXIOUS PLANTS LOCATED:

Species: SENJAC, CIRVUL, and CIRARV were located within the project area.

Distribution: SENJAC and CIRVUL are scattered throughout the survey area, both along stream banks, and on adjacent terraces where harvesting or other silvicultural activities have occurred, and where disturbance by elk is ongoing. Most CIRARV is located in a single, large population just below the beaver dam.

In general, the lower 1/2 of Elma Creek is quite weedy. *Rumex obtusifolius* is a weedy invader that is dominant on many of the gravel bars and banks of Elma Creek. *Stellaria media* and *Cerastium viscosum* are examples of weeds noted along the creek that are more common in clearcuts and urban areas, and probably should be interpreted as indicators of moderate to heavy disturbance. Other common weeds include *Ranunculus repens* and *Poa trivialis.*

RECOMMENDATIONS/COMMENTS

Most noxious weed populations in this watershed are associated with timber harvest or other silvicultural activities. Hand-pulling, bio-control (if available) and reducing disturbance should be considered and used where possible to reduce weeds.

A recent ALNRUB clearcut occurred in an obvious ALNRUB/OENSAR wetland on Elma Creek, adjacent to a clearcut. Such wetlands probably should be left undisturbed (except for weed removal) because of their habitat values. The conifer seedlings planted therein may not survive the high water table. Moisture-tolerant weedy species can be expected to invade from the adjacent clearcut.

One red-legged frog was observed within the lower surveyed portion of Elma Creek.

BOTANICAL SURVEY
WATERSHED SUMMARY
Siuslaw National Forest

SURVEY AREA: North Fork Siuslaw
WATERSHED: Porter Creek
SURVEYORS: Brainerd
DATES SURVEYED: 15 July and 15 August 1994

SURVEY METHOD:

Intuitive controlled (perimeter not walked).

HABITATS PRESENT:

General: Beginning at the upper end, there are clearcuts and young plantations on both sides of the creek. The valley bottom is narrow, with ALNRUB/RUBSPE/OXAORE. Hillsides are very brushy, or have dense PSEMEN reprod or both. Downstream, adjacent forests become large 2nd growth, and alternate back to younger plantations. At the large bend to the south, ALNRUB has been slashed and conifer seedlings planted along the stream. As valley broadens, it becomes weedier. The separate, southernmost section of the creek surveyed, begins (upstream end) with the following community: PSEMEN (very large)/ACEMAC/ACECIR/POLMUN. Some large ACEMAC are scattered along the valley sides. Beaver marshes, described under special habitats, are present. Just above the bridge, on the north side of the creek is a very dense PSEMEN plantation with no visible understory. On the south side is a mixture of ALNRUB and large PSEMEN. The bottom of the valley is dense, large ALNRUB (ALNRUB/RUBSPE/POLMUN). Again, patches of the ALNRUB have been slashed and planted with conifers. Some small beaver dams are present. Near the confluence with the N. Fk. Siuslaw, an open ALNRUB/POLMUN community with scattered large PSEMEN is on the north side, and the south side has young PSEMEN-PICSIT/SAMRAC/POLMUN-OXAORE. Here also, patches of ALNRUB have been slashed and conifer seedlings planted.

Special habitats:

1 Open water beaver pond with ALNRUB o-story.

2,3 Meadows dominated by *Phalaris arundinacea, Scirpus microcarpus, Holcus lanatus, Ranunculus repens.* SENJAC and CIRVUL numerous. The weedy meadows interspersed with clumps of ALNRUB, PSEMEN, and SAMRAC.

4 Beaver marsh complex dominated by scattered ALNRUB, RUBSPE, and dense PHAARU.

Potential habitats: One potential habitat was identified for CIMELA, but no plants were located. No areas were identified for revisits.

SENSITIVE/RARE PLANTS LOCATED:

Thirteen populations (totalling approximately 547 stems) of POALAX were found in the survey area. Eight populations are scattered in sections 32 and 36 to the west of the major bend, and the other five generally are near the middle stretch of the lower, disjunct portion of the surveyed portion of the creek. Other suitable habitat exists scattered throughout the survey area.

NOXIOUS PLANTS LOCATED:

Species: SENJAC, CIRVUL, and CIRARV were located within the project area.

Distribution: The populations occurred scattered along creek banks, terraces, and meadows. A large concentration of CIRARV (#4; about 200 stems) is located just north of the private land in section 6.

RECOMMENDATIONS/COMMENTS

Hand-pulling, bio-control (if available) and reducing disturbance should be considered and used where possible to reduce weeds.

BOTANICAL SURVEY
WATERSHED SUMMARY
Siuslaw National Forest

SURVEY AREA: North Fork Siuslaw
WATERSHED: Sam
SURVEYORS: Brainerd/Newhouse
DATES SURVEYED: 5 July 1994

SURVEY METHOD:

Intuitive controlled (perimeter not walked).

HABITATS PRESENT:

General: The West Branch is flanked by young plantations on both sides in the upper reaches, and ALNRUB has been cut in patches along the creek and restocked with conifers (THUPLI, PICSIT, PSEMEN). Terraces along the valley bottom are flat, 30'-40' wide and easily passable. The community type in this area (upper reaches of West Branch valley bottom) is ALNRUB/RUBSPE/POLMUN-OXAORE, and deer and elk trails are common. An aluminum tree tag with the note "Dick Miller '92" was located on a tree adjacent to the creek near the beginning of the survey area. Many blue and black/red flags are hung along the creek. The lower reaches, and most of Sam Creek itself, is second growth conifer forest. A power line crosses Sam Creek above its junction with the West Branch. Beginning just north of the power line, the valley bottom widens somewhat, and becomes a stand of large ALNRUB with dense u-story of RUBSPE to the south near the bridge.

Special habitats:

1 Meadow complex dominated by weedy pasture grasses.

2 Similar to #1: meadow complex dominated by weedy pasture grasses.

Potential habitats: Although potential habitat for POALAX is scattered throughout the survey area, no plants were located during this survey. No areas were identified for revisits.

SENSITIVE/RARE PLANTS LOCATED:

No sensitive or rare plant species were located in this watershed.

NOXIOUS PLANTS LOCATED:

Species: SENJAC, CIRVUL, and CYTSCO were located within the project area.

Distribution: The small populations of CIRVUL and SENJAC are scattered throughout the watershed. The 16-stem population of CYTSCO is located in the upper end of a meadow (part of special habitat #2) on Sam Creek, about 500' north of the bridge at road 5084.

RECOMMENDATIONS/COMMENTS

Control populations of noxious weeds while they are small by hand pulling. Remove old flagging along the West Branch if it is no longer needed, as it is a slight detraction to the otherwise pristine quality.

One red-legged frog (near lower end) and one pileated woodpecker (near upper end West Branch) were seen during the survey.

BOTANICAL SURVEY
WATERSHED SUMMARY
Siuslaw National Forest

SURVEY AREA: North Fork Siuslaw
WATERSHED: Wilhelm
SURVEYORS: Mockler/Newhouse
DATES SURVEYED: 18 (Deer Creek) and 25 (Wilhelm Creek) July 1994

SURVEY METHOD:

Intuitive controlled (perimeter not walked).

HABITATS PRESENT:

**Deer Creek**

General: Deer Creek is much less weedy than Wilhelm Creek although substantial clearcutting historically has occurred along most of its length. The clearcuts are steep and brush-choked where they border the creek. The small size of the creek and dense brush bordering the banks may be limiting weed occurrence in the upper half.

Special habitats: No special habitats were observed in the survey area.

Potential habitats: Potential habitat for POALAX is scattered throughout the survey area. No potential habitats were identified for revisits.

**Wilhelm Creek**

General: Wilhelm Creek and Left Fork Wilhelm Creek are bordered by a mosaic of quite old (regenerating) to very recent clearcuts. Older second growth occurs in small, scattered patches. Elk and deer trails are common along the creek and on terraces above the creek dominated by weedy pasture grasses and patches of RUBSPE and ALNRUB. Another common weed along the creek is *Rumex obtusifolius*, which colonizes gravel bars and banks and forms monocultures in some places. *Prunella vulgaris* var. *vulgaris*, *Holcus lanatus*, and *Poa trivialis* are common weeds occurring on the terraces above the creek. Light green patches on the aerial photo along the upper reaches of Wilhelm Creek are RUBSPE. Approximately 1/4 mile of the lowest part of the surveyed area is being grazed by cattle, apparently accessing the area from private land downstream. Cattle feces were noted in and near the creek, and heavy trampling of creek banks and adjacent vegetation are occurring in this area.

Special habitats: No special habitats were observed in the survey area.

Potential habitats: Potential habitat for POALAX is scattered throughout the survey area. One potential habitat was identified for CIMELA on Wilhelm Creek, but no plants were located. No areas were identified for revisits.

SENSITIVE/RARE PLANTS LOCATED:

Six small populations (totalling approximately 54 stems) of POALAX were found in the survey area. One population is on Deer Creek, one on the Left Fork, one on Wilhelm Creek above the left fork junction, and the remaining two on Wilhelm Creek just below the junction with the Left Fork.

NOXIOUS PLANTS LOCATED:

Species: SENJAC, CIRVUL, and CIRARV occur within the project area.

Distribution: The populations occur scattered along creek banks and terraces of the lower 1/2 of Deer Creek, and all along Wilhelm Creek. Only one noxious weed sighting (6 stems, SENJAC) was recorded on the Left Fork.

RECOMMENDATIONS/COMMENTS

Hand-pulling, bio-control (if available) and reducing disturbance should be considered and used where possible to reduce weeds. Eliminating cattle from the lower reach will be essential to restoring stream health and native vegetation in that area.

# *Appendix N*

## - TERRESTRIAL HABITAT TYPES - NORTH FORK OF THE SIUSLAW WATERSHED

The vegetation within the North Fork of the Siuslaw was separated into seven broad categories used to map out various seral stages or habitat types. Base line data was provided from the forest's Arc/Info Geographical Information System (GIS). This included vegetation typing performed from 1984-86 which was designed for timber resource management. This GIS coverage was updated using 1989 color aerial photographs (1:12,000), digital orthoquad photos taken in 1992 and low level aerial photographs (1:444) taken of key watershed riparian areas on November 24, 1993.

**GRASS/FORB** - This habitat type primarily consists of pasture land and managed meadows. Most of this habitat is located on privately owned lands. If left unmanaged, most of this habitat would convert into brush fairly quickly depending on the area's specific management history, topographical location and adjacent vegetation.

Due to the quick growth rate of brush species in this area, the occurrence of this habitat type prior to European settlement was probably very small. In a late successional period, it may have occurred adjacent to native American villages or in areas where they burned annually. It probably also occurred within small gaps in the forest canopy associated with late successional forests. Small areas (less than 1 acre) in the riparian areas may have occurred after small disturbances but likely grew into brush quickly. Soon after a large fire, it would be more widespread on the upper slopes and ridges within the burned areas. However, it would only last for 1-2 years until brush species dominated.

Common plant species currently found in this habitat type include many non-native grasses like common velvetgrass (*Holcus lanatus*), creeping bentgrass (*Agrostis tenuis*), reed canarygrass (*Phalaris arundinacea*), perennial ryegrass (*Lolium perenne*), orchardgrass (*Dactylis glomerata*), and forbs like common yarrow (*Achillea millefolium*) and creeping buttercup (*Ranunculus repens*).

**Figure 1.** Grass/forb habitat occurs in pasture lands and small managed meadows such as this one located in the Elma subwatershed adjacent to the North Fork Siuslaw River.

Those polygons attributed as "XME" or "XAD" were selected from the North Fork Siuslaw GIS layer to display this habitat type.

**BRUSH/FORB** - This habitat type represents the most common early seral stage usually seen in this area after a disturbance such as a fire or clearcut. Although grasses and annual forbs occur here, the overall structure is dominated by brush and young tree seedlings less than 10 feet in height. In clearcut units, brush quickly dominates over the grass and forbs. For this reason all recently clearcut stands (< 8 years old) were included in this habitat typing.

Brush and forbs quickly revegetate disturbed areas and can last for up to 10 years in upslope areas and longer in riparian areas. The longer persistence in riparian areas may be due to the increased frequency of disturbances (small scale) that occur on the steep slopes and flood plains associated with these riparian areas.

Field reconnaissance in this habitat type showed that conifer plantations begin to close in after approximately 8 years of age and function more as sapling/pole type habitat than as brush type habitat. Large pieces of dead wood on the ground and snags are very scarce but do occur in some areas. Most of this material is in later stages of decay. Higher quantities of snags and down wood have been retained in more recent clearcuts or have been created through the practice of topping live trees.

Common plant species found in this habitat type would include salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*), sword fern (*Polystichum munitum*), foxglove (*Digitalis purpurea*), bracken fern (*Pteridium aquilinum*), red alder (*Alnus rubra*) seedlings and various conifer seedlings such as Douglas-fir (*Psuedotsuga menziesii*) and western hemlock (*Tsuga heterophylla*).

Those polygons attributed as brush "XBR", power line corridors "XPL" or size class "C" were selected from the North Fork Siuslaw GIS layer to display this habitat type.

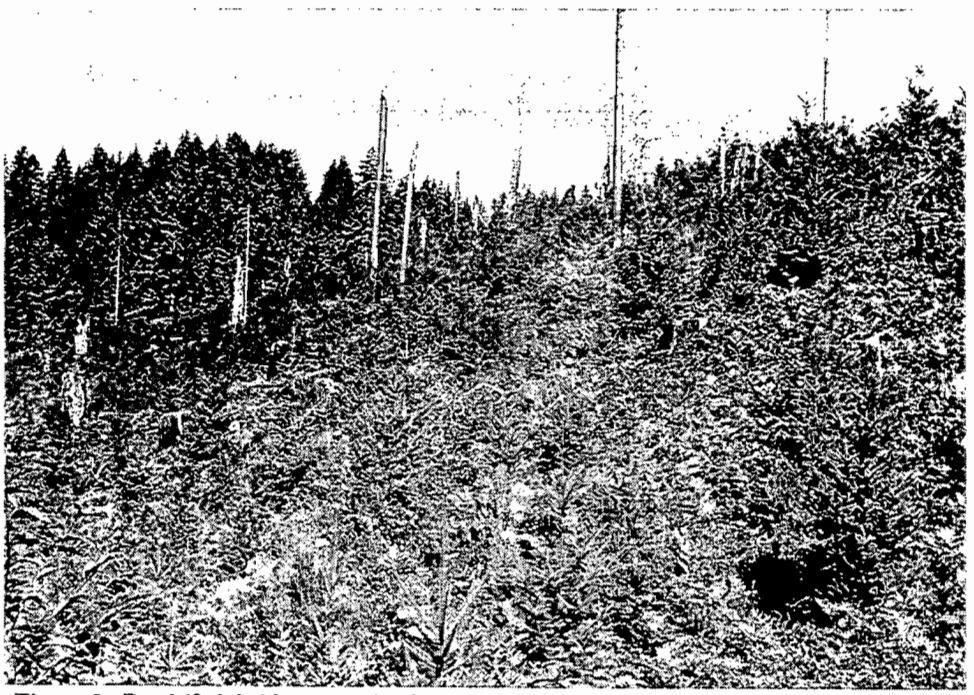


**Figure 2.** Brush/forb habitat occurring in a recent clearcut located in the Russell subwatershed.

**SAPLING/POLE** - This habitat type combines both open and closed stands of young conifer together. It is compromised entirely of managed stands that range in age from 8 to 24 years old. Due to the vigorous growth of vegetation in this area and the dense stocking of seedlings in plantations, open stands of sapling pole are uncommon.

Past silvicultural activities play a major role in the structure of this habitat type. After clearcutting, these areas were usually planted at a stocking density ranging from 400-500 trees per acre. At about 10-15 years of age the conifer are about 10-20 feet in height and very dense (9ft x 9ft spacing). At this point the stands are usually thinned to approximately 220 trees per acre which equates to a 14ft x 14ft spacing. After the thinning, brush and sometimes grass and forbs fill the spaces between the trees until at about 20 years of age the trees grow enough to once again close the canopy. Large pieces of dead wood on the ground and snags are very scarce to non-existent in the stands due to the practice of burning and removing this material after harvesting.

The overstory is predominately Douglas-fir. Common understory plant species found in this habitat type would include salmonberry, salal (*Gaultheria shallon*), trailing blackberry (*Rubus ursinus*) in the more open areas, and sword fern, red huckleberry (*Vaccinium parvifolium*) in the areas of higher canopy closure.

Those polygons attributed as dominantly conifer (SPP1= PSME, TSHE, PISI, or THPL) and size class "P" were selected from the North Fork Siuslaw GIS layer to display this habitat type.

**Figure 3.** A typical unthinned managed stand (age 9 years) which represents sapling/ pole habitat.

**YOUNG CONIFER** - In the North Fork of the Siuslaw watershed this habitat type is compromised exclusively of older managed stands containing small conifer trees from 25-50 years in age. Brown (1985) describes this habitat as closed sapling-pole-sawtimber.

Tree sizes range from 10-18 inches in diameter at breast height and 40-120 feet in height. Understory vegetation is very sparse as the crown closure is at or near 100%. Occasional openings do occur allowing sunlight to reach the ground. In these areas you can find various densities of brush and forb species. The stand is usually lacking in species and structural diversity. Large pieces of dead wood on the ground and snags are very scarce to non-existent due to past harvest practices.

**Figure 4**. Young conifer habitat type is represented by this managed stand (age 34 years) located within the Russell subwatershed.

The overstory is dominantly Douglas-fir. Although scarce, understory plant species found in this habitat type would include sword fern, salal, and huckleberry (*Vaccinium* spp.).

Those polygons attributed as dominantly conifer (SPP1= PSME, TSHE, PISI, or THPL) and size class "S" were selected from the North Fork Siuslaw GIS layer to display this habitat type.

**MATURE CONIFER** - This habitat type represents conifer stands with average diameters greater than 18 inches at breast height. Second growth conifer dominates this type but various sized patches or individual remnants of late succesional and old growth conifer are scattered throughout. Conifers usually exceed 120 feet in height and canopy closure is usually less than 100%, allowing the establishment of understory vegetation throughout the stand in various densities.

Past silvicultural activities have played a role in the variation of structure in this habitat type within the analysis area. Some of this habitat has been harvested since the 1960's. This harvesting included partial cutting which usually occurred in the upper 1/3 of the slope adjacent to existing roads because of easy access. In stands that were partially cut, most of the dead standing and down wood (snags and logs) were removed along with the sub-dominant trees and trees of poor merchantable quality. In some areas, cedar sales allowed the removal of western redcedar (*Thuja plicata*) within the stands and riparian areas. Helicopter yarding was used in some instances.

In areas where no harvest activities have occurred, stands are more structurally diverse and species rich. Snag and log quantities are higher than in managed areas and are probably at natural levels for this period in time. Dead wood densities generally increase as stand age increases and are higher in unmanaged old growth stands.

Conifer species primarily associated with this habitat are Douglas-fir, western hemlock, western redcedar and Sitka spruce (*Picea sitchensis*). Western redcedar probably was more common than Sitka spruce within this area historically, especially in stands located in the southwestern portion of the watershed. However, today Sitka spruce seemed to occur more frequently than the cedar. Sitka spruce is more common along the western margin of the watershed where the transition between the Sitka Spruce Zone and Western Hemlock

Zone occurs. Common understory plant species found in this habitat type would include Oregon grape (*Berberis nervosa*) and salal in drier areas and vine maple (*Acer circinatum*), Hooker's fairy-bell (*Disporum hookeri*), vanillaleaf (*Achlys triphylla*), Pacific trillium (*Trillium ovatum*), sword fern and Oregon oxalis (*Oxalis oregana*) in the moister areas.

**Figure 5.** Mature conifer habitat within the North Fork Siuslaw. Openings in the canopy allow growth of brush such as this salal in the understory.

Those polygons attributed as dominantly conifer (SPP1= PSME, TSHE, PISI, or THPL) and size class "M" or size class "L" were selected from the North Fork Siuslaw GIS layer to display this habitat type.

**PURE HARDWOOD** - This habitat type is predominantly red alder of various ages and greater than 5 inches diameter at breast height. Other hardwood species such as big-leaf maple (*Acer macrophyllum*) may also occur. Although red alder is considered a pioneer species, large stands can persist in an area for relatively long periods of time. Eventually, however, in most areas and with the lack of any disturbances this habitat would probably convert to conifer dominated conditions.

This type of habitat mostly occurs along riparian corridors and steep slopes such as headwall areas. It is also relatively abundant along roadsides and occasionally occurs in upslope areas and ridgetops, but usually is associated with some recent ground disturbance or nutrient deficiency in the soil. The dynamic nature of riparian areas, where debris torrents and floods are relatively common, probably accounts for its abundance in those areas.

Common understory plant species found in this habitat type would include salmonberry, but sword fern, and other small forbs also occur.

Those polygons attributed as pure deciduous (SPP1 = TREED or ALRU and SPP2 = NULL) and size class not equal to "C" were selected from the North Fork Siuslaw GIS layer to display this habitat type.

**Figure 6.** Pure hardwood habitat usually consists of stands of red alder and is strongly associated with riparian areas such as this stand located alongside McLeod Creek.

**HARDWOOD/CONIFER** - This habitat type predominantly consists of hardwoods with scattered conifer throughout. The hardwood is greater than 5 inches in diameter at breast height and the scattered conifer range in size from small saplings just beginning to penetrate the overstory to large trees greater than 18 inches in diameter.

In some areas this is a relatively long term seral stage but eventually grows into conifer dominated habitat. These areas may be indicative of older disturbed sites where natural ecological succession is still proceeding. Within the next 50 years most of these areas will probably convert to predominantly conifer, barring any further disturbances during that time frame. Like pure hardwood, this habitat type is also strongly associated with riparian areas. Canopy closure is commonly less than 100% allowing thick understory growth of brush species. Shade tolerant conifer species such as western hemlock, western redcedar and Sitka spruce can survive underneath the brush layer for extended periods of time until eventually they penetrate it or are released by openings created by fallen trees. These fallen trees (especially if they are large Douglas-fir or Sitka spruce) also serve as nurse logs for future conifer recruitment and thus accelerates the rate of conversion of this habitat type into a conifer dominated habitat.

The dominate overstory species is red alder but some big-leaf maple may occur. Common understory plant species found in this habitat type would include salmonberry, vine maple, salal, oceanspray (*Holodiscus discolor*), cascara (*Rhamnus purshiana*), sword fern and bracken fern.

Those polygons attributed as dominantly deciduous (SPP1 = TREED or ALRU) and subdominantly coniferous (SPP2 = PSME, THPL, PISI or TSHE) and size class not equal to "C" were selected from the North Fork Siuslaw GIS layer to display this habitat type.

**Figure 7**. Hardwood/conifer habitat is usually located adjacent to or within riparian areas such as this stand located in the Cataract subwatershed.

The following pages summarize the acres and percentages of these habitat types for each subwatershed within the North Fork Siuslaw watershed.

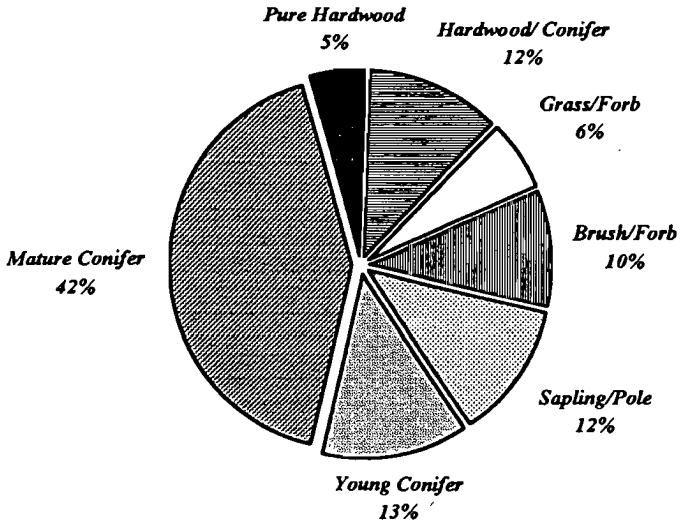



**Figure 8**. Breakdown of habitat types for the North Fork Siuslaw watershed.

Figure 9. Status of grass/forb habitat within the subbasins of the North Fork of the Siuslaw watershed as of September 1994.

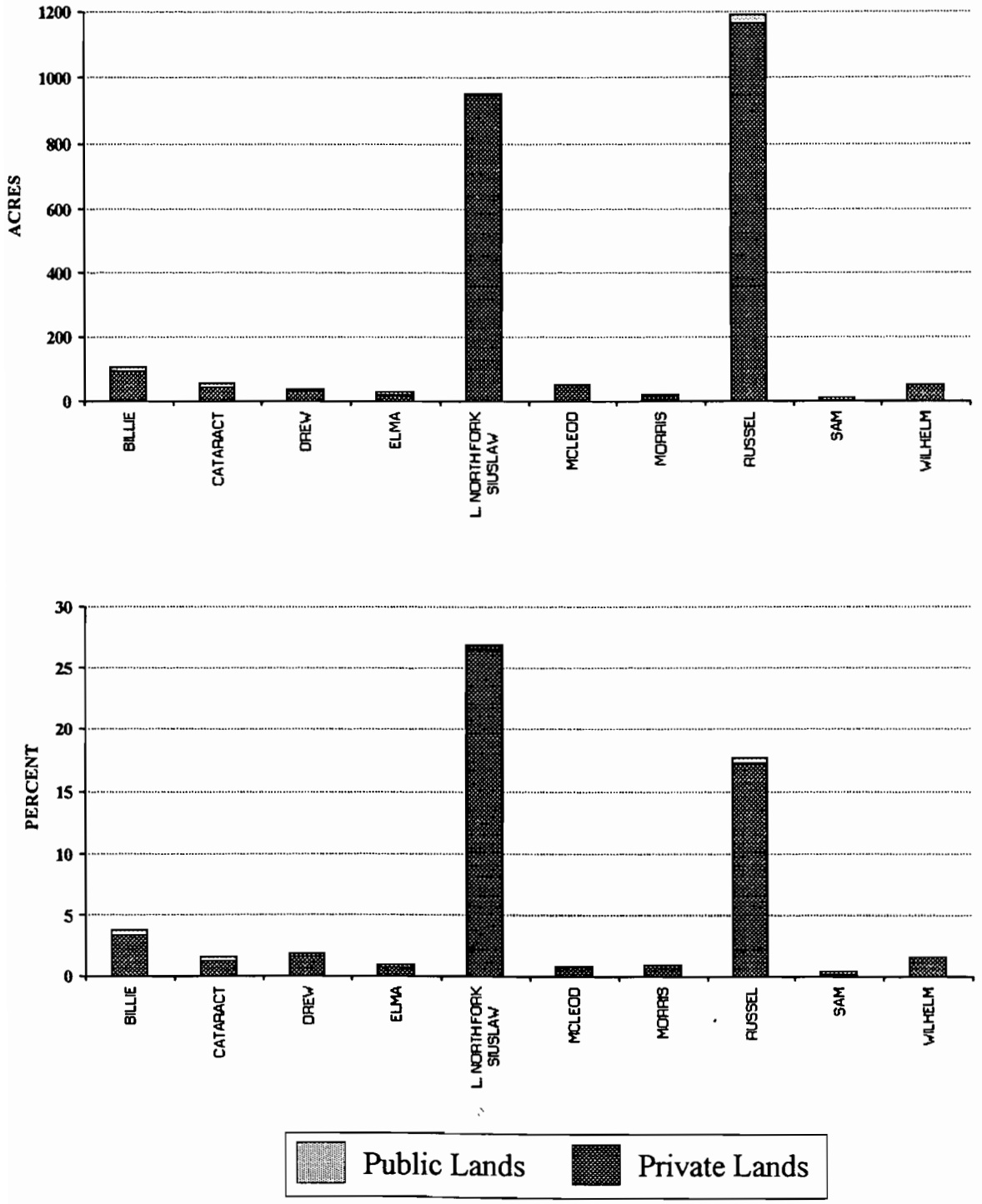


Figure 10. Status of brush/forb habitat within the subbasins of the North Fork of the Siuslaw watershed as of September 1994.

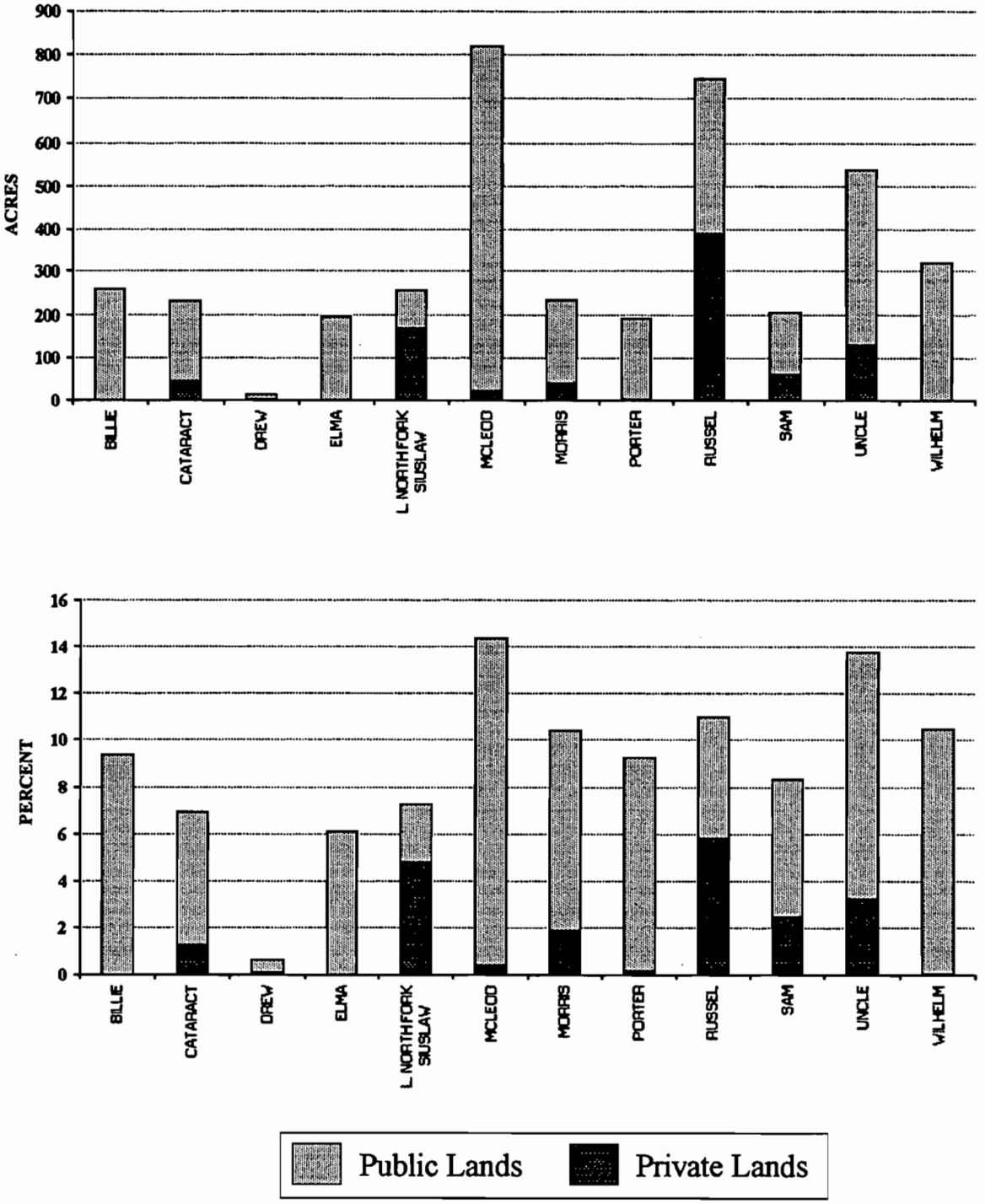


Figure 11. Status of sapling/pole conifer habitat within the subbasins of the North Fork of the Siuslaw watershed as of September 1994.

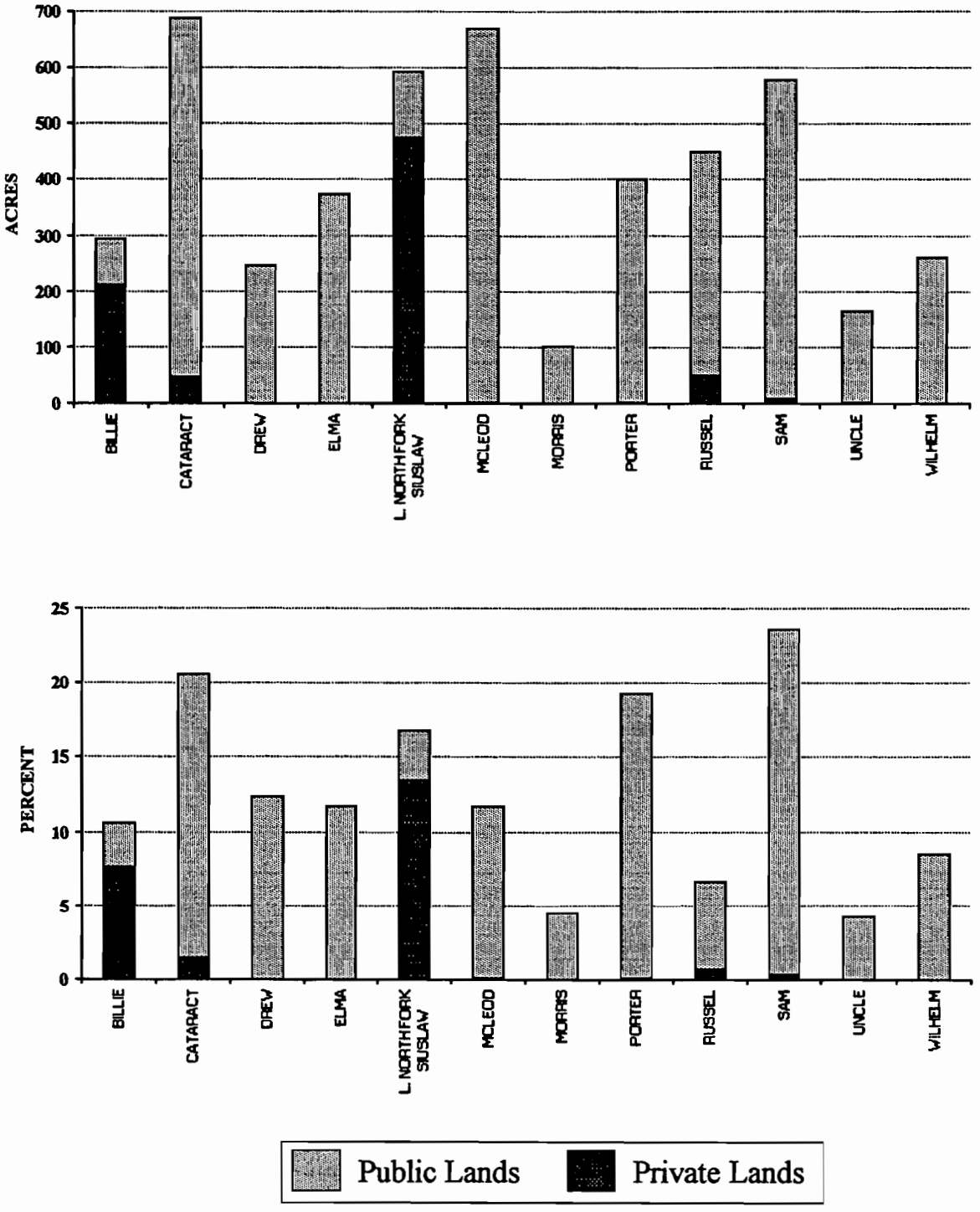


Figure 12. Status of young conifer habitat within the subbasins of the North Fork of the Siuslaw watershed as of September 1994.

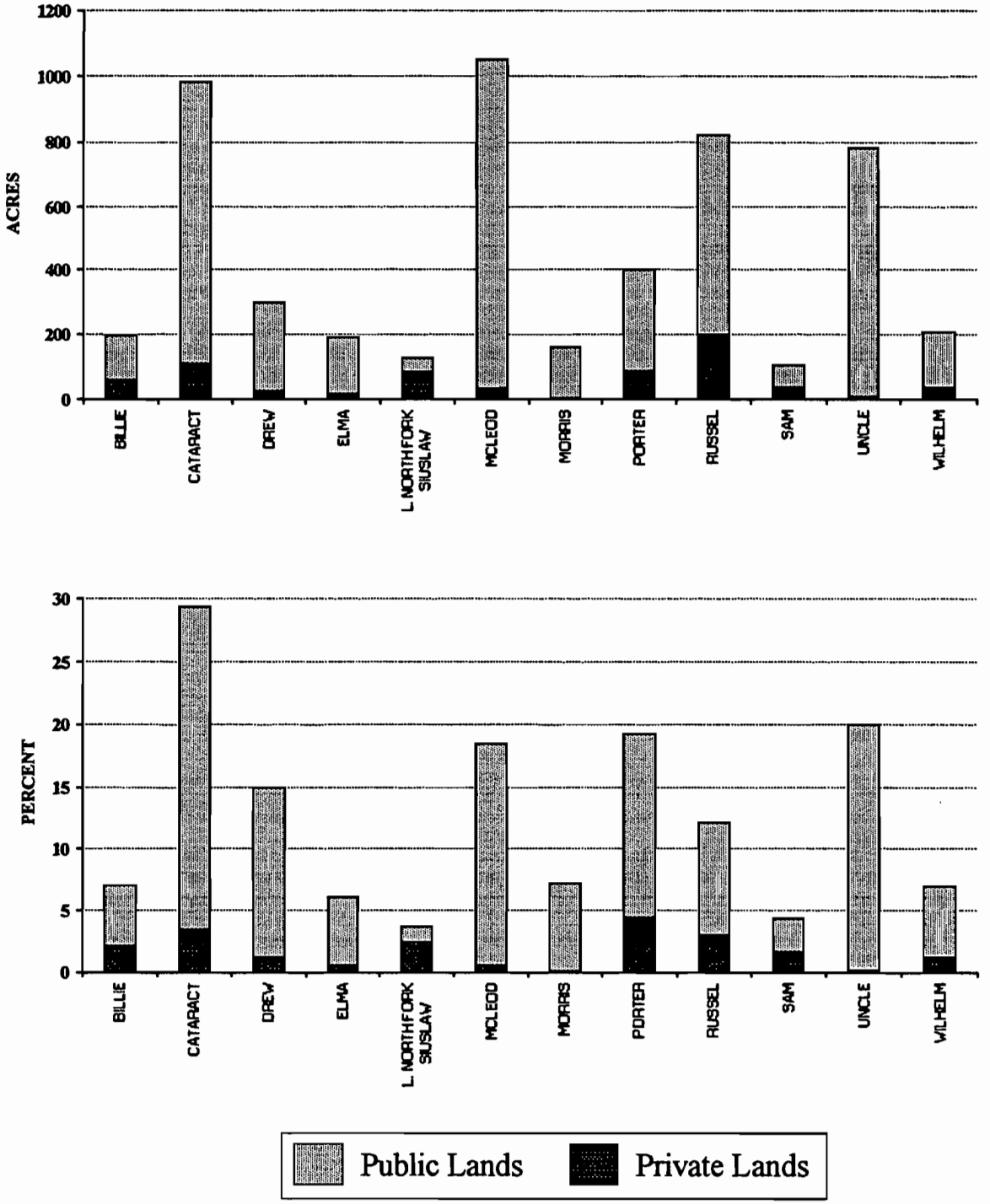


Figure 13. Status of mature conifer habitat within the subbasins of the North Fork of the Siuslaw watershed as of September 1994.

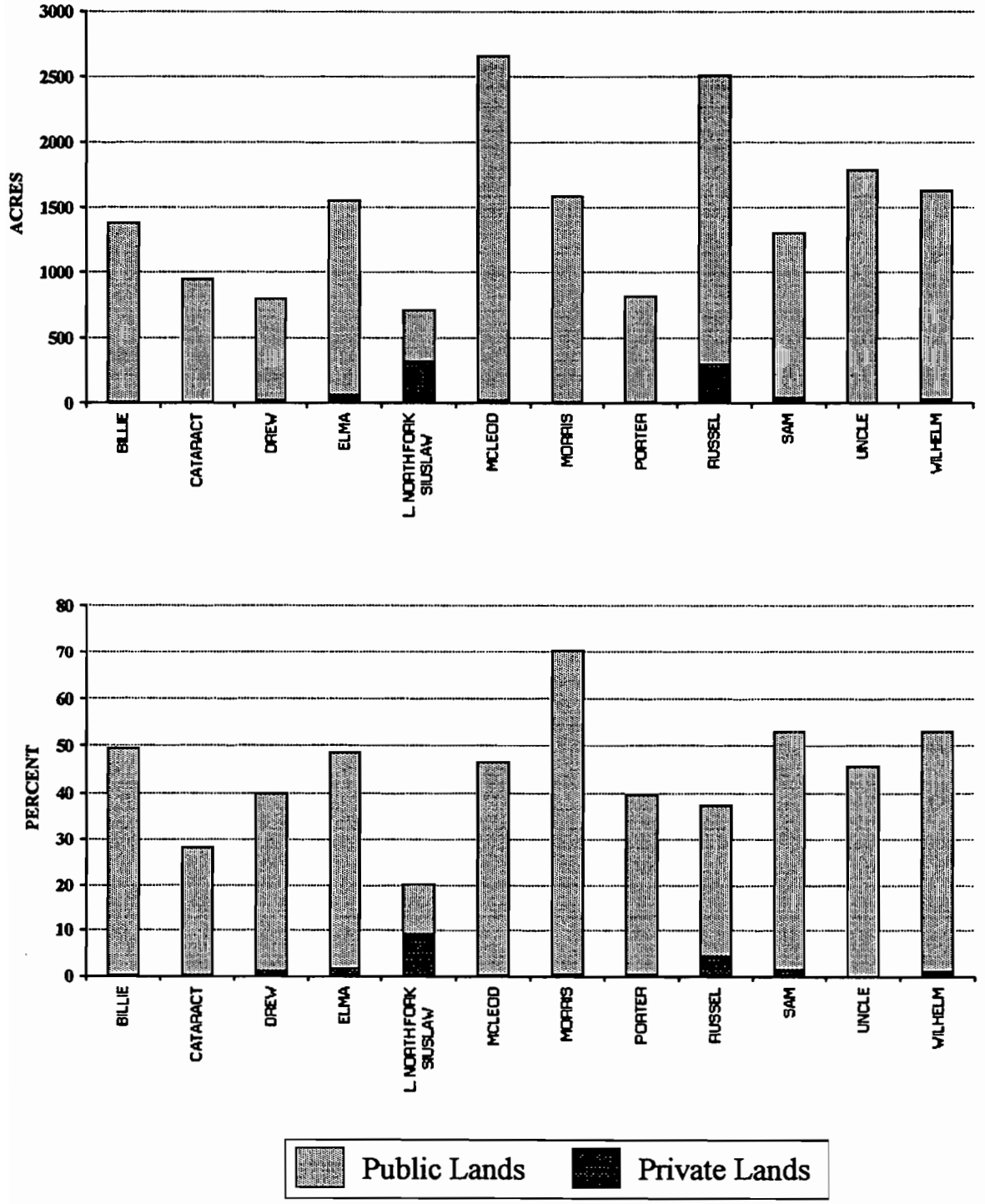


Figure 14. Status of pure hardwood habitat within the subbasins of the North Fork of the Siuslaw watershed as of September 1994.

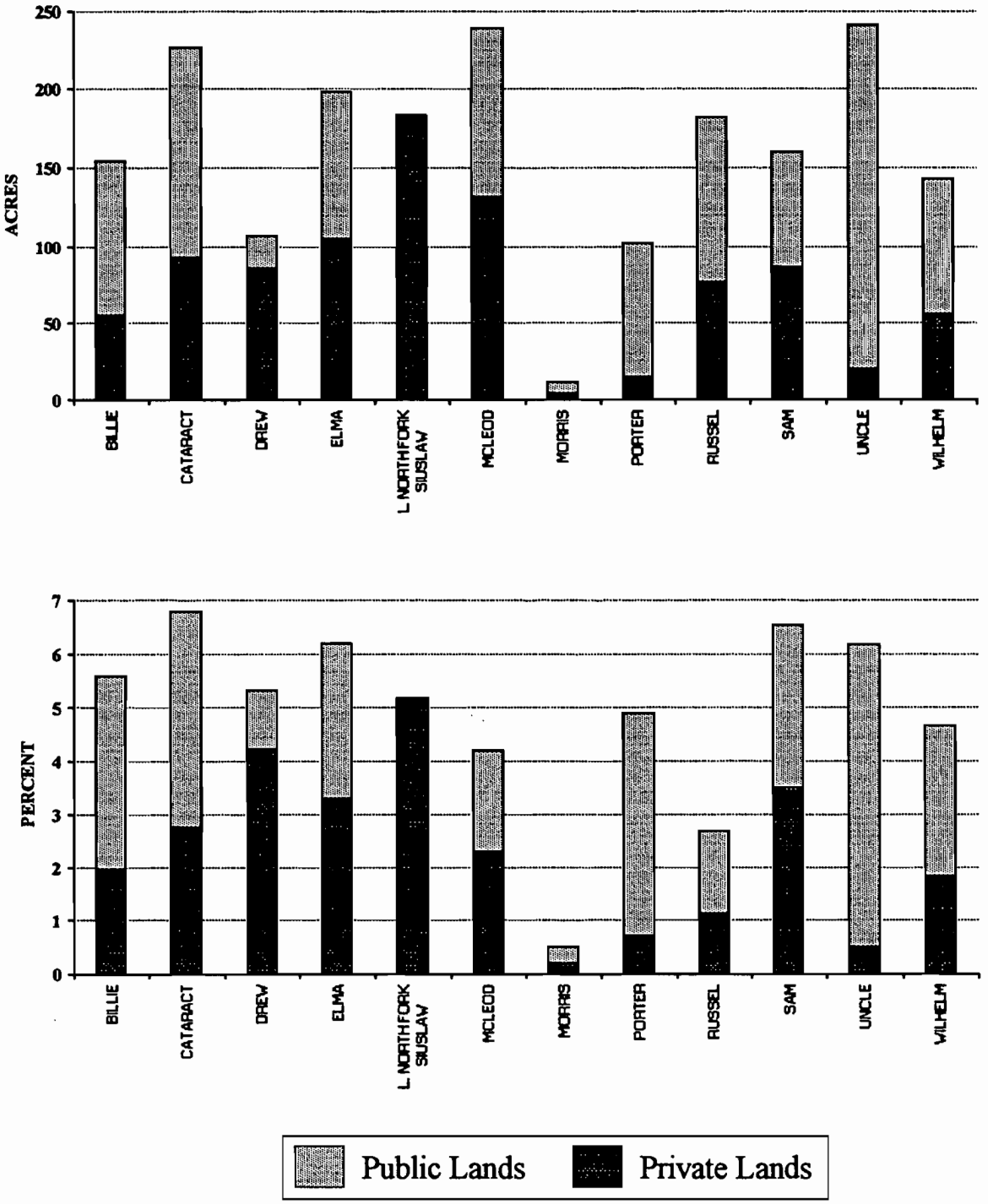
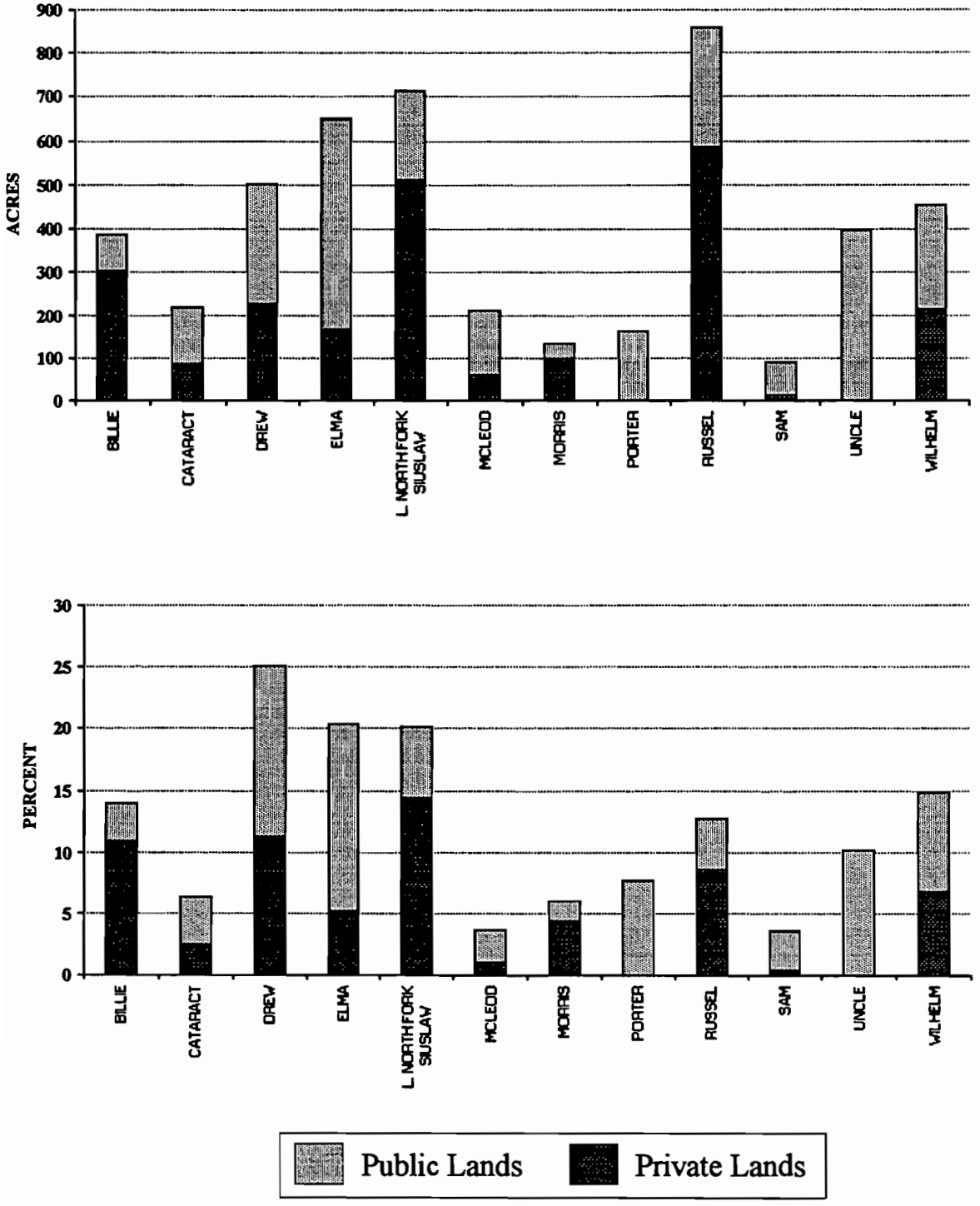


Figure 15. Status of hardwood/conifer mix habitat within the subbasins of the North Fork of the Siuslaw watershed as of September 1994.



# *Appendix O*

## - FOREST HEALTH - NORTH FORK OF THE SIUSLAW WATERSHED

### What Is Forest Health?

Many definitions of forest health exist so it is important to set the stage with a quick description of what is meant by one of the latest hot topics in the controversial world of forest management. Inner Voice has devoted an entire issue to the debate and is suspicious that the Forest Service may be using "forest health" as a way to get timber sales out, to avoid environmental analysis through categorical exclusions and even to maintain budgets and people in tough times.

On the other hand, many forest managers and scientist are offering other views of forest health. The July 1994 issue of the Journal of Forestry focuses on the subject also. I offer the following definitions that taken together give me a clear understanding of the phrase:

- "Forest health is a condition of forest ecosystems that sustains their complexity while providing for human needs." (Sampson et al, 1994)
- "Health is the capacity of the land for self renewal". (Leopold, 1949)
- "A healthy forest is one that is resilient to changes." (Joseph et al, 1991)

Many other definitions exist but that should suffice. Any definition of forest health needs to consider the forest having the capacity for replacement within the time frame of successional processes. Some climatic scientists would even claim that the whole discussion is irrelevant since climatic change will drive some ecosystems to drastic changes, even extinction.

### The National Picture

The Forest Service has developed a strategic plan called "Healthy Forests for America's Future". (FS publication MP-1513, April 1993). This plan says that "a desired state of forest health is a condition where biotic and abiotic influences on the forest (that is, pests, silvicultural treatments, harvesting practices) do not threaten resource management objectives now or in the future." It goes on to identify twelve strategic goals for the Forest Service to attain desired forest health. "Of major concern are forests where ecological conditions have been altered resulting in increased susceptibility of drought, pest epidemics, and wildfire".

### What is the Regional Picture (REAP)?

The Pacific Northwest Region just recently finished an assessment of overall forest health in the region, the Regional Ecosystem Assessment Project (REAP). ("A First Approximation of Ecosystem Health", June 1993) It does not address social or economic needs, but focuses on biological and physical elements. The historic range of natural variability was compared to current conditions on a river scale. As a general rule, there is normally a range of conditions that meet a desired condition rather than a single state. The Record of Decision (ROD) for the President's Forest Plan and the Forest Ecosystem Management Assessment Team (FEMAT) report both extensively describe desired conditions.

The REAP report can be thought of as a "coarse" filter, with our North Fork Siuslaw Watershed Analysis being a "finer" filter for viewing forest health conditions. Some findings reported in this assessment include:

- "Today the Siuslaw National Forest is a fine-textured, homogeneous mosaic of small patches less than 40 years old within a matrix of predominantly middle-aged stands."

- "Western hemlock ecosystems in the central Coast Range have less than historic conditions of late-successional, multi-layered canopy stands..."

- "Late successional vegetation has been broken up and amounts of interior forest habitat have decreased. Amounts of edge between early and late successional vegetation have increased, and the contrast is high..."

- Due to stand replacement fires, the Siuslaw is actually increasing in mature forest if looked at in 1890 and also currently. Many of the Siuslaw stands are now entering the mature stage and starting to show characteristics of that stage. At the same time, fragmentation and harvesting are now pushing some of those stands back to an early seral state. Patches are becoming more uniform and the density of openings is increasing. Most streams in the managed landscapes exhibit degraded habitat conditions. Overall temperature is getting warmer than natural ranges.

- The historic range of early successional vegetation is estimated to be from 10-90%.

- The historic range of late successional, multilayered vegetation is estimated to be 12-90%.

- The historic range of pools/mile for the Siuslaw drainage is estimated to be from 40-62 pools per mile.

- The historic range of temperature for the Siuslaw River is estimated to be from 10-18° C.

- "Smoke emissions from Forest Service lands are lower now than they were historically".

**The North Fork Picture**

Holistically, the health of a forest also includes aquatic conditions. However, the following discussions will be limited to the role of vegetation and to vegetation changes. The forests of the North Fork drainage have been changing, obviously since their initial development. Human influence started with Native Americans from pre-history. What we have today is a legacy from the interactions of the earliest peoples on the biologic and physical processes to the current population and its interaction with the landscape. Care must be taken to put "what is natural" in a realistic context. Let us discuss the past, present and future trends in terms of types of disturbance that have changed the landscape and the effect on the current make-up of the forest.

Important causal agents of change in the vegetation of North Fork include: physical forces such as wind, water (including erosive events), fire and such biological agents as insects, disease, other animals, noxious plants and non-native vegetation. Humans, of course, have influenced the form and shape of current vegetation by reactions with and against these forces. This is often a result of human activities related to constructing road access, harvesting timber or other forest products, fishing, recreation, home-building and farming.

***Wind***

Wind is responsible for both small (single tree) to large expansive blowdown areas. Wind in combination with heavy rainfall and saturated soils have resulted in vast disturbances such as the 1962 Columbus Day storm (the Freida typhoon) where millions of board feet of timber blew down. We know that our worst storm winds come from the southwest with most blowdown occurring along the north and east boundaries

of clearcuts, especially on the leeward side of ridges. The problem of windfirmness was the primary reason that selective cutting and thinning were avoided in the Coast Range and the reason that clearcutting became the prescription of choice for forest managers. Western hemlock, in particular, is shallow rooted and therefore suspect when thinned out. Douglas-fir and Sitka spruce are naturally more windfirm when grown to promote a wide sturdy root system. Western redcedar was more often sheltered under other trees or was growing farther down the slope and thus protected from the gale winds (Ruth and Yoder, 1953).

In natural conditions, root rots often became initial sources of blowdown with additional trees added as the edge was exposed to wind. Wind was but one of many agents that naturally recycled the forest processes. In larger areas of blowdown, bark beetles would tend to congregate, start broods and attack nearby standing trees. Most often, losses to wind are small and provide important inputs into the natural system. Sometimes, winter storm conditions are right for catastrophic problems. The Columbus Day storm blew down an estimated 6 billion board feet of timber, equal to the amount of timber burned in the Tillamook fire of 1933. Another example was the 1951 storm (before the era of intense harvesting) where the blowdown was estimated at 3.7 billion board feet. An additional 455 million board feet of mortality occurred when the Douglas-fir bark beetle moved in. Under normal conditions, bark beetle incidence is low, but after this storm, immense populations built up and then emerged to attack standing trees.

Over the last forty years, wind has created the opportunity for many salvage sales in the North Fork basin. Nearly all blowdown was salvaged, only a few single trees were left on the forest floor. Forest management has accelerated the amount of blowdown, but certainly not above natural levels of potential disturbance.

Trends and management recommendations

Looking into the future, we can continue to expect periodic heavy losses from wind. Management actions can greatly influence the amount of blowdown in managed stands. Without stocking control (precommercial and commercial thinning), these primarily even-aged Douglas-fir stands will continue to differentiate slowly, and develop poor crowns and root systems. In recent years some of the most severe blowdown on the Mapleton Ranger District has been on young stands with interlocking crowns that have not been thinned out. All managed stands that are not treated with stocking control will be at higher risk. Stocking control in all land allocations is needed to maintain healthy vigorous stands. Obviously some blowdown is needed both on the uplands and in the riparian zones. Management should provide those prescriptively as needed rather than risking entire stands to blowdown stemming from a non-natural management decision. The natural stands can expect to have periodic episodes where blowdown occurs. It is important that management not chase individual trees or clumps but rather take action when larger losses may be predicted (e.g...The ROD uses 10 acres as the normal rule; this may be too high to maintain overall forest health and should be evaluated by a site specific prescription).

Probably the most damaged portion of the North Fork Watershed is the riparian zone. It has been logged and farmed from the earliest settlement days. It is highly deficient in standing or down large conifers. Promoting windfall of these large conifers is to be encouraged...the problem becomes "when" (the trees need to live to a ripe old age first) and then "how much" (spreading out the inputs throughout different periods of time into the stream).

In the early years of the modern harvest era, headwalls were not recognized for their potential instability. Many headwalls have been totally harvested and replanted to tight spacing. Herbicides or other forms of brush control were also used to maintain much higher than natural stocking levels. I believe these areas will be the most sensitive wind-prone portions of the landscape and many will blow down unless treated. In some cases, harvesting may not be recommended even for thinning. For those sites, girdling or otherwise killing trees to get within recommended stocking would be wise.

*Water*

Water is normally an agent that works with others when creating a disturbance. The North Fork drainage receives from 60-100+ inches of rain each year. Most of the precipitation falls as rain in the late fall through spring months. Minor snowfall occurs but accumulations usually do not last long.

Wet heavy snow is a principal agent of change in western red alder through breakage. The distribution of alder seems to be limited by the snow belt in the Cascades. The higher portions near Cape Mountain get lots of snow breakage in the alder but there doesn't seem to be a survival problem.

The lower sections of the Siuslaw watershed are influenced by both tidal and regular flooding. Only trees and other vegetation that can withstand periodic high water tables are to be found in those lower parts of the drainage. Western redcedar seems well adapted to those conditions. Unfortunately, cedar has been a prized commodity from the first days of settlement and is nearly gone (especially in the riparian areas).

Water ponds created by beaver were certainly more prevalent before humans "tamed" the land. The backup of water created valuable fish habitat in the North Fork and led to a diverse, complex riparian ecosystem.

Human actions of particular importance to changing water behavior have been diversions, diking and draining for agriculture needs.

Trends and management recommendations

There are a number of management actions that can promote positive change in terms of restoring the natural functions of water in the North Fork area. These will need to be evaluated in terms of effect on private lands. Allowing the buildup of beaver populations, planting and promoting western redcedar in areas with wet soils or flood zones, and replanting some of the higher elevation alder stands to conifers or a conifer/hardwood mix will all improve the overall health of the North Fork.

*Fire*

What is the natural function of fire in this landscape? Our view of the past may not be clear enough to say with certainty. We know that most of the Siuslaw and North Fork forests are a product of massive stand replacement fires from the mid to late 1800's. We also know that the Native Americans present at that time had a great deal of influence on creating those early fire situations. European settlement also brought fire into the landscape as a tool to help clear, clean and convert a forest environment to agronomy purposes.

So what is the truly natural role of fire in the coastal landscape? Speculation is that stand replacement fires with intervals of 400 or more years were the pattern of disturbance in cedar/spruce/hemlock forests prior to the 1850 fires (Agee, 1990). Dendrochronology and pollen analysis of old lake beds/bogs will increase our understanding. (See Calvin Young's pollen study of Triangle Lake). Climatic change may have played a role in the actual time period of ignition too. We definitely should not be too hung up on an interval period since accurate fire return rates have never been calculated and because intervals are long and may not be cyclic.

Trends and management recommendations

In terms of risk from major non-stand replacement fires, the forests of North Fork are currently relatively healthy.

It is unusual, but not unknown to get late summer/early fall weather patterns that develop into thunderstorms, even on the coast. The central Oregon Coast receives less than one lightning storm per 40,000 hectares per year (Agee, 1994). But natural ignition is not common. More than 90% of the fires in

the Coast Range are not natural, nor often have the potential for catastrophic losses (John Kwait, personal conversation). Small to medium sized fires, less than 50 acres, are the norm (but infrequent) and will likely continue in that trend. Suppression access is extremely good in the Coast Range right now. With a well-maintained road system, and the availability of resources and trained personnel, the chance of small localized fires becoming large have been low.

For many management reasons, the current road system will be reduced in size and fewer miles will be maintained. Less road users will result in lower risk of "fire starts". However, more hunters will likely be utilizing closed roads as hunting areas, increasing some risk in terms of fire starts by camp fires or smoking (see Carl West, personal communication). Public concerns for fire suppression response are being voiced by North Fork residents. The public perceives our mission, above all else, to be fire prevention and suppression. The forest/public interface becomes more complex each year. Wherever homes and human lives are concerned, fire protection will continue to be the top priority.

The North Fork watershed lies mostly in a land allocation called Late Successional Reserves (87%). In addition, large riparian buffers from 260-520 feet wide are draped across both sides of all riparian areas throughout the entire landscape. The presence of overstocked managed stands in those areas cause some fire-related problems. First, blowdown, as noted above, may become a major disturbance in the watershed. If salvage is restricted to acreage greater than 10 acres (see ROD, S&G C-14), there may be a greater risk of ignition.

Second, heavy stocking of evenaged trees creates a fuels problem. Imagine a fuels ladder with a thick nearly continuous layer of vegetation across a slope, surrounded by late successional forests. Specialists involved in assessing the 1987 Silver fire in Southwest Oregon found that condition. It appeared that the fire used those managed stands to gain intensity to make further runs. Because the fuels were so concentrated and so close to the ground, site damage appeared to be more severe than elsewhere.

There is also an important fuels condition to consider when implementing the President's Forest Plan. Snags, down woody debris and complex multi-storied canopies will be actively managed for across the landscape. These all may add some risk of catastrophic fire across broad portions of a landscape that is managed with the same prescription. Although the increased risk is probably small, the importance that past fires have had on the landscape cannot be understated nor taken for granted. The risk to private lands can be ameliorated with road closures, restricted access and with aerial surveillance.

Periodic prescribed underburning is not needed in the Coast Range where there is not a history of low intensity ground fires. Since non-stand replacement fires are nearly all human caused and small in size, there should not be a "let-burn" policy on this, or any other area, in the central Oregon coast.

***Insects***

At this time there are only a couple insects known that have the potential to adversely affect the North Fork forests.

Douglas-fir Bark Beetle

The most important "pest" insect is the Douglas-fir bark beetle (*Dendroctonus pseudotsugae*). Much has been written and studied about this beetle (Ryker, 1984). Infestations by the Douglas-fir bark beetle vary considerably in different parts of the Douglas-fir range. In the Coast Range, it usually is present in small numbers and appears to normally need some other agent to cause enough damage to trigger a beetle outbreak. Even prior to 1950, this insect was known as a very important potential pest (Circular # 817, U. S. Department of Agriculture, 1950). Windthrown trees are the most common Coast Range host material in which to breed. It is also common to find small outbreaks spreading from *Phellinus* root rot pockets. The normal pattern of attack is to build up to incredible numbers in down host materials and then to spread out into healthy stands from there.

*Trends and management recommendations*

The concerns for windthrow have been addressed above. As blowdown potential goes up so does the potential for excessive bark beetle damage. A natural stand will normally have plenty of checks and balances built in and will benefit from the periodic, small scale disturbances of this bug. However, if managed stands are not treated to reduce stocking, these stands will be at risk for higher insect attack in addition to blowdown. Terpenes given out from stagnated stands of trees exhibiting stress will attract broods of beetles, in turn killing more host trees. In addition to killing the trees, bark beetles reduce the value of the potential timber commodity by the introduction of blue stain fungi and other rot organisms. Normally this cycle only goes on a few years, but with well distributed, overstocked stands across the landscape, and/or large areas of blowdown, it is easy to foresee a possibility of a Douglas-fir bark beetle outbreak such as has not been seen to date.

The concern for *Phellinus* will be discussed below. Any widespread increase in the spread of *Phellinus* above natural levels will also increase potential bark beetle attacks.

Casual observance across the landscape of the Mapleton Ranger District will show many minor kill pockets of bark beetle. Most of us agree that the trend is definitely more frequent. The fact that many more seem to be multi-tree rather than single tree attacks has me concerned. However, if current kill rates don't suddenly expand, the snags added to the landscape will be a benefit.

Sitka spruce tip weevil

Another important insect that periodically creates disturbance to the level of a "pest" is the Sitka spruce tip weevil (*Pissodes sitchensis*). This is a problem common to all managed stands in the Sitka spruce zone (near the coast) and in the transition area between the Sitka spruce zone and western hemlock zone. Efforts of creating genetically resistant Sitka spruce have failed to date. Most reforestation efforts in the North Fork area and nearby have shied away from planting Sitka spruce because of this pest.

*Trends and management recommendations*

Re-establishing natural levels of Sitka spruce populations is a concern in many of the subwatersheds of the North Fork. Young juvenile trees are attacked each year resulting in the die back of the current terminal growth. Sometimes it seems that all spruce trees in young stands are hit. Continued attacks normally put Sitka spruce in the position of being a subordinate in the stand or dropping out of the stands altogether. An observation which may have management implication is that Sitka spruce grown under the canopy of other trees often does not seem to be attacked by the weevil. Spruce should not be planted in the open newly reforested stands. Instead, I suggest that Sitka spruce be planted in the following environments: underplanted in commercial thinning areas, under the canopy of red alder, in riparian zones with overstory cover and in brushy unburned reforestation units.

Others

The only other significant insect outbreak on the Siuslaw that I am aware of was the western hemlock looper attack in the 1940's that caused defoliation in the hemlock (Turpin, personal conversation).

***Disease***

Laminated root rot

The most important disease in North Fork and throughout the Forest is, of course, laminated root rot (*Phellinus weirii*). The role of *Phellinus* in the natural forest has been very positive. The creation of diversity through structure and species changes has greatly benefited all forest organisms and users from

unique plants to common fungi. Most of the concern, therefore, is in the large natural *Phellinus* population centers and in all managed stands.

The disease spreads about one foot per year by root to root contact of susceptible trees (Hadfield, 1986). Of the North Fork trees, only Douglas-fir is highly susceptible. Western hemlock and Sitka spruce are rated as intermediately susceptible (infected but rarely killed). Western redcedar seems to be tolerant (seldom infected) and red alder is immune. *Phellinus* is commonly the initial damaging agent in a stand that also has bark beetles and/or windthrow problems. Much has been studied and published on this disease, the most damaging root pathogen in the Pacific Northwest.

One of the highest known rates of infection in this region lies east of the North Fork watershed in the Indian and Deadwood creek drainages. An in-depth prescription was written by a local silviculturist a few years ago which focused on management options for managed stands of commercial thinning size. See the Foot Fungus Silviculture Prescription by Lori Robertson from 1991. Some observations from researchers she reported include:

- Without control foresters should expect to lose 50-90 % of predicted harvest after 2-3 rotations of Douglas-fir (Thies, 1948).
- Rule of thumb - damage doubles every 15 years (Nelson, 1980, Childs, 1970).
- Pathologists predict volume losses of 50% to a high of 70% over an 80-year rotation for infected sites if they are replanted with Douglas-fir after harvest (Hatfield, 1984)

*Trends and management recommendations*

Nearly every managed stand in the North Fork drainage has some level of *Phellinus*. Most of the disease pockets occur where Douglas-fir is the primary species, often the only species. Stands reforested in the 60's and 70's have a much higher bias toward Douglas-fir planting. In those stands, the problem may soon become acute. Recent past management was focused on treating the *Phellinus* problem one stand at a time, as they became candidates for commercial thinning. Watershed analysis is giving us an opportunity to look at a broader view, across individual watersheds. The current levels of spread are certainly much faster than in the natural landscape. *Phellinus* control should be started at the harvest and preharvest stage. Appropriate identification and prescriptive techniques applied then would maintain no more than natural levels of the disease. Quite often, infection centers are overlooked until they start showing up as yellow spots in the mid to upper portions of the slope. These usually become apparent by the time trees are 10-20 years old, as their roots tap into infected sources. All managed stands need to have *Phellinus* surveys (some of these can be just visual). Management options should be evaluated. These should include, but not be limited to:

- Cutting infected trees plus buffer, not planting (leave as brush pocket)
- Cutting infected trees plus buffer, plant to cedar or cedar/spruce/hemlock
- Cutting infected trees plus buffer, plant alder
- Do not cut, allow "natural" processes to continue; no attempt should be made to eliminate *Phellinus* from the landscape, just reduce unnatural levels
- Do not partial cut heavy *Phellinus* pockets, small clearcuts are appropriate
- Consider opportunities to increase diversity through developing transitional forage areas (meadows)

- Treat at all stages of stand development (preharvest, harvest, precommercial thin, commercial thin, intermediate cuts, rotational cuts)

- Treatment of managed commercial sized stands may need to be done regardless of whether they meet the 10 acre size as indicated in the ROD

- Treatment of managed stands should occur across the landscape, regardless of allocation from the Northwest Forest Plan, otherwise the desired future condition of these stand allocations and the riparian objectives may not be met

- Treatments in Matrix lands should be given priority due to the specific emphasis on commodity production

Black stain

Another potentially important disease in the Coast Range is black stain (*Ceratocystis wageneri*). The most common host is 10 to 30 year old Douglas-fir. This disease is now frequent in young stands in the Siskiyou province (to the south of the Coast Province). The potential for extensive damage is great in young overstocked stands in this area as well. The disease moves by passage from root to root grafts at the rate of 6-12 feet per year. Black stain movement is much faster than laminated root rot (Goheen, 1984). Death is quick. Weevils and bark beetles probably are responsible as long distance vectors of the disease.

*Trends and recommendations*

I have found an occassional young Douglas-fir tree killed by black stain in the vicinity of North Fork Siuslaw. To date these seem to be related to stressed trees next to roads that for some reason were exposed to the disease. Black stain disease has the potential to be devastating. Scattered and pockets of young Douglas-fir should not be just assumed to be *Phellinus*. Dead trees along roads, in particular, should be field checked to see if the characteristic black stain is present next to the cambium. Cutting one or two tree lengths around infected trees should minimize the spread. The most important stand tending treatments to prevent infection are to thin to reduce interlocking root systems and to minimize tractor logging (to reduce both tree damage and compaction).

Dwarf mistletoe

Western hemlock is the principal host of hemlock dwarf mistletoe disease. The infection sources are usually most common on older hemlock trees that have escaped the last period of stand replacement fires from back in the 1850's. There is recent work that indicates dwarf mistletoe provides a mineral rich supplement to the diet of area birds (see Katie). In older trees and stands, dwarf mistletoe can indeed also have many benefits in terms of providing structure (e.g. brooms and large dead branches). In young managed stands, infected trees soon become subordinates and die. In addition, they become more vulnerable to hemlock looper attacks, especially unable to withstand repeated attacks (Ruth and Harris, 1979).

Dwarf mistletoes are flowering, seed-bearing plants with endophytic systems that invade woody tissues of host trees. These plants produce a fruit that is expelled up to 50 feet from the source. The dispersal distance obviously increases with height above ground and above other crowns. Steep slopes also promote spread. The disease always moves slower in dense stands since seeds are intercepted by adjacent crowns.

*Trends and recommendations*

There is probably less mistletoe in today's forest than 50 years ago. Many of the mixed conifer (hemlock-spruce-fir) stands have been replaced with mostly Douglas-fir. Mistletoed hemlock was removed at the time

of the clearcut harvest. Only minor infection sources remain to those stands from adjacent infected trees. Mistletoe levels seem to be within appropriate levels in natural stands. The diversity and structure they provide outweigh losses in individual tree productivity. No catastrophic buildups of the disease are anticipated in a dynamic, diverse mature forest where western hemlock is but one of the many stand components. Managed stands need to be treated for mistletoe control where hemlock is an important part of the young stand and where mistletoe either occurs in adjacent overstory trees or already is present in the younger hemlock. Treatment will simply be removal of diseased trees through thinning or sanitation partial cutting.

***Noxious Plants***

Scotch broom

The North Fork Siuslaw watershed has become the adopted home of two noxious weed species, scotch broom, and tansy. Both have followed human migration and management into this area.

Scotch broom (*Cytisus scoparius*) has a wide distribution worldwide. It is found in Europe from Scandinavia to Spain and Portugal and eastward to Poland and Hungary (Miller, 1993). Scotch broom has also been introduced in other mild temperate climates such as New Zealand and Australia. As an invader and nitrogen fixer, broom often establishes itself on nearly any disturbed site and flourishes. A pure stand of broom can produce up to 33 kg N/hectare. Phosphorous and sulfur availability strongly influence broom growth and Scotch broom will often remove these nutrients from conifers.

Aggressive reforestation has promoted early stand closure in the managed stands of North Fork. This has limited the spread and impact of broom to the early years of the new stand. Broom is common along roads and in stands less that 15 years old. Populations are not nearly as high as along the eastern Coast Range. The most serious problem, locally, with broom is in the Oregon Dunes National Recreation Area and the Sutton management area. Along with beach grass and gorse it is rapidly invading the open dunes.

*Trends and recommendations*

Very little broom control has been done in this area. Because of its potential for spreading across the landscape, it should be treated in the North Fork landscape. The Forest Service has a Memorandum of Understanding with the Oregon Department of Agriculture to reduce the spread of certain noxious weeds, of which broom and tansy are listed. The Forest Service has also established new direction as per the 1990 Farm Bill amendment to emphasize treatment of noxious weeds.

Broom can be controlled in various ways. Chemical control can be attained with picloram and triclopyr among others. Biological control is being aggressively pursued, with only limited success to date. The Scotch broom seed weevil (*Apion fuscirostre*) and a twig miner, the (*Leucoptera spartifoliella*) are two species being tried in Oregon. Another weevil, the brown seed weevil (*Apion fuscirostre*) was introduced at four sites in Oregon, one being near Florence. Results were not encouraging with only 11% seed predation. Biological control should be used in conjunction with other methods. Manual control is also feasible. Glenn Miller reports that if broom stems are more than one inch diameter and cut low to the ground that regrowth is limited. Broom stems less that one inch can be pulled out of the ground.

Tansy ragwort

Tansy ragwort (*Senecio jacobaea*) is found throughout the North Fork watershed. Initial spread occurred quickly following roads. Tansy then spread into clearcuts and has since been seen along most reaches of stream within the watershed. Early importance of tansy control was because of impacts to cattle. The lower portion of the watershed has been farmed for decades and grazing has always been limited. Tansy is harmful and causes abortion of pregnant cows among other effects. Tansy has spread from private to public and also the reverse, from public lands to private lands.

*Trends and recommendations*

Tansy control efforts have been sporadic over the years, following budget trends. Hand pulling, top cutting, chemical and biological controls have all been used. These efforts certainly seem to have kept the plant in check, but not by any means controlled. Annual grading of roads may have in fact promoted tansy by providing an annual seed bed for some of this prolific seeder. With the trend toward brushier roadsides and managed stands, tansy may soon find itself in more of a subordinate role in the landscape. Biological releases of both the cinnabar moth (which works on the top of the tansy) and the flea beetle (which eats the root system) have both been made in the North Fork and seem to be partially effective. Hand pulling in the moist riparian zones may be promising where the root system can be pulled up intact.

The priorities for treatment should be:

1. Meadows and/or range allotments
2. Interface lands with neighbors
3. Riparian zones
4. Open roads
5. Closed roads
6. Managed and natural stands

Others

There are, of course, other plants and animals that are impacting the forest health of the North Fork area. Blackberry invasion is a constant concern for maintaining existing forage in meadows. With reduced clearcutting, forage issues will become very important over the next decades. Maintaining all available non-forest in high quality forage will be important.

As many as four range allotments have been issued in the analysis area, all small with less than 15 total acres involved. There are no current allotments in this area, however three small meadow permits issued for grazing are in current use covering around 4 acres of land. Cattle impacts, though small, have often been in the most sensitive portions of the riparian zone. Private lands (mostly in lower North Fork) will likely continue to emphasize cattle and grazing.

**Summary**

Overall, the forest health in the uplands is generally good. However, fragmentation of the landscape is a major concern. The distribution of habitats from a fish and wildlife perspective definitely is an issue. The forests and vegetation of the North Fork look relatively safe from an event of human-caused catastrophic intensity. My only real concern is in terms of that portion of the landscape that is managed (e.g. past clearcut). Managed stands cover 1/3 of the Federal lands of the North Fork and are distributed in patches across the landscape. These lands should be managed back toward a diverse natural condition as quickly as possible to reduce risk from outside agents of change.

Dan Karnes
District Silviculturist
Mapleton Ranger District
9/27/94

# *Appendix P*

## - PUBLIC COMMENTS - NORTH FORK OF THE SIUSLAW WATERSHED

Two public meetings were held to explain watershed analysis and to verify the preliminary issues which the team identified as important. Both meetings were held in the North Fork Grange Hall. The first meeting was held on July 19, 1994 followed by another meeting on the 24th of August.

Basic background data was presented at the first meeting. Booths were set up for each resource/issue. Handouts, including a map of the watershed, a brochure entitled "Understanding Watershed Analysis and the Role You Play", and comment cards were handed out. Many people expressed dissatisfaction with the President's Forest Plan and with the waterbarring that had been done in the previous months for watershed restoration purposes. Other concerns included fear that watershed analysis would impose further regulations on private landowners and that elk would look for forage on private pasture lands.

The second meeting was a chance for the watershed team to share what we had learned about the North Fork Siuslaw with the public. Each specialist gave a presentation on their area of expertise.

When the document was completed, the executive summary was mailed to all participants of the public meeting as well as other interested parties for their review. The complete draft was mailed to approximately 33 people, committees and interested groups.

All materials used in the public meetings, handouts, public notes and comments concerning this analysis and the draft document are on file at the Mapleton Ranger District.

# *Appendix Q*

## - NORTHERN SPOTTED OWLS - NORTH FORK OF THE SIUSLAW WATERSHED

### OWL ACTIVITY CENTER SUMMARY

There are eight known northern spotted owl activity centers within the North Fork Siuslaw watershed. Currently, only six of the eight are occupied by spotted owls. One (Center 38) is occupied by a spotted owl (male) and barred owl (female) pair. Another one (Center 42) was historically occupied by a spotted owl pair which has recently been displaced by a barred owl pair. Two of the remaining six centers are used by the same spotted owl pair. In other words, there is one spotted owl pair that has been utilizing two different activity centers. Therefore in actuality, there are only four known spotted owl pairs, one mixed pair and one barred owl pair within this watershed. There is also one resident single spotted owl within the watershed. The following summarizes the historical and current status of each owl activity center and owl pair. Table 2, of this appendix, shows current nesting and foraging habitat conditions. Table 3 shows thinning opportunities acreage which may be used to reduce fragmentation by accelerating development of mature conifer and old growth habitat within 0.7 to 1.5 miles of each owl activity center.

Owl Activity Center 23

This activity center encompasses some of the "better" spotted owl habitat within the watershed (Doug Barrett, personal communication). It is currently occupied by a spotted owl pair. This pair has produced only one juvenile since 1989. The owls have established two nest sites within two separate stands. Both stands contain remnant old growth patches. One nest, found in 1993, is located in a 30 foot tall old growth Douglas-fir snag. The other nest, found in 1994, is located in a broken-top old growth Douglas-fir within a smaller stand of mature/old growth conifer habitat approximately 0.5 miles to the south and east of the first nest. Both the 1993 and 1994 nesting attempts failed to produce any young. Banding indicates that this owl activity center is relatively stable and has shown that the owl pair occupying it has consisted of the same female and male since 1990.

Owl Activity Center 38

This activity center is located near the larger old growth patches remaining near the Pawn Trail area. Historically, a spotted owl pair was located in this activity center in 1990 and again in 1992. No nest for this pair was ever found. In 1990, a female barred owl was heard for the first time in this area. In 1992, the female barred owl was observed taking mice aggressively from the male spotted owl while in the presence of the female spotted owl. Today, this center is currently occupied by a male spotted owl and female barred owl pair. In 1994, this pair successfully fledged one hybrid owl nestling. The nest is located within a broken-top old growth Douglas-fir. It appears that the female barred owl has likely displaced (or replaced) the female spotted owl of the historical spotted owl pair.

Owl Activity Center 42

This activity center is located within the lower portion of the watershed. The stand of conifer it encompasses does not contain many old growth trees but does contain a large amount of western redcedar. This center was occupied by a spotted owl pair from 1990-1992. This pair nested in a 20 foot tall rotten snag in 1990 and produced one juvenile which later dispersed 6 miles to the Cape subwatershed within the Waldport Ranger District. This juvenile became the male of the "Wapiti Pair" within the Cape subwatershed (the Wapiti site has proven to be one of the Forest's most productive owl producing sites with five young produced in the last 5 years).

In 1993, only the male spotted owl was found and a female barred owl was heard. In 1994, a pair of barred owls were found and no spotted owls were detected leading surveyors to the conclusion that the historical spotted owl pair of this center has likely been displaced by the barred owls. The barred owl pair successfully fledged two young in 1994.

Cedar harvesting and helicopter yarding occurred within this stand and near the nest tree during the nesting season of 1990. Observations by an owl surveyor (Pete Loschl, PNW) showed that the spotted owls remained on the nest during the harvesting and yarding activities.

Owl Activity Center 46

This center is located about in the middle of the watershed. It is located within a stand containing large amounts of red alder and young conifer. The stand has been partially harvested in the past, however, there is a large amount of dead and down woody debris in the stand and remnant old growth snags in the latter stages of decay. The center is currently occupied by a spotted owl pair. This owl pair seems to have a larger home range than the other owl pairs within the watershed. The male owl has been found as far as 2.8 miles from the activity center.

This pair is the highest producer of juveniles within the watershed (and the forest). Two nests have been established within the stand a distance of 260 meters from each other. Both are located in snags ranging from 40-50 feet in height and 4-6 feet in diameter at breast height. The pair produced two juveniles in 1990, 1992 and again in 1994. A nest attempt which failed in 1993 may have been the result of an unseasonably wet nesting season.

Owl Activity Center 62

This center is located in the Northern portion of the watershed and is occupied by a pair of spotted owls. This pair was first found in 1989 and have produced two juveniles in the last five years. The nest tree was found in 1992 and was located in a broken-top old growth tree. The owls seem to utilize the mature conifer habitat to the east of the activity center where both the male and female have been found as far as 1.2 miles from the nest tree.

Owl Activity Center 79

This center, located near the southern margin of the watershed, is one of two centers utilized by the same spotted owl pair. The pair was last found at this center in 1991. The center is currently not occupied. Even though the owls may not be nesting here the habitat is still being utilized and is part of the owl pair's home range.

Owl Activity Center 92

Not much is known about this owl activity center as it has not been surveyed to the same intensity as the other centers. It is located in a relatively larger stand of mature conifer with remnant old growth patches within it. A female spotted owl was observed in this center in 1990 and a male spotted owl was found in 1991. There has been no observations of these owls together. It is not known if these owls have formed an owl pair. This center is also located approximately 2.4 miles north of center 42. This is important because the spotted owls displaced by the barred owls in 1994 may now occupy the habitat near this owl center.

Owl Activity Center 979

This center is located in a stand with a dense brush understory (unlike the more open understories of the other owl activity centers). The stand is predominantly forested with even-aged mature conifer with a rhododendron, red huckleberry and vine maple understory. This center is currently occupied by the

same spotted owl pair which utilizes center 79. There are two known nest sites within the area approximately 350 meters away from each other. Both nests were located in side-entrance cavities on western redcedar snags. This pair produced two juveniles in 1994 of which one appears to have died prior to dispersal. The home range of this pair seems two extend between owl activity center 79 and 979 and encompasses the mature conifer habitat slightly to the east between the two centers. Within that mature conifer habitat, the owl pair was found in 1992 in some "nicer" looking owl habitat (Doug Barrett, personal communication)

## RANKING OWL CENTERS

To optimize management of spotted owls and their habitat it is essential to prioritize management activities based on where they are needed most. To do this, each owl center was given a rank from 1 to 8 with 1 = Best conditions and 8 = Worst Conditions. Those owl activity centers with the worst nesting and foraging habitat conditions are higher priorities for management activities. Current nesting and foraging habitat conditions were used to rank the owl activity centers (mature conifer habitat was used to represent this habitat. Unfortunately, this habitat type is based on aerial photo interpretation and does not adequately indicate stand structure. Therefore, it is a poor representation of stand quality concerning spotted owls).

The first step was to rank the centers based on the percentages of nesting/foraging habitat within 0.7 miles of the center, looking only at federal lands. Step 2 ranked the owls based on the same criteria for the 1.5 mile radius. Both of the rankings were summed to provide a "total score". The total scores were ranked to provide an initial ranking. Any "ties" in the initial ranking were eliminated by giving the center which had the most "total" habitat (included the habitat on private lands) the lower number. Those with the most habitat received the lowest ranking. **Owl activity centers with the highest "final ranking" score have the highest priority for management activities.** The following table summarizes the results of this process:

**Table 1.** Owl activity center rankings based on nesting and foraging habitat conditions surrounding each center (summarized in Table 2).

| OWL ACTIVITY CENTER | Rank for 0.7 mile radii | Rank for 1.5 mile radii | Total Score | Initial Ranking | Final Ranking |
|---|---|---|---|---|---|
| 23 | 3 | 2 | 5 | 1 | 2 |
| 38 | 4 | 6 | 10 | 4 | 5 |
| 42 | 1 | 5 | 6 | 2 | 3 |
| 46 | 8 | 8 | 16 | 6 | 8 |
| 62 | 7 | 1 | 8 | 3 | 4 |
| 79 | 6 | 4 | 10 | 4 | 6 |
| 92 | 2 | 3 | 5 | 1 | 1 |
| 979 | 5 | 7 | 12 | 5 | 7 |

## CONCLUSION

Results of the last few years of surveys and recent population modeling show that the spotted owl population for the Siuslaw National Forest may be decreasing at a rate estimated to be 13% annually. Within this watershed, the spotted owl population has decreased 23% within the last 5 years. Unaccounted emigration of juvenile spotted owls may lower these values. The decline of spotted owl populations may largely be due to fragmentation of nesting and foraging habitat resulting in poor nesting success. Barred owl range expansion and the recent increase of barred owl numbers within the Siuslaw National Forest may be due to forest fragmentation. Because of the aggressive nature of barred owls towards spotted owls it is believed

that they may be outcompeting and, in some cases, actually displacing spotted owls from historic occupied sites. This appears to be the case at the two sites within the North Fork Siuslaw watershed.

The number of sites occupied by spotted owls and their nesting success may be increased if nesting and foraging habitat conditions can be improved and/or increased. By increasing the amount of this habitat we may reduce the competition between the spotted and barred owls. Some recommendations to accomplish this are:

1. Reduce fragmentation around known owl centers through thinning projects designed to accelerate the development of old growth habitat (this will also benefit red tree voles and flying squirrels (prey species of the spotted owl).

2. Improve stand structure within previously managed mature conifer stands. This can be done by creating large snags and topping large trees to increase nesting structure.

3. Increase additional forage base by creating higher densities of dead and down woody material on the forest floor thus benefiting other small mammals and small creatures.

4. Foraging habitat may be improved by reducing some of the brush understory through brush picking (greenery lease) and/or through brush release.

5. Species diversity and stand structure are important to spotted owls and may be increased by planting western redcedar in the understory of stands which have previously had this component removed through harvesting (cedar sales).

Close monitoring of spotted owl utilization at potential project sites should be conducted prior to and after implementation of these projects to evaluate the effectiveness of these types of management activities. This monitoring would provide valuable information in habitat management for this species and other old growth dependent species.

**Table 2.** Summary of potential suitable nesting and foraging habitat (mature conifer >18 inch DBH) within 0.7 and 1.5 miles radii of northern spotted owl activity centers.

| Owl Activity Center | Mature conifer within a 0.7 mile radius | | | | | Mature conifer within a 1.5 mile radius | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | USFS acres | Private acres | Total acres | Total Percent of Circle | USFS Percent of Circle | USFS acres | Private acres | Total acres | Total Percent of Circle | USFS Percent of Circle |
| 23 | 531 | 8 | 539 | 55% | 54% | 2,169 | 35 | 2,204 | 49% | 48% |
| 38 | 437 | 10 | 447 | 46% | 45% | 1,872 | 97 | 1,969 | 44% | 42% |
| 42 | 690 | 0 | 690 | 70% | 70% | 1,895 | 128 | 2,023 | 45% | 42% |
| 46 | 371 | 36 | 407 | 42% | 38% | 1,682 | 64 | 1,746 | 39% | 37% |
| 62 | 405 | 0 | 405 | 41% | 41% | 2,183 | 80 | 2,263 | 50% | 49% |
| 79 | 424 | 15 | 439 | 45% | 43% | 2,003 | 55 | 2,058 | 46% | 45% |
| 92 | 559 | 0 | 559 | 57% | 57% | 2,016 | 9 | 2,025 | 45% | 45% |
| 979 | 427 | 18 | 445 | 45% | 44% | 1,685 | 53 | 1,738 | 39% | 37% |

**Table 3.** Summary of potential thinning opportunities to increase suitable nesting and foraging habitat (mature conifer >18 inch DBH) within 0.7 and 1.5 miles radii of northern spotted owl activity centers.

| Owl Activity Center | 8-20 year old stands | | 21-50 year old stands | |
|---|---|---|---|---|
| | Acres within the 0.7 mile radius | Acres within the 1.5 mile radius | Acres within the 0.7 mile radius | Acres within the 1.5 mile radius |
| 23 | 250 | 797 | 4 | 333 |
| 38 | 148 | 301 | 114 | 479 |
| 42 | 57 | 154 | 50 | 179 |
| 46 | 80 | 651 | 63 | 448 |
| 62 | 220 | 654 | 0 | 98 |
| 79 | 3 | 295 | 82 | 323 |
| 92 | 0 | 146 | 33 | 183 |
| 979 | 21 | 190 | 95 | 613 |

# *Appendix R*

## - UNMAPPED LATE SUCCESSIONAL RESERVES - NORTH FORK OF THE SIUSLAW WATERSHED

The ROD describes unmapped Late Successional Reserves (LSR) as areas of potential nesting habitat within 0.5 miles of occupied marbled murrelet sites and 100 acres around known spotted owl activity centers or nest sites. Adjustments were made to the original edition of the President's Forest Plan (Option 9) GIS coverage to incorporate unmapped LSR's within this watershed.

**Occupied Marbled Murrelet Sites**

Currently, there is one documented observation of occupied behavior within the original mapped Matrix within this watershed. There are six observations within 0.5 miles of the Matrix. The ROD states that all contiguous existing and recruitment habitat for marbled murrelets (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years) within a 0.5 mile radius of the documented behavior should be protected. It also states that the 0.5 mile radius circle should be centered on either the behavior point or within 0.5 miles of the behavior point, whichever maximizes interior old growth habitat (ROD, C-10).

Marbled murrelets in this area seem to nest exclusively in mature conifer and old growth. All known nest trees have been in large old growth coniferous trees located within unmanaged (not modified by timber harvesting) conifer stands (Ralph, 1994). Old growth trees are likely selected for nest trees because they usually contain desirable nesting structures such as large, moss covered limbs (>5 inches diameter) and other deformities.

For the purpose of mapping the "unmapped" LSR's within the Matrix, mature conifer stands were used to represent potential marbled murrelet nesting habitat. Interior habitat derived from these stands (see Appendix T) was used to determine the best placement of the 0.5 mile radius circles around the occupied behavior sites. The result was the mapping of a new "island" of LSR within the Matrix. Topographic features such as ridges and valleys were used to delineate the LSR as well as taking into consideration the contiguity of the occupied stand.

**Known Spotted Owl Activity Centers**

In accordance with the ROD standards and guidelines (p. C-10), if a spotted owl activity center or nest site occurs within the Matrix it should be protected by retaining 100 acres of the best northern spotted owl habitat as close to the nest site as possible (mature conifer habitat was used to represent this habitat). There are two known nest trees that occur within the originally mapped Matrix within this watershed. Both of these nests occur within the same stand of mature conifer and are associated with owl activity center 979.

Approximately 200 acres of this stand were delineated as LSR to encompass the best owl habitat around both nest trees. Once again, topographic features were used to aid in this delineation.

**Future Unmapped LSR's**

Much of the mature conifer habitat within the Matrix has not been surveyed for marbled murrelets, however, most of it has been surveyed for northern spotted owls (refer to Appendix M for survey history). Additional survey effort will be necessary prior to any potential harvesting or removal of this habitat. All newly discovered murrelet or owl sites will need to be analyzed as described above and additional LSR mapping may result.

# *Appendix S*

## - THE ROADS DATABASE - NORTH FORK OF THE SIUSLAW WATERSHED

The Roads Database was designed to facilitate decisions about road management. Definitions of the columns are listed below:

**Road Segment**: Road number of individual roads and spurs. If a road was an old temporary road that no longer had a number, it was assigned a letter as a suffix.

**Topo Position**: Topographic position of the road.

R = Ridge top
M = Mid-slope
VB = Valley Bottom.

**Soil Risk**: The soil-risk category for the road location, based on the Soil Resource Inventory.

100% DT = 100% debris torrent risk
50% DT = 50% debris torrent risk
30% DT = 30% debris torrent risk
0% = little risk of landslides
100% = 100% slump area
50% = 50% slump area

**Construction**: Type of road construction used. If blank, construction method is unknown.

S = Sidecast construction
NS = Not Sidecast

**Past Stabilization**: Any restoration or stabilization work done as of 1994.

WB = Waterbarring
SP = Sidecast Pullback

**Risk Score**: A relative risk of landslides and erosion, based on assigning one point for each of the following categories - topo position, soil risk, construction method, and past failure. Highest risk = 4 and lowest risk = 1.

**Open/closed**: Whether the road is currently open or closed to traffic.

CG = Closed with gate

**Thin 5 years**: Whether the road will be needed to access a stand ready to thin in 5 years.

**Thin 10 years**: Whether the road will be needed to access a stand ready to thin in 10 years.

**Access pvt**: Whether the road accesses private land.

**Land Cat**: Land allocation IAW President's Forest Plan.

R = Reserve (LSR or Riparian)
M = Matrix

**Existing problems**: Any known erosion or landslides problems present.

**Past Failures**: Whether the road has had landslides.

Table 1. The roads database for the North Fork Siuslaw watershed.

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Billie | 5070-744 | R | 30% DT | S | | 1 | | | | | M | | |
| Billie | 5841-763(FS) | R | 100% DT | S | WB | 2 | | yes | | | R | | |
| Billie | 5841-763A | M | 100% slump | | | 1 | | yes | | | R | | |
| Billie | 5084-751 | M | 30% DT | | | 1 | | | | | M | | |
| Billie | 5842 | R | 100% slump | S | | 1 | | | | | R | | |
| Billie | 5842-771 | R | 100% DT | NS | | 1 | | | | | R | | |
| Billie | 5841-763B | M | 100% slump | | | 1 | | yes | | | R | | |
| Billie | 5841-763 (pvt) | M | 30% DT | S | | 2 | | | | yes | | | |
| Billie | 5841-763 (end) | M | 100% slump | S | | 2 | | yes | | | R | | |
| Cataract | 2553 | M | 0% | | WB 94 | 1 | | yes | | | R | | |
| Cataract | 2570-777 | M | 100% DT | S | WB | 3 | | | | | R | | |
| Cataract | 2570-754A | M | 100% DT | | | 3 | | yes | | | | | Y |
| Cataract | 7000-739H | M | 30% DT, 100% DT | | | 2 | | | | yes | | | |
| Cataract | 5841-739I | M | 30% DT | | | 2 | | yes | | | | | Y |
| Cataract | 2570-773 | R | 100% DT | | WB 94 | 1 | | yes | yes | | | | |
| Cataract | 2570-776 | M | 100% DT | NS | WB 94 | 2 | | | | | R | | |
| Cataract | 7000-739E | R | 100% DT | | | 2 | | | | yes | | | Y |
| Cataract | 2570-754 | R | 100% DT | S | WB 94 | 2 | | yes | | | R | | |
| Cataract | 2570-781 | R | 100% DT | NS | WB 94 | 1 | | | yes | | R | | |
| Cataract | 2570-783 | R | 100% DT | NS | WB 94 | 2 | | yes | yes | | R | | Y |
| Cataract | 2570A | M | 100% DT | | WB, SP 94 | 3 | | yes | yes | | R | | Y |
| Cataract | 2570-772 | M | 100% DT | S | WB 94 | 4 | | yes | | | | | Y |
| Cataract | 5084B | VB | 0% DT, 30% DT | | | 1 | | yes | | | R | | |
| Cataract | 2553A | M | 0% | | | 1 | | | | | R | | |
| Cataract | 2553-665 | M | 0% | | | 1 | | | | | R | | |
| Cataract | 2570B | R | 100% DT | | | 1 | | yes | | | R | | |

Table 1 (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cataract | 2570C | R | 100% DT | | | 1 | | yes | | | R | | |
| Cataract | 5084-718 | VB, M | 0% | | WB 94, SP | 1 | | yes | | | | | |
| Cataract | 5084-717 | VB,M | 0% | | WB 94, SP | 1 | | yes | | | | | |
| Cataract | 7000-739F | R | 100% DT | | | 1 | | yes | | | | | |
| Cataract | 5084A | VB, M | 0% | | | 1 | | | | | R | | |
| Drew | 5854, Sec 2 | R | 0% | S | | 2 | | yes | yes | | | | |
| Drew | 5070-753 | M | 0% | NS | WB | 0 | | | yes | | | | |
| Drew | 5070-754 | M | 50% slump | NS | WB | 1 | | | | | | | |
| Drew | 5854, Sec 12 | M | 50% slump | S | | 2 | | yes | yes | | | | |
| Drew | 5854-750 | R | 50% slump | S | WB | 1 | | | yes | yes | | | |
| Drew | 5854, Sec 34 | R | 0% | S | | 1 | | yes | yes | | | | |
| Drew | 5854-748B | M | 50% slump | | WB | 1 | | | | | | | |
| Drew | 5854-748C | M | 0% | | WB | 1 | | yes | | | | | |
| Drew | 5854-749 | M | 30% DT | NS | WB | 1 | | | | | | | |
| Drew | 5854A | M | 50% slump | | | 1 | | yes | | | | | |
| Drew | 5070-756 | M | 0% | NS | | 1 | | | yes | | | | |
| Drew | 5854-748 | R | 100% slump | S | WB | 1 | | | | | | | |
| Elma | 2500-638 | M | 30% DT | | WB | 1 | | | | | R | | |
| Elma | 2500, sec 18 | M | 30% DT | S | | 2 | | yes | | | R | | |
| Elma | 5084, Sec 32 | M | 0% | S | | 2 | | | | yes | | county road | |
| Elma | 2500-652 | R, M | 100% DT | S | WB | 3 | | | yes | | R | | |
| Elma | 2500-648 | M | 30% DT | S | WB | 3 | | yes | yes | | R | | Y |
| Elma | 2500-646 | R | 30% DT | S | WB | 1 | | | yes | | R | | |
| Elma | 2500-645 | M | 30% DT | S | | 2 | | yes | | | R | | |
| Elma | 2500-644 | R | 30% DT | S | WB | 2 | | yes | | | R | | Y |
| Elma | 2500-642 | R | 30% DT | S | WB | 1 | | | | | R | | |

Table 1 (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elma | 2500, sec 20 | R | 30% DT | S | | 1 | | yes | | | R | | |
| Elma | 2500-642A | M | 30% DT | | WB | 1 | | | | | R | | |
| McCleod | 2800-721 | M | 30% DT | S | | 3 | | yes | | | R | | Y |
| McCleod | 2570-771C | R | 50% DT | | | 1 | | yes | | | M | | |
| McCleod | 2570-774 | R | 50% DT | S | WB | 2 | | yes | | | R | | |
| McCleod | 2570-775 | R | 50% DT | S | WB | 2 | | yes | | | R | | |
| McCleod | 2570-778 | M | 100% DT | S | WB | 4 | | yes | yes | | | | Y |
| McCleod | 2570-780 | R | 50% DT | NS | WB | 1 | | | | | R | | |
| McCleod | 5070-731 | VB | 0% | S | | 2 | | | | yes | | | |
| McCleod | 2800-723 | R, M | 50% DT | S | | 3 | | yes | | | R | | |
| McCleod | 2570-785A | M | 100% DT | | | 3 | | yes | | | R | | Y |
| McCleod | 2610-714 | 75%R,25%M | 30% DT | S | | 2 | | yes | | | R | | |
| McCleod | 2610, Sec 30 | R | 50% DT | S | | 2 | | yes | | | | | |
| McCleod | 2570-787 | R | 30% DT | NS | WB | 0 | | | | | R | | |
| McCleod | 2570-771B | R | 50% DT | | | 1 | | yes | | | R | | |
| McCleod | 2570-786 | 25%M,75%R | 30% DT | NS | WB | 1 | | | | | R | | |
| McCleod | 2570-779 | R | 50% DT | NS | | 1 | | | | | R | | |
| McCleod | 2570-785C | M | 30% DT | | | 1 | | yes | | | R | | |
| McCleod | 2570-785 | R | 30% DT | S | WB | 1 | | yes | yes | | R | | |
| McCleod | 2570-785B | R | 30% DT | | | 1 | | yes | | | R | | Y |
| McCleod | 2070 | M | 30% DT | S | | 1 | | | | yes | | | |
| McCleod | 2570-771 | R | 50% DT | | WB | 1 | | yes | | | R | | |
| McCleod | 2570-765 | R | 30% DT | NS | WB | 0 | | ? | | | R | | |
| McCleod | 2570-753 | R | 50% DT | | WB | 1 | | | | | R | | |
| McCleod | 2570 | M | 30, 100% DT | S | SP | 4 | | yes | | | R | Sec 4, 8, 9 | Y |
| McCleod | 2510-775 | R | 50% DT | | | 1 | | yes | | | R | | |

Table 1 (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| McCleod | 2510-774 | R | 50% DT 100% DT | | | 1 | | yes | | | R | | |
| McCleod | 2570-782 | R,M | 30% DT | S | | 2 | | yes | | | | | |
| McCleod | 2570-771A | R | 50% DT | | | 1 | | yes | | | R | | |
| McLeod | 796A (sec 10) | M | 30% DT | | | 1 | | yes | | | M | | |
| McLeod | 2570-778A | R | 100% DT | | | 1 | | | | | | | |
| McLeod | 796C | M | 50% DT | | | 2 | | yes | | | R | | |
| McLeod | 796B | R | 100% DT | | WB | 1 | | yes | | | M | | |
| McLeod | 796 (sec 16 & 21) | M | 50% DT | | | 3 | | yes | | | | | Y |
| McLeod | 2500 (sec 10) | R, M | 30% DT, 100% DT | | | 2 | | yes | | | M/R | | |
| McLeod | 2500A | R | 50% DT | | | 1 | | yes | | | R | | |
| McLeod | 2500B | M | 0% | | | 1 | | no | | | M | | |
| McLeod | 2570, Sec 17 | R | 30% DT | S | | 2 | | | | | | | Y |
| McLeod | 5070-731 | VB | 0% | | | 1 | | | | | R | | |
| McLeod | 796-711 | R | 50% DT | | WB | 1 | | | | | M | | |
| McLeod | 2070 (FS) | M | 30% DT | | | 1 | | | | | R | switchbacks | |
| McLeod | 2070 (FS) | VB | 0% | | | 1 | | | | | R | w. of switchbacks | |
| Morris | 5842-768 | M | 0% | NS | WB | 1 | | | | | R | | |
| Morris | 5842-784A | R | 50% DT, 100% DT | | | 1 | | yes | | | R | | |
| Morris | 5842-787 | R | ? | S | WB | 1 | | | | | R | | |
| Morris | 5842-788 | M | ? | S | | 2 | | | | | R | | |
| Morris | 5842-784B | R | 50% DT, 100% DT | | | 1 | | yes | | | R | | |
| Morris | 5842-784 | R | ? | S | WB | 1 | | yes | | | R | | |
| Morris | 5842-778 | R | ? | S | WB | 1 | | | | | R | | |
| Morris | 5842-777A | R | 0% | | | 0 | | | | | R | | |
| Morris | 5842-769 | R | 100% DT | NS | WB | 1 | | | | | R | | |
| Morris | 5842-777 | R | 0% DT, 100% DT | S | WB | 2 | | | | | R | | |

Table 1 (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Porter | 5863-666E | R | 50% DT | | | 1 | | yes | | | R | | |
| Porter | 5084-668 Sec 6 | M | 0,100% DT | S | | 4 | | yes | | | R | | Y |
| Porter | 5084-668 Sec 25 | R | 50% DT, 100% slump | | | 1 | | yes | | | R | | |
| Porter | 5084-668 Sec 26 | M | 50% DT | | SP 94 | 2 | | yes | | | | | |
| Porter | 5084-668 Sec 31 | M | 0% | | | 1 | | yes | | | | | |
| Porter | 5084-668A | M | 30% DT | | | 1 | | | | | | | |
| Porter | 5084-668B | M | 30% DT | | | 1 | | yes | | | | | |
| Porter | 5084-668C | M | 30% DT | | | 1 | | yes | | | | | |
| Porter | 5084-665 | M | 30% DT | | | 1 | | yes | | | R | | |
| Porter | 5084-677 Sec 31 | R | 100% DT | S | WB, SP 94 | 2 | | yes | | | | | |
| Porter | 5863-666G | VB | 0% | | | 1 | | | | yes | R | | |
| Porter | 5863 | R | | | WB | 0 | | yes | | | | | |
| Porter | 5863-666H, Sec 32 | R | | | WB | 0 | | | | | | | |
| Porter | 5084-677 Sec 36 | | | | SP 94 | | | yes | | | | | |
| Porter | 5084-675 Sec 36 | R | | | SP 94 | | | yes | | | | | |
| Porter | 5063-660 | R | | | WB | | | | | | | | |
| Porter | 5084-668A | M | 100% DT | | | 3 | | yes | | | R | | Y |
| Porter | 5863-666F | R | 30% DT | | WB | 0 | | yes | | | R | | |
| Porter | 5863-666D | R | 50% DT | | | 1 | | yes | | | R | | |
| Porter | 5084-671 | R | 50% DT | NS | WB | 1 | | | yes | | R | | |
| Porter | 5084-668B | R | 50% DT, 50% slump | S | | 2 | | yes | | | R | | |
| Porter | 5863-666C | M | 50% DT | | | 2 | | yes | | | R | | |
| Porter | 5084-668C | M | 50% DT | | | 2 | | yes | | | R | | |
| Porter | 5863-666B | M | 50% DT | | | 2 | | yes | | | R | | |
| Porter | 5084-675 Sec 6 | R | 100% DT | S | WB | 2 | | yes | | | R | | |
| Porter | 5863-664 | M | 30% DT | S | WB | 2 | | | | | R | | |

Table 1 (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Porter | 5863-665 | R | 30% DT | S | WB | 1 | | yes | | | R | | |
| Porter | 5863-666 Sec 32 | R | 50% DT | S | WB | 2 | | yes | | | R | | |
| Porter | 5863-666A | M | 50% DT | | | 2 | | yes | | | R | | |
| Russell | 7000-740 | M | 30% DT | S | | 2 | | yes | | | M | | |
| Russell | 7000-739 | M | 30% DT | S | | 2 | | yes | | | M | | |
| Russell | 7000-743A | R | 30% DT | S | | 1 | | | | | M | | |
| Russell | 7000-743 | R | 30-100% DT | S | | 2 | | | yes | | M | | |
| Russell | 7000-740C | R | 30% DT | | | 0 | | yes | | | M | | |
| Russell | 7000-747 | M | 30% DT | S | | 2 | | | | | M | | |
| Russell | 2610-721 | R | 30% DT | S | | 1 | | yes | | | R | | |
| Russell | 2610-716 | R | 30% DT | S | | 1 | | yes | | | | | |
| Russell | 2610, Sec 3 | R | 50% DT | S | | 2 | | yes | | | | | |
| Russell | 7000-739A | M | 30% DT | | | 1 | | yes | | | M | | |
| Russell | 2610, Sec 35 | R | 30% DT | S | | 1 | | yes | | | | | |
| Russell | 5070-739D | M | 30-100% DT | | | 3 | | yes | | | M | | Y |
| Russell | 2610-722 | R | 30% DT | S | | 2 | | yes | | | | | Y |
| Russell | 2610A | R | 0% | | | 0 | | yes | | | M | | |
| Russell | 2610B | M | 0% | | | 1 | | yes | | | M | | |
| Russell | 2610C | M | 0% | | | 2 | | yes | | | R | | Y |
| Russell | 7000-739A | M | 30% DT | | | 1 | | yes | | | M | | |
| Russell | 7000-739C | R | 30% DT | | | 0 | | yes | | | M | | |
| Uncle | 5841-758 | R, M | 30-100% DT | S | | 3 | | yes | | | M | | |
| Uncle | 5841 sec 21,22 | VB | 100% DT | S | | 3 | | yes | | | | | |
| Uncle | 5841-759 | R | 0% | S | | 1 | | yes | | | M | | |
| Uncle | 5841-755 | M | 0% | NS | | 1 | | | | | M | | |
| Uncle | 5841-754 | M | 30% DT | S | | 2 | | yes | | | M | | |

Table 1 (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uncle | 5841B | R | 100% DT | | | 2 | | yes | | | M | | Y |
| Uncle | 7000-739H | M | 30% DT | | | 1 | | | | | | | |
| Uncle | 5841 Sec 15 | M | 100% DT | S | | 3 | | yes | | | | | |
| Uncle | 5841A | R | 100% DT | | | 2 | | yes | | | M | | Y |
| Uncle | 5070-763 | M | 100% DT | | | 3 | | yes | | | | | Y |
| Uncle | 7000-739J | R | 30% DT | | | 0 | | yes | | | | | |
| Uncle | 7000-739K | R | 30% DT | | | 0 | | | | | | | |
| Uncle | 7000-739L | R | 30% DT | | | 0 | | | | | | | |
| Uncle | 7000-739M | R | 30% DT | | | 0 | | | | | | | |
| Uncle | 5841-766 | R | 100% slump | NS | | 0 | | | | | R | | |
| Uncle | 5841-767 | M | 100% slump, 100% DT | NS | | 1 | | | | | R | | |
| Uncle | 5800 | R | 100% slump | | | 0 | | yes | | | R | | |
| Uncle | 5841 | R | 100% DT | S | | 3 | | yes | | | | | Y |
| Uncle | 5070-744 | R | 30%, 100% DT | NS | | 1 | | | | | M | | |
| West Branch | 5084B | VB | 0% | | | 1 | | yes | | | R | | |
| West Branch | 5800-662 Sec 26 | M | 100/50% DT | | | 2 | | yes | | | R | | |
| West Branch | 5084-657A | R | 30% slump | | SP, WB 94 | 0 | | yes | | | | | |
| West Branch | 5863-663 | M | 30% DT | S | | 1 | | yes | | | R | | |
| West Branch | 5863-657 | R | 30% DT | S | | 1 | | | | | R | | |
| West Branch | 5800A | M | 100% DT | | | 2 | | yes | | | R | | |
| West Branch | 5084, Sec 25 | VB | 0% | S | | 2 | | | | yes | R | county road | |
| West Branch | 2500-641A | R | 30% DT | | | 0 | | | | | R | | |
| West Branch | 2500-640 | R | 30% DT | S | SP 94 | 1 | | yes | | | R | | |
| West Branch | 5800-656A | M, R | 30% DT | | | 2 | | yes | | | R | | Y |
| West Branch | 5084, Sec 24 | M | 50% slump, 30% DT | S | | 3 | | | | yes | R | county road | Y |
| West Branch | 5800-655 | M | 100/30% DT | S | SP 94 | 4 | | yes | | | R | | Y |

Table 1 (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| West Branch | 5084, Sec 30 | VB | 0% | S | | 2 | | | | yes | R | county road | |
| West Branch | 5084-656 | M | 30% DT | S | WB, SP 94 | 2 | | yes | | | R | | |
| West Branch | 5084-657 | M | 30% DT | S | WB | 2 | | yes | | | R | | |
| West Branch | 5084-658 | M | 30% DT | S | | 2 | | yes | | | R | | |
| West Branch | 5084-659 | M | 30% DT | S | WB | 2 | | yes | | | R | | |
| West Branch | 5084A | VB | 0% | | | 1 | | yes | | | R | | |
| West Branch | 2500-641 | M | 30% DT | S | | 2 | | | | | R | | |
| Wilhelm | 5084-668 | R, M | 100% DT | S | | 3 | | yes | yes | | R | | |
| Wilhelm | 5084-714 | M | 0% | S | WB | 2 | | yes | | | R | | |
| Wilhelm | 5854D | M | 0% | | | 1 | | | | | R | | |
| Wilhelm | 5854C | M | 50% DT | | | 2 | | yes | | | R | | |
| Wilhelm | 5854B | M | 50% DT | | | 2 | | yes | | | R | | |
| Wilhelm | 5800 | R, M | 50% DT | S | | 4 | | yes | | | R | | Y |
| Wilhelm | 5084-712 | M | 50% slump | NS | | 1 | CG | | | | R | | |
| Wilhelm | 5084-711 | M | 50% slump | NS | WB | 1 | CG | | | | R | | |
| Wilhelm | 5084-710 | M | 50% slump | NS | WB | 1 | | | | | R | | |
| Wilhelm | 5084-676 | M | 50% slump | NS | WB | 1 | | | | | R | | |
| Wilhelm | 5084-673B | M | 50% DT | | WB 94 | 2 | CG | yes | | | R | | |
| Wilhelm | 5084-673A | M | 50% DT | | | 2 | | yes | | | R | Needs waterbar/block | |
| Wilhelm | 5084-673 Sec 36 | M | 100% DT | | WB, SP | 2 | CG | yes | | | R | | |
| Wilhelm | 5084-673 Sec 1 | R | 50% slump | S | WB | 2 | CG | yes | | | R | | Y |
| Wilhelm | 5084-672 | M | 50% slump | NS | WB | 1 | | | | | R | | |
| Wilhelm | 5084-670A | R | 50% slump | | | 0 | | yes | | | R | | |
| Wilhelm | 5084-670 | M | 50% slump | S | WB | 2 | | yes | | | R | | |
| Wilhelm | 5084-668 | R | 0% DT | S | | 0 | | yes | yes | | R | | |
| Wilhelm | 5084-668 | | | | | | | yes | yes | | R | | |

**Table 1** (cont.)

| Sub Water Shed | Road Segment | Topo Position | Soil Risk | Construct | Past Stabilization | Risk Score | Open/ Closed | Thin 5 Years | Thin 10 Years | Access Pvt | Land Cat | Comments | Past Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uncle | 5841C | M | 100%DT, 50% DT | | | 2 | | | | | | | |
| Uncle | 5841D | R | 100%DT | | | 1 | | | | | | | |
| Uncle | 5841E | R | 50% DT | | | 2 | | | | | | | Y |
| Uncle | 5841F | M | 100%DT | | | 1 | | | | | | | |
| Uncle | 5841-763A | M | 100%DT | | | 3 | | | | | | | Y |
| Uncle | 5841-763B | R | 100%DT | | | 2 | | | | | | | Y |
| Russell | 7000-739C | | 30%DT | | | 0 | | | | | | | |

# *Appendix T*

## - FRAGMENTATION ANALYSIS METHODOLOGY - NORTH FORK OF THE SIUSLAW WATERSHED

Fragmentation analysis was performed for remaining mature conifer habitat as well as interior habitat. The results of this analysis are shown in Table 4 of the main document. Mapping of mature conifer was done by selecting certain attributes from the vegetation GIS coverage as described in Appendix N. An ARC/INFO polygon coverage was created that used the reselection process to create a habitat map coverage representing the habitat types in Appendix N. This habitat coverage was called "NFKHAB" and was input into ArcView for analysis.

The North Fork Vegetation coverage was input into ARC/INFO GRID format and an AML was created to provide the following outputs:

- Total watershed area
- Total mature conifer perimeter
- Total mature conifer area
- Percentage of the watershed in mature conifer

The AML was also designed to "shrink" the remaining mature conifer habitat based on adjacent habitat types. The AML shrank the mature conifer polygon by 400 feet from grass/forb, brush/forb and sapling/pole habitat edges and 150 feet from young conifer habitat. No "shrinkage" occurred along pure hardwood or hardwood/conifer habitats (mainly riparian areas). This "shrinkage" represented edge effect and the resulting mature conifer polygon represented interior habitat. The AML also provided additional outputs based on this interior habitat as follows:

- Total interior perimeter
- Total interior habitat area
- Percentage of watershed in interior habitat
- Max interior patch size
- Min interior patch size
- Mean interior patch size
- Standard interior patch size
- Mean linear distance between interior patches

**Table 1.** Results of the AML for interior habitat.

| WSHED | EDGE (m) | AREA (Acre) | % | MAX (Acre) | MEAN (Acre) | DISTANCE (m) | # PATCH | TOT ACRE | TOT PERIM (m) |
|---|---|---|---|---|---|---|---|---|---|
| BILLIE | 38,400 | 968 | 0.36 | 348 | 74 | 162 | 15 | 2,776 | 20,943 |
| CATARACT | 23,280 | 446 | 0.13 | 195 | 32 | 349 | 15 | 3,346 | 24,167 |
| DREW | 33,780 | 551 | 0.27 | 199 | 39 | 127 | 15 | 2,007 | 14,672 |
| ELMA | 55,860 | 1,161 | 0.37 | 378 | 61 | 142 | 20 | 3,193 | 21,160 |
| L NFK SIUS | 30,540 | 418 | 0.12 | 122 | 21 | 260 | 22 | 3,546 | 17,301 |
| MCLEOD | 63,720 | 1,407 | 0.25 | 769 | 94 | 204 | 16 | 5,706 | 24,909 |
| MORRIS | 31,140 | 1,122 | 0.55 | 1,048 | 561 | 40 | 4 | 2,251 | 15,221 |
| PORTER | 26,760 | 486 | 0.23 | 230 | 49 | 313 | 11 | 2,085 | 16,215 |
| RUSSEL | 70,140 | 1,721 | 0.25 | 333 | 78 | 181 | 23 | 6,753 | 32,279 |
| SAM | 35,640 | 647 | 0.26 | 185 | 46 | 160 | 15 | 2,451 | 16,525 |
| UNCLE | 66,180 | 1,159 | 0.30 | 318 | 64 | 79 | 20 | 3,901 | 18,658 |
| WILHELM | 47,100 | 1,133 | 0.37 | 712 | 76 | 115 | 17 | 3,064 | 18,107 |

**Table 2.** Summary of mature conifer habitat statistics from NFKHAB using ArcView.

| WATERSHED | TOT ACRES | AREA (m2) | EDGE (m) | MAX (ac) | AVG (ac) | # PATCHES |
|---|---|---|---|---|---|---|
| BILLIE | 1,377 | 5,573,085 | 45,977 | 718 | 106 | 13 |
| CATARACT | 945 | 3,822,760 | 43,247 | 296 | 59 | 16 |
| DREW | 800 | 3,236,987 | 34,306 | 269 | 62 | 13 |
| ELMA | 1,552 | 6,278,993 | 59,919 | 429 | 82 | 19 |
| L. NORTH FORK | 717 | 2,900,878 | 36,795 | 463 | 34 | 21 |
| MUSLOW | 2,661 | 10,767,296 | 78,755 | 1,203 | 222 | 12 |
| MORRIS | 1,584 | 6,408,943 | 29,009 | 1,584 | 1,584 | 1 |
| PORTER | 825 | 3,340,152 | 33,477 | 327 | 69 | 12 |
| RUSSEL | 2,503 | 10,130,414 | 80,456 | 465 | 125 | 20 |
| SAM | 1,302 | 5,268,741 | 44,232 | 540 | 163 | 8 |
| UNCLE | 1,781 | 7,205,827 | 67,218 | 450 | 99 | 18 |
| WILHELM | 1,622 | 6,563,770 | 54,222 | 1,158 | 116 | 14 |

Using the above statistics from Tables 1 and 2, various fragmentation indices were calculated for both remaining mature conifer and interior habitat as follows:

**Habitat remaining**

$$\text{Habitat Remaining} = \left(\frac{\text{Habitat Area}}{\text{Total Watershed Area}}\right)\left(100\%\right)$$

**Diversity index (DI)**

This is a basic shoreline index equation used to relate length of edge to area. The higher the value, the higher the fragmentation.

$$DI = \frac{\text{PERIMETER}}{(2PI)x(\text{SQR ROOT }(\text{AREA}/PI))}$$

**Base index (BI)**

Same equation as diversity index but for watershed polygon. This gives a baseline value for shape of the watershed.

**Frag index (FI)**

Because all watersheds are different in shape it would not allow a comparison between two different watersheds. By deriving the ratio of the diversity index to the base index you can now compare different watershed to each other.

$$FI = \frac{DI}{BI}$$

**Patch density (PD)**

$$PD = \#\text{ PATCHES/WSHED AREA}$$

All of these index values were recorded in Table 4 of the main document. For ranking of watersheds, remaining habitat had the highest weighted value, followed in weight by the frag index, mean patch size and patch density.

# Cavity Nester Population Levels

*22-Dec-94*

| [redacted]tershed Name | | Grass Forb | Brush Forb | Sapling Pole | Young Conifer | Managed Mature | Natural Mature | Hard Wood | Hdwd Conifer | Totals | Population Level |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BILLIE | Acres | 107 | 260 | 294 | 195 | 83 | 1,294 | 155 | 388 | 2,693 | 54% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 13 | 0 | 0 | 8 | 1,294 | 15 | 116 | 1,447 | |
| CATARACT | Acres | 53 | 231 | 688 | 984 | 90 | 855 | 227 | 218 | 3,256 | 30% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 12 | 0 | 0 | 9 | 855 | 23 | 66 | 964 | |
| DREW | Acres | 37 | 13 | 247 | 300 | 95 | 705 | 107 | 503 | 1,912 | 46% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 1 | 0 | 0 | 9 | 705 | 11 | 151 | 877 | |
| ELMA | Acres | 32 | 195 | 374 | 194 | 154 | 1,397 | 198 | 649 | 3,039 | 54% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 10 | 0 | 0 | 15 | 1,397 | 20 | 195 | 1,637 | |
| L. NORTH FOR | Acres | 954 | 258 | 593 | 128 | 6 | 712 | 183 | 713 | 3,540 | 27% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 13 | 0 | 0 | 1 | 712 | 18 | 214 | 958 | |
| MCLEOD | Acres | 53 | 819 | 669 | 1,052 | 368 | 2,292 | 239 | 212 | 5,338 | 46% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 41 | 0 | 0 | 37 | 2,292 | 24 | 64 | 2,458 | |
| MORRIS | Acres | 23 | 234 | 101 | 161 | 317 | 1,267 | 12 | 136 | 1,934 | 70% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 12 | 0 | 0 | 32 | 1,267 | 1 | 41 | 1,352 | |
| PORTER | Acres | 0 | 193 | 400 | 402 | 193 | 632 | 102 | 162 | 1,892 | 38% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 10 | 0 | 0 | 19 | 632 | 10 | 49 | 720 | |
| RUSSEL | Acres | 1,194 | 746 | 450 | 819 | 203 | 2,300 | 182 | 858 | 6,549 | 40% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 37 | 0 | 0 | 20 | 2,300 | 18 | 258 | 2,634 | |

| Watershed Name | | Grass Forb | Brush Forb | Sapling Pole | Young Conifer | Managed Mature | Natural Mature | Hard Wood | Hdwd Conifer | Totals | Population Level |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SAM | Acres | 11 | 204 | 579 | 105 | 323 | 979 | 160 | 89 | 2,127 | 50% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 10 | 0 | 0 | 32 | 979 | 16 | 27 | 1,064 | |
| UNCLE | Acres | 0 | 538 | 164 | 781 | 402 | 1,379 | 241 | 397 | 3,500 | 45% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 27 | 0 | 0 | 40 | 1,379 | 24 | 119 | 1,589 | |
| WILHELM | Acres | 51 | 321 | 261 | 211 | 224 | 1,398 | 143 | 456 | 2,840 | 56% |
| | POP% | 0 | 5 | 0 | 0 | 10 | 100 | 10 | 30 | | |
| | Value | 0 | 16 | 0 | 0 | 22 | 1,398 | 14 | 137 | 1,587 | |