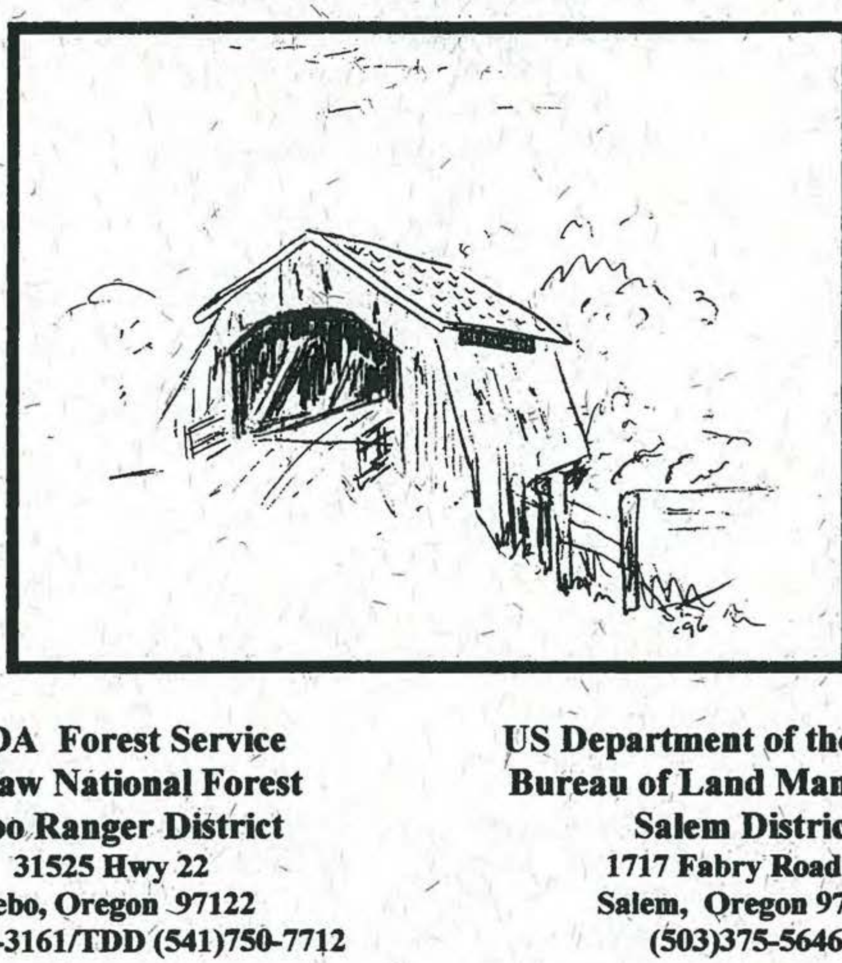
DRIFT (SILETZ) Watershed Analysis



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1. INTRODUCTION

Watershed is described in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD) (USDA and USDI 1994c) as follows:

> Watershed analysis is a systematic procedure to characterize the aquatic, riparian, and terrestrial features within a watershed. Managers will use information gathered during the watershed analyses to refine riparian reserve boundaries, prescribe land management activities including watershed restoration, and develop monitoring programs (USDA and USDI 1994c: 10).
>
> Watershed analysis is one of the principal analyses that will be used to meet the ecosystem management objectives of the standards and guidelines. Watershed analyses will be the mechanism to support ecosystem management described in the standards and guidelines at approximately the 20 to 200 square mile watershed level. The use of watershed analysis to meet Aquatic Conservation Strategy objectives is a more narrow focus and is just one aspect of its role (USDA and USDI 1994c: E-20).

For more discussion of the role of watershed analysis to meet ecosystem management objectives, see the ROD, pp. E-20 to E-21.

The watershed analysis process documented in this report follows the six step process outlined in Ecosystem Analysis at the Watershed Scale- Federal Guide for Watershed Analysis, Version 2.2 (EPA and others 1995). The process consists of six steps:
1) Characterization
2) Issues and Key Questions
3) Current Conditions
4) Reference Conditions
5) Synthesis and Interpretation
6) Recommendations
Steps 3 and 4 are combined in one chapter to compare the reference and current conditions.

The Assessment Report for Federal Lands in and Adjacent to the Oregon Coast Province (USDA 1995a) provides information and makes recommendations that are helpful in placing the watershed within the context of the Oregon Coast Province.

1. INTRODUCTION

2. CHARACTERIZATION

2.1 The Analysis Area

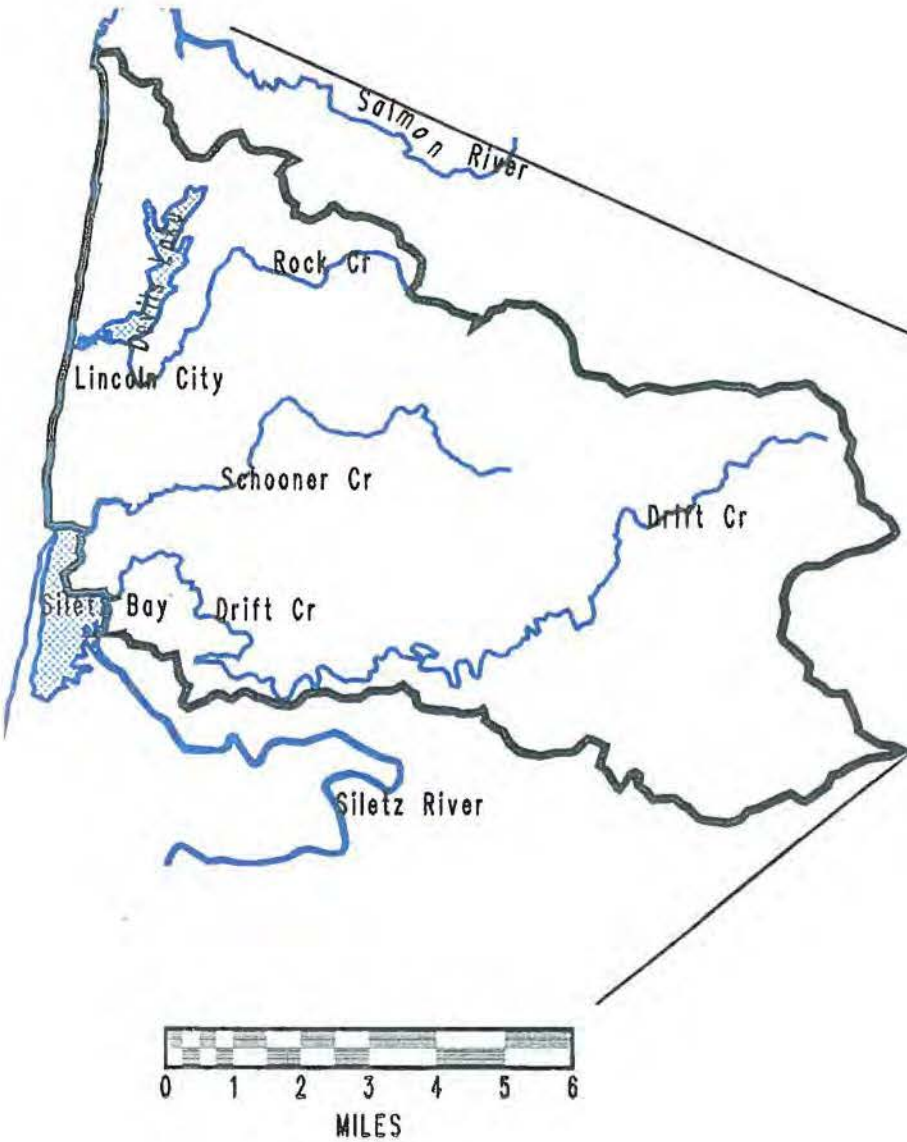
The Drift (Siletz) watershed analysis area occupies about 48,000 acres between the drainages of the Salmon River and the Siletz River (Map 1, following page). The streams in the analysis area (Map 19, following Map 1) flow into the Pacific Ocean via Siletz Bay or Devils Lake/D River. The analysis area includes two watersheds, Devils Lake and Schooner Creek/Drift Creek. Throughout this report, Drift (Siletz) refers to both of these watersheds.

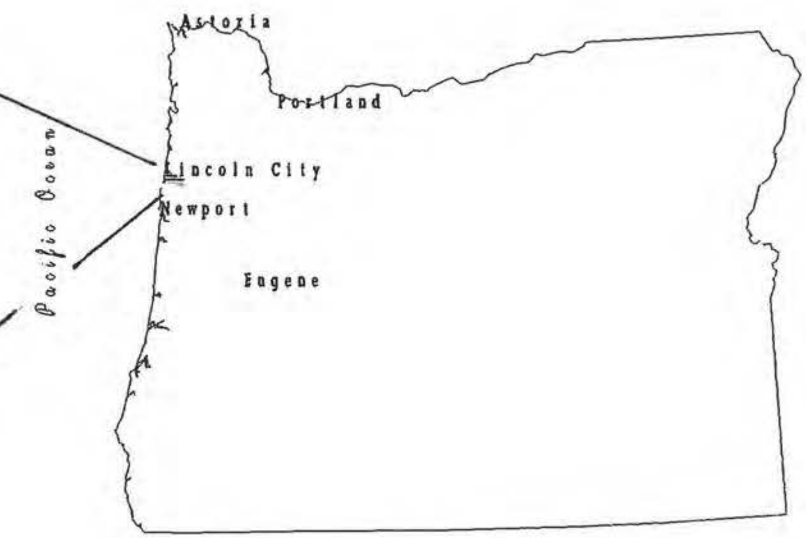
The analysis area can be subdivided into three broad areas (Map 3) as to ownership and land use. The western portion, bordering the Pacific Ocean, is occupied by Lincoln City which runs the entire length of the analysis area except for Roads End, an unincorporated area at the extreme north end. The total area within the Lincoln City limits is approximately 4,480 acres. Devils Lake, which borders the city limits, is a 680 acre fresh water lake that empties into the Pacific Ocean via the D River, often cited as the world's shortest river. East of the city, much of the area can be classified as rural residential with scattered houses and small land holdings extending up Schooner Creek, Drift Creek and Rock Creek as well as around the shores of Devils Lake. This area is largely buffered from Forest Service land by a belt of industrial forest land owned by the Boise Cascade Corporation. To the east, the next area is a relatively solid block of the Siuslaw National Forest, administered as part of the Hebo Ranger District. To the east of the Forest Service land is a block of mixed ownership, composed of industrial forest land and federal lands administered by the Bureau of Land Management. Table 2.1-1 summarizes statistics for the individual subwatersheds comprising the analysis area.

Table 2.1-1: Vital statistics of subwatersheds

Subwatershed	HUC Watershed Number	Acres	% FS Ownership	% Managed Stands	Road Density	Potentially High Fish Habitat Stream Miles	% Mature Conifer
Erickson	1710020447B	1857	86.9	57.5	5.52	3.80	36
Gordey/L.Drift	1710020447K	4644	35.1	41.9	4.65	5.84	41
Lower Schooner	1710020447A	4916	22.6	56.9	4.71	6.59	25
Lincoln City/D.Lake	1710020448A	7179	2.2	26.6	3.64	3.30	22
North	1710020447I	2832	100.0	50.1	4.86	3.18	50
N Fork Schooner	1710020447C	2139	77.5	44.5	5.67	2.49	54
S Fork Schooner	1710020447D	2729	76.8	53.5	5.62	3.85	51
Quarry	1710020447J	2462	96.6	34.4	5.40	2.86	24
Rock 1	1710020448B	3413	55.6	66.9	6.59	6.32	14
Sampson	1710020447G	6326	14.4	81.6	4.59	2.17	16
Smith	1710020447F	2084	0.3	75.9	5.24	1.37	38
Upper Drift	1710020447E	5155	18.9	66.9	4.91	5.80	23
Wildcat	1710020447H	3039	100.0	26.5	1.98	2.48	63

Drift Creek (Siletz)
Map 1: vicinity map





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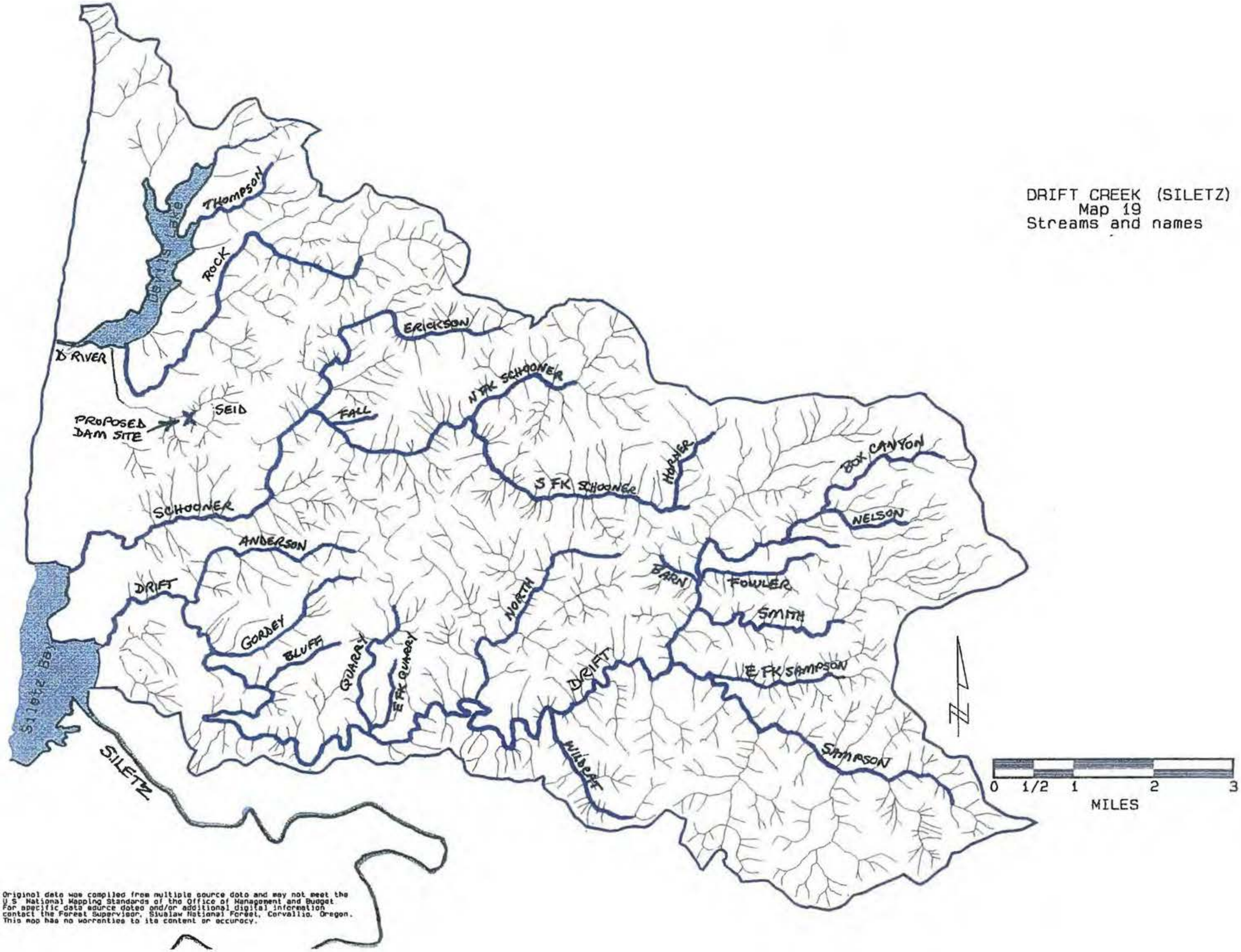
DRIFT CREEK (SILETZ)
Map 19
Streams and names



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2.2 Land Allocations/Plan Objectives/Regulatory Constraints

- All the land administered by the Forest Service (FS- 20,242 ac.) and Bureau of Land Management (BLM- 2,198 ac.) is designated in the Northwest Forest Plan as part of the Northern Coast Range Adaptive Management Area (AMA) (Map 3). The AMA is jointly managed by the Siuslaw National Forest (Hebo Ranger District) and the Salem District of the BLM (Tillamook and Mary's Peak Resource Areas). General objectives for AMA's, as well as specific direction for the Northern Coast Range AMA, are given in the ROD (USDA and USDI 1994c, D-1, D-4, D-8, D-15).

- All but 851 acres of federal land in the watershed analysis area are designated as Late-Successional Reserves (LSRs) in the Northwest Forest Plan.. See pages C-9 through C-21 of the ROD for LSR objectives, standards and guidelines.

- The LSR is designated critical habitat for marbled murrelets and northern spotted owls (USDI 1996, 1992). Critical habitat is essential for the conservation of a species because it contains primary constituent elements of nesting and/or foraging or roosting habitat.

- The analysis area also includes 80 acres of the Cascade Head Scenic Research Area (CHSRA), an Administratively Withdrawn Area. All land under this designation is categorized as "unsuitable for timber production". Congress designated Cascade Head as the first Scenic-Research Area in the United States on December 22, 1974 (Public Law 93-535). CHSRA is a Biosphere Reserve designated by the United Nations for research and other purposes. Pages IV-81 through IV-86 of the Forest Plan (USDA 1990) provide a full description standards and guidelines for this area.

- Overlaying the above land allocations are approximately 12,963 acres of riparian reserves. Drift Creek watershed (exclusive of the Schooner Creek watershed) is designated a Tier 1 Key Watershed (26,548 ac.). Riparian reserves and key watersheds are two components of the Northwest Forest Plan's Aquatic Conservation Strategy. See the ROD pages B-9 through B-20, C-9, C-30-38 and D-9 for a full description of these allocations and applicable standards and guidelines.

- The analysis area also contains 55 acres included in the Siletz Bay National Wildlife Refuge. The refuge was established in 1990 with the goal of protecting and restoring rapidly disappearing coastal wetland habitats and upland buffers needed to maintain healthy fish and wildlife populations (USDI 1990).

- The *Devils Lake Watershed Coordinated Resource Management Plan* (CRMP) was completed in 1993. This plan recommends a large number of general guidelines for the management of resources as they relate to water quality in the Devils Lake watershed. This plan was put together by a broad spectrum of ownerships/management agencies in the watershed and represents an effort that "...integrates them in a single, unified action program of use and management which minimizes conflicts, benefits ecosystems functions and biodiversity, and is consistent with applicable laws, property rights, and objectives of resource owners, managers, and users" (Lincoln County Soil & Water Conservation District and others 1993: 1). The Forest Service was a key participant in the formulation of this plan.

- The private land in the analysis area is subject to numerous federal, state and local laws. Private timber lands are subject to the Oregon Forest Practices Act administered by the Oregon Department of Forestry.

2.3 Erosion Processes

- Most sediment is produced by debris torrents that occur in first and second order stream channels.
- Clearcut and road landslides have increased the rate of sediment introduction into all three basins.
- The southern part of the analysis area has a high risk for landslides.
- Major earthquakes occur approximately every 300 to 500 years. When they do occur, they cause coastal areas to sink and may trigger large landslides.

2.4 Geology

- The majority of the Drift Creek watershed is underlain by the Siletz River Volcanics, sea-floor basalts that are the oldest rock formation in the Coast Range. They are overlain by younger sedimentary rocks, the Tyee Sandstone and the Yamhill Formation, a siltstone, in the northeastern portion of the watershed. The western part of the watershed along the coast is underlain by soft sedimentary rock that includes the Yamhill Formation, the Alsea Formation, and Quaternary terrace deposits (Walker and MacLeod 1991) (Map 5).
- The underlying bedrock determines many aspects of the landscape. Stream channel gradient, confinement and substrate are all influenced by lithology. In general, in the Coast Range, streams on basalt bedrock usually have a steeper gradient than those on sedimentary bedrock. In the Drift (Siletz) area, there is a higher percentage of stream miles that are confined in the Siletz River Volcanics as compared to streams on sedimentary bedrock.. Drift Creek itself is very incised and has very little floodplain development, even though the mainstem is low-gradient and highly sinuous. Substrate type and size are also determined by the bedrock. The Siletz River Volcanics contain lava flows that are resistant to erosion and produce cobbles and gravels that do not break down easily; volcanic breccias that weather to clay, gravel and cobbles; and pillow basalts that weather to clay. Tyee Sandstone tends to produce gravels and sand that are not as durable as the volcanics. The Yamhill Formation is highly erodible and weathers to clays and silts (Map 5).
- Geology has also influenced land ownership patterns. Most of the National Forest land is located in the steep slopes of the Siletz River Volcanics. Private land, on the other hand, is mostly located on the gentle ground underlain by sedimentary rocks. The exception to the rule is the Sampson Creek subwatershed, which is underlain by Siletz River Volcanics and is mostly private timber land.

Stratifying the Watershed by Landtype Associations

The Coast Range has been divided into Landtype Associations (LTAs), based on the underlying geology and topography. The Drift (Siletz) area covers portions of five LTAs, each with different characteristics (Maps 6 and 7). The individual LTA's in Drift (Siletz) area are compared in Table 2.4-1. Each one is described in more detail below:

2Z and 3Z: The coastal lowlands around Lincoln City and Devils Lake. It is underlain by soft sedimentary rock, and has relatively low relief. Compared to the other LTAs in this watershed, the coastal lowlands contain the highest percentage of low-gradient, unconfined stream miles.

2P2: This LTA is underlain by Siletz River Volcanics, and has moderate relief. It has a moderate susceptibility for landslides (Map 6), which is borne out by the landslide survey (Map 7). It includes most of Rock and Erickson Creek subwatersheds, and parts of North Fork Schooner and Lower Schooner Creek subwatersheds.

2PSR2: The majority of this LTA is underlain by Siletz River Volcanics and contains the steepest ground in the watershed. As a result, much of this LTA has a moderate to high susceptibility for debris torrents. The photo inventory of existing landslides also shows that this area has the highest number of landslides in the watershed. It includes all of the Sampson and Wildcat subwatersheds, and parts of Smith, Upper Drift, North Quarry and Gordey subwatersheds.

2B: The topography in this LTA is relatively subdued compared to the surrounding LTAs. It forms a plateau, and is underlain by gently sloping Tyee Sandstone and Yamhill Formation sedimentary rocks in the northeast portion, and a sill of more resistant volcanic rock in the far western part. As a result, landslide susceptibility is low in this LTA. It contains parts of the Upper Drift, Smith, South Fk Schooner, North, Quarry, Lower Schooner and Gordey subwatersheds.

Table 2.4-1: Comparison of Landtype Association Characteristics in the Drift Creek Watershed Analysis Area

LTA	Dominant bedrock	% stream miles low-gradient, unconfined to moderately confined	High-potential fish habitat stream density (miles/square mile)	Relative debris torrent risk
2P2	Siletz River Volcanics	15.0	2.27	Moderate
2PSR2	Siletz River Volcanics	9.8	1.06	High
2B	Sedimentary rocks	8.9	1.18	Low
2Z	Sedimentary rocks	30.0	8.53	Low
3Z	Sedimentary rocks	26.0	----	Low

2.5 Water Quality

- Lincoln City has water rights on Schooner Creek.
- The Kernville-Gleneden Beach-Lincoln Beach Water District has water rights on Drift Creek.
- The Confederated Tribes of Siletz Indians of Oregon may have treaty implied water rights within the analysis area (Les McConnell, pers. comm. August, 1996).
- Two years worth of temperature data indicate that Drift Creek water temperatures exceed DEQ standards.
- Devils Lake is outside of DEQ's acceptable standards for algae and pH during summer months.
- A number of individual water rights are located throughout the analysis area.

2.6 Aquatic Species and Habitats

- Coho and steelhead have been petitioned for listing under the Endangered Species Act. Coho are proposed for listing as threatened. Steelhead have been listed by the National Marine Fisheries Service (NMFS) as possible candidates for listing.
- Coho and steelhead populations are severely depressed in Drift Creek and Schooner Creek basins.
- Coho spawning counts in Rock Creek are among the best on the northern coast of Oregon; however, they are still depressed compared to historic conditions.
- Devils Lake appears to be the critical factor in the relatively high abundance of coho in Rock Creek.
- Drift Creek is listed as a "source area" for steelhead by the Oregon Department of Fish and Wildlife (ODFW) (Buckman et al.).
- Drift Creek is the only key watershed in the Siletz basin.
- ODFW management for Drift Creek has shifted to a natural production scheme (i.e., no hatchery releases within the basin).
- South Fork Schooner Creek has been selected by the U.S. Forest Service Pacific Northwest Research Station (PNW) as a long term monitoring stream. It is unique on the northern coast of Oregon because of the long term data set of adult, juvenile and smolt populations.

2.7 Riparian Conditions

- Functional riparian areas are an integral part of late successional ecosystems. This includes early seral species such as alder, dominating sites which are prone to continued disturbance (landslides, slumps, areas of high beaver activity, etc.).
- The conditions that allow riparian areas and wetlands to function at their full capacity are dependent on both natural and human-caused disturbances. Human-related activities can seriously impair the capability of riparian areas and wetlands to route and store water and provide fish and wildlife habitat.
- In the upper Drift Creek watershed and in much of Schooner, Erickson and Rock Creeks, the primary human disturbance to riparian areas has been logging and road building.

- In the lower portion of Drift Creek, and primarily on private land, the disturbances to riparian and wetland areas include human related activities such as logging, road building, grazing, waste treatment, water source development and exotic species (plant and animal) introduction.

2.8 Vegetation Patterns

- The mild, wet climate and low elevation of this analysis area provide ideal growing conditions for a wide variety of plants, creating one of the most productive timber zones in the world.
- The highest point in the watershed is one of the points on Stott Mountain, with an elevation of approximately 3,100 feet. The lowest elevation is sea level - the beaches along the west edge of the watershed.
- According to the 1961 through 1990 average rainfall map, rainfall averages 80 inches per year on sites at lower elevations near the ocean to 120 inches per year on sites at higher elevations along the eastern edge of the watershed (State Climatologist, Oregon Climate Service).
- Eighty percent of the precipitation occurs during the months from October through March.
- Historically, August is the warmest month of the year with an average high air temperature of 73 °F. The average low temperature in January (historically the coldest month of the year) is 36°F.
- The Assessment Report for Federal Lands In and Adjacent to the Oregon Coast Province (USDA 1995a:15-16) identified and mapped two soil/climate zones within this watershed, the Coastal Fog Zone and the Central Interior Zone (Map 2).
- Fire and wind are the two most dominant natural disturbance processes that affect landscape vegetation patterns in this watershed. These processes are clearly described in the provincial assessment report, see <u>Coastal Fog Zone (Block 1)</u> on pages 20 through 23 and <u>Central Interior Zone - Lincoln County (Block 5)</u> on pages 24 and 25 of the assessment report for information regarding disturbance size, behavior, frequency and severity. These fire regime blocks correspond closely to the soil/climate zones since the gradation of fire effects appear to be strongly related to climate.
- Fire disturbance history for this watershed:
  - In the 1840's, most of the central portion of the watershed (including virtually all of the current National Forest System lands) burned as part of a 30,000+ acre fire (Teensma and others 1991).
  - Between "about 1849 and 1902," a portion of a 50,000+ acre fire/fires burned through the northwest corner of the watershed "nearly to the coast" (Morris 1934).
  - In the 1850's through the 1870's, several medium to large sized fires (100 to 10,000 acres) burned areas within the watershed: at the head of the North Fork of Schooner Creek, the head of Thompson Creek, and the ridge south of the South Fork of Schooner Creek (Teensma and others 1991).
  - In approximately 1904, the upper end of Box Canyon burned (Willis and Weidlein 1954) in what appears to have been a severe (>70% stand mortality), medium size disturbance (100 to 1,000 acres).

* There is some evidence that at least 3,000 acres along the southeastern edge of the National Forest boundary burned sometime between 1690 and 1720. This fire may have been much larger, but the fires in the 1840's limit our ability to determine it's size and extent based upon current vegetation.

- Oblique aerial photographs of the Forest from 1930 and panoramic photos from Cougar Mountain Lookout in 1934 indicate that these fires left a mosaic of young conifer stands, alder stands, and brush fields on the landscape. Generally, young conifer stands blanketed the western half of the National Forest and were restricted to north facing slopes and bottoms in the eastern half of the Forest. Many ridges and south facing slopes, and some bottoms were dominated by alder or brushfields.
- We have little information on specific wind disturbance events in this watershed. We know that strong winds with gusts up to 100 mph occur with major storm events. Generally, the effect of such strong winds in the Coast Range is the creation of 1-10 acre forest openings due to tree blowdown and such blowdown most commonly occurs along ridgetops and in stream buffers adjacent to harvest units.
- One strong storm, the Columbus Day Storm in October, 1962 resulted in larger areas of blowdown in this watershed. Several areas, 20 to 50 acres in size had extensive blowdown and were subsequently clearcut to more windfirm boundaries within two or three years after the storm.
  * Recent wind disturbance history includes:
  * October, 1962 -- Columbus Day Storm
  * March 27, 1963 -- gusts over 100 mph occurred along the Oregon coast
  * December 27-29, 1965 -- 75-120 mph winds unofficially recorded on the coast
  * October 2, 1967 -- 100-115 mph winds recorded along the coast
  * March 26, 1971 -- scattered damage along the coast
  * December 18 -- 22, 1971 -- wind and rain caused a lot of damage
  * January 7, 1975 -- gusts reaching 70 mph on the coast
  * March 24, 1976 -- widely scattered blowdown on ridgetops
  * February 12-13, 1979 -- wind and ice cause extensive top breakage
  * November 14-15, 1981 -- most intense storm since the Columbus Day Storm
  * December 19-26, 1983 and November 1-2, 1984 -- 90 mph winds on the coast
  * December 12, 1995 -- 120 mph winds on the coast
- Because wind events are so common and have the potential to impact management activities in this watershed, wind events were studied in the early 1950's. The study was similar to that described in the wind/blowdown watershed analysis module (EPA and others 1995). Results are published in USDA (1953) and are used in conjunction with USDA (1964) to guide management activities in the analysis area.

2.9 Terrestrial Species and Habitats

- The majority of federal lands in the analysis area are designated critical habitat for both northern spotted owls (USDI 1992) and marbled murrelets (USDI 1996).
- The analysis area includes two bald eagle Recovery Plan Sites.
- Two pairs of spotted owls and ten occupied murrelet sites are documented in the watershed.

- One Pacific fisher, federally listed as a "species of concern", has been documented in the watershed.
- The southern half of the analysis area includes part of the largest block of late-successional habitat on the Hebo Ranger District. This area includes adjacent BLM land and adjacent National Forest in the Siletz River watershed, and is the only block of late-successional forest for 20 miles to the south and for 8 miles to the east.
- Some of the habitat currently unsuitable for mature forest species is of the age, stand density and crown closure that could benefit from commercial thinning.

2.10 Human Uses

Roads

◊ The analysis area has the highest total road density (non-Forest Service included) on the Siuslaw National Forest- about 5 miles/square mile.

◊ Two-thirds of the road density is accounted for by private and state, county and city roads.

◊ Siuslaw National Forest Access and Travel Management (ATM) roads occur at a density of about 0.9 mile/square mile.

◊ Approximate ATM road traffic service levels are as follows: 26% maintained for low clearance vehicles (passenger car) subject to the Highway Safety Act (maintenance level 3-5); 74% are maintained for high clearance vehicles, i.e., trucks (maintenance level 2).

◊ Roads in the ATM system can be characterized as some of the least stable Forest Service roads in the watershed. They are generally the oldest roads, lie in riparian zones, were built prior to the compacted fill specifications of the mid-1970s.

◊ Of National Forest System roads, ATM roads tend to be the largest contributors of sediment.

Tribal Cultural Resources

◊ There are no treaty obligations related to the analysis area.

◊ The Confederated Tribes of Siletz Indians of Oregon have cultural ties to this land and will be consulted prior to federal land management activities.

◊ Appendix 7.12 contains a draft Memorandom of Understanding between the Confederated Tribes of the Siletz Indians of Oregon and the Siuslaw National Forest for the coordination of natural and heritage resources management issues.

Recreation/Scenic Values

◊ Tourism, i.e., recreation, is the major industry in Lincoln City. The primary draws are the Pacific Ocean and the Chinook Winds Gaming Center.

◊ Except for Drift Creek Organizational Camp, dispersed recreation characterizes the use of federal lands in the analysis area.

◊ Drift Creek Organizational Camp is operated by the Mennonite Camp Association of Oregon under a special use permit. Camper days in 1995 totaled 11,464.

◊ Drift Creek is eligible to be a Wild and Scenic River because of its recreational and scenic values, but is not formally designated.
◊ The analysis area is bordered by scenic features: the Pacific Ocean to the west; Cascade Head Scenic-Research Area to the north; and the Siletz estuary with the Siletz Bay National Wildlife Refuge to the south.
◊ The area is bounded on three sides by scenic corridors: Highway 18 to the north; Highway 101 to the west and Highway 229 to the south. The land in view along these routes is a high priority for scenery in the Forest Plan. There are national and state considerations and guidelines for protecting scenery viewed from Highway 101. The scenery along Highway 18 (Van Duzer Corridor) is also recognized by the State for its scenic value.
◊ Forested land forms the inland backdrop for Lincoln City. Most of what is in view is private forest land. Forested land dominates the setting above Devils Lake and where the Siletz River crosses to the Pacific. National Forest is mostly background, coming more into the middleground east of Devils Lake.
◊ Along Highway 18, the view is mostly of the immediate foreground (outside the analysis area). As along Highway 101, glimpses of ridgetops on National Forest land are seen as background.
◊ The south hills of Cascade Head Scenic Research Area (CHSRA) are viewed from the south, north, and east from Highway 101 and Highway 18.
◊ Much of the scenery in the analysis area was inventoried in the 1980's as heavily modified; this landscape will gradually change under LSR management guidelines.
◊ The LSR designation for the analysis area classifies the recreation opportunity spectrum setting as semi-primitive.

Commercial Uses

◊ Special forest products (fuelwood, greens, etc.) permits are occasionally issued for Federal land within the analysis area.

◊ Excepting some quarry sites for rock (road gravel) or sand, there are no mining activities in the analysis area.

◊ There are no existing right-of-ways or easements for Forest Service roads in the analysis area except for a court ordered (1905) right-of-way to Lincoln County for all of the Schooner Creek Road and Bear Creek Road.

◊ United Telephone Northwest (Sprint) has a phone line accessing Drift Creek Organizational Camp that follows Forest System Road (FSR) 19 from the Siletz Highway (Hwy 229).

3. ISSUES AND KEY QUESTIONS

3.1 Introduction

This step identifies the issues that the team decided would form the focus for this iteration of the watershed analysis. This step also identifies key questions that will be answered in the course of the analysis. These questions were developed by the team to address the issues and promote synthesis among the core topics. The answers to these questions will provide managers with information needed to make decisions, implement resource programs and design projects. Core topics and questions will be addressed in the context of their relevancy to these issues and key questions.

Issues were arrived at through a process of identifying existing conditions (Step 1) and comparing these with desired conditions (Table 1):

Table 3.1-1: Results of exercise to develop issues

EXISTING CONDITION	DESIRED CONDITION
Extensive vehicle access (high road density)	"Good neighbors" coord. with private Natural sedimentation rates Roads outside riparian zones Limited vehicle access Designated access Access w/purpose One route vs. many to same place Low road density Road conditions meet use needs Roads adequate for administrative use Roads adequate for recreation demands Roads do not create fish blockage
Degraded fish habitat	Good fish habitat Stable roads Woody debris recruitment near natr'l rate Near natr'l sedimentation rates/types Natural temperature regime Flows support desired populations Near normal beaver activity Healthy riparian function Good channel/floodplain interaction Good water quality Healthy wetland function Suitable rearing habitat in Rock Creek
Varying size blocks of mature conifer and late-successional habitat	One BIG block of late-successional habitat Low disturbance level (noise, log removal, noxious weeds, etc.) Road density within NW Forest Plan standards
No harvest currently occurring on federal land	LSR boundaries that meet need to harvest timber and protect species (long-term goal) Harvest in LSR that enhances late-successional habitat
Some potential for major loss due to long, narrow strip of urban area adjacent to Forest land. Community is not prepared to respond to a major fire.	Federal agencies and community are prepared for wildfire
Human use of the Forest is high and demand is growing. May be commitments we are unaware of.	No non-native species of plants and animals Special forest products are available and use is within the ability of the ecosystem to sustain Recreation opportunities available and within the ability of the ecosystem to sustain People respect/appreciate Water quality/quantity is good Federal agencies are involved in planning of non-agency uses (mineral rights, right-of-ways, county roads, etc.)

After the above exercise was completed, the group went through the desired conditions and created issue statements that would summarize these management goals. The following issues were developed and identified for analysis during this iteration of the watershed analysis.

3.2 *Issue*: Provide stable roads and trails to the extent needed to meet public and agency needs.

The high density of roads in the analysis area is of concern for several reasons. The greatly reduced level of road maintenance on federal land poses danger to public safety and increases the risk of road failure. Roads are a major source of sediment in streams and several major road failures have occurred in the analysis area. Roads also contribute to the disturbance of wildlife and can be at variance with the goal of developing late-successional stand characteristics. Conversely, an efficient transportation system is vital to meeting the needs of private landowners, public agencies and the public at large. The effective management of roads is a basic step in restoring degraded watersheds and is one of the primary reasons for this analysis (USDA and USDI 1994c: C-32).

Key questions developed for this issue include:

What types of roads have a high potential for resource impacts?
What types of roads are likely to fail?
What types of roads are most likely to alter streamflow?
What criteria should be used to select roads for upgrading or obliteration?

3.3 *Issue*: Provide and maintain quality fish habitat with emphasis on road stability and woody debris.

Fish habitat in much of the analysis area is degraded; coho and steelhead populations are severely depressed in Drift Creek and Schooner Creek basins. Focusing management activities on providing stable roads, increasing the amount of woody debris in streams and increasing beaver populations have been identified as the most effective way to promote optimum fish production in the analysis area. These goals are in direct support of the Aquatic Conservation Strategy set forth in the ROD (USDA and USDI 1994c: B-19).

Key questions developed for this issue include:

What problems are affecting crucial fish habitat?
What are the historic levels, current recruitment levels and long-range potential of woody debris in streams?

3.4 *Issue*: Maintain desired late-successional characteristics where they exist; manage vegetation to develop late-successional characteristics where they are currently lacking.

All but 80 acres of National Forest and 771 acres of BLM land in the analysis area have been designated Late-Successional Reserves in the Northwest Forest Plan. The southern half of the analysis area includes part of the largest block of late-successional habitat on the Hebo Ranger District. This block of land, along with adjacent BLM land within the watershed and adjacent National Forest land in the Siletz watershed, is the only late-successional forest for 20 miles to the south and for 8 miles to the east. Maintaining this existing habitat is vital to meeting the objectives of Late-Successional Reserves. The analysis area also contains approximately 10,000 acres of Federal land in young (≤ 45 yr. old) even-aged plantations.

Key questions developed for this issue include:

What factors are preventing or inhibiting the development of late-successional characteristics?

What criteria determines which areas or stands will benefit by treatments designed to hasten the development of late-successional characteristics?

3.5 Issues Not Addressed In This Iteration

Several issues were discussed but rejected for analysis in this iteration. These include:

Within the AMA, demonstrate that timber commodities can be removed from late-successional stands, while maintaining late-successional characteristics. Because all existing late-successional habitat within the analysis area is currently within Reserve Pair Areas (RPA) for northern spotted owls, recovery plan sites for northern bald eagles, and/or suitable or occupied marbled murrelet habitat, harvest of mature timber will not be considered at this time. This issue may be addressed in a future environmental document. The ROD (D-16) has specific direction for this AMA regarding RPAs: "reserve all suitable habitat in that area from timber harvest." (USDA and USDI 1994c) The portion of the analysis area in the RPA includes all land south of the North Fork of Schooner Creek. Harvesting in mature stands north of this line (i.e., Erickson and Rock Creeks) is not recommended because it is designated critical habitat for spotted owls (USDI 1992) and marbled murrelets (USDI 1996). Mature and late-successional stands in this area provide a link to a block of late-successional habitat at Cascade Head. Rock Creek subwatershed includes one bald eagle recovery plan site and occupied murrelet sites.

Improve water quality where it is currently impaired. The Oregon Department of Environmental Quality (DEQ) has identified Devils Lake as being outside acceptable standards for algae and pH during summer months (DEQ 1995). In addition, Forest Service temperature data for the last two years indicates that Drift Creek exceeds temperature standards set forth by the DEQ. The analysis team recognizes water quality as an important issue but it will not be addressed in this iteration due to the fact that there are few management options for improving these problems. The water quality in Devils Lake is directly related to lake-side development which is outside of Forest Service or BLM jurisdiction. The causal factors for high temperatures in Drift Creek will be explored in this analysis but factors related to geologic or hydrologic features cannot be "fixed" and streamside shading on private land is also outside of agency jurisdiction. Standards and guidelines for management on federal lands ensure the retention of vegetation necessary for streamside shading. An in-depth analysis of sunlight's role in the temperature regime would require the use of a solar pathfinder or a similar method, a procedure too costly and time-consuming for this analysis.

Modify Late-Successional Reserve boundaries and/or standards and guidelines to better meet other AMA goals and objectives. Almost all of the federal land within the analysis area is designated LSR. This designation limits the pursuit of other AMA goals such as timber sales that combine the objectives of experimentation and providing economic benefits to adjacent communities. The ROD gives specific direction for the AMA:

> However, because much of the Adaptive Management Area is Late-Successional Reserve, primarily designated for a single species about which information is still being developed, the designation and/or standards and guidelines for Late-Successional Reserves may be reconsidered in the Adaptive Management Area plan. Relaxation of the Late-Successional Reserve status is not necessarily assumed; proposals will require careful analysis to assure consistency with the Endangered Species Act and National Forest Management Act requirements, new marbled murrelet information, and overall objectives of these standards and guidelines. In the interim, the maximum age for thinning within Late-Successional Reserves in this Adaptive Management Area is 110 years. (USDA and USDI 1994c: D-15)

This issue will be deferred to the LSR assessment scheduled for development in 1997.

Maintain and Restore functional components and processes within riparian areas and wetlands. The maintenance and restoration of riparian and wetland areas is another key requirement of the Aquatic Conservation Strategy (USDA and USDI 1994c: B-10). Riparian conditions as they relate to healthy fish habitats will be covered under the issue dealing with fish. The bulk of wetlands in the analysis area are on private land or within the Siletz Bay National Wildlife Refuge. Given time constraints, lack of information on these habitats and the limited opportunities for restoration on FS or BLM land, this issue will not be dealt with in depth during this iteration.

Federal agencies and communities are prepared for wildfire. Lincoln City is essentially a long, narrow strip of developed land between the Pacific Ocean and the forest land that occupies the rest of the analysis area. A wildfire driven by an east wind could have devastating effects on this community. Currently there is no coordinated plan between the federal, state and local agencies for this area. Such a plan should consider access for fire management. It was decided that the expertise and amount of time needed for agency representatives to meet and formulate plans was outside the scope of the team's ability and time frame. However, the team recognizes this as a serious need and recommends that management pursues this outside the watershed analysis process. The ROD (USDA and USDI 1994c: C-11) states that LSR assessments should generally include a fire management plan.

Concerns about the occurrence and spread of non-native plants and animals. Concerns and problems related to non-native species will be identified under Steps 3 and 4 of this document and considered in specific recommendations e.g. the use of native plant species in restoration projects, the need for specific eradication programs during wetland restoration, etc. The team felt that this issue would be adequately addressed by this approach.

Concerns about the growing demand for special forest products. The team felt that the current Forest-wide environmental assessment for special forest products and direction in the ROD adequately address this issue.

Concerns about the growing demand for recreation opportunities in the analysis area. The area's proximity to the Willamette Valley and the Pacific Ocean seem to make the demand for more recreation opportunities in the analysis area inevitable. However, scoping did not reveal any significant public demand for more recreation opportunities. In addition, Forest Service recreation budgets have steadily decreased and it would be unrealistic to propose major additions to the recreation program at this time. The emphasis on managing this area for late-successional habitat should also temper expectations for recreational development. The current status of recreation in the analysis area will be discussed under Steps 3 and 4 and the public's use of roads (and the possibility of converting roads to a trail system) will be considered in recommendations for managing the transportation system.

Concerns about the need for more cooperation with other public agencies and private landowners. The ROD (D-2) states:

> ...Innovation [in AMA's] in integration of multi-ownership watersheds is encouraged among federal agencies and is likewise encouraged among state and federal agencies, and private landowners. (USDA and USDI 1994c)

Much of this is outside the actual process of watershed analysis and will be addressed in the Northern Coast Range Adaptive Management Area Guide developed jointly by the Forest Service and BLM. Management recommendations within this analysis will identify opportunities for joint restoration efforts between landowners where they exist.

Isolated parcels of BLM land in this watershed could be exchanged for isolated parcels of National Forest System lands elsewhere to improve management efficiency of this LSR and AMA. This should be addressed in the AMA Guide or LSR assessment.

4. CURRENT & REFERENCE CONDITIONS

4.1 Erosion Processes

Landslides

Two types of landslides occur in the Drift Creek watershed analysis area, debris torrents and rotational slumps. In general, the debris torrents originate at the top of first-order channels located on steep slopes, and usually occur during rainfalls that are of sufficient intensity to saturate the soil. Debris torrents can be a major source of woody debris and sediment in larger streams. In contrast, rotational slumps can cover many acres. The slip plane is deeper, they may move slowly, or may slide suddenly after sufficient rainfall saturates the slide.

Debris Flows

Debris torrents are a naturally occurring disturbance, and are an importance source of gravels and large woody debris for streams. A single location within the Coast Range generally has a recurrence interval for debris torrents on the order of thousands of years. They become a concern when the rate of landsliding is above natural levels, or when they occur in plantations or from roads. Accelerated rates of landsliding may overload the stream network's ability to transport sediment, and may result in the aggradation of low-gradient reaches, and/or an increased deposition of fine sediment. Landslides that originate in plantations generally lack the large woody debris found in naturally occurring slides. In addition, accelerated rates of debris torrents tend to deplete the soil reserves along first order streams by scouring the channel down to bedrock, thus decreasing the rate of re-vegetation in these areas. This, in turn, affects future large woody debris recruitment.

An aerial photo inventory of landslides in the Drift (Siletz) area was done for this analysis. The photos cover the period from 1961 through 1995. In the Drift (Siletz) area, as in the rest of the Siuslaw National Forest, the majority of debris torrents over the past 35 years have been caused by roads, either from fill slopes or stream crossings that have failed (Table 4.1-1). Small torrents originating in natural stands may be underestimated because of the difficulty of detecting them on photos. Miles of streams that have been affected by torrents is shown in Table 4.1-2. Slides within clearcuts were the second most common origin for debris torrents. These data imply that the rate of debris torrent occurrence has been accelerated by land management practices.

Table 4.1-1 Number of Debris Torrents by Origin in Drift (Siletz) Analysis Area

Origin	Number	Percent
Roads	72	57
Clearcuts	39	31
Natural	9	7
unknown	6	5

Based on historic aerial photo survey

Table 4.1-2: Miles of Streams Affected by Debris Torrents by Subwatershed

Subwatershed	Miles of Debris Torrent	% Stream Miles with Torrents
Lower Schooner	0.0	0.0
Erickson	0.0	0.0
N. Fork Schooner	0.0	0.0
S. Fork Schooner	0.0	0.0
Upper Drift	0.7	1.5
Smith	0.2	0.9
Sampson	2.5	4.4
Wildcat	0.9	3.2
North	0.0	0.0
Quarry	1.2	6.0
Gordey/Lower Drift	1.5	4.0
Lincoln City/Devils Lake	0.0	0.0
Rock	0.0	0.0

Rotational Slumps

Compared to areas of the Siuslaw National Forest located on the Tyee Sandstone, the Drift Creek watershed analysis area is more prone to rotational slumps. Many of them are naturally occurring slides; however, some have been reactivated due to road building. Roads built across the toes of rotational slumps tend to de-stabilize the gravitational center of the slide, causing the slide to move in order to find a new center of balance. Care must be taken in siting areas for storing excess soil removed from unstable sidecast fill areas or stream crossings. Excess material on landslide benches may also cause the slide to become unstable and seek a new center of balance. A rule of thumb when working in areas with rotational slumps is "never cut the toe, never load the top."

Bank Erosion

There is no data on the amount of bank erosion that is occurring in the Drift Creek watershed analysis area, or on historic trends. However, if peak flows have increased due to an increase in land management activities in the last few decades, it may be expected that bank erosion has also increased (See the following section on the Effects of Roads and Harvest on Peak Flows). The hypothesized link between increased peak flows and increased bank erosion may account for increased amounts of sand in low-gradient streams in the Rock and Schooner subwatersheds, especially in the absence of significant landslide activity.

4.2 Hydrology

Stream Flow Characteristics

There are no stream gages located within the Drift Creek watershed analysis area, therefore no data is available on stream flow. The closest stream gages are located on the Siletz River to the south and the Nestucca River to the north. Because Drift Creek is markedly different in size and underlying geology compared to both of these river basins, data from those two gage sites were not extrapolated to this analysis.

Effects of Roads and Harvest on Peak Flows

Roads and timber harvest may affect peak flows in several ways. In western Oregon, soil infiltration capacity is high and hillslope flow is dominantly subsurface, so roads have the potential to increase surface runoff by intercepting subsurface flow. Ditch lines act as extensions of the stream network, which make the watershed more efficient at routing water (Wemple 1994). Evapotransporation is a major determinant of streamflow in forest basins, so suppression of evapotransiration by timber harvest can be expected to increase water yield and peak discharges. The magnitude of this change may vary by season. (Jones and Grant 1996). Studies by Jones and Grant (1996) in the western Cascades demonstrated that road construction combined with patch clear-cutting that covers 10-25% of the basin produced significant, long-term increases in peak discharges in both small and large watersheds.

The Drift Creek watershed analysis area has some of the highest road densities on the Siuslaw National Forest (Table 4.2-1). As a result, peak flows are expected to have increased over time. There are no stream gage data; therefore, the hypothesis cannot be tested.

Table 4.2-1: Road Density by Subwatershed (miles per square mile)

Subwatershed	USFS Miles	Other miles	Total Miles	Total Road Density
Lower Schooner	4.3	31.9	36.2	4.71
Erickson	11.3	4.7	16.0	5.52
N. Fork Schooner	12.8	6.2	19.0	5.67
S. Fork Schooner	14.5	9.4	24.0	5.62
Upper Drift	5.6	36.1	41.8	4.91
Smith	0.0	17.0	17.0	5.24
Sampson	4.1	41.6	45.7	4.59
Wildcat	9.5	0.0	9.5	1.98
North	21.5	0.0	21.5	4.86
Quarry	15.3	5.5	20.8	5.40
Gordey/Lower Drift	12.8	21.0	33.8	4.65
Lincoln City/Devils Lake	0.3	40.3	40.5	3.64
Rock 1	11.6	20.0	31.6	6.59
Unknown	----	4.3	4.3	----
TOTAL	123.6	237.9	361.5	----

Water Rights and Diversions

Lincoln City has water rights on both forks of Schooner Creek. Low flows during the summer in Schooner Creek average 10 cubic feet/second (cfs). Lincoln City current takes 6 cfs from Schooner Creek during the summer months, and plans to increase the withdrawal to 8 cfs. ODFW and other agencies are working on the plan for this increased withdrawal. The results of this planning should be used to guide activities in Schooner Creek.

The Kernville-Gleneden Beach-Lincoln Beach water district removes water from Drift Creek downstream from the Forest Service boundary.

4.3 Stream Channel Morphology

Channel classification is a first step in providing a framework to understand how the stream network functions, especially how sediment, woody debris and water move through the system. Channel classification is useful in identifying stream reaches most sensitive to changes in water flow, sediment and wood input, and 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 (Map 9) and confinement (Map 10) as described in the Washington State Timber/Fish/Wildlife (TFW) Watershed Analysis Manual, Module E: Stream Channel Assessment (1993). Gradient serves as a surrogate for stream energy, which is a dominant control on sediment transport and channel morphology (Map 9). Six gradient categories were identified: 0-1%, 1-2%, 2-4%, 4-8%, 8-20%, and >20%. US Geological Survey topographic maps at the 1:24000 scale with 40 foot contours were used to determine gradient. Channel confinement is a ratio of the valley floor width to the bankfull channel width (Map 10). 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. Three confinement categories were identified from aerial photos and topographic maps: unconfined, moderately confined, and confined. Unconfined channels have a valley floor to stream channel width ratio greater than 4. Moderately confined channels have a valley floor to stream channel width ratio between 2 and 4. Confined channels have a valley floor to stream channel width ratio less than 2.

Confinement and gradient together (Map 11) can be used to describe how different parts of the stream network function (Montgomery and Buffington 1993). In terms of sediment routing, the stream network can be divided into source, transport and depositional reaches (Table 4.3-1). Historically, the areas with less confinement and lower gradients (less than 4%) were the areas that had the highest productivity for the aquatic resources, whereas the highly confined and steep areas provided little in the form of highly productive aquatic habitat. Today, because of human settlement history, much of the unconfined valley area is in private ownership.

<u>Source reaches</u> have a gradient that is greater than 8%, and are moderately confined or confined channels. These reaches are subject to periodic scour by debris torrents. They are important sources of cool water and pulses of sediment and wood to the rest of the stream network. Riparian vegetation typically occurs in narrow bands along these segments and may be dominated by a deciduous or coniferous overstory.

<u>Transport reaches</u> have a relatively high gradient (4-8%), and are moderately confined or confined channels. Wood and sediments are stored for a relatively short period of time before being pushed through the reach by high flows. These reaches are fairly resistant to changes in stream morphology because any increase in sediment input is quickly passed downstream.

<u>Depositional reaches</u> have a low gradient (less than 4%), are moderately confined or unconfined, and are areas of sediment deposition. These reaches serve as long-term storage sites for sediments and wood. If these reaches are functioning properly, they tend to interact often with the floodplain during high water events. 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. These reaches experience significant changes in stream morphology as sediment and woody supplies increase from upslope or upstream. The most sensitive areas are locations where transport reaches empty directly into response reaches because of the rapid decrease in the streams' ability to transport sediment. During floods, these stream segments can shift laterally and create side channels. Gravels accumulated in these reaches can provide excellent spawning habitat for salmonids. Floodplains in these reaches also provided refuge areas for juvenile fish during flood events.

Map 11 shows the location of unconfined, low-gradient stream reaches in this analysis area.

Table 4.3-1: Types of Stream Reaches in Drift (Siletz) Analysis Area

Stream Gradient and Confinement*	% of stream miles in Drift (Siletz) area	Sediment	Wood	Water
>8% gradient M, C	66.8%	Source Primarily debris torrents	Source	Cool temperatures low to intermittent flows in summer
4-8% gradient M, C	4.4%	Transport	Transport	Cool temperatures perennial flows
0-4% C	2.2%	Transport		Temperature variable perennial flows
0-4% M	2.5%	Deposition	Deposition	Warmer temperatures, influences by shading and subsurface flow
0-4% U	4.7%	Deposition	Deposition	Warmer temperatures, influences by shading and subsurface flow

*U= unconfined, M=moderately confined, C=confined stream channel

Channel Substrate

Sediment production is a function of bedrock geology, topography and land use. The geology and topography determine the area's susceptibility to landslides, a major source of sediment in the Coast Range. Harvest history, road density and road location are also factors that increase landslide potential. Sediment deposition is a function of stream confinement and gradient, which determine the stream's ability to transport sediment and also determines which areas are prone to deposition. Stream reaches with low gradients that are unconfined or moderately confined tend to be areas of sediment deposition, and may be more prone to beaver activity. Beaver dams and ponds tend to trap fine sediments.

Unlike other areas on the Siuslaw National Forest, there does not appear to be a good correlation between number of debris torrents and the amount of sediment deposition in low gradient streams in this analysis area. The Drift (Siletz) area differs from other areas on the forest in that it has a higher percentage of low-gradient ***confined*** stream channels. Specifically, the mainstem of Drift Creek is a low-gradient stream; however, much of its length is moderately confined to confined. Interestingly, the area Drift Creek drains has the highest susceptibility to landslides, and the highest number of landslide occurrences in the analysis area; however, there appears to be very little sediment deposition in the mainstem. This lack of sedimentation may be related to the high degree of confinement, which gives the stream sufficient power to flush the sediment out of the system. Also, the increase in logging and road density may have increased peak flows, which would increase the ability of the stream to transport sediment out of the channel. If that is the case, the question is, where is the sediment from the debris torrents being deposited? There is anecdotal evidence that much of this sediment has been deposited in Siletz Bay. The long-term consequences of increased sediment deposition in Siletz Bay are unknown.

Erickson, Rock, and Schooner Creek appear to have an increase in sand accumulation between the 1950's ODFW stream surveys and today's surveys; however, they have very few landslides, if any (Table 4.3-2). These watersheds have a relatively high number of low gradient stream miles, and the highest road densities in the analysis area. A more intense land use history may be coupled with a higher susceptibility to sediment deposition, which would lead to an increase in sand in these watersheds. However, the data are too sketchy and insufficient to do much more than note a possible correlation. The increase in sand in Erickson Creek is probably due to the removal of a log jam that had a wedge of sediment deposited behind it. The jam was mentioned in the 1953 surveys, and was removed in the early 1980's. The stream has downcut 14 feet through the accumulated sediment.

Table 4.3-2: Comparison of Sand and Gravel Stream Substrate in early 1950's and 1990's. Numerical data is shown; however, the data from both time periods cannot be compared as absolute values because of differences in survey methods and differences in delineating reaches. The location of the1950's reaches were correlated as closely as possible to the location of the 1990's reaches, but there are some gaps and overlaps. Numbers that suggest a change in substrate composition are in bold face, italicized type.

Stream	1950s Reach	1990s Reach	% sand 1950s	% sand 1990s	% gravel 1950s	% gravel 1990s
Schooner	1	1	0	6	40	22
Schooner	2	1	0	6	***100***	***22***
Erickson	1	1	0	7	50	46
Erickson	2	2	0	9	40	40
Erickson	3	3	***0***	***35***	***0***	***49***
Erickson	4	3	***0***	***35***	***100***	***49***
N Fk Schooner	1	1	0	10	***80***	***12***
N Fk Schooner	2	1	0	10	20	12
N Fk Schooner	3	2	***0***	***32***	***60***	***36***
Drift Cr	1	1	0	1	0	18
Drift Cr	2	2	5	5	15	6
Drift Cr	3	3	5	13	15	26
Drift Cr	4	4	5	8	15	21
Drift Cr	5	5	5	10	15	13
Drift Cr	6	6	5	13	25	3
Drift Cr	7	6	5	13	15	3
Gordey Cr	1	1	5	8	***15***	***70***
Rock Cr	1	1	***0***	***55***	38	45

4.4 Water Quality

In 1994, the Oregon Department of Environmental Quality (DEQ) listed Devils Lake as having impaired water quality because of problems with algae and pH during the summer months (Wagner 1994). There is no data on whether the streams within the watershed analysis area are meeting water quality standards except for temperature monitoring that covers the period of 1994-1995. As of December 1995, the state water quality standards stipulate that temperatures are not to exceed 64°F for the central coast streams. Stream temperature data is summarized in Tables 4.4-1 and 4.4-2. In general, stream temperatures seemed to be warmer across the Coast Range in 1995 as compared to 1994 (Callie McConnell, pers. comm. June, 1996).

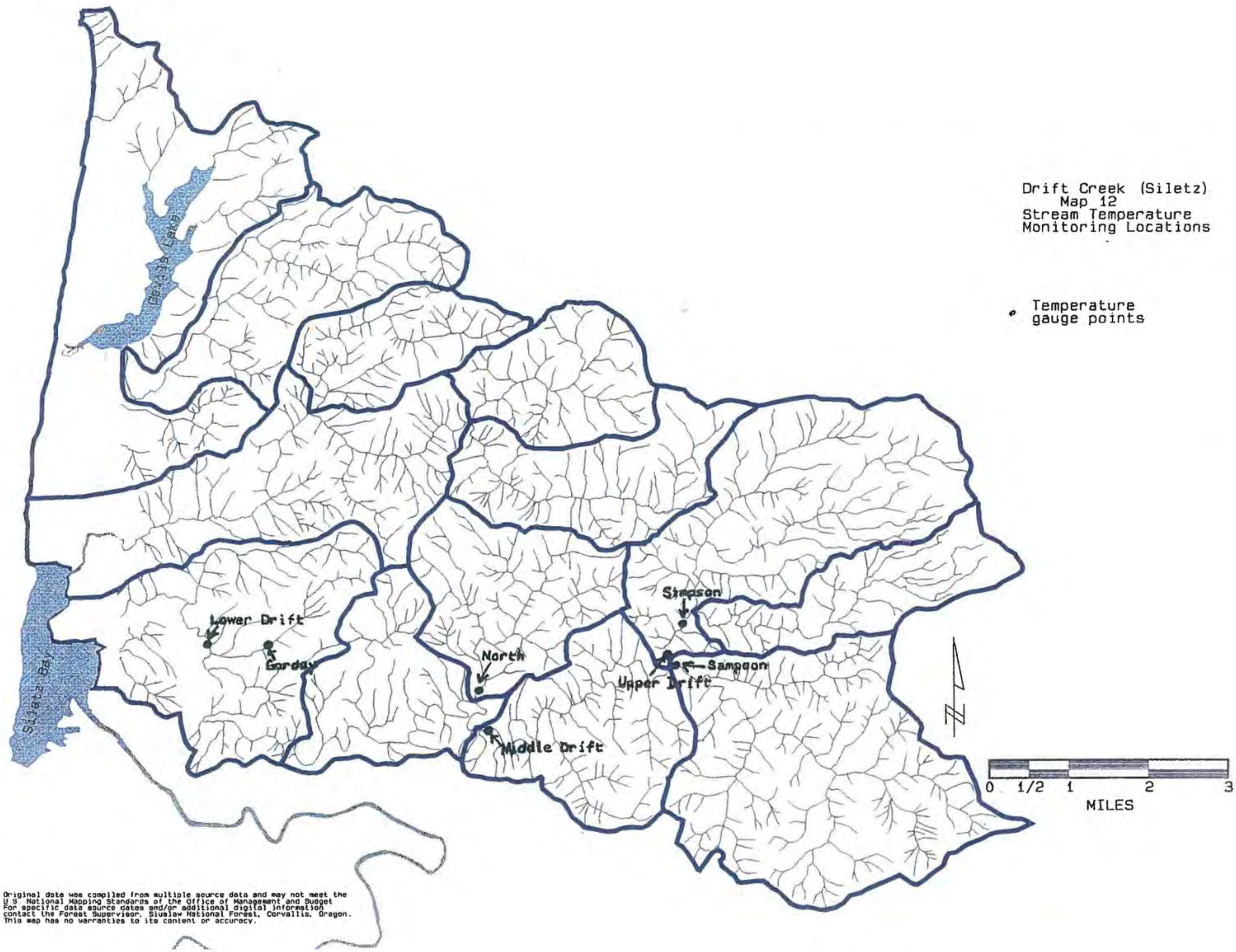
Table 4.4-1: Stream Temperature Monitoring Data Based on 7 Day Average Maximum*

	1994			1995		
Gauge	# Days >58F	# Days >64F	# Days >70F	# Days >58F	# Days >64F	# Days >70F
Gordey	0	0	0	0	0	0
Lower Drift	—	—	—	73	65	0
Middle Drift	74	18	0	69	10	0
Upper Drift	46	4	2	15	0	0
North	25	0	0	15	0	0
Sampson	32	3	1	36	0	0
Simpson	31	4	2	—	—	—

*For both years, temperature is recorded for the period of July 18 through October 8, based on 7 day average maximum.

Table 4.4-2: Temperature Data based on Individual Daily Maximums

Gauge Location (Map 12)	Date of Record	Total # Days in Record	# Days above 64 F	% Days above 64 F	Highest Temperature	Date of Highest Temperature
1994						
Gordey	7/15/94-10/29/94	97	0	0	55.3	8/19/94
Lower Drift	no data					
Middle Drift	7/15/94-10/29/94	107	15	14	65.8	8/3/94
Upper Drift	7/19/94-10/21/94	95	2	2	64.1	7/23/94, 8/2/94
North	7/15/94-10/19/94	97	0	0	60.1	8/3/94
Sampson	7/19/94-10/19/94	93	0	0	62.1	7/23/94, 8/3/94
Simpson	9/19/94-10/19/94	93	0	0	62.7	7/23/94
1995						
Gordey	6/14/95-10/12/95	120	0	0	57.0	7/18/95
Lower Drift	6/19/95-10/16/95	121	71	59	71.8	7/17/95
Middle Drift	6/20/95-10/18/95	121	14	12	67.5	7/17/95
Upper Drift	6/14/95-10/14/95	122	5	4	65.8	7/17/95
North	6/14/95-10/12/95	121	0	0	62.0	7/17/95
Sampson	6/14/95-10/14/95	122	1	0	64.0	7/17/95
Simpson	—	—	—	—	—	—


Drift Creek (Siletz)
Map 12
Stream Temperature
Monitoring Locations
Temperature gauge points
Devils Lake
Siletz Bay
Lower Drift
Gorday
North
Middle Drift
Simpson
Sampson
Upper Drift
0 1/2 1 2 3
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.

4.5 Aquatic Species and Habitats

Physical Stream Habitat

Productive Flats

Fish production within river basins is seldom spatially uniform. Along with the spatial "patchiness" of fish production, habitat needs vary depending on season and the maturity of fish. Fish production is usually concentrated into areas where geomorphologic conditions are conducive to the formation of high quality habitat. High quality habitat varies depending on species and fish maturity. Areas that have low gradients and are relatively well connected to their floodplains typically have many of the channel attributes that constitute good habitat. Riffles provide habitat for steelhead, young trout and post-emergent coho. Pools, especially complex pools, provide summer and winter habitat for larger steelhead and trout, and young-of-the-year coho. Side channels, floodplains, and beaver ponds provide low velocity winter habitat for coho and trout. Channels with less than 4% gradient are typically pool-riffle bed channels. Unconstrained and moderately constrained channels are associated with developed floodplains. Low gradient, unconstrained channels also tend to accumulate wood that forms complex pools. Consequently, low gradient relatively unconstrained channels have high fish production potential, especially for coho and chinook.

Less than 20% of the streams in the Drift (Siletz) watershed analysis area have gradients less than 4% and less than 15% have low gradient and are relatively unconstrained. Ninety five percent of the area accessible to anadromous salmonids, is less than 4% gradient of which about 75% is less than 4% gradient and unconstrained. Most of this habitat is concentrated in the mainstems of Drift, Schooner, and Rock Creeks. Different fish species spatially segregate to use different portions of this habitat. For instance, below Sampson Creek on Drift Creek, use of the mainstem is dominated by chinook and steelhead, while Drift Creek and its tributaries above Sampson Creek are dominated by coho.

Potential fish habitat can be approximated using channel morphology (Washington Forest Practices Board 1993). For anadromous fish unconstrained or moderately constrained areas with less than 4% channel gradient have the potential to provide good winter habitat and areas less than 8% channel gradient have the potential to provide good summer habitat (Map 13). Resident trout can tolerate higher gradients and rely less on pool habitat and in general reaches with less than 12% channel gradient provide good habitat. About 70% of the analysis area accessible to anadromous fish is potential good quality habitat (Table 4.5-1), but none of it currently meets all the criteria for Properly Functioning streams (Appendix 7.8).

Table 4.5-1. Miles of potentially high quality habitat by watershed.

Subwatershed	High Quality Miles	Percent of total
L. SCHOONER	6.59	13.2
ROCK1	6.32	12.6
GORDEY/L. DRIFT	5.84	11.7
U. DRIFT1	5.80	11.6
SOUTH FORK SCHOONER	3.85	7.7
ERICKSON	3.80	7.6
LINCOLN CITY/DEVILS LAKE	3.30	6.6
NORTH	3.18	6.4
QUARRY	2.86	5.7
NORTH FORK SCHOONER	2.49	5.0
WILDCAT	2.48	4.9
SAMPSON	2.17	4.3
SMITH	1.37	2.7
TOTAL	50.04	

Large Woody Debris

Large Woody Debris (LWD) is widely recognized as a crucial component of fish habitat in streams in the Oregon Coast Range (Bisson and others 1987). LWD creates rearing pools (by bed scour or damming the flow) stores substrate and fine organic material, provides cover for migrating and rearing fishes, dissipates stream energy, and serves as colonization areas for invertebrates which are important as fish food (Bryant 1983, Meehan and others 1977). In many smaller streams (1st - 4th order) roughness elements such as LWD are the major pool forming element (Keller and Swanson 1979; Washington Forest Practices Board 1993).

The amount of time large woody debris functions in stream systems varies depending upon the size and type of woody debris and the condition of the watershed. Large diameter, long pieces of woody debris are more stable because they are more likely to hang up on other channel features such as boulders, streamside trees, and meander bends. Coniferous species such as cedar and Douglas-fir last longer than hardwood species such as red alder. Pieces that are over 24 inches in diameter and 50 feet or 1.5 channel widths long are more likely to be stable, persistent habitat elements (USDA and USDI 1994a; OR Coast Province Level-I Fishery Biologists 1996).

There are several projects in the Drift (Siletz) area which were designed to improve fish habitat through the introduction of large woody debris. Projects have been completed on the mainstem of Drift Creek in the vicinity of "The Loop." Boise Cascade is planning a major instream structure restoration project on their property in Rock Creek for 1996. The Central Coast Chapter of the Association of Northwest Steelheaders is also planning a project in Thompson Creek, a tributary to Devils Lake. Several other projects, primarily aimed at providing fish passage through culverts (e.g., North Creek Weirs) have also been completed. Projects such as these, in many places, are the only means of increasing LWD levels and habitat associated with LWD (pools, backwaters, gravel bars) in the short term.

Large Woody Debris Dynamics

Large woody debris enters stream channels through a variety of methods (Keller and Swanson 1979). The most obvious method is streamside trees falling directly into streams from blowdown or bank undercutting. Other methods include sliding down adjacent hillslopes after falling, debris torrents from tributary streams, floating downstream, and earthflows into stream channels. The relative importance of each of these processes changes with channel size. In small channels (1st - 2nd order), blow down and bank cutting introduce the majority of the wood. In slightly larger channels (3rd - 4th order), debris torrents from tributaries, earthflows, and transport from smaller channels contribute the most wood. In large channels (mainstem Drift Creek), debris torrents and transport from upstream are the dominant input processes. Natural disturbance processes also affect the relative importance of these methods. Immediately after large fires LWD is likely to increase due to increased windthrow and debris torrenting, but after the initial influx of LWD, inputs will decrease until the forest community can again produce LWD. Floods may float wood out of the system, but floods also typically trigger several of the input methods and bring in large quantities of LWD. Depending on the character and duration of floods, they may either increase or decrease the total amount of LWD in the stream system. Large scale, long lasting floods are likely to decrease the total amount of LWD, while local, short duration floods are likely to increase the amount of LWD in the system.

Most wood appears to be entering streams from blowdown and bank cutting. The rate of wood entering streams from blowdown has increased due to timber harvest. Buffers along harvest units exhibit increased windthrow after the removal of the timber in the harvest unit. Bank cutting has increased in the watershed as a result of removal of LWD from streams. The removal of LWD has caused an increase in stream energy that increases the streams ability to remove and transport bank materials. Some trees are currently being introduced by debris torrents; however, the increased incidence of debris torrents has not increased the amount of woody debris. Many of the major debris torrents in recent years initiated on roads and in clearcut units. Clearcut torrents typically have little, if any, LWD to entrain and deliver to the stream channels. Road related torrents can bring in large wood, but not in the quantities typical of natural torrents. Road related torrents can also scour channels and banks and remove the soil adjacent to streams that can support tree production.

Large woody debris transport out of streams and stream systems follows several pathways (Bisson and others 1987). Debris torrents and physical and biological breakdown remove LWD from small streams (1st - 2nd order). Larger streams also experience physical and biological breakdown but most wood floats out of the system into the estuary or ocean.

Large woody debris transport out of streams has been directly affected by land management in Drift Creek. Many accumulations of LWD were removed or modified from the 1950's to the early 1980's in Drift Creek. ODFW survey reports from 1955-1965 recommended removing numerous logjams. In addition, the USDA Forest Service and many private timberland owners were required to remove most woody material from areas where timber sales were conducted. Cedar trees and logs in and along streams were sold for bolts and shakes. The actual amount and source of wood that has been removed is difficult to quantify but certainly exceeds the amount that is present in the system. The removal of many of these logjams has also had a cascading effect on entrapment of woody debris that has entered the stream since their removal. Without large pieces and accumulations of LWD, wood that is currently entering the stream is less likely to hang up and remain in the system. The general decrease in channel roughness that occurred because of stream clean out has reduced the capacity of the stream to store and hold wood.

The reference condition for this watershed is based on the standards and guides outlined in the ROD and is applicable to channels with less than 4% gradient. The reference conditions appear to be most applicable to 5th order and smaller streams in the Drift (Siletz) area. The volume of wood in relation to stream area is expected to decrease with increased stream size. Because larger streams have an increased capacity to move wood they are more likely to congregate wood into areas where the LWD will hang up, while smaller streams will tend to move pieces in a saltatory manner down their longitudinal axis. In small channels, LWD will tend to be spread uniformly along the channel, while in larger channels, wood will be concentrated in smaller areas. LWD is likely to accumulate at the junctions with tributaries, at the upper end of low gradient unconstrained channels, on the outside of meander bends in low gradient channels, and at channel constrictions.

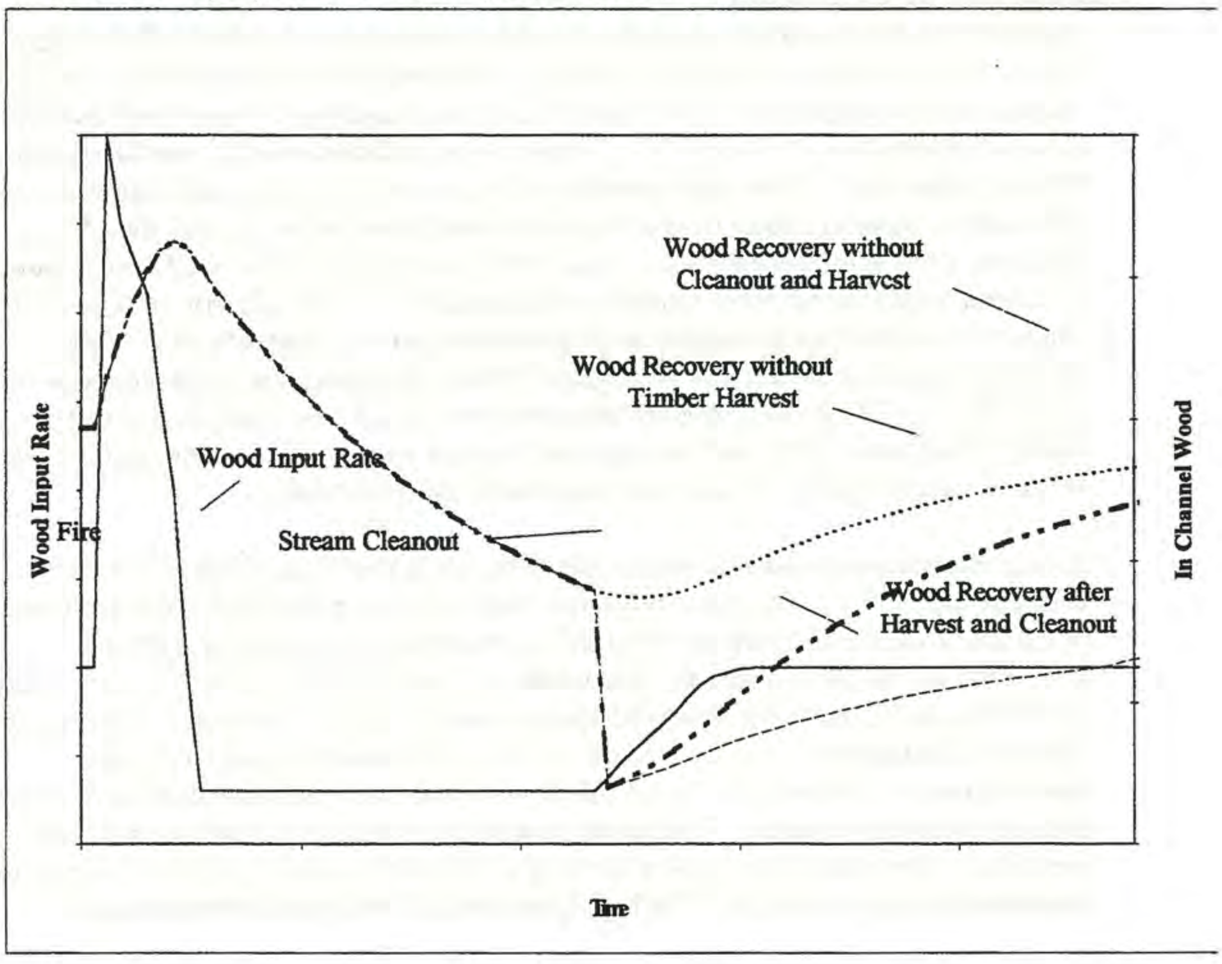
Large woody debris loadings and ratings for each of the subwatersheds in the Drift (Siletz) area that have recent quantitative habitat inventories are displayed in Appendix 7.8. Current LWD levels only meet the reference condition in Wildcat Creek, which comprises less than 7% of the total surveyed miles. Erickson Creek and Rock Creek were rated as "At Risk" regarding LWD and account for almost 26% of the total surveyed miles. The remainder of the surveyed Drift (Siletz) area (67%) is "Not Properly Functioning" in regards to LWD.

The amount of wood within each subwatershed is expected to change through time, however it typically should not fall into the "Not Properly Functioning" category (Figure 4.5-1). After large scale disturbance such as fire, woody debris levels should be high as a result of increased blowdown, rot, and debris torrenting associated with hot burning fires. The amount of debris will decline after the disturbance as the "wood bank" of the mature forest is gone and inputs are drastically reduced. After 80 years or so, trees will again be large enough to function as stable pieces. As more and more of the stands in the watershed reach stable piece size, debris inputs should increase. Debris inputs should level off after stands attain maturity. Instream LWD loading will increase; however, until a balance is reached between the amount of wood coming into channels and the amount leaving through rot and abrasion, or floating. Stream clean out in the Drift (Siletz) WA area intercepted the natural trajectory of debris recruitment. Debris levels were likely descending towards a natural low when stream clean out operations began. This lowered the base level of LWD in channels. Timber harvest in riparian and unstable areas also removed potential sources of LWD. The dominant species composition of managed stands also has changed. There are more acres of alder dominated riparian area adjacent to managed stands than there are adjacent to unmanaged stands (Appendix 7.9, Table C3.2-2). The effects of this removed LWD will remain until trees on these areas attain sufficient size to act as stable LWD. It is likely that most of the private land within the basin will not be managed for instream LWD production. Because of the reduction in production of LWD recruitment material, LWD levels are unlikely to ever again reach undisturbed levels.

Debris Recruitment

Potential for debris recruitment is dependent on the size of stands in areas likely to input LWD into stream channels. These areas included unstable upland areas, headwalls, and riparian and upland areas near stream channels. In channels with steep walls and little or no floodplain, wood can enter channels from upslope areas. In areas

Figure 4.5-1 General trends in LWD recruitment and instream levels following large scale disturbance (fire), stream cleanout, and timber harvest.



with flatter slopes and wide floodplains or terraces, wood is most likely to come from areas closer to the channel. Because streams migrate across their floodplains, particularly in the presence of debris torrent deposits, all the woody vegetation on the floodplains and terraces is potential wood for the stream channel.

Natural stands within 200' of channels in Drift Creek are predominately (93%) composed of large (>21" dbh) trees. Only 14% of stands within 200' of channels adjacent to managed stands are dominated by large trees. Appendix 7.10 (Figure C3.3-1,2,3) displays percentage of each watershed in large and small tree (<21" dbh) components for natural, managed, and managed and natural stands combined. Timber harvest areas were usually selected to avoid the most unstable areas. Therefore, the natural stands used to develop the reference condition contain a disproportionate amount of unstable ground. The reference condition of 93% of riparian stands being in the large size class should be considered a minimum amount at this stage after a fire because of the disproportionate amount of unstable ground included. The species distribution of trees in these riparian stands will differ as a function of elevation, slope, aspect, and soil conditions. The vegetation analysis section should be consulted for species specific information.

Channel Substrate Condition

Substrate conditions were evaluated using stream inventory data from ODFW and the USFS. ODFW data was typically from the 1950's and was only available for the large streams in the analysis area. USFS data is low flow quantitative habitat information obtained primarily in 1994 and 1995. Substrate information used to rate the current habitat (Appendix 3.1) was aggregated by subwatershed and is the only information on riffle habitat types in stream reaches that were designated as having less than 4% gradient. On a subwatershed scale, none of the Drift (Siletz) watershed analysis area evaluated meets the reference conditions (Appendix 7.8). The Quarry and Upper Drift subwatersheds are Not Properly Functioning based on the standards set by Oregon Coast Province Level-I Fishery Biologists (1996). However, due to the lithology of the 2PSR2 and 2B blocks, the standards proposed by O Coast Province Level-I Fishery Biologists (1996) may be unrealistic for this watershed. Further analysis may refine the amount of gravel and sand expected in these systems.

Stream channel sand levels do not appear to have changed dramatically from those found in the 1950's. There are indications that sand levels have increased in streams in the 2P2 LTA but they are not elevated to levels that are associated with Not Properly Functioning watersheds. Subwatersheds in the 2PSR2 and 2B blocks, except for Wildcat and Quarry, are not exhibiting problems with fine substrates. The elevated sand levels in Quarry Creek are associated with an extremely large beaver dam complex near its headwaters. Nearly all the area with sand as a dominant substrate is located in the dam complex. The higher sand levels in Wildcat Creek are not easily explained. There have been several torrents in the subwatershed, but no more nor less than neighboring watersheds. The high quantities of LWD may be trapping and storing more fine sediment than other neighboring watersheds (Keller and Swanson, 1979).

Gravel levels may have declined since the 1950's, however it is difficult to quantify the magnitude of change due to differences in survey methodologies. Gravel levels, like sand levels, may be linked to LWD levels. There is little apparent connection between instream gravel levels and slide activity, road density, or harvest history. It is likely that most gravels entering streams are being transported out of the system because of the lack of LWD in stream channels. Additionally, the nature of the breakdown of the Siletz River Volcanics may be such that cobbles, not gravels, should predominate in low gradient riffles.

Backwater/Low Velocity Habitat

Backwater and low velocity habitats are extremely important habitats for certain life stages of salmonids during high flows (Nickelson and others 1992a, Bjornn and Reiser 1991). Off channel habitat is associated with low gradient unconfined stream channels, LWD, and biologic (beaver) activity. Unconfined stream channels develop side channels, meander bend cutoffs that leave the old channel as an alcove, oxbow or levee ponds, and flooded tributary mouths that provide off channel habitat. Large woody debris forms dams and slack water areas that provide low velocity and off channel habitat. Beavers build large ponds that, while they persist, typically provide large areas of low velocity habitat.

Beaver ponds, dam pools, and side channel habitats were classified as backwater/low velocity habitats for this WA. All the evaluated subwatersheds save Quarry and Rock were classified as Not Properly Functioning. Quarry Creek was evaluated as Properly Functioning primarily due to the large beaver dam complex located near its headwaters. Unfortunately no fish were found in these beaver ponds, so their value as rearing habitat is limited. Rock Creek was rated At Risk of Not Properly Functioning. Most of the off channel habitat in Rock Creek is formed by complexes of large woody debris. The current lack of backwater/low velocity habitat in the Drift (Siletz) WA area is most likely related to the lack of LWD in the area.

Pool Quality

Pool quality was rated using the criteria listed in Appendix 7.8. With the exception of Wildcat and Rock Creeks, all the evaluated watersheds were Not Properly Functioning. Wildcat and Rock Creeks were both rated as At Risk. Large deep pools are most commonly associated with LWD accumulations in the channel types found in the Drift (Siletz) area. It is possible that increased fine sediment input have filled pools; however, there are no readily apparent connections to landslides or road densities.

Aquatic Populations and Viability

The Drift (Siletz) watershed analysis area historically contained 5 species of salmonid fishes: coho, chinook, and chum salmon, steelhead and cutthroat trout (Map 14). All salmonid species in the Drift (Siletz) watershed analysis area are depressed except for fall chinook and resident cutthroat trout (Table 4.5-2). Coho salmon have been proposed for

Table 4.5-2. Status of Siletz Basin* salmonid stocks (from Buckman and others).

Species	Status	Comments
Chum salmon	Depressed	Near southern edge of range of chum salmon; present in only a few tributaries in the lower basin.
Fall chinook salmon	Healthy	Stable or increasing trend similar to other north and central coast fall chinook stocks.
Coho salmon	Depressed	Multiple factors responsible for depressed status: hatchery strays, over-harvest, loss of habitat, El Niño ocean conditions.
Winter steelhead	Depressed	Multiple factors responsible for depressed status; limited inventory information.
Cutthroat trout	Searun depressed, resident healthy	Complex biology with multiple life history types.

*Stocks in the Drift (Siletz) WA area are assumed to be following similar patterns to those of the Siletz River, with the possible exception of Rock Creek coho salmon.

listing under the Endangered Species Act (ESA) from Northern California to the Columbia River by the National Marine Fisheries Service (NMFS). Steelhead trout are proposed for listing by the NMFS. All other anadromous salmonids in the Drift (Siletz) area are undergoing a status review by the NMFS. Chum salmon are seldom seen in the Drift (Siletz) WA area. In the mainstem Siletz River, chum landings from commercial net fisheries averaged about 1,200 fish per year from 1923 to 1940. Spawning surveys in Bear Creek from 1985 to 1995 have shown highly variable returns ranging from 316 fish in 1986 to 17 fish in 1987 (Buckman and others). Chum salmon may have been present in Rock Creek, however it is unlikely. A resident of Rock Creek told an ODFW surveyor that he had seen chum in Rock Creek, but this report was not substantiated by any of the other residents in the basin (Willis and Nibler 1955). Because chum are near the southern extent of their range, it is unlikely that Drift Creek supported large populations of chum salmon. Historical stream surveys suggest that they were present in some of the lower tributaries of Drift Creek. Although chum have been found in recent surveys, little evidence exists that there are still viable populations. Because chum spawn in the lower, flatter portions of streams, they are particularly susceptible to increases in sediment deposition. Little quantitative habitat data are available for lower Drift Creek to assess the magnitude of sediment impacts. Increased sediment loads deposit fine sediment in spawning gravels and can also cause instability of gravel bars where spawning occurs. Increased fine sediment levels reduce the interstitial space necessary for oxygen flow to the eggs and instability of gravel bars destroys redds by disturbing them (Bjornn and Reiser 1991, Chamberlin and others 1991).

Coho salmon catch in commercial fisheries in the Siletz basin averaged about 17,000 fish from 1923 to 1940, equating to an approximate total run size of 50,000 coho spawners (Buckman and others). Historic run sizes in Schooner and Drift Creeks were estimated using the proportion of suitable habitat in each basin to develop proportional populations relative to the Siletz Basin as a whole (Table 4.5-3). Recent run sizes were estimated using the number of fish per mile in the Siletz Basin (Buckman and Reeve 1996) and miles of suitable habitat in Drift Creek and Schooner Creek respectively. Estimates for the Siletz basin for 1993 and 1994 are unadjusted for hatchery strays. The actual run of coho in Schooner Creek exceeded the estimate in Table 4.5-3 during 1990 and 1991. This was predominately due to an influx of accelerated growth fish released from the Ore-Aqua commercial hatchery in Newport straying into Schooner Creek. In several different years the hatchery return to the trap at Schooner Creek was over 50% of the total adult returns. Population estimates in Table 4.5-3 probably overestimate the true wild spawning populations in Drift and Schooner Creeks because the nature of the habitat in these creeks is less productive than that of the survey streams in the Siletz.

Table 4.5-3. Estimated spawning populations for naturally produced coho for Siletz Basin and Drift(Siletz) WA area (from Buckman and others).

Year	Miles Surveyed	Fish/Mile	Est. Siletz Basin pop.	Est. Drift pop.	Est. Schooner pop.
1923-1940	-----	~230	~33000	2730	1505
1990	9.32	3.5	441	41	23
1991	8.52	7.9	984	93	51
1992	10.55	19.6	2447	231	127
1993	12.57	3.2	400	38	21
1994	7.78	7.7	967	91	50
1995	8.33	3.34	417	39	22

Historical run size in Rock Creek is difficult to estimate because of the lack of commercial fisheries and management that occurred before the initial spawning surveys on Rock Creek. Stream surveys from the fifties suggest that populations were variable from year to year but average peak counts of adult fish were about 22 fish/mile, equating to approximately 360 fish in Rock Creek (Appendix 7.8). In comparison, in recent surveys of the same reach of Rock Creek, peak counts averaged about 7 fish per mile, equating to approximately 110 fish in Rock Creek. These recent data are somewhat misleading because additional surveys on Rock Creek above the index reach found consistently higher numbers of adult coho. It is likely that the average population in 1985-1995 was closer to 200 adult fish in Rock Creek. If the trend of increased escapement in the upper reaches of Rock Creek held true for the earlier surveys in Rock Creek the 1957-1967 average population estimate for Rock Creek would have been approximately 540 adult fish (based on linear regression of upper survey adult numbers on lower survey adult numbers, r^2 = 0.63). It is likely that fish numbers in the early 1900's in Rock Creek were higher than those found in the 1950's and 1960's because of the effects of exotic species introductions, poisoning Devils Lake in the 1950's to remove exotic species, timber harvest and channel straightening that had already occurred along Rock Creek.

The fall chinook salmon in Drift Creek appear to be stable. There is no standard spawning survey in Drift Creek for fall chinook; however, spawning surveys by the USFS in 1994 found a peak count of 65 adult fish/mile. Average peak counts for index surveys in the Siletz Basin have been 50 adults and jacks per mile (Cooney and Jacobs 1993). Assuming that ocean survival, catch, and freshwater habitat remain similar to past years, chinook populations are expected to remain healthy.

Winter steelhead have shown a drastic decline in recent years based on punch card catch data (Buckman and Reeve 1996). Because little other population information (e.g., spawning surveys) is available, catch data is the best estimate of population size. Catch on Drift Creek has declined from peaks of over 2000 fish in 1968 and average catches of close to 1000 fish, to average catches of less than 100 fish in the 1990's. These data may be skewed because harvest effort and reporting are difficult to measure without creel census data. However, because of the magnitude of the change, it is likely that steelhead populations are severely depressed in Drift Creek. Inventory data is needed if steelhead populations are to be assessed accurately.

4.6 Vegetation

The vegetation data used for much of the analysis in this section was adequate for landscape scale planning. However, review by BLM and FS Silviculturists identified many site specific discrepancies and significant amounts of missing data. The data layer used in this analysis should be reviewed and corrected before being used in site specific analysis.

Natural Disturbance Processes

The scale at which natural disturbances occur is important for understanding how they affect the watershed resources spatially and temporally. Fire occurs infrequently across the landscape at a very large scale. Thus, it has the greatest influence on setting vegetation patterns at the landscape scale. In this analysis area, fire reset large blocks (greater than 10,000 acres) back to an early seral stage forest. Often, burned stands then moved through successional stages as one large block. These contiguous, large blocks usually remain in later seral stages for a few hundred years.

Other disturbances occur at a smaller scale, generally impacting areas less than 10 acres in size. Insects, root rots, and winds create small openings which allow herbs, shrubs and tree seedlings to become established within stands. These factors add to the complexity of stands by creating snags and down wood, and allowing multiple layers of vegetation to develop.

Floods and Debris Torrents

Floods are not just high water: they include multiple processes: landslides, debris flows, sediment-laden streamflows, movement of woody debris and disturbance to riparian vegetation. Changes are not uniformly distributed across the landscape. The effects of floods are both temporally and spatially variable, but generally confined to the riparian influence zone and the associated flood plain. In properly functioning riparian influence zones, these processes typically result in minor disturbances.

Insects and Disease

At this time, insect and disease levels in this watershed are at endemic levels, except for Swiss needle cast (*Phaeocryptopus gaeumannii*) which has become increasingly evident in young, managed stands in the past three or four years and is being studied by private, state and federal managers. The most common insect and disease agents for creating small openings in the forest are root rots/diseases and bark beetles. Both are common at low levels in stands scattered throughout the entire watershed. Root diseases such as Laminated root rot (*Phellinus weirii*), Shoestring root rots (various species of the genus *Armillaria*), and Annosus root rot (*Fomes annosus*) have been found in this watershed. They are pervasive, but slow moving disturbance agents which operate at a small-scale. Root rots are fungi which primarily spread from one tree to the next by means of root contacts or spores from the fruiting body coming in contact with stumps or wounds which go all of the way through the bark of the tree. These diseases affect the roots of the host tree, destroying their ability to take up water and nutrients, and making them more susceptible to blowdown. All types of management which affect trees (soil compaction, road building, timber harvest, tree planting, etc.) have the potential to increase the spread of root diseases. Careless treatments can result in all of the trees in a stand dying, returning the stand to an early seral stage. Site specific measures should be taken to minimize the spread of root diseases caused by management activities.

Many types of insects which defoliate or kill trees are common in this watershed, but the insect which seems to be most commonly associated with individual tree mortality or small pockets of dead trees is the Douglas-fir beetle (*Dendroctonus pseudotsugae*). Spruce beetle (*Dendroctonus rufipennis*) is also common, especially in the coastal fog zone, but tree mortality has been rare over the past ten years. From the mid-1960's through 1990 tree mortality caused by these beetles steadily declined, as a result of land managers effectively harvesting pockets of blowdown. In the past few years, bark beetle tree mortality has increased slightly on National Forest System lands. Bark beetles breed in down, injured or diseased trees (Furniss and Carolin 1977) which are still relatively green (have not yet dried out). At endemic levels in this watershed, small populations of Douglas-fir beetle build up in trees that have been weakened by root diseases or in blowdown. A rule of thumb is:

> When the number of infested trees and/or logs reaches or exceeds three trees larger than 12 inches in diameter per acre, for every two trees which were infested during the first year, we can expect to see one healthy standing Douglas-fir infested during the following spring; the infested trees generally die one year later. For every four trees infested and killed during the second year, we can expect to see one tree infested in the third year; and for every 25 trees infested and killed in the third year, we can expect to see one tree successfully infested in the spring of the fouth year (Hostetler and Ross 1996; Appendix 7.6).

The actual impacts may vary due to climate, general tree vigor, etc. Since 1990, beetle mortality on the Hebo Ranger District has been increasing slightly (field observations, not detected in low elevation insect and disease flights), as windthrow and the resulting tree mortality is not being salvaged. These dead trees are being retained to increase snag and down woody debris levels on National Forest System lands. Guidelines have been developed and are being implemented to limit beetle risk from management activities (see "Guidelines", last page of Appendix 2.1). Additionally, large numbers of trees are being felled to increase down wood on Mt. Hebo (about 20 miles north of this analysis area). This project will be closely monitored to further refine these guidelines if needed.

Because large blocks of old growth stands have not been available and, when available on a smaller scale, are difficult to study, our knowledge of large, landscape scale disturbances resulting from insects and/or diseases is very limited. We do know that several insects have the potential for killing large numbers of trees over the entire watershed as we increase the extent of old growth stands on federally managed lands. As more of the federal lands grow into large blocks with late-successional forest characteristics, conditions will increasingly favor several species of bark beetles (*Dendroctonus sps.*) and western hemlock looper (*Lambdina fiscellaria lugubrosa*). At the same time, we know that old growth stands are better able to withstand insect and disease attacks - having relatively larger and more diverse populations of insect predators, more diverse tree species mixes, etc. Epidemic levels of these insects have been recorded in western Oregon and are potential disturbances over large areas.

Vegetation Patterns

This section describes coarse scale vegetation patterns in the watershed associated with fire regime blocks and soil/climate zones. Historic vegetation patterns were reconstructed by examining fire history studies, a digitized vegetation map constructed from 1940's vertical aerial photos, and historic oblique aerial photos from 1939 available at the University of Oregon map library. The fire history studies and oblique photos provided general vegetation patterns of patch size and seral stages, while the vegetation map provided seral stage distributions from one point in history, 1950. This period is assumed to reflect vegetation patterns typical of those prior to extensive logging. Distribution of historic seral stages is shown on Map 15 and Table 4.6-5

The 1956 vegetation layer indicates that before extensive logging took place, stands of mature conifer at least 100 years old occupied about 32,000 acres or 66% of the analysis area. A mature conifer/deciduous mix occupied the southern portion of the analysis area. Deciduous species were a lesser component of the vegetation in the central portion of the watershed.

Unfortunately, the historic vegetation map reflects only upland, not riparian, vegetation patterns. Vegetation patterns resulting from wind, flood or landslide disturbances are not evident in the map. The unconfined, mainstem valleys were homesteaded at the turn of the century, and vegetation was changed considerably for pasture, farming and homesites. Also, some of the mainstem creeks were channelized and used for mill ponds. As a result of human activities, streamside vegetation was often removed.

Plant Association Groups

Plant Association Groups (PAGs) refer to a community of plant species that inhabit a climax (late-successional) forest. PAGs are often considered to be hypothetical units, because landscape disturbances, both natural and human-caused, prevent many sites from reaching climax condition. Nevertheless, if one hypothetically excludes disturbance from the picture, and assumes that succession will follow certain trajectories, then potential vegetation communities can be predicted for a given site (USDA 1995a).

Plant Association Groups (Map 19) are groupings of plant associations which are a finer scale classification of potential vegetation communities frequently used in field work to characterize the vegetation community of the plot location. Plant associations reflect micro-site characteristics, which may change over short distances. The more general (or macro) environment is best expressed when grouping individual plant associations into plant association groups. The distribution of the plant association groups has recently been mapped for the Siuslaw National Forest lands and extended across adjacent private lands using models based on environmental factors. This model does not take into account the noble fir plant associations found at higher elevations in the northeast portion of the analysis area.

Plant Association Groups are useful for identifying potential changes in stand composition, structure and successional pathways. They also indicate relative differences in soil fertility and wildlife use. Knowledge of species composition differences among plant associations and their relative locations and abundance can provide guidance for development of silviculture prescriptions designed to promote late-successional structure in plantations.

Plant species and soil characteristics of the most prevalent plant association groups in the watershed are displayed in Table 4.6-1. Within the western hemlock (*Tsuga heterophylla* (TSHE)) and Sitka spruce (*Picea sitchensis* (PISI)) series, salal (*Gaultheria shallon* (GASH)), swordfern (*Polystichum minutum* (POMU)) and salmonberry (*Rubus spicatum* (RUSP)) are common in the Coast Range. A complete list of plant associations in each PAG is described in the Federal Lands Assessment (USDA 1995a).

Table 4.6-1 Plant Associations and Soil Conditions

Plant Association	Major Overstory Tree Species	Major Shrub Species	Major Herb Species	Soil Fertility	Soil Moisture and Slope Position
TSHE/RUSP Western hemlock/ Salmonberry	Douglas-fir and pure stands of alder.	Primarily salmonberry. Also evergreen huckleberry, red huckleberry.	Few herbs. Low amounts of oxalis and montia. Swordfern in openings.	Soil is nitrogen enhanced by pure stands of alder. Conifer growth excellent.	Very moist soils, high organic matter content. Lower slope positions including riparian.
TSHE/POMU Western hemlock/ Swordfern	Some alder. Douglas-fir associated with western hemlock and redcedar in lower layers.	Usually has limited cover but consists of red huckleberry, salal, salmonberry and vine maple.	Swordfern is most common with Oregon oxalis, deerfern, Pacific trillium and bedstraw common.	High. Natural stands normally well stocked. Red alder regenerates and develops well.	High moisture, but well drained soils. Usually midslope position. Can occur in riparian.
TSHE/GASH Western hemlock/ Salal	Douglas-fir and western hemlock. Some western redcedar. Some bigleaf maple and chinquapin.	Dense salal. Salal is enhanced by disturbance.	Swordfern.	Douglas-fir grow moderately well. Salmonberry and alder are not as aggressive.	More common at higher elevation at tops of slopes and on ridgetops.
PISI/GASH Sitka spruce/ Salal	Sitka spruce, western hemlock and Douglas-fir. Some red alder.	Dense salal. Red huckleberry and salmonberry nearly always present.	Swordfern minor or absent. Trace amounts of other herbs.	Douglas-fir grows moderately well. Salmonberry and alder not aggressive.	Well-drained soils.
PISI/POMU Sitka spruce/ Swordfern	Sitka spruce, western hemlock Douglas-fir, western red cedar. Red alder may dominate canopy.	Total shrub cover low. Red and evergreen huckleberry, fool's huckelberry, salal.	Swordfern is abundant. Oregon oxalis, deerfern, Pacific trillium and bedstraw common.	High. Natural stands normally well stocked. Red alder regenerates and develops well.	Middle and lower slopes and benches or on shaded northerly slopes. Soils deep and rich in organic matter.
PISI/RUSP Sitka spruce / Salmonberry	Sitka spruce, Douglas-fir, western hemlock to pure alder stands.	Dense salmonberry with red hucklberry, vine maple and fool's huckleberry.	Swordfern and Oregon oxalis with deerfern, ladyfern, montia, bedstraw.	High. Salmonberry and alder aggressive competitors.	Very moist soils, adequate drainage. Lower slopes to ridgetops.

(From Hemstrom and Logan, 1986)

The distribution of PAGs from west to east across the watershed shows a gradation from wet to dry with associated changes in species composition, stand structure, and differences in succession and disturbance regimes. These components are described for the Coastal Fog and Central Interior Disturbance Blocks.

Coastal Fog Disturbance Block

The primary disturbance factor in the Coastal Fog Block is wind. Large scale fires occur infrequently. High winds and high rainfall are common in winter. Fog and low clouds moderate the differences between summer and winter air and soil temperatures, which increases effective soil moisture during the summers. Vegetation is dominated by Sitka spruce, western red cedar (*Thuja plicata* (THPL)) and western hemlock, with salmonberry, Douglas-fir and alder (*Alnus rubra* (ALRU)) as common components (USDA 1995a). The Coastal Fog Block is primarily composed of wet and moist PAGs (salmonberry and swordfern) with drier PAGs (salal) occurring as small bands on ridgetops. Over 75% of the Coastal Fog Block is within the Sitka spruce/salmonberry PAG. Approximately 2% of the block is in the Sitka spruce/salal association. The remainder is Sitka spruce/swordfern or, in the coastal dunes, shore pine (Pinus contorta). Most of the shore pine areas have been converted to residential or commercial lots within Lincoln City.

On slopes dominated by salmonberry and/or swordfern, stands 120 years old have many attributes of old-growth structure. They are multilayered and have an open overstory of large Douglas-fir bearing large limbs and wide crowns. An understory of clumpy cedar and hemlock develops as the alder senesces about 75 years after the initial stand establishment. By contrast, on moderate slopes dominated by salal, stands 120 years old are simpler with single-story, even-aged Douglas-fir and little evidence of old-growth structural features.

Central Interior Disturbance Block

The primary disturbance factor in the Central Interior Block is fire, although large-scale fires occur infrequently. The area receives occasional high winds in the winter. Summers are moist and winters are wet. There is a significant difference in soil temperatures from summer to winter. Summer soil moisture levels range from very high on lower slopes to moderately dry on upper sideslopes. Douglas-fir and western hemlock are the dominant conifers. Plant communities are mixed-conifer and alder/salmonberry with either alder or conifer dominating the higher slopes, depending upon summer soil moisture levels and disturbance history.

Approximately 40% of the Central Interior Block is within the western hemlock/swordfern plant association. Dry ridgetops are dominated by the western hemlock/salal PAG, which covers over 11% of the block. At higher elevations on Stott Mountain, noble fir replaces Douglas-fir and western hemlock. The Sika spruce or western hemlock/salmonberry PAGs are primarily within riparian areas.

Generalized Forest Succession

The flowcharts below indicate the successional pathways expected for the dominant PAGs. These pathways were developed from examination of data summaries in the Plant Association and Management Guide for the Siuslaw National Forest (Hemstrom and Logan 1986) and knowledge of plantation success and difficulty in each of the PAG types. These pathways may be used at the appropriate age to guide restoration treatments of plantations where the objective is to favor species composition common in natural stands. Due to lack of information, they should be regarded as hypotheses that need to be tested and would present excellent opportunities for monitoring and adaptive management. The flowcharts of successional pathways indicate expected species composition through time for three types of environments (dry, wet, moist). [Note: In the following figures insert PISI/TSHE in place of TSHE for spruce associations.] The following discussions regarding dry, moist and wet environments indicate that Douglas-fir disappears from late seral forests. However, Douglas-fir survives in the overstory for more than five hundred years and fire frequencies in this watershed will preclude successional development from reaching a "pure climax" stage.

Dry Environments

Dry environments (TSHE/GASH , PISI/GASH) probably have three successional pathways (Figure 4.6-2), beginning with Douglas-fir or Douglas-fir/western hemlock in the early seral stage (first 10 years). In the young seral stage (10-80 years), shade tolerant western hemlock and Sitka spruce may be a small component of the understory and increase as a component in mature (80-150 years) and late seral stages. Regeneration of dense stands with conifer results in considerable self-thinning between the young and mature seral stages. We predict that old-growth structure develops slowly--150 to 180 years after stand initiation when gaps develop. Deciduous trees are a small component of stands throughout succession and are not shown as a species in the Figure 4.6-2. Regeneration of the salal PAG results in dense young conifer stands and considerable self-thinning from young through mature successional stages.

Figure 4.6-2 Dry Environment Salal Types (TSHE OR PISI/GASH):

Forest Type		Early Seral (0-10 yrs)	Young Seral (10-80 yrs)	Mature Seral (80-150 yrs)	Late Seral (150-300 yrs)
1. Conifer	→	PSME	→ →	PSME/TSHE	TSHE
2. Conifer	→	PSME	PSME/TSHE	→ →	TSHE
2. Conifer	→	TSHE	TSHE	→ →	TSHE

Moist Environments

Moist environments (TSHE/POMU, PISI/POMU)) may have four pathways (Figure

Figure 4.6-3 Moist Environment Swordfern Types (TSHE OR PISI/POMU):

Forest Type		Early Seral (0-10 yrs)	Young Seral (10-80 yrs)	Mature Seral (80-150 yrs)	Late Seral (150-300 yrs)
1. Conifer	→	**PSME**	→ →	**PSME/TSHE**	**TSHE**
2. Conifer	→	**PSME/TSHE**	→ →	→ →	**TSHE**
3. Conif/Decid Mix	→	**ALRU/PSME**	→ →	**PSME/TSHE/ THPL**	**TSHE(THPL)**
4. Conif/Decid Mix	→	**ALRU**	→ →	**TSHE**	→ →

4.6-3), two dominated by conifers throughout succession and two with a conifer/deciduous mixture. The two groups occur with equal probability (50/50%).

In the stands that are dominated by conifers throughout succession, the first pathway begins with Douglas-fir in the early seral stage; and the second pathway begins with a mix of Douglas-fir, Sitka spruce and western hemlock. By the mature seral stage, both paths develop a mixture of the three coniferous species.

Stands that have a mixture of conifer/deciduous species represent the third pathway for the moist environments. These begin with a mixture of alder, Douglas-fir and Sitka spruce in the early and young seral stages. In the mature seral stage, the major species are Douglas-fir, Sitka spruce, western hemlock and western red cedar. A fourth pathway begins with alder in the early through young seral stages and develops into a PISI/TSHE, PISI/PSME, or, TSHE/PSME stand in the mature and late seral stages.

Wet Environments

Wet environments (TSHE/RUSP, PISI/RUSP) could have five pathways (Figure 4.6-4). Regeneration of conifers is sparse. Alder has a larger role than conifers in early seral stages and remains a large component in young and mature stages. Understory development of conifer is slow due to high salmonberry competition There are often 1-2 seral stages present at any one time since wide spacing of conifers allows for understory development to begin early in succession. The rapid growth and tree shape of Douglas-fir that results from wide spacing appears to accelerate old-growth structure earlier (at about year 120) than in the other PAGs.

Figure 4.6-4. Wet Environment Salmonberry Types (TSHE OR PISI/RUSP):

Forest Type		Early Seral (0-10 yrs)	Young Seral (10-80 yrs)	Mature Seral (80-150 yrs)	Late Seral (150-300 yrs)
1. Conifer	→	**PSME**	→ →	**PSME/ TSHE**	**TSHE**
2 Conifer (uncommon)	→	**PSME /TSHE**	→ →	→ →	**TSHE**
3. Conif/Decid mix	→	**ALRU**	→ →	**ALRU / TSHE**	**TSHE (THPL)**
4. Conif/Decid mix	→	**ALRU/PSME**	→ →	**PSME**	**TSHE (THPL)**

Effects of Disturbance on Succession

For all western hemlock/Sitka spruce PAGs, the theoretical climax consists of all-aged stands of western hemlock /spruce or western hemlock/spruce/western red cedar. Small scale disturbances like wind and laminated root rot usually accelerate a site's succession, but a fire disturbance would return the site to an earlier stage of succession.

In general, a high intensity fire at any stage of stand development would probably return the site to the shrub/herb dominated stage of development. Some shrub fields may last for many decades before conifers can re-establish. The next stage (early seral) consists of stand initiation dominated by Douglas-fir and/or alder seedlings and saplings. If no fires burn, the stand will eventually develop through the young, mature and old-growth phases.

Depending on fire severity and stage of forest succession, fires tend to retard or revert stand development to varying degrees. For example, a low intensity fire in the stem exclusion phase would thin out the understory with little effect on the overstory, but a moderate intensity fire would thin both the understory and overstory. Repeated low intensity fire would keep western hemlock in the understory at greatly reduced numbers and favor two-storied stands. A moderate intensity fire would back the stand up one level in the successional pathway and create a mosaic forest through a mix of crown fire and underburning. As documented in the Nestucca Watershed Analysis (USDA and USDI 1994b), multiple high intensity fires over a short period of time result in extensive stands of alder and shrub species into which conifer regeneration is difficult and may be delayed until such time as the alder overstory begins to break-up.

Seral Stage Distribution

The watershed contains a wide distribution of seral stage vegetation types (Appendix 7.11), as shown on Map 16. Since the 1950's, when intensive timber management began, there has been a decrease in mature conifer distribution and patch size, and an increase in young conifer and young conifer-mix. These changes are displayed in Table 4.6-5. The trends in differences between the seral stage distribution of the 1940's and 1990's are similar to those described in the Federal Lands Assessment (USDA 1995a) and other watershed analyses on the Forest.

Mature conifer (mature conifer mix, mature conifer, old-growth/mature) currently occupies the most area (24% in the entire watershed - 3% on private lands & 21% on NFS/BLM lands), though this is much less than the 66% that existed in the 1940's. Past timber management activities, including harvesting mature conifers and soil compaction from road building, has increased the area occupied by deciduous stands on upper and mid slopes (Table 4.6-5).

Table 4.6-5 is based upon Map 15. Much of the coastal strip and the Schooner Creek area had already been impacted by Euro-American settlement. Although the southeastern portion of the map shows private cutover areas in the 1950's, the figures in the table are based on these areas having been mature conifer prior to the 1950's.

Table 4.6-5 Changes in Seral Stage Distribution from the 1940's to Current (Acres and Percent)

Seral Stage Vegetation Type	Acres and % in 1940's	Current in Entire Watershed	Current on USFS and BLM in Watershed
Grass/forb/seedling/sapling	7,807 (16%)	7,557 (16%)	2,617 (5%)
Pure Hardwood	1,073 (2%)	989 (2%)	490 (1%)
Hardwood Mix Pole	133 (0%)	591 (1%)	438 (1%)
Conifer Mix Pole	1,422 (3%)	2,210 (5%)	1,793 (4%)
Conifer Pole	1,525 (3%)	2,066 (4%)	1,097 (2%)
Young Conifer	2,678 (6%)	6,589 (14%)	1,745 (4%)
Young Conifer Mix	922 (2%)	7,642 (16%)	2,681 (6%)
Young Hardwood Mix	582 (1%)	2,273 (5%)	423 (1%)
Mature Hardwood Mix	0	2,632 (6%)	902 (2%)
Mature Conifer Mix	5,554 (12%)	3,437 (7%)	2,660 (5%)
Mature Conifer	5,904 (12%)	5,904 (12%)	5,407 (11%)
Old Growth/Mature	20,237 (42%)	2,487 (5%)	1,865 (4%)
Nonforest (unknown)	—	3,460 (7%)	—
Total	47, 837	47,837	22,118 (46%)

Species Composition and Structure

Intensive timber management changed the species composition and structure of stands within the watershed. After a natural stand of mature timber was harvested, the combination of site preparation (slashing and/or burning), genetically-improved nursery seedlings, and early use of herbicides contributed to the rapid reforestation of conifers. In the riparian areas of managed stands, brush and alder persist because of increased competition in wet areas.

Plantations contain denser stands of trees than most early natural stands. Dense planting was intended to ensure survival and re-establishment of conifers to a given stocking level. The higher stocking levels were also planned as part of the management regime that contributed to intermediate thinning entries to increase total yields of timber. The species selected for regeneration was the shade intolerant Douglas-fir, because of it's high timber value. Clearcutting became the predominant regeneration system because of the emphasis on production of Douglas-fir and because clearcut harvest is cost effective. Shade-tolerant species (western hemlock and western red cedar) were expected to seed in naturally as site conditions became more favorable. Precommercial thinning of very young stands in the 1960's and 1970's favored the faster growing Douglas-fir as crop trees over the slower growing shade tolerant trees.

Today, about 54% of the lands in the watershed (46% of USFS & BLM lands) are in managed stands less than 50 years old. On USFS and BLM lands, 32% of these plantations are in the 25-45 year age class and potentially eligible for commercial thinning (Table 4.6-6).

Table 4.6-6 Acres of Plantations by Age Class

Age Class (yrs.)	All Owners	USFS	BLM
1-10	4,701	2,324	300
11-20	4,394	2,291	259
21-30	6,791	2,217	255
31-40	9,809	2,356	127
41-50	249	0	61
55-60	36	0	24
TOTAL	25,980	9,188	1,026

Map 18 shows the distribution of managed stands on National Forest. About 2,280 acres (19%) of the remaining natural stands were thinned in the early 1970's in an effort to salvage commercial trees nearing mortality and improve tree growth of the remaining stock.

Existing Mature Stand Characteristics

The emphasis for stands on federal lands in this analysis area is "for restoration and maintenance of late successional forest habitat" (USDA and USDI 1994c). This basically sets the long term reference condition. The components of late-successional forest habitat are best described by Franklin and Spies in USDA 1991.

In an effort to identify/quantify some of the components specific to this analysis area, to help guide the development of silvicultural prescriptions, data was compiled from 160 plots taken in mature or old growth stands - (109 plots from the 1987 Siuslaw Vegetation Resource Survey and 51 plots from the 1984 Siuslaw Ecoplot Intensive Survey). Generally, the stands appear to be in the 100 to 150 year old range, representing stands that have had little human disturbance and are successfully moving towards the late-successional forest characteristics planned for the federally managed lands in this watershed. These natural stands serve as a yardstick by which to measure our progress. Although it may seem logical that coarse woody debris (CWD) levels vary with plant association, research indicates little relationship between the two (Harmon and others 1986). Intensive ecoplot data compiled for the Siuslaw western hemlock series reveals no differences in CWD by PAG alone (Hemstrom and Logan 1986). The data indicates that different plant associations in the Coast Range have similar levels of snags and widely varying, but unpredictable, levels of down logs across the western hemlock series. The noble fir sites in the Stott Mountain area were not analyzed.

Tables 4.6-7 and 4.6-8 display the average numbers of logs, snags, and trees per acre for the various hemlock and spruce PAG environments common in this watershed. The sub-series plant associations included in each group are shown at the bottom of the table (see Hemstrom and Logan 1986, for definitions of the plant associations). Additionally, we wanted to show the range of natural variability within the sampled plots for each of the factors sampled. Tables 4.6-9 and 4.6-10 show the maximum numbers of trees, logs and snags found in each category. For each of these factors, one or more of the plots recorded no individuals which met the criteria for that factor. For instance, in the hemlock series on dry sites, the range of variability recorded for western hemlock in the giant size class is 0 to 1.4 trees per acre. Photos from the logging which occurred in the 1940's and 1950's east of Lincoln City and north of the Siletz River clearly show that the old growth hemlock on the site at that time greatly exceeded 1.4 trees per acre. However, the range displayed in these tables will help us understand the range of natural variability in stands 100 to 150 years old within this watershed.

Table 4.6-7 Average Structure and Composition of Mature Conifer Stands in the Western Hemlock Series (shown below as numbers of trees, logs or snags per acre)

Tree Species	Hemlock - Dry (18 plots)					Hemlock - Moist (21 plots)					Hemlock - Wet (36 plots)				
	Small	Med.	Large	Giant	Total	Small	Med.	Large	Giant	Total	Small	Med.	Large	Giant	Total
Bigleaf maple					0.0					0.0	0.8	0.0			0.8
Douglas-fir	20.2	25.3	5.5	0.4	51.4	28.3	23.4	6.2	0.4	58.3	9.0	10.3	5.7	0.3	25.3
Red alder	2.2	0.1			2.3	7.2	1.3			8.5	13.4	1.6			15.0
Sitka spruce		0.3	0.1		0.4	0.5	0.1	0.2	0.0	0.8	1.5	0.5	0.3	0.1	2.4
Western hemlock	18.9	10.2	2.2	0.1	31.4	24.5	10.8	2.1	0.0	37.4	22.8	10.7	2.7	0.0	36.2
Western redcedar	3.5		0.0	0.1	3.6	3.6	0.3	0.3	0.1	4.3	5.0	0.9	0.3	0.1	6.3
Total live trees	44.8	35.9	7.8	0.6	89.1	64.1	35.9	8.8	0.5	109.3	52.5	24.0	9.0	0.5	86.0
Snags:															
Hard conifer snags	14.8	1.5	0.6	0.1	17.0	14.1	1.8	0.4	0.0	16.3	4.4	0.8	0.3	0.0	5.5
Soft conifer snags	2.4	2.1	2.6	0.8	7.9	2.7	2.7	2.2	0.6	8.2	0.9	0.7	1.3	0.5	3.4
Logs on the ground:															
Hard logs	23.3	5.9	0.9		30.1	14.3	2.2	1.4	0.3	18.2	9.7	2.3	1.1	0.2	13.3
Soft logs	5.1	2.0	2.2	0.5	9.8	7.3	4.9	4.7	0.6	17.5	2.8	5.7	2.3	0.5	11.3

Sub-series plant associations:	Hemlock - Dry	Hemlock - Moist	Hemlock - Wet
	dwarf Oregon grape dwarf Oregon grape-salal salal salmonberry-salal	Oregon oxalis swordfern vine maple-swordfern vine maple-salal	devil's club salmonberry salmonberry-vine maple

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

Data sources: 1987 Vegetation Resource Survey (109 plots)
1984 Siuslaw Ecoplot Intensive Survey (51 plots)

Live trees & snags measurement - diameter at breast height (dbh)

Hard snags - snags in decay classes I, II & III (Cline, 1977)   Soft snags - snags in decay classes IV & V (Cline, 1977)

Logs = pieces greater than 20 feet long and having the large end of the log in the above size classes.
Hard logs - logs in decay classes I, II & III (Fogel, 1973)   Soft logs - logs in decay classes IV & V (Fogel, 1973)

Table 4.6-8 Structure and Composition of Mature Conifer Stands in the Sitka Spruce Series
(shown below as number of trees, logs or snags per acre)

	Spruce - Dry (13 plots)					Spruce - Moist (39 plots)					Spruce - Wet (33 plots)				
Tree Species	**Small**	**Med.**	**Large**	**Giant**	**Total**	**Small**	**Med.**	**Large**	**Giant**	**Total**	**Small**	**Med.**	**Large**	**Giant**	**Total**
Douglas-fir	8.1	13.4	9.5	0.3	31.3	2.8	5.7	2.5	0.1	11.1	9.3	5.0	4.9	0.3	19.5
Red alder	11.4	1.0	0.2		12.6	7.5	0.7	0.0		8.2	7.7	1.7	0.1		9.5
Sitka spruce	6.1	6.7	3.4	0.1	16.3	7.9	11.0	8.6	1.9	29.4	3.2	2.5	3.6	1.7	11.0
Western hemlock	18.5	6.1	2.1		26.7	32.6	16.7	3.5	0.2	53.0	12.1	6.2	3.2	0.1	21.6
Western redcedar	1.4	0.5	0.3		2.2	0.4				0.4	2.1	0.2	0.2	0.2	2.7
Total live trees	45.5	27.7	15.5	0.4	89.1	51.2	34.1	14.6	2.2	102.1	34.4	15.6	12.0	2.3	64.3
Snags:															
Hard conifer snags	3.6	0.7	0.4	0.1	4.8	9.0	2.1	0.9	0.2	12.2	5.0	1.0	0.6	0.2	6.8
Soft conifer snags	0.9	1.5	2.9	0.7	6.0	1.3	1.3	2.0	0.6	5.2	0.9	0.5	1.9	0.9	4.2
Logs on the ground:															
Hard logs	6.2	2.4	0.4		9.0	11.9	3.6	1.8	0.2	17.5	8.4	3.3	3.2	1.3	16.2
Soft logs	3.5	1.9	2.7	1.0	9.1	8.1	4.4	4.5	0.6	17.6	3.3	4.6	2.1	0.8	10.8

Sub-series plant associations:	Spruce - Dry	Spruce - Moist	Spruce - Wet
	salmonberry-salal salal	Oregon oxalis fool's huckleberry-red huckleberry swordfern	devil's club salmonberry

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

Data sources: 1987 Vegetation Resource Survey (109 plots)
1984 Siuslaw Ecoplot Intensive Survey (51 plots)

Live trees & snags measurement - diameter at breast height (dbh)

Hard snags - snags in decay classes I, II & III (Cline, 1977)
Soft snags - snags in decay classes IV & V (Cline, 1977)

Logs = pieces greater than 20 feet long and having the large end of the log in the above size classes.
Hard logs - logs in decay classes I, II & III (Fogel, 1973)
Soft logs - logs in decay classes IV & V (Fogel, 1973)

Table 4.6-9 Max. Numbers of Trees, Logs or Snags Found on Any Plots Surveyed in Western Hemlock Series Mature Conifer Stands (shown below as number of trees, logs or snags per acre)

	Hemlock - Dry (18 plots)				Hemlock - Moist (21 plots)				Hemlock - Wet (36 plots)			
Tree Species	**Small**	**Med.**	**Large**	**Giant**	**Small**	**Med.**	**Large**	**Giant**	**Small**	**Med.**	**Large**	**Giant**
Bigleaf maple									28.5	1.5		
Douglas-fir	82.2	64.1	14.8	2.8	172.6	49.2	16.4	1.8	105.9	54.3	20.1	3.3
Red alder	17.0	2.0			67.5	18.4			127.9	10.6		
Sitka spruce		3.1	1.4		10.2	2.2	2.1	0.6	15.8	10.2	3.7	1.6
Western hemlock	82.5	39.2	7.9	1.4	80.6	39.0	8.4	0.5	89.1	56.2	11.2	0.6
Western redcedar	14.7		0.7	1.2	41.2	2.5	4.5	2.2	44.5	11.4	3.6	1.1
Snags:												
Hard conifer snags	71.7	8.3	4.2	0.3	38.5	7.0	3.3	0.6	23.2	5.7	2.2	0.6
Soft conifer snags	20.5	9.1	10.7	3.7	16.3	11.2	10.7	3.4	21.0	6.0	10.9	2.6
Logs on the ground:												
Hard logs	140.6	35.6	10.3		50.5	16.2	13.7	2.7	62.8	15.3	11.2	3.7
Soft logs	32.6	16.3	23.3	3.4	74.7	22.2	30.7	10.8	26.8	57.9	22.3	13.2
Sub-series plant associations:	dwarf Oregon grape dwarf Oregon grape-salal salal salmonberry-salal				Oregon oxalis swordfern vine maple-swordfern vine maple-salal				devil's club salmonberry salmonberry-vine maple			

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

Data sources: 1987 Vegetation Resource Survey (109 plots)
1984 Siuslaw Ecoplot Intensive Survey (51 plots)

Live trees & snags measurement - diameter at breast height (dbh)

Hard snags - snags in decay classes I, II & III (Cline, 1977)   Soft snags - snags in decay classes IV & V (Cline, 1977)

Logs = pieces greater than 20 feet long and having the large end of the log in the above size classes.
Hard logs - logs in decay classes I, II & III (Fogel, 1973)   Soft logs - logs in decay classes IV & V (Fogel, 1973)

Table 4.6-10 Max. Numbers of Trees, Logs or Snags Found on Any Plots Surveyed in Sitka Spruce Series Mature Conifer Stands (shown below as number of trees, logs or snags per acre)

	Spruce - Dry (13 plots)				**Spruce - Moist (39 plots)**				**Spruce - Wet (33 plots)**			
Tree Species	**Small**	**Med.**	**Large**	**Giant**	**Small**	**Med.**	**Large**	**Giant**	**Small**	**Med.**	**Large**	**Giant**
Douglas-fir	48.6	38.7	31.8	1.8	26.1	36.5	9.7	1.2	186.7	33.0	16.9	2.5
Red alder	61.8	6.3	2.4		76.8	13.3	1.1		94.9	10.6	1.3	
Sitka spruce	46.3	15.7	15.4	1.1	39.2	43.2	28.2	8.4	21.5	15.2	23.0	7.6
Western hemlock	125.5	36.3	11.8		135.6	58.4	14.5	3.4	59.9	17.7	9.7	1.0
Western redcedar	13.1	2.5	2.0		13.9				43.8	2.9	2.7	2.6
Snags:												
Hard conifer snags	11.0	4.1	2.2	1.8	40.5	9.5	8.0	1.4	49.6	8.0	3.7	1.2
Soft conifer snags	7.6	7.3	11.4	2.6	9.2	6.7	12.7	4.3	15.3	3.2	9.8	6.2
Logs on the ground:												
Hard logs	27.0	8.1	5.4		40.5	16.2	23.7	2.7	24.3	24.1	20.5	25.6
Soft logs	13.5	13.5	8.1	10.8	53.1	34.3	21.2	5.4	36.7	29.7	20.4	10.9

Sub-series plant associations:	Spruce - Dry	Spruce - Moist	Spruce - Wet
	salmonberry-salal salal	Oregon oxalis fool's huckleberry-red huckleberry swordfern	devil's club salmonberry

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

Data sources:
1987 Vegetation Resource Survey (109 plots)
1984 Siuslaw Ecoplot Intensive Survey (51 plots)

Live trees & snags measurement - diameter at breast height (dbh)

Hard snags - snags in decay classes I, II & III (Cline, 1977) Soft snags - snags in decay classes IV & V (Cline, 1977)

Logs = pieces greater than 20 feet long and having the large end of the log in the above size classes.
Hard logs - logs in decay classes I, II & III (Fogel, 1973) Soft logs - logs in decay classes IV & V (Fogel, 1973)

Riparian Vegetation

An inventory of natural stands within 150-300 feet of streams in the Drift Creek watershed was conducted on National Forest lands in 1994. Along the larger streams (orders 4-6) with lower stream gradients, the stand structure was similar to the Siuslaw description of Spruce-Wet plant associations. Even within the Western Hemlock plant associations, the lower order streams (orders 1-3) had stand structures similar to the Siuslaw National Forest description for the Spruce-Moist plant associations,. The sapling/pole seral stages made up 43-58% of the riparian stands. Although there were some deciduous seedlings and saplings, regeneration in the stands was primarily conifer, with western hemlock in the higher order streams and western redcedar with some western hemlock in the lower order streams. Most seedlings were found on logs. Along the lower order streams, deciduous trees comprised 21% of the sapling through medium-sized trees. Along the higher order streams, deciduous trees comprised between 10 and 15% of the sapling through medium-size trees. In all stream orders, trees greater than 21 inches in diameter at breast height (dbh) tended to be Douglas-fir or western red cedar. Sitka spruce greater than 32 inches in dbh were found in the riparian areas of higher order streams. Spruce were not found along lower order streams. The mean snag size was 25 inches dbh and 30 feet high. Only slightly more snags and logs were found in the riparian areas of higher order streams than in lower order streams.

As identified in the Floods and Debris Torrents section, man-caused disturbance is impacting riparian ecosystems in this analysis area. Plantations and other environments manipulated by man do not provide the range of habitat components (vertical and horizontal struture, large woody debris) needed to support the full complement of riparian-dependent wildlife). The unnaturally high rate of disturbance has increased the amount of alder, especially in riparian areas. Competition with alder will delay re-establishment of conifer, slowing the recruitment of large woody debris and long term stabilization of disturbed areas.

4.7 Wildlife Species and Habitats

Wildlife Resources

Wildlife diversity and abundance are related to vegetation pattern and human presence. After fires in the mid-1800's, elk populations probably increased due to large amounts of forage on the burned lands. Because Roosevelt elk (*Cervus elaphus*) were heavily hunted in the Coast Range around the turn of the century, the State did not allow elk hunting between 1917 and 1938. Elk populations increased with the use of transplanting and forage-seeding of USFS clearcuts. Between early 1971 and late 1983, 91 elk were released into the watershed analysis area. Between 1984 and 1989, 351 acres of clearcuts were seeded with forage species, usually after site preparation by broadcast burning. Elk populations in the analysis area are currently high. With the decline in new clearcuts on federal lands, elk and black-tailed deer (*Odocoileus hemionus columbianus*) will forage more heavily in riparian alder stands, harvested private lands, and private pastures (USDA 1996).

Exotic wildlife species have been introduced to the area by humans. Peacocks housed at a farm near the head of Schooner Creek have occasionally nested in National Forest clearcuts.

For a list of wildlife species that were or are present in the area, refer to Appendix C-3.2 of the Nestucca Watershed Analysis (USDA and USDI 1994b).

Mature Forest Habitat and Associated Species

Species once common are now uncommon to rare, but still exist in the analysis area, including the American marten (*Martes americana*), Pacific fisher (*Martes pennanti pacifica*), northern spotted owl (*Strix occidentalis caurina*), marbled murrelet (*Brachyramphus marmoratus*) and bald eagle (*Haliaeetus leucocephalus*). Martens, once abundant enough in the area to be trapped for their fur, are rarely seen; however, martens were sighted on BLM 's Lindsay Ridge (adjacent to the watershed) in 1974. A fisher, listed by the USFWS as a species of concern, was sighted in the Schooner Creek drainage in 1991.

The amount of mature conifer habitat in the analysis area has decreased since the 1940's (Table 4.7-1). The old-growth stands that surrounded federal lands into the 1940's and 1960's were prime habitat for the above listed species. As the old growth was logged on private land, species dependent upon mature and old growth forests were displaced to federal lands. Since the 1960's, the mature forest habitat in the southern portion of the analysis area has provided the only available refuge for these species.

Interior mature conifer habitats are critical to certain species sensitive to moisture, light, and ambient air movement for either their long term existence in one area or for mobility across the landscape for dispersal and genetic exchange with other individuals. The edge effect of forest fragmentation further reduces the amount of available interior habitat by increasing the risk of predation and competition by edge-associated and non-native species. As stands on federal lands were harvested, the amount of interior habitat decreased. Species are increasingly forced to compete for limited resources. For example, only the southern portion of the watershed analysis area and the adjacent watershed to the south have enough habitat to support more than four pairs of spotted owls (the number currently known for the area). Spotted owls are dependent on unfragmented landscapes. Barred owls (*Strix varia*), an aggressive competitor of spotted owls, have been documented adjacent to National Forest lands south of the Drift Creek watershed.

Table 4.7-1 Changes in Mature Conifer Distribution from the 1940's to Current (Acres and Percent of the Watershed)

	1950's Entire	1995 Entire	USFS/BLM Lands
Mature Conifer Mix	5,554 (12%)	3,437 (7%)	2,660 (6%)
Mature Conifer	5,904 (12%)	5,904 (12%)	5,407 (11%)
Old Growth/Mature	20,237 (42%)	2,487 (5%)	1,865 (4%)
TOTAL MATURE	31,695 (66%)	11,828 (24%)	9,932 (21%)

Spotted Owls

All of the USFS and BLM land in the watershed is within critical habitat for the northern spotted owl. There are all or portions of 4 spotted owl pair home ranges on federal lands in the watershed. Within the Northern Coast Range Adaptive Management Area, northern spotted owls are to be protected by establishing a Reserve Pair Area (RPA) around each owl activity center. The RPA should be equal to the home range size for pairs in the Coast Range Province and encompass as much suitable habitat as possible close to the owl activity center. All suitable habitat in the RPA will be reserved from timber harvest (USDA and USDI 1994c; D-16).

To provide as much suitable habitat as possible for each of the four known owl pairs between the Siletz River and Schooner Creek (2 centers are outside the watershed analysis area, but their home ranges overlap the watershed boundary), the four potential RPAs were incorporated into one large RPA (20,220 acres) that extends outside of the watershed boundaries to the south and slightly to the northeast onto BLM lands. At no place is the RPA more than four miles from an owl activity center. The RPA is not four times the size of the median home range (4 x 6,390 acres) for the typical pair in the Coast Range. It includes 11,245 acres of suitable habitat, which is over six times the median amount (1,783 acres) of suitable habitat within the home range of a typical pair. The RPA contains less than 4 times the maximum amount (3,580 acres) of suitable habitat (Map 17). The area included in the RPA contains most of the interior forest habitat within and south of the Drift Creek Watershed (Table 4.7-2).

Owl activity centers are all within interior cores exceeding 185 acres and close to other large blocks of interior forest.

Table 4.7-2 Mature Forest Interior Cores within the Reserve Pair Area

Size Range of Interior Core*	Number of Cores	% of Total Cores	# of Acres in Core Size	% of Total Interior Core	Average Core Size
1 - 5 acres	12	23	46 acres	1	4 acres
6 - 11 acres	14	26	119 acres	3	9 acres
15 - 30 acres	8	15	176 acres	4	22 acres
35 - 60 acres	6	11	284 acres	7	47 acres
70 - 140 acres	8	15	752 acres	18	88 acres
185 - 210 acres	3	6	592 acres	14	190 acres
500 - 850 acres	3	6	2,232 acres	55	744 acres
TOTAL	54		4,201 acres		
TOTAL MATURE FOREST IN RPA			11,245 acres		
% OF RPA MATURE FOREST IN INTERIOR CORES			37%		

* No core sizes fell outside of the listed ranges.

Marbled Murrelets

The murrelet habitat base consists of all mature conifer stands throughout the watershed regardless of size and surrounding habitat. Although only 10 occupied sites have been identified through survey, it is likely that the majority of the unsurveyed suitable habitat is occupied. Except for a small parcel of land in the Casccade Head Scenic Research Area (CHSRA), the National Forest land in the watershed is entirely within Late-Successional Reserves R0269 and L0269, which was designated as critical habitat for the marbled murrelet on June 24, 1996. The primary constituent elements of murrelet critical habitat are individual trees with nest platforms or potential nest platforms and trees with a canopy height of at least one half the site potential tree height (over 100 feet high and 70-80 years old) within 0.5 miles of trees with potential nest platforms (USDI 1996). Mistletoe in western hemlock provides murrelet nest sites within stands which have not otherwise developed late-successional characteristics (Nelson pers. comm. 1996).

Bald Eagles

There are two bald eagle management areas in the watershed analysis area. Both are inactive, but are among the 23 territories in the Coast Range required to attain recovery of the northern bald eagle in the Pacific Northwest (USDI 1986). Eagles forage in Devils Lake, Siletz Bay and along all the major creeks in the analysis area. Two active nest sites are on private land at least one mile west of the Recovery Plan sites in the Rock Creek and Gordey/Lower Drift subwatersheds.

Mature Conifer Connectivity

In the northwestern portion of the RPA, there is a large gap between mature conifer stands. Connectivity to stands outside of the RPA is weak to the north and non-existent to the south. BLM's Lindsay Ridge and adjoining National Forest land outside the watershed forms part of a connection northeast toward the Van Duzer Corridor and east toward Valley of the Giants. Fragmented stands of mature conifer provide some connection to the northwest through the Schooner, Erickson and Rock subwatersheds, through adjacent stands in the Salmon River Watershed and across a 0.5 to 1 mile gap to the Cascade Head Experimental Forest.

Survey and Manage Wildlife Species

The red tree vole (*Arborimus* or *Phenacomys longicaudus*) is a "Survey and Manage" species due to its vulnerability to habitat fragmentation and dependence on Douglas-fir over 100 years old. Red tree voles are poor dispersers, requiring large areas of suitable habitat or corridors connecting areas of suitable habitat. It is assumed that the species will be protected by providing corridors between large blocks of contiguous conifer and connectivity between LSRs.

Four species of bats listed in Appendix J2 of the Northwest Forest Plan are likely to occur within the coniferous forests of the Drift (Siletz) watershed: the silver-haired bat, long-eared myotis, long-legged myotis and fringed myotis (a species of concern). Bats commonly use snags, decadent trees with loose bark, wooden bridges and old buildings. Riparian areas are important foraging habitat. Management for late-successional characteristics and forested riparian areas will provide habitat for these species.

It is likely that some of the survey and manage species of mollusks are present within the analysis area and will be protected under guidelines for management of mature and late-successional forests.

Neotropical Migrant Birds

Neotropical migrants winter in the tropics and breed in temperate climates. Of the neotropical migrants whose populations have been declining over the long term, nine species use mature and old growth habitat; however, only the Vaux's swift is specifically associated with mature and old growth forests. The olive-sided flycatcher is associated with both mature forests and sapling/pole stands. The other seven species are also associated with riparian vegetation: western tanager, dark-eyed junco, Wilson's warbler, Swainson's thrush, rufous hummingbird, band-tailed pigeon and turkey vulture (Andelman and Stock 1994).

Other Federally Listed Species and Species of Concern

A July 1996 USFWS list of endangered, threatened and proposed species, along with species of concern, is in Appendix 7.7. Fish on this list are discussed elsewhere in this document.

Threatened or Endangered Species

Marbled murrelets, northern spotted owls and northern bald eagles were previously discussed. The other threatened or endangered birds are associated with habitats not found on BLM or National Forest System lands within the analysis area. Aleutian Canada geese (*Branta canadensis leucopareia*) do not frequent pasture/estuarine lands in the Siletz Bay National Wildlife Refuge. Brown pelicans (*Pelecanus occidentalis*) forage near the mouth of Siletz Bay and peregrine falcons (*Falco peregrinus*) forage in the estuary. Western snowy plovers (*Charadrius alexandrius nivosus*) have not been sighted on Siletz Spit during any surveys conducted since 1985.

Oregon silverspot butterflies (*Speyeria zerene hippolyta*), a federally threatened species, have not been documented within the watershed analysis area. See the discussion under **Special Habitats**.

Species of Concern

The Pacific fisher was mentioned under species associated with mature conifer habitat. The white-footed vole (*Arborimus albipes*) has been found in dense alder/salmonberry riparian areas on the Hebo Ranger District, and could be present in the watershed analysis area. It is highly unlikely that the California wolverine (*Gulo gulo luteus*) inhabitats the analysis area. Fringed myotis bats (*Myotis thysanodes*) are documented in the CHSRA and are likely to be found in the Drift (Siletz) area, as are Pacific western big-eared bats (*Plecotus townsendii townsendii*).

Tailed frogs (*Ascaphus truei*) are a major component of the biomass in South Fork Schooner Creek (Olson, pers. comm. 1996) and are assumed to inhabit all other major streams in the analysis area. Red-legged frogs (*Rana aurora aurora*) are found in riparian areas and on forest floors throughout the Hebo Ranger District and have been documented in the Rock Creek subwatershed. The southern torrent salamander (*Rhyacotriton variegatus*) inhabits cold, rocky streams within the area. Northwestern pond turtles (*Clemmys marmorata marmorata*) are not known to be in the analysis area, but adequate surveys have not been conducted.

An isolated population of Roth's blind ground beetles (*Pterostichus rothi*) has been documented on private land in the western portion of the Schooner Creek subwatershed.

Special Habitats

Special habitats include cliffs, rock faces, lakes, ponds, marshes and meadows. The steep landscape of the Siletz River Volcanics give rise to numerous cliffs and waterfalls. Meadows are a result of fires and/or clearing and maintenance by humans (either for homesteads or, in the case of Cougar Mountain, for use as a fire lookout). Two meadows are maintained on National Forest lands by slashing. Most of the ponds in the forested watershed are associated with beavers. Beaver dams and ponds have been documented in Erickson, Rock, Quarry and Wildcat Creeks.

Large wetlands are associated with the floodplains of major streams, such as Drift Creek, Schooner Creek, the Siletz Bay Estuary (part of the Siletz Bay National Wildlife Refuge), and Rock Creek (which enters Devils Lake from the south),. Devils Lake, which is non-federal property, has its own management plan. Because of the warm, nutrient rich water in Devils Lake, algae and other undesirable underwater vegetation proliferated. Sterile grass carp were introduced in the mid-1980's to control the vegetation. The carp did so well that there was little for the wintering waterfowl populations to eat; overwintering coot populations in the lake have declined in recent years.

The small parcel of land within the watershed that is included within the CHSRA is north of the Roads End portion of Lincoln City. Although a portion is forested, its distinguishing feature is a grassy headland. It was acquired primarily to provide habitat for recovery of populations of the Oregon Silverspot butterfly, federally listed as a threatened species. Slashing and burning of grass and subsequent seeding of nectar-producing species occurred in the late 1980's and early 1990's, but continued management has been deferred for lack of funds and inadequate habitat for introduction of silverspot butterfly larvae.

4.8 Botanical Resources

Species of Concern

No threatened or endangered plants are documented in the area. Loose-flowered bluegrass (*Poa laxiflora*) is the only sensitive plant that has been found in the watershed. Previous surveys prior to implementation of timber harvest and fish habitat improvement projects have documented seven separate populations in the watershed analysis area. A management strategy and monitoring plan has been developed for loose-flowered bluegrass on the Forest. This strategy provides adequate protection to the species and permitted removal from the USFS Region Six (R-6) Sensitive Species List. Two management sites have been selected within the watershed analysis area; one in the riparian area of the South Fork of Schooner Creek and one in the riparian area of Sampson Creek.

Refer to Appendix 7.7 for a list of plant species tracked by the Oregon Natural Heritage Program but not officially managed by State and Federal Agencies. The appendix also includes a list of BLM Assessment Species which are not listed on the R-6 list.

Survey and Manage Plant Species

Although no survey and manage plant species have been documented in the watershed analysis area, they are present in the CHSRA and Van Duzer Corridor State Wayside in habitats similar to those in the analysis area. It is likely that they also occur within the Drift (Siletz) area. Refer to Appendix C-2.5 of the Nestucca Watershed Analysis (USDA and USDI 1994b) for a list of species to be protected through survey and management strategies.

Noxious and Invasive Weeds

Since the 1970's, a cooperative program for control of exotic plant species has been ongoing with the Oregon Department of Agriculture and Lincoln County Road Maintenance and Vegetation Management Department. The County distributes biological controls for tansy ragwort (*Senecio jacobaea*), Scot's broom (*Cytisus scoparius*) and Canada (*Cirsium arvense*) and bull (*Cirsium vulgare*) thistle, manually removes tansy ragwort and giant knotweed (*Polygonum sachalinense*), and monitors the populations of several noxious and invasive weeds. Other species in the monitoring/control program include purple loosestrife (*Lythrum salicaria*), which has been found in Devil's Lake, and gorse (*Ulex europeaus*), which has been found within 10 miles of the Drift (Siletz) Watershed. Other invasive species are purple starthistle (*Centaurea calcitrapa*), diffuse knapweed (*C. diffusa*), Iberian starthistle (*C. iberica*), meadow knapweed (*C. pratensis*), French broom (*Cytisus monspessulanus*), Japanese knotweed (*P. cuspidatum*), knotweed (P. polystachyum), milk thistle (*Silybum marianum*), smooth cordgrass (*Spartina alterniflora*),curly dock (*Rumex crispus*), bitterdock (*R. obtusifolius*) and English ivy (*Hedera helix*). Reed's canary grass (*Phalaris arundinacea*), which is spreading along Drift Creek and throughout the marsh south of Devil's Lake, and Himalayan blackberry (*Rubus procerus*) are so pervasive that they may never be eliminated. Scot's broom is spreading along some of the roads in the watershed, but has not been aggressively managed by slashing.

4.9 Human Uses

Roads

Early transportation in the analysis area was limited to trails. It appears even trails were scarce prior to opening up the area to homesteading in 1895. Because the area was opened to settlement so late, most of the early transportation routes leading to the coast were directed north towards Tillamook via Dolph or to the south to Siletz and Yaquina Bays. The beach offered a fairly easy route, which is another reason few trails were built. Probably since prehistoric times the main route into the area was a trail along the Salmon River. The paved Salmon River Highway, locally known as the Salmon River Cutoff, was opened July 19, 1930. In 1924 the Roosevelt Highway (Highway 101) was opened as far south as Taft. By 1926 it was drivable to Newport. Prior to paving the Salmon River Highway, it was the primary route to the Willamette Valley by driving north to Hebo and then east via the road between Hebo and Valley Junction. Settlers in the southeastern portion of the analysis area most likely traveled to Siletz and Toledo for supplies. The road from Siletz to Kernville was completed in 1935.

Even after some of the major roads were constructed, trails continued to be used for many years as routes to homesteads and for fire patrol. The most recent Forest map that shows major access trails is dated 1949. The earliest Forest map consulted is from 1924. It shows the road from Rose Lodge to Taft via Bear Creek and Schooner Creek with a "poor" road branching off to the top of Cougar Mountain. It also shows a trail from Salmon River Ranger Station (no information was found concerning the numerous "ranger stations" that appear on early maps, they were either shacks or tent sites) near Rose Lodge to the Bald Mountain Ranger Station on Cougar Mountain. Trails lead from Cougar Mountain to the Willamette Valley, down Schooner Creek, and to a shortcut between two points on the Rose Lodge-Taft Road. The map also shows two trails that go from the Siletz River to Drift Creek. Other main roads appear to be the present day Gorton Road, Drift Creek Road and Anderson Creek Road. The Forest maps for 1939 and 1949 show no additional roads or trails.

By 1959, the map shows the beginning of the era of rapid road development on both federal land and the private industrial land to the east. This mirrors the rapid increase in logging during the same period. To the east the only sections that do not have any road segments are T. 7 S., R. 9 E., Sections 21, 22 and 31 and T. 8 S., R. 9 E., Section 6. Forest road development was not as extensive but included the first major continuation of Forest Road 17 and the first appearance of what is now Forest Road 19. By 1968, the current Forest Service transportation system was either in place or on the drawing board.

U.S. 101, better known as Highway 101 or the Oregon Coast Highway serves as the main street of Lincoln City. Commercial development exists along practically the entire stretch that traverses the analysis area. Just north of the analysis area Highway 18 intersects Highway 101, providing a direct link to the Willamette Valley. This is the most heavily traveled route across the Coast Range (Oregon Department of Transportation (ODOT) 1995). The existence of this junction plus the north-south orientation of Highway 101 hemmed in by the Pacific Ocean on one side and the Coast Range on the other, has greatly influenced the pattern of development in the analysis area. Traffic on Highway 101 reflects seasonal fluctuations in tourism, the Lincoln City police estimate that 8.75 million cars a year pass through Lincoln City (ODOT 1995). Specific recommendations for portions of Highway 101 within the analysis area can be found in the draft *Oregon Coast Highway Corridor Master Plan* (Oregon Dept. of Transportation 1995: II-52-3) including the following:

> Lincoln City, in its proposed Transportation Master Plan and TSP, has identified the implementation of an East Side Bypass after the year 2015. This plan recognizes the potential land use and policy implications of such a facility and calls for the formation of a regional task force to evaluate the feasibility of a bypass.
>
> The Oregon Coast Highway Corridor Master Plan has identified the need for capacity improvements through Lincoln City to address significant increases in traffic volumes projected in this area. A bypass of Lincoln City is considered a long-term alternative transportation solution. As a next step toward implementing the Oregon Coast Corridor Master Plan, a task force of regional interests should be formed to examine the feasibility of an East Side Bypass. This task force should consider the relationship of a bypass facility to local, regional, and state land use plans and policies, the opportunity to develop alternative transportation modes to reduce congestion on Highway 101, and the economic impacts of a bypass.

Investigate the potential for improving the local street system as parallel routes to reduce reliance on Highway 101 for local traffic within Lincoln City. Identify the potential of this approach to mitigate the need for additional highway capacity following establishment of a consistent highway cross-section through Lincoln City.

A bypass would route Highway 101 east of Devils Lake. Both west entrances into National Forest would be directly connected with the new highway route. Lincoln County Road 106 is the west end connection to FSR 17 and leaves Highway 101 just south of Lincoln City at the mouth of Drift Creek. This same county road also links FSR 17 at the North end to Highway 18 at Bear Creek. [A note on the use of the term FSR: FSR is used in this document as a synonym for Forest Development Roads (FDR) which are defined in the ATM Guide as "A road serving the National Forest System which is necessary to protect, administer, and use the National Forest System and its resources, and is under the jurisdiction of the Forest Service" (USDA 1994). This is the opposite of a "non-system road" which usually provides temporary access.] The other forest road connection with Highway 101 and 18 is FSR 1726, which receives far less traffic than FSR 17. It joins with County Road 101 (Old Highway 101) just north of Devils Lake State Park, crossing Rock Creek, and connecting with Bear Creek County Road near the head of Bear Creek. North-South inter-forest connection has primarily been along FSR road 19 to 1929 to 19 again connecting State Highway 229, along the Siletz River to FSR 17. General public access and travel concerns surrounding Oregon Department of Transportation's Corridor Planning and Highway 18 Draft Issues Document, March 1996 express safety issues with highway intersects at Bear Creek and Slick Rock Roads. For this reason, left-turn lanes are needed anywhere traffic leaves the highway. Other comments brought out the need for improved signage to guide Forest visitors. ODOT estimates that one quarter of travelers on Highway 18 to the coast are enroute specifically to sightsee. This could mean that as many as 1,250 to 2,500 travelers a day on this end of Highway 18 are potential forest visitors. See Map 8 for the location of the present day roads in the analysis area.

A mix of landownerships and timber management access needs has developed an extensive system of roads within the analysis area. Current and future vehicle access needs show only 26% of the current Forest System Roads need to remain open. Fifty-one percent of the current road miles can be closed. Closed roads can be reopened for future management needs rather than relying on continuous maintenance. The Forest strategy for road management is expressed in the ATM Guide and in the various road density categories shown in Figure 4.8-1.

Figure 4.8-2 depicts ratio of ATM strategy for road management versus historical to current management costs, including repairs, upgrades for risk reduction, and reconstruction beyond design life of road. This analysis includes only National Forest System Roads (Appendix 7.4, Map 8).

Forseeable forest system road reductions will be in the range of 23 to 74 percent. However, notwithstanding non-forest system road reductions, this only amounts to a net overall road density reduction of 0.4 miles per square mile to 1.2 miles per square mile.

Tribal Cultural Resources/Area History

Tribal Cultural Resources

Although specific cultural sites or other resources have not been specifically identified for the analysis area, the Confederated Tribes of Siletz Indians of Oregon have cultural ties to this land and will be consulted prior to the implementation of federal land management activities. Appendix 7.12 contains the draft Memorandum of Understanding between the Confederated Tribes of the Siletz Indians of Oregon and the Siuslaw National Forest for the coordination of natural and heritage resources management issues. No treaty obligations relate to the analysis area, however, there may be treaty implied water rights within the analysis area

Prehistory to 1855

The Native Americans occupying the analysis area at the dawn of the historic period were Tillamook Indians, speakers of a Salishan language. The Tillamook territory extended from Tillamook Head in the north to the vicinity of Otter Rock in the south (Beckham and others 1982). Two major dialects were spoken, Siletz (on Siletz Bay and up the Siletz River) and Tillamook (remainder of their homeland) which further narrows the distinction of Indians living in the analysis area. The Tillamook are isolated from the rest of the Coastal Salish to the north and it is uncertain whether this group once occupied the entire stretch of coast or whether they arrived within the last one to two thousand years. The Hudson's Bay Company explorer Michel Laframboise identified four distinct groups of Tillamooks including the Kowai (Salmon River) and the Neselith (Siletz) which occupied the analysis area (Beckham and others 1982). Indians engaged in fishing, hunting, gathering and trading for subsistence.

Coastal Exploration 1579 - 1788

Visits by Europeans were restricted to coastal waters. During this time most of the prominent coastal landforms were named and the coast mapped. The area was claimed by the Spanish, English and later by Americans. Indians were introduced to trade goods and devastating diseases such as tuberculosis and smallpox.

Inland Exploration/Fur Trapping 1825 - 1851

Michel Laframboise and Alexander Roderick McLeod (1825 and 1826) explored the area for the Hudson's Bay Company during the era of the Joint Occupancy Agreement between Great Britain and the United States. The United States took formal possession in 1846 and sent Theodore Talbot to explore the area in 1849.

Indian Reservation 1855 - 1892

On November 9, 1855, President Franklin Pierce signed an executive order designating the Siletz Reservation. The area designated for the reservation extended from Cape Lookout southwards to the Siltcoos River and extended from the Pacific Ocean to the western boundary of Range 8, Willamette Meridian, a total of 45 townships or an area in excess of one million acres. This was the aboriginal homeland of the Tillamook, Siletz, Alsea, Yaquina, Siuslaw and Lower Umpqua. In addition to these coastal tribes, Indians from southwestern Oregon, lately vanquished in a war, were resettled on the reservation in 1856. "The discovery of oyster beds in Yaquina Bay and the desire of Willamette Valley settlers to gain a harbor and build a railroad from Corvallis to Newport led in 1865 to an executive order cutting a wide [20 mile] section through the center of the Siletz Reservation" (Beckham and others 1982:223-224). Another major shrinkage of Reservation land occurred in 1875 when the entire southern half of the Reservation was closed, as well as all of the land between the Salmon River and Cape Lookout to the north. This still left the land in the analysis area as part of the Reservation. The final blow came in 1892 when allotments were made under the Dawes Act of 1887. Under this act the Indians received $142,000 and approximately 44,000 acres in specific parcels as trust properties for Indians. The entire analysis area was included in this last reduction. Although much of the best land along the western portion of the analysis area was in Indian allotments, most were sold or lost for not paying taxes by the turn of the century.

<u>Homesteading Era 1895 - 1938</u>

The former Reservation lands, nearly 200,000 acres and including the entire analysis area (excluding Indian allotments) were thrown open to homesteading on July 25, 1895. Initially, title to land could be acquired under the 1862 Homestead Act or the 1878 Timber and Stone Act. Homesteaders could spend long periods of time waiting for their land to be surveyed (a prerequisite to gaining title), meanwhile living a hard life. By the time the patents were acquired, many were ready to sell out. Although homesteaders had to swear they were not acting for others in their filings, fraud was used to amass large timber holdings. The Timber and Stone Act didn't provide for ownership of blocks large enough to make logging economical and this tended to promote the fraudulent use of "dummy entrymen" who would be hired to pose as legitimate homesteaders. Some of the large blocks of private timberlands in the analysis area may or may not have originated in this way.

The bulk of the Forest Service land in the analysis area was withdrawn by proclamation on March 2, 1907 as the Tillamook Forest Reserve. The Forest Reserve was eliminated by executive order on July 1, 1908 with the establishment of the Siuslaw National Forest. The Forest Homestead Act of June 11, 1906 was in effect at the time of the Siuslaw's creation. This act allowed homesteading on forest reserve land with high agricultural value. The Forest was closed to further applications on December 20, 1910 on grounds that all suitable agricultural lands had been patented. Due to public protest, the Forest was re-opened to homesteading in 1913 but finally closed permanently in 1916.

Timber speculation notwithstanding, many of the first settlers, many of them from Finland, came with a desire to establish homes and farms. Within the analysis area, the best agricultural land was in the vicinity of Devils Lake and up the Drift Creek and

Schooner Creek valleys. These lands are still privately owned. Within the analysis area, by far the most entries made under the Act of June 11, 1906, were in T. 7 S., R. 10 W. Some entries were made in T. 8 S., R. 10 W., primarily along Drift Creek. Many of the homestead applications in these townships were rejected after examination showed them to "not be chiefly valuable for agriculture" due to steep or rough topography. A major portion of Forest Service work in those years was checking homestead and "June 11" claims. While most of the homesteading took place in the western portion of the analysis area, there is some record of homesteading to the east, the most prominent being the Horner homesteads. Just outside the analysis area, there seems to have been a lot of homesteading on Slick Rock, Bear and McMillin Creeks (probably erroneously shown as McMullen Creek on current maps). Survey notes from 1900 mention several homesteads in T. 8 S., R. 9 W., Sections 8, 9, 16, and 17. Creek names are a good clue to homesteading activity. Creek names that can be reasonably tied to known homesteaders include: Sampson Creek (4 or 5 Sampson families), Smith Creek (Lloyd Smith), Fowler Creek , Nelson Creek (Bob Nelson), Osterman Creek (John Osterman- cabin ruins still locatable on F.S.), Erickson Creek (Abraham Erickson), and Horner Creek (probably Wesley Horner).

The homesteading era came to a close in the 1930's. The scattered tracts within the Forest were either abandoned or occupied by settlers unsuccessfully struggling on land unsuitable for agriculture. Outside of "fern burning" done to maintain open pastures, homesteading left little mark on the land until consolidated parcels were logged over. In order to relieve the land owners and at the same time promote effective land use, a land acquisition program under the Agricultural Adjustment Administration was established and continued under various names (the Resettlement Administration, Farm Security Administration, the Bureau of Agricultural Economics, and finally the Soil Conservation Service), all having a part in handling the acquisition program which terminated in its entirety on June 30, 1938. Lands that were never deeded and remained in government ownership, administered by the General Land Office, were eventually transferred to the BLM.

Overall, the history of settlement is still reflected in ownership patterns in the analysis area. The industrial forest lands were for the most part mature forest at the turn of the century (see fire history), unsuitable for agriculture and remote from any population centers. These were gradually consolidated into large tracts that were economical to log. Portions outside the Forest boundary that were less desirable or unsuitable for logging became Public Domain lands which are now administered by the Bureau of Land Management. Homesteading on much of what was, and is, Forest Service land was a failure and the land remains part of the Siuslaw National Forest. Land along the coast, occupied by Lincoln City and outlying areas up Schooner Creek, Drift Creek and Devils Lake, provided the best agricultural land and access to ocean resources as well as major transportation routes. These were the lands first selected by Native Americans after the reservation was closed. Later, they were successfully homesteaded by settlers or broken up into housing lots as the Native Americans sold out or otherwise lost title to the land. This desirable land is still typified by small private holdings and lots.

Logging History

The first sawmill in the north part of Lincoln County was built on Drift Creek by one of the Parmele's. The lumber produced was for local use with the mill closing after an explosion in 1919. The only other record that could be discovered of a sawmill in the area is reference to a ruined mill on Erickson Creek in a 1953 fish survey. Kernville (and other points on the Siletz River) and Toledo to the south have a long history of lumber production. Kernville was also the site of the major fish cannery for the area (no canneries existed within the analysis area). Although no written documentation was found, Nielo Hill (Hill 1996) mentioned that a lot of small mills sprang up during World War II. Forest Service records indicate timber harvest in the analysis area began in 1953 and peaked in the 1960's (approximately 12,292 ac. were clearcut between 1960 and 1969). Logging on the industrial land to the east began in the 1940's and culminated in the 1960's after most of the mature timber was removed.

Ecosystem Management 1990's

The 1990's ushered in a new era in Forest management beginning with the Interagency Scientific Committee Conservation Strategy that established Habitat Conservation Areas (HCAs) for the northern spotted owl (1990). In 1991, *Alternatives for Management of Late-Successional Forests of the Pacific Northwest* by the Scientific Panel on Late-Successional Forest Ecosystems ("Gang of Four") was released. 1992 saw the adoption of ecosystem management by the Forest Service and the announcement that clearcutting as a standard practice on National Forests would be phased out. In 1993 *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment* was issued by the Forest Ecosystem Management Assessment Team (FEMAT). All of this culminated in 1994 with the *Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* otherwise known as the Northwest Forest Plan. All these documents contributed to the change in emphasis from timber management to late-successional ecosystem management within the analysis area.

Lincoln City 1900 - 1965

Improved transportation brought about a transformation of the coastal area and ushered in the era when tourism gradually grew in economic importance. A quick synopsis of Lincoln City's evolution is as follows:

⇒ 1896: Kernville (just outside the analysis area) is the first town founded in northern Lincoln County.

⇒ 1900: A post office is established at Neotsu.

⇒ 1904: The first store and post office in Taft is opened. The first residents were Jacob and Cissie Johnson who had an Indian allotment of 80 acres. The town became incorporated in 1949.

⇒ 1913: Mr. Frank Gibbs builds the first summer home at what was to become Cutler City. The land had been purchased by Mr. and Mrs. George Cutler from Charlie DePoe (namesake of Depoe Bay) who had an Indian allotment.

⇒ 1924: First store and post office established at Delake. It was incorporated in 1949.

⇒ 1925: Nelscott is founded by Charles P. Nelson and Dr. W. G. Scott. The Nelscott Land Company was formed and divided up the 170 acre tract for people wishing to build summer homes.

⇒ 1926: Oceanlake named and post office established. It incorporated what was then called Devils Lake Park and Raymond (owned by a Father Raymond). Oceanlake is notable as the first "tourist" spot on the coast when Rev. and Mrs. Jason Lee camped here on their honeymoon in 1837! Oceanlake was incorporated in 1945.

⇒ 1935: Wecoma Beach established by W. H. Lohkamp of Portland. The area was originally the Indian allotments of the John Morris family. Indians were brought here for burial as early as the 1850's.

⇒ 1965: Lincoln City established by consolidating the towns of Cutler City, Taft, Nelscott, Oceanlake and Delake.

Lincoln City Demographics

◊ Lincoln City has seven square miles of incorporated area (Lincoln City Chamber of Commerce 1995).

◊ "Lincoln City's draft inventory document of the Comprehensive Plan (April, 1991) identified 1,836 acres of vacant residential land within the city limits. The plan also identifies another 780 acres of vacant land within the unincorporated Urban Growth Boundary. The City has concluded that its existing vacant land inventory will sustain all future projected land uses. The vacant land inventory includes 286 buildable acres zoned for commercial use and over 90 acres zoned for industrial use within the Urban Growth Boundary. The City is reviewing the possibility of expanding the industrial land inventory." (Ibid.: 46).

◊ "As with Lincoln County as a whole, Lincoln City has considerable constraints on its supply of buildable land. Slopes, wetlands, riparian zones, natural hazards, tsunamis, and topography all effect the availability and supply of affordable housing within the city limits" (University of Oregon 1995: 36).

◊ During the period 1984 to 1994, Lincoln City's population increased from 5,840 to 6,335, an average annual growth rate of 0.8 percent; however, actual yearly population greatly fluctuated during this period and growth was by no means on a straight line (Ibid.).

◊ "It is not uncommon for Lincoln City's permanent population of 6,195 to expand to well over 30,000 during the warm summer months" (Lincoln City Chamber of Commerce 1995: 31).

◊ "Demographic trends over the past decade [1980 - 1990] indicate that an increasing number of retirees are choosing to locate in Lincoln City. According to the 1990 Census, approximately 26 percent of the City's population was 65 or older; up from 23 percent in 1980. Only 14 percent of Oregon's population were in the 65 and older category in 1990; up from 12 percent in 1980" (Ibid: 15).

◊ "Another demographic development is the gradual decline in the number of young people between the ages of 18 and 24. This age group is typically relied upon to fill entry-level employment positions for many coastal businesses. The 1990 Census shows that only 5.6 percent of Lincoln City's population was between 18 and 24. In contrast, 5.8 percent and 9.4 percent of the county's and state's population fell into this age group, respectively" (Ibid: 15).

◊ "Lincoln City has a significant percentage of single/non-family households (35.5%) compared to Lincoln County (26.5%) and Oregon (25.3%)" (Ibid: 20).

◊ "Lincoln City has a smaller percentage of people under 18 (21.1%) and a greater percentage over 65 (26.2%) than either Lincoln County or the State of Oregon. Consequently, the median age in Lincoln City (43.0 years) is older than Lincoln County (39.6) and Oregon (34.5)" (Ibid: 20).

◊ The local economy is based primarily on tourism, small commercial/retail businesses and a large population of retirees.

LINCOLN CITY'S MAJOR EMPLOYERS
JANUARY, 1994

Employer	FTEs
Lincoln County School District*	900
Chinook Winds Gaming Center**	865
North Lincoln Hospital	225
Inn at Spanish Head	118
Shilo Inn	80
Lincoln City Government	98

* Includes employees throughout District ** Updated after completion of permanent facility in 1996 (Lincoln City Chamber of Comerce 1995: 26).

◊ "Lincoln City had the highest percentage of its population below the poverty level of any community in the study area [Lincoln County], 21 percent" (University of Oregon 1995: 58).

◊ Some relevant data on Lincoln County includes:

- "Total personal income in Lincoln County rose by 37.7 percent between 1988 and 1993, lower than the 42.7 percent increase for the state" (Ibid: 58).
- "Per capita income in Lincoln County in 1993 was 87 percent of Oregon per capita income and only 81 percent of national per capita income, down from 86 per cent of national per capita income in 1970. Per capita incomes in Lincoln County increased 355 percent between 1970 and 1990, compared to a 320 percent rate of increase nationwide" (Ibid: 58). Declines in recent years probably reflect the severe decline in forestry and fishing industries which are expected to continue through the end of the decade (Ibid: 19).

* "Dividends, interest, rent and transfer payments, all of which are closely tied to retiree populations, make up a much higher percentage of total personal income in Lincoln County than in Oregon" (Ibid: 58).
* "Population growth is expected to increase between 0.8 percent and 1.6 percent annually between 1990 and 2010. The Oregon Department of Transportation estimates that Lincoln County will have 54,869 persons in 2012" (Ibid: 71).

◊ Lincoln City's water comes from Schooner Creek. There is a need for an additional source of water due to population growth and the subsequent increase in demand for water. At present the city is withdrawing water from Schooner Creek at a rate of nearly six cubic feet per second (cfs). There are plans to increase withdrawals to 8.3 cfs to meet interim water supply needs. Late summer flows in Schooner Creek average 10 cfs. This is not enough to ensure adequate supply during the summer months (mid July - mid October) when demand is up and water flows are down (McKevitt 1996). The preferred source alternative for these summer months is an impoundment constructed on Seid (after the original homesteader) Creek. Preference is based on engineering feasibility and the desire to avoid impacts to valuable fishery resources on Rock Creek (Lincoln City 1994). This impoundment would be created by an 85 foot high dam, creating a reservoir storage of 1,350 acre-feet (News Guard 3/27/96). Because the Seid Creek watershed is small, the reservoir would be supplemented by two cfs or more from Schooner Creek over the intervening eight months when flows on Schooner Creek are sufficiently high to meet demands and minimize impacts to aquatic resources. The proposed dam would be located just below the confluence of two forks of Seid Creek, an area classified as a wetland. The Oregon Department of Fish and Wildlife (ODFW) and the National Marine Fisheries Service (NMFS) propose mitigation options to compensate for fish and wetland resources. Options include: transfer water rights on Rock Creek to ODFW for instream beneficial use; improve fish habitat on Rock Creek, implement wetland enhancement and creation in the area between Seid Creek and Rock Creek downstream from the proposed dam site (McKevitt 1996). Water conservation measures are also being investigated, including a plan to recycle water at the sewage treatment plant (News Guard 4/10/96).

◊ Lincoln City's sewage treatment plant is located on Schooner Creek. A decrease in flows due to withdrawals plus the twice-daily influence of the low-tide creates a dilution problem. Currently the City plans to maximize mixing by installing a diffusing system for the outfall (McKevitt 1996).

Recreation/Scenery

Lincoln City

Recreation, as reflected by tourism, is a major industry in the analysis area:

> The Oregon Employment Division estimates that one out of every five jobs in Lincoln City is tourist-oriented...Research by the Oregon Tourism Division indicates that over 62 percent of Oregon Visitors travel to the coast...Lincoln City has 52 hotel/motels, 99 vacation rentals, eight bed and breakfast inns, and one R.V. campground, offering approximately 2,038 rooms and spaces, more than 45 restaurants. (Lincoln City Chamber of Commerce 1995: 31).

The Confederated Tribes of the Siletz Indians of Oregon built Chinook Winds Gaming and Convention Center with a capacity for 2,000 attendees. Lincoln City's transient room tax receipt for fiscal year 1992-1993 was $1,369,819 (Ibid: 32). Parks within the analysis area include Devils Lake State Park (west- 42,674 visits/yr.), Devils Lake State Park (east- day use only, 141,762 visits/yr.), Roads End State Park (day use- 399,516 visits/yr.), D River Wayside (State- day use only, 1,460,660 visits/yr.), Regatta Grounds Park (Devils Lake), Holmes Road Park (Devils Lake) and Sand Point Park (Devils Lake) (USDA 1995a).

Highway 101 is a National Scenic Byway. The Oregon Department of Transportation, in its *Draft Oregon Coast Highway Corridor Master Plan* has identified numerous goals and recommendations for the stretch of highway within the analysis area (Oregon Dept. of Transportation 1995). As noted earlier, Highways 101, 18 and 229, as well as land adjacent to Drift Creek, are recognized as important scenic corridors. See the "Visual Quality Inventory Map" for lands seen from these roads and Drift Creek. This map is on file in the Recreation Department at the Siuslaw NF Supervisor's Office and in the project file at Hebo RD.

Drift Creek

The reason most people come to the area to recreate is the Pacific Ocean. Recreation within the interior of the analysis area is mainly restricted to dispersed recreation within the National Forest. Dispersed recreation includes camping, hunting and fishing as well as driving the backroads. Drift Creek is particularly valued as a stream for hike-in fishing opportunities. Mr. Ben Schaad of McMinnville sent the District a map of some of the Drift Creek fishing trails during scoping. There were two non-fee Forest Service campgrounds, Schooner Creek and North Creek, both of which have been recently closed and restored due to concerns about resource damage within riparian areas. At present there are no plans to re-open these campsites. The Forest Service has constructed a new trail, scheduled to open October, 1996, that begins on Forest Road 17 (T. 7 S., R. 10 E., Sec. 25) and leads to the falls on a tributary of Drift Creek. A parking lot has been constructed at the trailhead and the trail will feature an impressive view of the falls from a bridge.

Another focal point of recreation is the Drift Creek Organization Camp, commonly referred to as the Mennonite Camp. The special use permit is issued to the Mennonite Camp Association of Oregon every five years. At present, it appears likely that the permit will continue to be renewed into the future. Expansion of the camp or the construction of additional facilities, however, is not envisioned. The camp occupies 12 acres and includes 11 structures including cabins, bath house, generator house, lodge and multi-purpose building. Use of the camp has steadily increased over the years (the camp was founded in 1960) with 11,464 camper days in 1995. The camp is authorized for approximately 180 people at a time. The water source is a small tributary creek to Drift Creek. The septic system is composed of two tanks/leach fields with the largest being a 10,000 gallon tank installed in 1995. The system is subject to a surprise inspection once a year by the county. The camp's power source is a diesel generator that operates off an above ground, 1,000 gallon fuel tank. The old underground fuel tank has been removed. The camp has a spill prevention plan and the tank has a small capacity (approx. 5 gallons) overflow cup at the intake. The biggest risk of a fuel spill is during transport of the fuel which necessitates the fuel truck taking a roundabout route now that portions of FSR 19 have been closed. The Camp Association's special use permit includes three hiking trails outside the camp. One trail has tenting sites that are typically used once per youth session and are rotated to prevent resource damage.

Drift Creek is eligible to be a Wild and Scenic River (a copy of the Eligibility Study, 1990, is on file at the Siuslaw National Forest Supervisor's Office) but has not been designated. The recommended Wild and Scenic River classifications are Recreational from the eastern Forest boundary to Sampson Creek (about 2.1 miles) and Scenic from Sampson Creek to the western Forest boundary (about 11.9 miles).

Guidelines for a potential Scenic River require that, "the river area should be maintained in its near natural environment. Timber outside the boundary but within the visual seen area should be managed and harvested in a manner which provides special emphasis on visual quality." Refer to Forest Service Handbook 1909.12, Chapter 8 for all applicable guidelines. A suitability study is needed for Drift Creek (see LMP Forest Wide Standards 017, 019, 020 and 022).

Other Recreation Values

The recreation opportunity spectrum setting for much of the National Forest land within the analysis area was classified as rural with some roaded natural (in the LMP) as a result of the generally modified appearance of the vegetation. The inventory of recreation opportunity done in conjunction with the Forest Planning effort found much of the area to be "roaded modified" in condition. Within the LSR, the recreation opportunities and social setting would classify the bulk of this area as roaded natural or semi-primitive. The ROD (C-18) gives direction for recreation in LSRs.

Much of the scenery within the analysis area was classified as heavily modified during the Forest planning effort in the 1980's. This characterization will gradually change as the scenery reflects management under the LSR designation.

Commercial Uses

Timber

On federal lands, there are two remaining units (52 acres) to be harvested from Section 318 sales. The final determination on what harvest activity will take place on these units is undecided as of this writing. Harvest on the industrial land continues with entries being made in stands harvested and regenerated during the 1950's. Map 18 and Map 16 depict the harvest history in this area. With the completion of this watershed analysis and an LSR assessment, it is expected that low levels of timber harvest will be resumed, primarily, if not exclusively, limited to commercial thinning in young managed stands.

Special Forest Products

Commercial special forest products permits can be issued for the area but very few are. Special forest products allowed to be collected within the analysis area include firewood, greenery, transplants, cascara, and mushrooms, essentially everything except moss. Moss collection may be included after an LSR assessment is completed (due to a lack of alder stands, the area is not an important commercial source of moss). The Decision Notice for the Special Forest Products Program Environmental Assessment (3/2/95) notes that as stated in the ROD, special forest product harvest in LSRs must be found to be neutral or beneficial to the creation and maintenance of late-successional forest habitat. Currently, fuelwood gathering is restricted to blowdown blocking roads. Historically, special forest products were an important supplemental source of income for people living in the area, particularly cascara bark and ferns in the early days and firewood more recently. It is expected that the currently low level of special forest product collection will continue due to public demand and the need to be consistent with LSR objectives. A reduction in road density and road maintenance is also expected to decrease collection. Although few permits are issued for special forest products, we cannot assume that demand for special forest products is low. An unknown amount of special forest products are removed illegally.

Mining

Most of the federal land in the analysis area can be patented under the 1872 Mining Law. An exception to this is 40 acres (SW1/4 of the SE1/4 Section 3, T8S, R10W) acquired under the 1914 Weeks Law in which case the land would be leased. Mining is prohibited in the CHSRA, and in the vicinity of Lincoln City's water transmission line, the old Cougar Mountain lookout and the Drift Creek Organizational Camp. Currently there is no commercial mining activity on federal land and none is anticipated. There is one commercial quarry in the analysis area and there are other quarries for crushed rock on federal lands (Bald Mountain, Cougar Mountain).

Easements/Rights-of Way/Special Use Permits

There are no existing private right-of-ways or easements on Forest Service roads in the analysis area except for a court ordered (1905) right-of-way to Lincoln County for all of the Schooner Creek Road and Bear Creek Road. Road use permits are issued by the Forest Service, usually on a project by project basis. Several roads access private property and this needs to be considered in the transportation analysis. Usually when a Forest Service road crosses private lands, the Forest Service acquires or secures an easement or buys the land in fee. There are many such easements in the analysis area. The BLM managed land is much more intermixed with private ownership and there is a correspondingly higher number of easements and reciprocal agreements for road use. The ROD (C-19) gives direction for existing and proposed right-of-way agreements, contracted rights, easements and special use permits within LSRs.
Other special use permits in the analysis area include:

⇒ The City of Lincoln City has diversion dams, municipal water intake and transmission mains on the north and south forks of Schooner Creek.

⇒ United Telephone Northwest (Sprint) has a phone line accessing Drift Creek Organizational Camp. This line is underground except for a short stretch above ground at the Skunk Creek slide.

⇒ The Mennonite Camp Association of Oregon has a special use permit for the Drift Creek Organizational Camp.

5. SYNTHESIS AND INTERPRETATION

5.1 *Issue:* Provide stable roads and trails to the extent needed to meet public and agency needs.

Key Question: What types of roads are likely to fail?

Roads that have the highest potential for failing have the following characteristics:

- They are located on slopes with a high susceptibility to landslides and debris torrents.
- Mid-slope roads are more likely to have multiple stream crossings, and may have culverts that are too small to handle the water and debris associated with a 100-year storm event (Appendix 7.5).
- They are usually older roads that were built using "sidecast" construction. The older roads may also have a higher number of culverts that are rusting and are likely to collapse sometime in the future.
- They usually have a history of road maintenance problems or other failures, such as small sidecast failures.

Key Question: What types of roads have a high potential for resource impacts due to landslides?

Roads that have the highest potential have the following characteristics:

- They have characteristics that suggest a high possibility for failure (see preceding key question), AND
- The resulting debris torrent or landslide has a high probability of reaching a stream channel.

Key Question: What types of roads are most likely to alter stream flow?

Mid-slope roads can make the watershed more efficient at routing water by intercepting subsurface downslope flow, capturing the subsurface flow in ditchlines and carrying it to stream channels. Valley bottom roads reduce the amount of floodplain available for groundwater storage, and also intercept downslope groundwater flow.

Key Question: What criteria should be used to select roads for upgrading or obliteration?

Roads should be selected for stabilization work based on the degree of risk the road poses to other resources. Whether the road is upgraded or decommissioned should be balanced between the future need for that road, and the risk of erosion or failure (USDA 1994).

Appendix 7.3 contains a table that has information regarding the risk factors for each road segment, and future administrative use of the road. This table is intended to give managers the information needed to prioritize roads for stabilization work. These roads must be field-checked to verify specific problems and conditions.

The Siuslaw National Forest ATM plan is a strategy to define a minimal network of roads which provide adequate and safe access for management (including fire protection) with a minimum impact to the environment. For this reason this analysis, along with the ATM plan, should serve to make strategic long-term decisions as to what roads to upgrade for resource protection and extended service life, which roads to close to vehicle use in order to preserve for future planned use, and which roads to decommission (obliterate) for resource protection. Secondary roads planned for low clearance travel (passenger car) and high clearance travel (truck) are displayed on Map 8. ATM is also a strategy by which to utilize county and state highways as much as possible for access and travel rather than reliance on the forest system, which was built for timber access. The ATM plan therefore defines the desired future condition for a travel network. Overall, ATM road density contained within this watershed is approximately 0.9 miles/sq. mile (Figure 4.8-1). This represents approximately 26% of the existing Forest System Roads. Analysis also defines non-ATM roads to include 51% of existing Forest System for closure and 23% for decommissioning.

Appendix 7.4, Access & Travel Management Benefit-to-Cost, defines economic costs and maintenance levels of current (historic) road segments, as well as a economic comparison to the ATM plan (desired future condition). All costs are in terms of present-net-worth and in the context of total life-cycle costs, 38 years, based on road age and reconstruction periods. Comparing historic maintenance costs with risk factored in with those defined by an ATM plan results in a Benefit-to-Cost (B:C) ratio. Large ratios indicate excellent opportunities for restoration action. This can range from road stabilization, including road closure to eliminate traffic impacts and associated costs, to obliteration of road elements for decommissioning. One of the single most effective means of road stabilization has been to waterbar high clearance travel roads and closed roads. Risk rating correlates to potential failures due to inherent geological instabilities, road age, maintenance levels, road structure and channel crossing inadequacies. These benefit cost ratios result from the cost differential of desired future condition (ATM) versus the cost to maintain all roads for access against these risks. High B:C ratios indicate potential cost savings in the desired future condition expressed by the ATM plan. Costs, risk and planned uses expressed per road segment and subwatershed should assist managers in identifying priorities for upgrades, road closures, and decommissioning roads within subwatersheds.

Roads with known specific, chronic problems are listed below:

Forest System Road 19 from the concrete bridge east of the Drift Creek camp to the Skunk Creek slide south of the Drift (Siletz) watershed analysis area boundary should be considered for decommissioning. During winter storms of November and December (1995), the Skunk Creek slide was reactivated, and blocked Road 19. This slide has been active for a number of years, as the road cuts through the toe of a rotational slump and has destabilized the slope. Numerous attempts to stabilize the slide have failed. Further attempts to keep the road open are likely to continue to destabilize the slide above the road. During the February 1996 flood, Road 19 between the concrete bridge and the

Skunk Creek slide had one debris torrent which crossed the road and reached Drift Creek. Two other sites along this road segment have a high potential of failure. Maintaining this road will be costly, and rebuilding or relocating the road will also be expensive. Slopes in this area are very steep, so in order to move the road bed, a very high cutbank will have to be created in unstable bedrock, the Siletz River Volcanics, or retain present location with a retaining wall. Even if the 19 road is kept open from the concrete bridge to the top of the ridge through the Drift Creek watershed, the Skunk Creek slide is likely to keep the road blocked. Road 19 is used as a utility corridor, which may preclude the decommissioning option.

Road 19 from Road 17 to Road 1929 (Gordey/Lower Drift and Quarry subwatersheds) should be considered for decommissioning. This road segment is already closed due to a culvert failure and debris torrent that dissected the road in 1995. Other stream crossings on this road have a high risk of failure.

Road 1956 is a dead-end ridgetop road that is only accessible from road 19. It is on the southern boundary of the Drift (Siletz) watershed analysis area in the Wildcat subwatershed. It should be considered for decommissioning along with road 19; otherwise, it will be cut off from future access.

Road 1980 from the intersection with 19 to 1958 should be considered for decommissioning. A debris torrent removed much of the road bed during the winter of 1995 just east of the intersection with road 19. It lies on unstable bedrock on steep slopes. Springs are present above the road. This road provides the only access to road 1958 across National Forest land, which may limit options for decommissioning in the near future.

5.2 *Issue:* Provide and maintain quality fish habitat with emphasis on road stability and woody debris .

Key Question*:* What problems are affecting crucial fish habitat?

There are several problems affecting crucial fish habitat in the Drift (Siletz) WA area. Landslides, sediment input from roads, increased peak flows from clearcut harvesting and road building, increased stream temperatures and decreased bank stability from harvest of riparian vegetation all have contributed to the degradation of aquatic habitat. The most important factor affecting fresh water fish production, however, is most likely the reduction in large woody debris levels.

- Increased landslides, particularly in the 2PSR2 LTA, have resulted in the direct mortality of fish and reduced the ability of riparian areas to provide LWD.
- Landslides associated with roads and clearcuts are primarily introducing sediments without the LWD to keep the sediments stable.
- Pool quality has been reduced in most stream channels due to debris removal.

- In Rock and Schooner Creeks, pool quality has probably declined from increased fine sediments.
- Substrate conditions are not optimal for fish production, however a causal link to management is not apparent. Part of the problem may be the inherent nature of bedrock in the drainage.
- Pool area meets the reference condition in only one subwatershed (Quarry Creek, which has no anadromous fish.) Deficiencies in pool area are most likely due to reductions in LWD levels.
- Off-channel habitat is not meeting the reference condition in seven of nine subwatersheds. This is most likely due to reductions in LWD levels.
- Temperatures in the watershed are above state water quality standards and above the desired level for fish production.

Key Question: What are the historic levels, current recruitment levels and long-range potential of woody debris in streams?

Historically LWD levels fluctuated in streams in the Drift (Siletz) area in response to major disturbances such as fire, major wind storms, and floods. Debris levels probably exceeded 80 pieces per mile on an average throughout the basin. The absolute magnitude of in-channel wood levels was not ascertained in this analysis.

Table 5.2-1 Percent of stands within 200' of stream channels in mid and late seral condition

Subwatershed	Managed	Natural	Total
ERICKSON	4.5%	94.5%	40.2%
GORDEY/L. DRIFT	37.8%	91.6%	62.4%
L. SCHOONER	13.3%	95.0%	48.2%
LINCOLN CITY/DEVILS LAKE	30.0%	90.8%	54.1%
NORTH	10.0%	99.8%	57.5%
NORTH FORK SCHOONER	14.9%	99.8%	67.0%
QUARRY	1.7%	86.6%	60.7%
ROCK1	6.2%	99.4%	34.8%
SAMPSON	11.6%	96.9%	23.5%
SMITH	17.2%	79.6%	34.5%
SOUTH FORK SCHOONER	8.3%	93.1%	46.0%
U. DRIFT1	11.9%	87.0%	39.9%
WILDCAT	30.3%	93.6%	76.8%
AVERAGE	15.2%	92.9%	49.7%

- Seral stages are heavily skewed towards the early seral class in most watersheds (Table 5.2-1).
- Area wide the current recruitment availability is about 54% of the reference condition.
- Recruitment levels are unlikely to meet the reference levels due to conversion of forested lands into agricultural and domestic lands. It is also likely that private lands within the recruitment zone of stream channels will not be managed exclusively for providing LWD to stream channels.
- Based on existing LWD and recruitment levels it is unlikely that LWD will meet the reference condition in the next 100 years without direct introductions of LWD from upslope sources.

- Recruitment recovery is being retarded because most riparian stands in the early seral stage are either densely stocked Douglas-fir plantations or alder and brush patches.
- Without intervention many overstocked plantations and alder patches will take hundreds of years to attain trees with sufficient size to function as stable LWD.

5.3 *Issue:* Maintain desired late-successional characteristics where they exist; manage vegetation to develop late-successional characteristics where they are currently lacking.

Key Question: What factors are preventing or inhibiting the development of late-successional characteristics?

- Fragmentation of mature conifer blocks by managed stands of varying ages.
- Even-aged and, often, single species composition of managed stands.
- Isolation of LSRs by short rotation timber management.
- Length of time for development of late-successional characteristics (Stands can be treated in many ways to accelerate growth and development of late-successional structure but it will take time for these structures to develop).

Key Question: What criteria determines which areas or stands will benefit by treatments designed to hasten the development of late-successional characteristics?

- Blowdown potential: topography, taper ratios, species susceptibility.
- Plant association and understory competition, for example:
  - Dry environments with salal understory - if overstory is opened greatly, salal will proliferate and suppress herb/forb layer, decreasing wildlife habitat.
  - Wet environments - salmonberry and alder are aggressive competitors with conifer seedlings.
  - Wet to moist environments - large, open grown conifers develop with alder understory; as alder senesces, uneven-age coniferous stands develop.
- Necessity of maintaining integrity of interior habitat (would treatment increase disturbance to interior habitat, e.g. through road-building, gap creation, etc.?).
- Insects and Disease: extent of root rot, Swiss needle cast presence, presence of dead and dying trees over large areas (bark beetles), etc.
- Stand Density: overstocked and stagnating stands.
- Proximity to mature conifer habitat blocks:
  - does stand fill in hole in habitat block or provide connection to other blocks of mature conifer?
  - does stand provide primary constituent elements of northern spotted owl or marbled murrelet critical habitat?
- To maximize the successful reproduction and dispersal of species dependent on mature forest habitat, prioritize the silvicultural treatment of stands which would fill in blocks of mature forest habitat or would increase the connectivity between blocks of mature

forest. Prioritize by location (subwatershed and stands that would logically be treated at the same time, even if not a wildlife priority) and by plantation age (older plantations would be more likely to be ready for commercial thinning than would 25 year old plantations, although plantation growth can differ by site and quality of original planting stock). The highest priorities to consider for thinning are listed in Tables 5.3-1 and 5.3-2.

Table 5.3-1 Acres of Potential Thinning to Block-up Mature Conifer or Provide Connectivity on National Forest Lands

High Priority (Low Priority)- Fills-In Blocks of Mature Conifer

Subwatershed	35-40 yrs. old	30-34 yrs. old	25-29 yrs. old	High Priority
N. Fk Schooner	90	0	0	90
S. Fk. Schooner	81	0	0	81
Gordey/Drift	35	164	35 (60)	234
Quarry	114 (194)	(7)	0	114
North	84	127	136	347
Wildcat	(1)	51	(31)	51
TOTAL	404 (195)	342 (7)	171 (91)	917

High Priority (Low Priority)- Provides Connectivity

Subwatershed	35-40 yrs. old	30-34 yrs. old	25-29 yrs. old	High Priority
Rock	139 (70)	71	139 (63)	349
Erickson	0	246	0	246
N. Fk Schooner	0	198	0	198
S. Fk. Schooner	114	69	39	222
L. Schooner	247	0	(48)	247
North	50 (19)	94 (29)	0	144
Upper Drift	62	0	0	62
TOTAL	612 (89)	678 (29)	178 (111)	1,468

Table 5.3-2 Acres of Potential Thinning to Block-up Mature Conifer or Provide Connectivity on BLM Lands

High Priority (Low Priority)- Fills-In Blocks of Mature Conifer

Subwatershed	35-40 yrs. old	30-34 yrs. old	25-29 yrs. old	High Priority
Smith Creek	0	0	16	16

High Priority (Low Priority)- Provides Connectivity

Subwatershed	35-40 yrs. old	30-34 yrs. old	25-29 yrs. old	High Priority
L. Schooner	0	0 (28)	0	0
Upper Drift	0	0 (9)	22	22

6. RECOMMENDATIONS

The ability to implement these recommendations is contigent upon funding and workforce availability.

6.1 *Issue:* Provide stable roads and trails to the extent needed to meet public and agency needs.

Information on the Forest Service system roads has been compiled in the table in Appendix 7.3. This information is intended to guide management decisions regarding road upgrading and decommissioning. Roads that should be reviewed as high-priority decommissioning candidates are those with high risk scores, little need for silvilculture access, and high maintenance costs. Intermediate term decommissioning candidates are roads that may be needed for future silviculture access, and have a high risk of failure. Table 6.1-1 lists roads with a "risk score" greater than 4 (range is 0-7). The risk score reflects a number of factors that contribute to road instability; the higher the number, the more factors an individual road segment has that contributes to its susceptibility to landslides. Road 19 in the Quarry and Wildcat subwatersheds received the highest risk score of all road segments in the Drift (Siletz) watershed analysis area. For more information on data used to compile the table, see Appendix 7.3.

Silvicultural projects located along roads that have a high risk of failure should receive a high priority for treatment in the near future, so that the roads may be closed as soon as possible.

For project level work, refer to the USDA Siuslaw National Forest Road Obliteration and Upgrade Guide (1995c).

Consult with other agencies and landowners before roads are closed or decommissioned.

6. RECOMMENDATIONS

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Table 6.1-1: High-risk roads listed by subwatershed.

Subwatersh	Road #	Length	# of culverts	Risk Score	silv needs	Historic maint costs	ATM plan costs	ATM rate of return
Erickson	1780-	1.97		4	thin 10 years	6.04	0.44	12.7
Erickson	1781-	0.85		4	thin 10 years	2.23	0.78	1.9
Erickson	1726	0.28		4		1.08	0.96	0.1
Gordey/L.	1700-	0.25		5		0.03	0.03	0
Gordey/L.	1700-	0.24		5	PCT	0.02	0.02	0
Gordey/L.	1928	1.69		5		5.81	0.41	13.2
Gordey/L.	1900	2.6	4	5		9.98	1.22	26.7
Gordey/L.	1700	4.2	5	4		16.13	19.44	-0.2
Gordey/L.	1700-	0.4		4	PCT	0.04	0.65	-0.9
Gordey/L.D	1928-	0.56		4		0.06	0.05	0
L. Schooner	1700-	0.44		4	thin 5 years	0.04	0.09	-0.5
L. Schooner	1700-	0.88	2	4	thin 5 years	2.3	0.58	3
North	1784-	0.6		4	thin 5 years	0.06	0.13	-0.6
North	1929	1.17		5		4.02	4.49	-0.1
North	1900	0.53		4		2.04	2.51	-0.2
North	1700	3.27		4		12.56	12.56	0
North	1784	2.31		5		7.95	0.56	13.2
Quarry	1900	4.78	16	7		18.36	12.51	4.1
Quarry	8493	0.26		4		0.89	0.4	23.2
Quarry	1929	1.27		5		4.37	4.88	-0.1
Quarry	1700-	0.09		4	thin 5 years	0.19	0.02	11.1
Quarry	1900-	0.54	2	4	thin 5 years	0.05	0.61	-0.9
Quarry	1900-	0.45	1	4	thin 5 years	0.04	0.29	-0.8
Quarry	1928-	0.76		4	thin 10 years	1.99	0.15	12
Quarry	1928-	0.7	9	4		1.79	1.83	0
Quarry	1928-	0.64		4		1.96	0.08	23.9
Quarry	1929-	1.45		4	thin 5 years	3.8	0.29	12
Quarry	1929-	0.31		4		0.03	0.03	0
Quarry	1928	1.54	4	4		5.3	1.51	2.5
Quarry	1929-	0.1		4	thin 10 years	0.01	0.02	-0.5
Quarry	1929-	0.5		4		0.05	0.04	0.3
Rock 1	1726	5.02		4		19.28	23.42	-0.2
Rock 1	1729	2.76		4		9.49	0.67	13.2
S. Fk	1700-	0.41		4	thin 5 years	1.26	0.09	12.7
S. Fk	1700-	0.36		4	thin 5 years	0.04	0.08	-0.6
Sampson	1701-	1.46		4	thin 5 years	3.82	0.29	12
Wildcat	1958	1.09		4		3.75	0.26	13.2
Wildcat	1900	2.23	5	6		8.56	13.93	-0.2

6.2 *Issue:* Provide and maintain quality fish habitat with emphasis on road stability and woody debris.

Vegetation:

- Priority work areas for riparian vegetation manipulation are Rock1, Sampson, South Fork Schooner, and Lower Schooner subwatersheds (Table 5.2-1).
- Riparian vegetation manipulation should occur primarily within and adjacent to managed stands.
- Manipulate vegetation within recruitment areas so that there is an excess of large (>24") free growing conifers as compared to natural late seral conditions until in channel woody debris levels approach reference levels.
- Remove no trees which could function as LWD from stands where sufficient large conifers are present in recruitment areas.
- Fall and leave trees should not exceed four trees/acre/every four years unless placed in the water to reduce the potential for large scale insect damage (Douglas-fir beetle (Dendroctonus pseudotsugae)) and riparian vegetation loss. Avoid falling and leaving spruce trees on a widespread basis because of the danger of infestation with spruce beetles (Dendroctonus rufipennis).
- When re-establishing conifers in the riparian area do not remove alder or other riparian hardwoods to a degree that decreases streambank or floodplain stability.

Roads:

- Priority areas for road work are Sampson, Gordey/L Drift, Wildcat and Quarry because of their extensive history of torrenting and their current fish habitat condition.
- Roads in other watersheds should be evaluated. Those that have been stable for long periods should be the lowest priority for restoration.
- Avoid road construction in areas with high slide potential. Ridge top locations are preferred for roads.
- Inventory and monitor substrate conditions throughout the analysis area and determine if sediment levels are indeed a problem.
- Road maintenance should concentrate on maintaining road crowns and outslopes, and keeping culverts open. Ditch pulling and minor slough removal should be minimized.

In-channel work:

- Place wood in areas with high fish habitat potential.
- Sampson Creek, Drift Creek between Sampson and Barn Creek, North Fork Schooner Creek, and Lower Schooner Creek are highest priority for instream wood additions.
- Evaluate Erickson Creek and North Creek before planning structure projects.
- Encourage beaver activity in areas where fish habitat will benefit.

Project Level Guidance:
Riparian vegetation treatments:

- Evaluate stream channels within and below project areas prior to project planning.

- Stratify channels according to stream gradient, entrenchment ratio, bed and bank substrate composition, and bankfull width to bankfull depth.
- Evaluate channel stability and potential channel stability within each stratum.
- Vary riparian vegetation leave areas according to stratum and channel stability.
  - Very stable channels with stable channels downstream can accommodate small riparian vegetation leave areas (RVLA).
  - Stable channels with unstable or potentially unstable channels immediately downstream may require wider RVLAs than similar channels with stable channels below.
  - Unstable or potentially unstable channels may require RVLAs as wide as 500' or more.

Evaluate slope stability:

- On highly unstable slopes remove no more trees than necessary to achieve desired growth. If tree removal would substantially decrease rooting mass, consider no treatment in those areas.
- Potentially unstable slopes should not be categorically eliminated from thinning treatment. They are likely to serve as source areas for in channel woody debris in the future and so it is desirable to have large trees growing on them.

6.3 *Issue:* Maintain desired late-successional characteristics where they exist; manage vegetation to develop late-successional characteristics where they are currently lacking.

- Vegetation treatment to achieve late-successional characteristics should occur primarily within managed stands.
- Use the criteria developed under Section 5.3-Key Question 2 of the Late-Successional Characteristics Issue to select silvicultural prescriptions for commercial thinning.
- Provide connectivity to mature forest habitat on federal lands to the north and, through BLM lands, east to the Valley of the Giants Area of Critical Environmental Concern (ACEC) and northeast to the Saddleback Mountain ACEC.
- When possible, acquire non-federal lands to block up areas where connectivity is weak or where private lands interrupt a block of mature conifer. Particularly emphasize the acquisition of lands surrounded on 3-4 sides by federally owned lands.
- Retain western hemlock as a major component within plantations to provide future nest trees for marbled murrelets.
- Retain sufficient numbers of green trees to provide down wood and snags over the life of the stand. These need to be in the size and decay class distribution reflective of the level at which they are found in natural mature conifer stands in the area. Until more data is available, use the ***average numbers*** per acre listed for each plant association (Tables 4.6-7 and 4.6-8) as the ***minimum numbers*** to be left per acre.
- Within riparian reserves, the area outside of the stream LWD recruitment zone should be managed to achieve LSR objectives.

6.4 Other Recommendations

- Give special consideration to scheduling high priority thinning and road projects in the Rock Creek subwatershed because it has the highest coho spawning counts of any stream in the North Coast.
- Give priority to completing multi-project environmental assessments in Lower Schooner and South Fork Schooner because they are high priority subwatersheds under all three issues.
- Develop adequate population information for fish species within the watershed.
- Protect the integrity of existing study sites. Sites include three progeny sites (two Douglas-fir and one Western Hemlock) and the Hemlock Fertilization Study (see study files at Hebo Ranger District).
- Cooperate with Oregon Department of Agriculture, Lincoln County Vegetation Management and other interested parties to control noxious and invasive weeds.
- Periodically monitor historic/known sensitive, threatened or endangered species sites to identify any changes in occupancy or populations.
- Comply with "Survey and Management" strategies in the Northwest Forest Plan.
- Revise appropriate scenery objectives for consistency with late-successional reserve goals and objectives

7. APPENDICES

APPENDIX 7.1: TEAM MEMBERS/CONTRIBUTORS

Drift (Siletz) Watershed Analysis Team

This analysis was done by staff of the Siuslaw National Forest, 4077 Research WayCorvallis, OR 97333 (541) 750-7000.

Core Team

John Johansen	Team Leader, Document Editor, Social/Cultural Resources
Carol Bickford	Wildlife Biologist
Barbara Ellis-Sugai	Hydrology, Soils and Geology
Dan Johnson	Geographic Information Specialist
Bob Miller	Fisheries Biologist
Dan Mummey	Transportation Planner
Wayne Patterson	Silviculturist

Support

Rich Babcock	Cultural Resource Technician/Vegetation Analysis, Hebo R.D.
Carol Johnson	Public Affairs, Hebo R.D.
Charlie Severson	Recreation and Lands, Hebo R.D.
Clark Tiecke	Team Liason with the Salem District of the BLM

The following individuals also contributed time, technical expertise and knowledge to the analysis area:

Federal Employees:

Cal Baker	Former Hebo R.D. Fish. Bio., USFS
Bill Beene	Fuels Technician, USFS
Bruce Cleland	EPA, Seattle, WA
Nancy Craft	AMA Plan Team, USFS
Jessica Dole	Landscape Architect, USFS
Andy Gray	PNW, Corvallis, OR
Jane Kertis	Ecologist, USFS
Cynthia Leonard	Public Affairs (Demographics), USFS
Gary Licata	Wildlife Biologist, BLM
Chris McDonald	Soil Scientist, USFS
Roger Monthey	Ecologist, BLM
Diane Morris	Silviculturist, BLM
Carrie Phillips	USF&W Agency Representative
Jim Reim	Meeting Facilitator, USFS
Matt Ruedy	Recreation and Lands Technician, USFS
Phyllis Steeves	Cultural Resources, USFS
Joanne Wu	NMFS Agency Representative

Non-Federal Contributors:

Dr. Lew Ayres	Guru, mentor, fisheries input
Kent Boring	Stimson Lumber Co., Forest Grove, OR- ownership info
Bob Buckman	Fisheries Biologist, ODF&W
Lance Burke	Public Works Director, Lincoln City
Sylvia DeForest	Private Citizen- Longtime resident- history
Bob Fuller	CH2M Hill- Proposed Side Creek impoundment
Michael Hicks	Boise Cascade Corp., Monmouth, OR- ownership info
Nielo Hill	Private Citizen, Longtime resident- local history
Dick Holmes	Miami Corp.- ownership info
Fred Johnson	Private Citizen- former Hebo R.D. surveyor
Phil Lamberson	Lincoln County Mycological Society- list of fungi
John McKevitt	Superintendent, Lincoln City Water Dept.
George McKibben	Simpson Lumber Co., Tillamook, OR- ownership info
Dick Patton	Georgia Pacific Corp., Toledo, OR- ownership info
Ketrina Poole	North Lincoln County Historical Museum, Inc.
Ben Schaad	Private Citizen- trail map, McMinnville, OR
Jerry Sparks	Hampton Tree Farms, Willamina, OR- ownership info
Glen & Althea Theisyen	Drift Creek Organizational Camp

To all of the above and others inadvertently omitted, thank you for your assistance!

APPENDIX 7.2: PUBLIC INVOLVEMENT/SCOPING

The main public involvement/scoping effort for this analysis involved the distribution of brochures and posters. Approximately 300 brochures were mailed out (see attached table) and an additional 250 brochures and posters were delivered for placement in the following locations:

- Driftwood Library- Lincoln City
- South Tillamook County Library- Pacific City
- Hebo Post Office
- Pacific City Post Office
- Kernville-Gleneden Beach-Lincoln Beach Water District office
- Waldport Ranger Station
- Siuslaw NF Supervisors Office front desk
- USFS R-6 Regional Office front desk
- Alsea Ranger Station
- Hebo Ranger Station- lobby
- Earth Day- Tillamook
- Earth Day- Siuslaw NF Supervisors Office
- Lincoln City Visitor's Center
- Tillamook County Library- Tillamook
- Adaptive Management Area Open House (4/96)

News releases were sent to the following:

- Radio stations KYTE (Newport) and KBCH (Lincoln City). The message was broadcast on at least one of these stations (as reported by a private citizen- not sure which station).
- Four newspapers: The News Times (Newport), The Sun (Sheridan), The News Guard (Lincoln City- **published**), The Headlight Herald (Tillamook).

Scoping included interviewing current and former District employees and contacts with other federal, state and local agencies (see Appendix 7.1).

Over 60 individuals responded or were contacted in conjunction with the mailings. The purpose of the scoping was to solicit information and concerns about the area that would be useful to the analysis (see attached copy of brochure). Most of the responses merely indicated a desire to stay informed on the progress of the analysis. The other major category were responses that were general statements such as "no more clearcutting" or "I can't believe you're closing roads and not cutting timber", etc. All returned response forms are on file at Hebo Ranger Station. Because the mailings were not made at random they are not a true representative cross section of opinions concerning the analysis area, however, they do provide a good beginning point for scoping and issue development for subsequent project EA's. Although there are a few notable exceptions (see Appendix 7.2), most of the responses did not contribute appreciably to our understanding of the watershed.

After the completion of the final watershed analysis, a second brochure will be mailed out to all respondents summarizing the process as well as findings and recommendations.

Siuslaw National Forest

John Johansen
Hebo Ranger District
31525 Hwy 22
Hebo, Oregon 97122

Tape to mail

STAMP

DRIFT (SILETZ) Watershed Analysis

Forest Service
Siuslaw National Forest
Hebo Ranger District
31525 Hwy 22
Hebo, Oregon 97122
(503)392-3161/TDD (541)750-7127

The Hebo Ranger District, Siuslaw National Forest, will be conducting a watershed analysis of the Schooner Creek/Drift Creek (Siletz Bay) and Devils Lake Watersheds (see map) during the next three months. We will be referring to this as the Drift (Siletz) Watershed Analysis but the area of the analysis is much wider than the immediate drainage of Drift Creek.

WHAT IS IT?

WATERSHED analysis is a way of collecting information about a watershed and developing an understanding of how the watershed ecosystem works. Information includes current and historical conditions that are compared for similarities, differences, and trends that can lead to an understanding of the underlying processes that make the ecosystem "tick". The end product is a report that explains to managers what this information means and how it can be applied to make future management decisions that meet the objectives of the Northwest Forest Plan. These management objectives will focus on providing high quality fish habitat and the development of mature forest conditions. The analysis is not intended to direct how other agencies or landowners manage their lands.

ABOUT THE WATERSHED.

THE Drift (Siletz) analysis area occupies about 48,000 acres between the drainages of the Salmon River (to the north) and the Siletz River (to the south). The streams in the analysis area flow into the Pacific Ocean mainly via Siletz Bay or Devils Lake/D River. About 62% of the area is under federal land management (U.S. Forest Service and Bureau of Land Management) with most of the remaining land in private ownership.

The analysis team has identified some broad issues that outline the major areas for analysis. These "issues" are resource problems or concerns that we know exist, some of which relate to potential management projects. These issues include -

...landslides
...roads
...riparian conditions
...water temperature
...threatened/endangered species
...the forest/urban interface

These issues will be refined during the analysis process and others may come to light, particularly through public participation.

WE WANT YOUR HELP

To improve our understanding of the area - its resources, human uses, history and ecological processes - we could use as much information as is available. If you have any information that can help with this analysis, we would like to hear from you.

Examples of information we would like include:

HOW was the watershed used in the past? Do you have old photos? Family history?
WHERE were the early homesteads, farming & grazing. How was it logged?
HOW was the fishing in various streams?
WHEN did you last see uncommon plant, wildlife species? What?Where?
WHAT were the effects of the Columbus Day storm, 1964 flood, etc?
WHAT is unique/unusual about this watershed to you?

HOW would you like to see the watershed managed?
ARE there any special places you want protected? For what purpose?
ARE there particular roads you're concerned about?
DO you depend on certain areas for forest resources?
DO you have ideas for sustaining healthy forest conditions that can also accommodate some human uses?

****

If you would like to provide information, please contact any of the following people by phone at **(503) 392-3161** or mail the enclosed form.

Don Gonzalez - District Ranger
Carol Bickford - Wildlife/Botany
Bob Miller - Fisheries
Charlie Severson - Recreation
John Johansen - Coordinator
Barb Ellis - Geology/Hydrology
Wayne Patterson - Silviculture

RESPONSE FORM

Please check all boxes that apply.

NAME:____________________________________
ADDRESS:_________________________________
CITY:______________**STATE**____**ZIP**____________

☐ **YES, I am interested in the anaysis and would like to remain on your mailing list.**

☐ **PLEASE contact me, I would like to talk with you further about the analysis. The best way to contact me is** __________________

☐ **ADD me to your mailing list.**

ISSUES? IDEAS? INFORMATION? CONCERNS?
Let us know your thoughts!

____
____
____
____
____

APPENDIX 7.3: ROADS DATABASE: EXPLANATORY NOTES

NOTE: THE DATABASE IS INCLUDED IN THE MAP PACKET ACCOMPANYING THIS DOCUMENT.

A database was created to provide managers with objective data on Forest Service roads in the Drift Creek (Siletz) watershed analysis area. The information is intended to guide management decisions regarding which roads should be upgraded because of future needs, which roads should be decommissioned and stabilized to prevent damage to other resources, and finally, to prioritize road projects. Only Forest Service system roads are included in this data base because of time constraints in completing the analysis. There are several abandoned spur roads that are no longer considered system roads. They may or may not have erosion problems, and will need to be field checked. No data was readily available for them. The abandoned spur roads were identified from historic aerial photos and digitized into the GIS road database. The information included in this table is listed and defined below. It can be divided into broad categories: factors that contribute to risk of instability, eg. topographic position, construction method, undersized culverts and location of the road in areas with a high susceptibility to landslides; need for the road, eg. future use for timber management, recreation, public access, and the cost of maintaining the road.

Subwatershed: The subwatershed in which most of the road is located.

Second subwatershed: Other subwatersheds the road might cross. Many roads are located on ridges and may cross into more than one subwatershed.

Road number: U.S. Forest Service Road number

Length (miles): Length of the road segment. In the case of the main roads, it is the length of the road within the subwatershed.

Topographic position: The slope position of the road. R = ridge top roads, M = mid-slope roads, VB = valley bottom roads. Because mid-slope roads generally have more stream crossings, more fill slopes, and more likelihood of disrupting water flow, they are considered to be at higher risk of failure.

Photo year: The first year in the record of aerial photos in which the road is visible. The road may be older than the photo year.

Construction: The type of construction most likely used to build the road. S = sidecast construction, NS = not sidecast or endhaul construction. This information is based on the age of the road, which is assumed from the photo year. Roads that were built prior to and including those that appear on the 1972 aerial photos were assumed to be sidecast; roads built later than 1972 were assumed to be not sidecast.

Past Failures: This information is based on the aerial photo survey of landslides. If the road segment had landslides along its length, it received a "yes" in this column.

Risk Category: This information is based on a model that uses digital elevation model (DEM) data to identify areas that are susceptible to debris failures. If the road crosses ground that has a slope greater than 60%, it is rated as "high" risk; if the slopes are 30-60%, the road is rated as "moderate" risk; if the slopes are less than 30%, it is rated as "low" risk.

Debris torrent risk from SRI: This information is similar to the risk category, except that information from the Soil Resource Inventory was used to rate areas with high, moderate and low degrees of risk for debris torrents. Both the DEM data and the SRI data agreed.

Slump Risk from SRI: This information came from the Soil Resource Inventory, as thDEM model did not provide information on susceptibility to deep-seated rotational slumps and earthflows.

Number of culverts: Total number of culverts on this segment of road.

 # Culvert <08 HW/D: Number of culverts out of the total number that are too small to allow passage of water from a hundred year flood event at a ratio of 0.8 headwater depth to diameter of the culvert.

 # Culverts <05 HW/D: Number of culverts out of the total number that are too small to allow passage of water from a hundred year flood event at a ratio of 0.5 headwater depth to diameter of the culvert. This number was calculated to allow debris and water passage through the culvert.

Risk Score: The risk score is combined number based on topographic position, construction, past failures, risk of debris torrents, and risk of slumping. Points were assigned as follows:

Topographic position: Ridge = 0, Mid-slope = 1, Valley bottom = 0
Construction: Sidecast = 1, not sidecast = 0
Past failures: Yes = 1, No = 0
Debris torrent risk: high = 2, moderate = 1, low = 0
Slump Risk: high = 2, moderate = 1, low = 0

Ages and acres of timber stands that are reached by each road segment were acquired from GIS data. The stands are listed in order from oldest to youngest.

Age of Stand 1: Year of origin of oldest stand accessed by road segment.

Acres of Stand 1: Total number of acres of stand 1.

Age of Stand 2: Year of origin of stand 2 accessed by road segment.

Acres of Stand 2: Total number of acres of stand 2.

Age of Stand 3: Year of origin of stand 3accessed by road segment.

Acres of Stand 3: Total number of acres of stand 3.

Age of Stand 4: Year of origin of stand 4 accessed by road segment.

Acres of Stand 4: Total number of acres of stand 4.

Thin 5 Years: If the road will be needed to access timber stands that will probably be commercially thinned in the next 5 years, the column was marked with a "yes". Any stand with a year of origin older than 1964 was considered eligible for thinning in the next 5 years.

Thin 10 Years: If the road will be needed to access timber stands that will probably be commercially thinned in the next 10 years, the column was marked with a "yes". Any stand with a year of origin between 1965 and 1974 was considered eligible for thinning in the next 10 years.

PCT: If the road will be needed to access timber stands that will be precommercially thinned, the column was marked with a "yes". Any stand with a year of origin younger than 1984 was considered eligible for precommercial thinning and/or alder release.

Access pvt land: The road provides access to private, or non-forest service lands.

ATM category: The maintenance category for the road based on the Access and Travel Management Plan, Siuslaw National Forest

Land category: The land allocation category based on the Northwest Forest Plan.

Historic maintenance costs: The average annual costs to maintain the road. Listed as $1000's.

ATM plan costs: Projected annual costs to maintain the road segment under the Access and Travel Management Plan. Listed as $1000's.

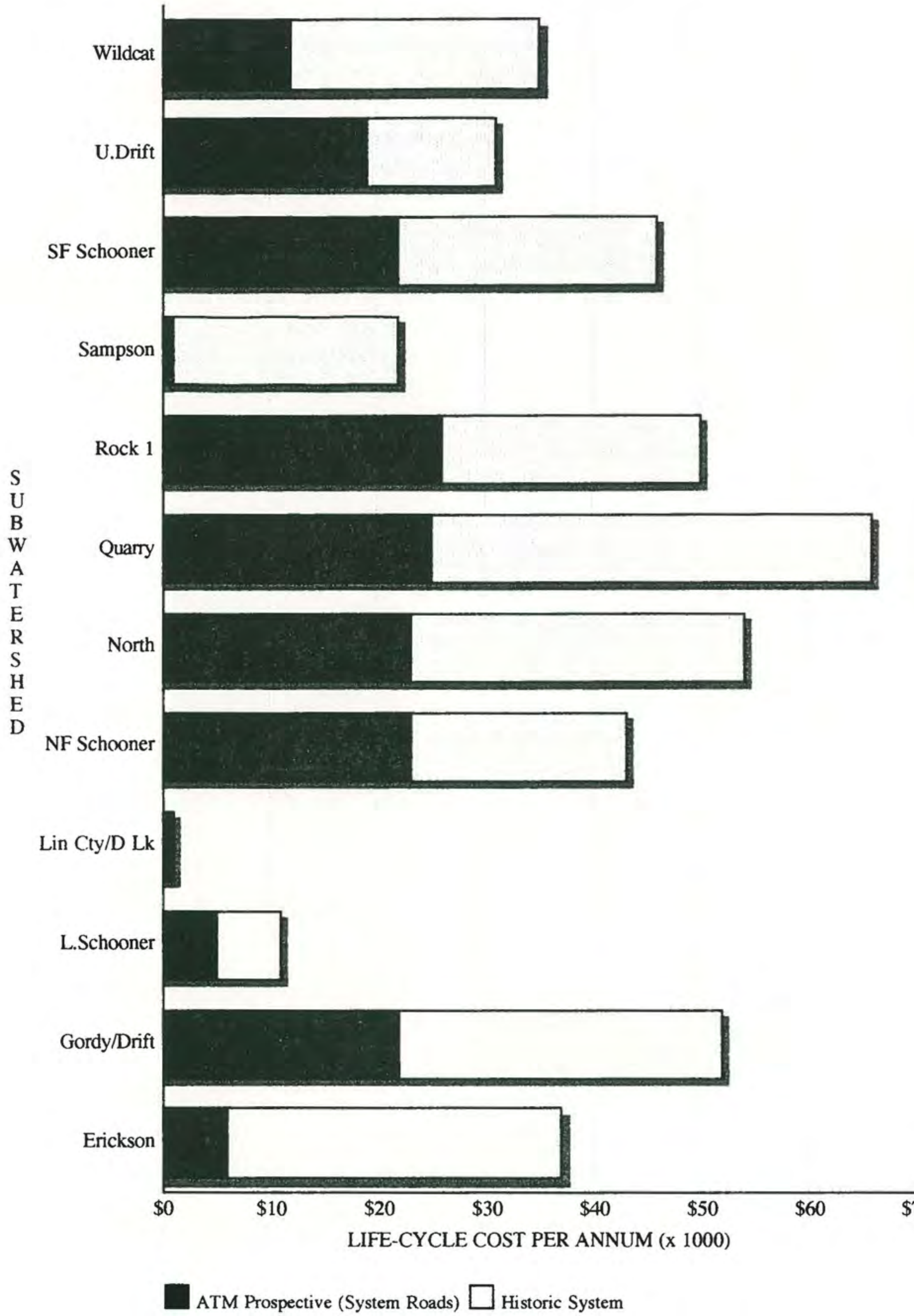
ATM rate of return: A cost/benefit analysis based on dollar savings only. Formula used is: historic costs-ATM plan costs/ATM plan costs. Listed as $1000's.

B/C according to risk score: A benefit/costs ratio that factors in the "risk score" for potential failures. A factor of 1 is the break-even point, economically. A score higher than 1 suggests the benefits outweight the costs of continuing to maintain the road. This number should be used with caution, and other factors need to be taken into account. Its primary use is to prioritize roads that are targeted for closure and/or decommissioning. For more information on the costs analysis, Section xx and Appendix xx.

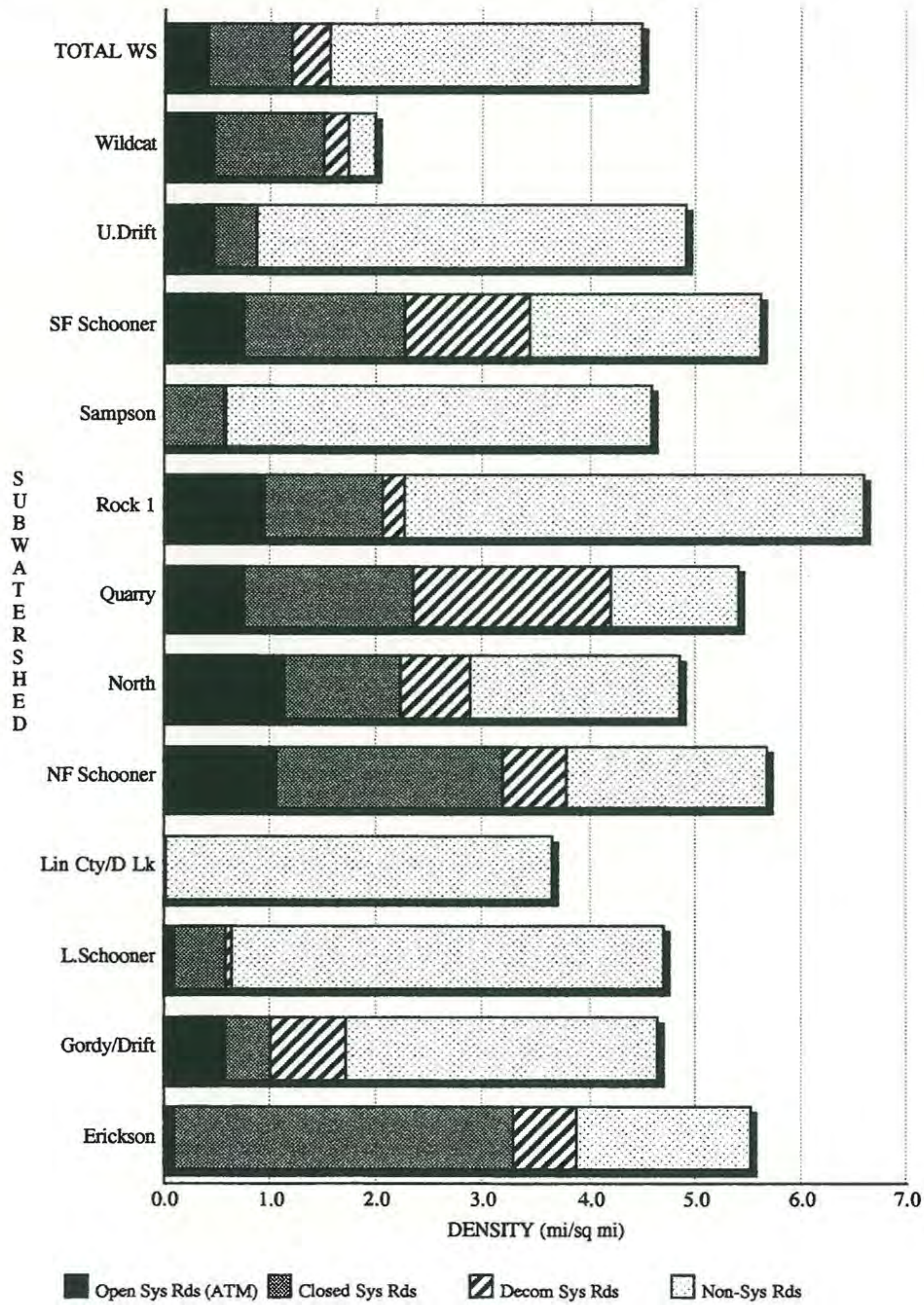
Comments: Includes comments on illegal activites (eg. trash dumping), effects of the February 1996 floods, etc.

APPENDIX 7.4: ACCESS & TRAVEL MANAGEMENT BENEFIT/COST

ATM Potential Cost-Benefit Comparison to Historic System of Forest Roads



ATM and Other System & Non-system Prospective Road Density Mix



APPENDIX 7.5: 100 YEAR CULVERT CAPACITIES

Q100Yr. Culvert Capacities (Campbell, et. al. 1982)

Sub Watershed	Road Number	GIS Pipe Number	Pipe Dia (in.)	Basin Acres	Mean Elev. (E)	Q100 (cfps)	Existing Pipe Capacity	Actual Reqr'd Dia(in.) HW/D=1 (100 Yr)	Reqr'd Pipe Dia (in) For HW/D = 0.8	Reqr'd Pipe Dia (in) For HW/D = 0.5
Erickson	1781	121	18	1	1000	1	OK	8	9	13
Erickson	1781	17	24	1	1000	1	OK	8	9	13
Erickson	1726112	119	24	20	1000	8	OK	19	20	30
Erickson	1726124	9	24	3	1000	1	OK	9	10	14
Erickson	1726124	14	24	16	1000	7	OK	18	19	27
Erickson	1726124	15	24	16	1000	7	OK	18	19	27
Erickson	1781114	123	18	6	1000	2	OK	12	13	18
Erickson	1781115	122	24	6	1000	2	OK	12	13	18
Erickson	1781120	21	24	14	1000	6	OK	17	18	26
Erickson	1781120	120	24	9	1000	4	OK	14	15	22
Erickson	1781120	124	24	8	1000	3	OK	13	14	21
Gordy/L.Drift	[redacted]	75	18	9	1600	5	OK	15	16	24
Gordy/L.Drift	[redacted]	78	18	17	1600	9	NG	20	21	31
Gordy/L.Drift	[redacted]	79	18	1	1600	1	OK	8	9	13
Gordy/L.Drift	[redacted]	77	24	31	1600	16	NG	25	27	39
Gordy/L.Drift	[redacted]	76	36	31	1600	16	OK	25	27	39
Gordy/L.Drift	[redacted]	109	24	3	1000	1	OK	9	10	14
Gordy/L.Drift	[redacted]	93	48	2	1000	1	OK	8	9	13
Gordy/L.Drift	[redacted]	89	60	485	1000	201	NG	68	73	107
Gordy/L.Drift	1700139	134	18	10	1000	4	OK	14	16	23
Gordy/L.Drift	1700151	73	15	1	1000	1	OK	8	9	13
Gordy/L.Drift	1700151	74	15	6	1000	2	OK	12	13	18
Gordy/L.Drift	1700151	110	18	1	1000	1	OK	8	9	13
Lowr Schooner	1700127	57	24	10	1000	4	OK	14	16	23
Lowr Schooner	1700127	133	36	9	1000	4	OK	14	15	22
Lowr Schooner	1700130	59	18	1	1000	1	OK	8	9	13
Lowr Schooner	1700130	60	18	1	1000	1	OK	8	9	13
Lowr Schooner	1781117	20	18	1	1000	1	OK	8	9	13
NF Schooner	[redacted]	12	18	10	1600	5	OK	16	17	25
NF Schooner	[redacted]	19	18	2	1600	1	OK	8	9	13
NF Schooner	[redacted]	28	18	1	1600	1	OK	8	9	13
NF Schooner	[redacted]	34	18	5	1600	3	OK	12	13	19
NF Schooner	[redacted]	35	18	1	1600	1	OK	8	9	13
NF Schooner	[redacted]	127	24	7	1600	4	OK	14	15	22
NF Schooner	[redacted]	16	30	8	1600	4	OK	15	16	23
NF Schooner	[redacted]	22	30	2	1600	1	OK	8	9	13
NF Schooner	[redacted]	10	36	1	1600	1	OK	8	9	13
NF Schooner	[redacted]	131	36	25	1600	13	OK	23	25	36
NF Schooner	1772	23	18	6	1600	3	OK	13	14	20
NF Schooner	1772	27	18	32	1600	17	NG	25	27	40
NF Schooner	1772	29	18	7	1600	4	OK	14	15	22
NF Schooner	1772	30	18	32	1600	17	NG	25	27	40
NF Schooner	1772	32	18	1	1600	1	OK	8	9	13
NF Schooner	1772	37	18	1	1600	1	OK	8	9	13

Q100Yr. Culvert Capacities (Campbell, et. al. 1982)

Sub Watershed	Road Number	GIS Pipe Number	Pipe Dia (in.)	Basin Acres	Mean Elev. (E)	Q100 (cfps)	Existing Pipe Capacity	Actual Reqr'd Dia(in.) HW/D=1 (100 Yr)	Reqr'd Pipe Dia (in) For HW/D = 0.8	Reqr'd Pipe Dia (in) For HW/D = 0.5
NF Schooner	1772	38	18	5	1600	3	OK	12	13	19
NF Schooner	1772	24	24	27	1600	14	OK	24	25	37
NF Schooner	1700111	8	18	20	1000	8	NG	19	20	30
NF Schooner	1700111	126	36	6	1000	2	OK	12	13	18
NF Schooner	1781112	18	10	1	1000	1	OK	8	9	13
NF Schooner	1781112	125	18	1	1000	1	OK	8	9	13
North	1730 spur	63	18	1	1400	1	OK	8	9	13
North	1730 spur	65	18	18	1400	9	NG	20	21	31
North	1730 spur	69	18	18	1400	9	NG	20	21	31
North	1730	61	15	1	1400	1	OK	8	9	13
North	1730	62	15	3	1400	1	OK	10	10	15
North	1730	64	24	18	1400	9	OK	20	21	31
North	1730	66	48	1	1400	1	OK	8	9	13
North	[redacted]	101	120	2	1000	1	OK	8	9	13
Quarry	1900	98	18	15	1000	6	OK	17	18	27
Quarry	1900	105	18	85	1000	35	NG	34	37	53
Quarry	1900	106	18	3	1000	1	OK	9	10	14
Quarry	1900	137	18	4	1000	2	OK	10	11	16
Quarry	[redacted]	94	24	24	1000	10	OK	21	22	32
Quarry	[redacted]	142	24	84	1000	35	NG	34	36	53
Quarry	[redacted]	146	24	2	1000	1	OK	8	9	13
Quarry	[redacted]	147	24	13	1000	5	OK	16	17	25
Quarry	[redacted]	96	30	15	1000	6	OK	17	18	27
Quarry	[redacted]	100	30	15	1000	6	OK	17	18	27
Quarry	1900	136	30	3	1000	1	OK	9	10	14
Quarry	1900	139	30	13	1000	5	OK	16	17	25
Quarry	[redacted]	95	36	24	1000	10	OK	21	22	32
Quarry	[redacted]	104	36	40	1000	17	OK	25	27	40
Quarry	[redacted]	140	36	12	1000	5	OK	16	17	24
Quarry	[redacted]	143	36	1	1000	1	OK	8	9	13
Quarry	[redacted]	144	36	78	1000	32	OK	33	35	52
Quarry	1900	138	48	1	1000	1	OK	8	9	13
Quarry	1900	102	96	633	1000	263	OK	76	82	119
Quarry	1928	141	15	6	1400	3	OK	13	14	20
Quarry	1928	99	18	1	1400	1	OK	8	9	13
Quarry	1928	135	18	25	1400	12	NG	22	24	35
Quarry	1928	97	36	25	1400	12	OK	22	24	35
Quarry	1900111	91	18	24	1000	10	NG	21	22	32
Quarry	1900111	92	18	24	1000	10	NG	21	22	32
Quarry	1900112	103	24	54	1000	22	NG	28	31	45
Quarry	1928115	80	18	25	1400	12	NG	22	24	35
Quarry	1928115	81	18	25	1400	12	NG	22	24	35
Quarry	1928115	82	18	25	1400	12	NG	22	24	35
Quarry	1928115	84	18	21	1400	10	NG	21	22	33

Q100Yr. Culvert Capacities (Campbell, et. al. 1982)

Sub Watershed	Road Number	GIS Pipe Number	Pipe Dia (in.)	Basin Acres	Mean Elev. (E)	Q100 (cfps)	Existing Pipe Capacity	Actual Reqr'd Dia(in.) HW/D=1 (100 Yr)	Reqr'd Pipe Dia (in) For HW/D = 0.8	Reqr'd Pipe Dia (in) For HW/D = 0.5
Quarry	1928115	85	18	25	1400	12	NG	22	24	35
Quarry	1928115	86	18	25	1400	12	NG	22	24	35
Quarry	1928115	145	18	11	1400	5	OK	16	17	25
Quarry	1928115	83	24	36	1400	18	NG	26	28	40
Quarry	1928115	87	24	2	1400	1	OK	8	9	13
Rock 1	1726	112	18	1	1000	1	OK	8	9	13
Rock 1	1726	113	18	7	1000	3	OK	13	14	20
Rock 1	1726	7	18	2	1000	1	OK	8	9	13
Rock 1	1726	118	18	6	1000	2	OK	12	13	18
Rock 1	1726	114	24	7	1000	3	OK	13	14	20
Rock 1	1726	2	24	35	1000	15	OK	24	26	37
Rock 1	1726	4	24	2	1000	1	OK	8	9	13
Rock 1	1726	5	24	7	1000	3	OK	13	14	20
Rock 1	1726	116	24	6	1000	2	OK	12	13	18
Rock 1	1726	117	30	6	1000	2	OK	12	13	18
Rock 1	1726	3	30	4	1000	2	OK	10	11	16
Rock 1	1726	6	30	30	1000	12	OK	22	24	35
Rock 1	1726	111	48	16	1000	7	OK	18	19	27
Rock 1	1726124	13	18	1	1000	1	OK	8	9	13
Rock 1	1726124	11	30	16	1000	7	OK	18	19	27
Rock 1	1729111	1	24	16	1000	7	OK	18	19	27
Rock 1	1729118	115	18	5	1000	2	OK	11	12	17
SF Schooner	[redacted]	39	18	1	1600	1	OK	8	9	13
SF Schooner	[redacted]	40	18	1	1600	1	OK	8	9	13
SF Schooner	[redacted]	41	18	1	1600	1	OK	8	9	13
SF Schooner	[redacted]	43	18	3	1600	2	OK	10	11	15
SF Schooner	[redacted]	44	18	1	1600	1	OK	8	9	13
SF Schooner	[redacted]	45	18	2	1600	1	OK	8	9	13
SF Schooner	[redacted]	46	18	4	1600	2	OK	11	12	17
SF Schooner	[redacted]	42	24	23	1600	12	OK	22	24	35
SF Schooner	[redacted]	36	72	8	1600	4	OK	15	16	23
SF Schooner	1782	25	18	2	1600	1	OK	8	9	13
SF Schooner	1782	26	18	2	1600	1	OK	8	9	13
SF Schooner	1783	58	30	6	1400	3	OK	13	14	20
SF Schooner	1700125	132	24	10	1000	4	OK	14	16	23
SF Schooner	1772112	128	18	8	1600	4	OK	15	16	23
SF Schooner	1772112	49	18	12	1600	6	OK	17	18	27
SF Schooner	1772112	48	24	4	1600	2	OK	11	12	17
SF Schooner	1772112	51	24	8	1600	4	OK	15	16	23
SF Schooner	1772112	54	24	8	1600	4	OK	15	16	23
SF Schooner	1772112	53	30	1	1600	1	OK	8	9	13
SF Schooner	1772112	47	36	32	1600	17	OK	25	27	40
SF Schooner	1772119	55	18	1	1000	1	OK	8	9	13
SF Schooner	1782122	31	18	1	1600	1	OK	8	9	13

Q100Yr. Culvert Capacities (Campbell, et. al. 1982)

Sub Watershed	Road Number	GIS Pipe Number	Pipe Dia (in.)	Basin Acres	Mean Elev. (E)	Q100 (cfps)	Existing Pipe Capacity	Actual Reqr'd Dia(in.) HW/D=1 (100 Yr)	Reqr'd Pipe Dia (in) For HW/D = 0.8	Reqr'd Pipe Dia (in) For HW/D = 0.5
SF Schooner	1782122	33	18	2	1600	1	OK	8	9	13
SF Schooner	1782122	130	18	6	1600	3	OK	13	14	20
Uppr Drift 1	[redacted]	56	18	1	1600	1	OK	8	9	13
Uppr Drift 1	[redacted]	50	24	1	1600	1	OK	8	9	13
Uppr Drift 1	[redacted]	129	24	31	1600	16	NG	25	27	39
Uppr Drift 1	[redacted]	52	30	1	1600	1	OK	8	9	13
Uppr Drift 1	1770	71	12	1	1000	1	OK	8	9	13
Uppr Drift 1	1770	151	12	38	1000	16	NG	25	27	39
Uppr Drift 1	1770	72	18	12	1000	5	OK	16	17	24
Uppr Drift 1	1770	90	24	7010	1000	2909	NG	200	214	312
Uppr Drift 1	1770	67	30	3	1000	1	OK	9	10	14
Uppr Drift 1	1770	68	30	2	1000	1	OK	8	9	13
Uppr Drift 1	1770	70	36	110	1000	46	NG	38	41	59
Uppr Drift 1	1770	88	36	11	1000	5	OK	15	16	24
Wildcat	[redacted]	107	24	8	1000	3	OK	13	14	21
Wildcat	[redacted]	148	24	13	1000	5	OK	16	17	25
Wildcat	[redacted]	149	24	15	1000	6	OK	17	18	27
Wildcat	[redacted]	108	36	22	1000	9	OK	20	21	31
Wildcat	[redacted]	150	42	38	1000	16	OK	25	27	39
				Summary						
SUBSHED	Total Culvert Head Basin Acres		ATM Roads Head Basin Acres		% Acres ATM Roads Head Basin	Num of pipes	Peak Flow 100 Year Event (cfs)	% Drainage Capacity deficient of Peak Flow Q100 Years	% Drainage Capacity deficient of Peak Flow Q100 Years HW/D = 0.8	% Drainage Capacity deficient of Peak Flow Q100 Years HW/D = 0.5
Erickson	100		0		0%	11	43	0%	0%	64%
Gordy/L. Drift	597		579		97%	12	259	87%	87%	90%
Lowr Schooner	22		0		0%	5	11	0%	0%	0%
NF Schooner	201		62		31%	22	106	33%	33%	71%
North	62		2		3%	8	32	59%	59%	86%
Quarry	1419		308		22%	35	610	35%	35%	90%
Rock 1	167		129		77%	17	71	0%	21%	52%
SF Schooner	147		48		33%	24	79	0%	0%	54%
Uppr Drift 1	7221		34		0%	12	3003	3%	3%	3%
Wildcat	96		96		100%	5	40	0%	0%	16%
Total WS	10,032		1258		13%	151	4,254	13%	14%	25%
							ATM %	1%	1%	2%
% drainage capacity deficientcy = Q>culvert capacity : tot ws pk flow									Legend	
HW/D = ratio of allowable flow level (for debris passage) to pipe dia.								[redacted]	ATM high clr	def.culverts

APPENDIX 7.6: BARK BEETLE GUIDELINES

Generation of Coarse Woody Debris and Guidelines for Reducing the Risk of Adverse Impacts by Douglas-fir Beetle

by

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April 5, 1996

Introduction

Since the completion of the Northwest Forest Plan, forest managers have been devising ways to manipulate stands to accelerate the development of late-successional stand characteristics. Some of the methods entail the felling of green trees to leave on site as coarse woody debris (CWD). This will help meet the CWD requirements, but there is concern that this will increase the probability of Douglas-fir beetle (Dendroctonus pseudotsugae) populations increasing to levels that may adversely affect the achievement of management objectives in some areas. Accordingly, we were asked to develop some guidelines for reducing the risk of adverse impacts caused by Douglas-fir beetles while generating desired amounts of CWD.

The Douglas-fir beetle (DFB) is indigenous to Douglas-fir forests of North America. In wetter areas, such as west of the Cascade Crest and in the Coast Range of Oregon, this beetle maintains its low-level populations by infesting trees weakened by root disease or other stress factors and in scattered windfall. After a significant disturbance event, populations will increase in down and damaged Douglas-firs to levels at which beetles, in subsequent years, will attack and kill healthy standing trees. If significant amounts of windthrow do not occur in following years, these outbreaks typically will last only three years with the beetles attacking and killing successively fewer trees each year.

This DFB-caused mortality can be benign, beneficial or harmful, depending upon management expectations and desired forest conditions. Moderate amounts of beetle-caused tree mortality, for instance, can significantly improve habitat diversity for numerous species of vertebrate and invertebrate fauna. Conversely, large amounts of mortality can severely damage high- value recreation sites, timber stands, old-growth areas, or habitat conservation areas. It is of particular significance that some of these areas depend on the number and sizes of old-growth trees to meet habitat requirements. This would be particularly true of spotted owl conservation areas, late-successional reserves, other designated old-growth areas, and recreation sites. Some of the older, less vigorous trees, weakened by disease or other factors, will be the most vulnerable to the DFB.

Beetle Life History

The DFB has one generation per year with most adults emerging, flying to, and infesting new host trees during the months of March through May in most Westside locations. A smaller flight composed of re-emerged parent beetles and progeny of the previous years re-emerging parent beetles may occur later in the summer. Only the spring flight of beetles has the potential, in terms of population levels, to infest significant numbers of standing green trees. This potential would be manifested the second spring after occurrence of significant disturbance events.

Infestation Behavior of Beetles

The fresher the felled material, the more attractive it is (Jantz and Rudinsky 1966; Johnson 1963; Lejeune, McMullen, and Atkins 1961). Some beetles attracted to a felled tree will land on and bore into nearby standing trees. If the beetles are not expelled by excessive flow of pitch, they will gain entrance and release more attractant. If large numbers of beetles infest a living tree, even the healthiest tree can be killed (Johnson and Pettinger 1961). In years of high beetle populations, the trees most likely to be killed are those near freshly felled or damaged trees that provide the initial attractant compounds for the beetles (Johnson and Belluschi 1969).

Johnson and Belluschi (1969) collected information during an infestation following the Columbus Day storm of 1962. In 1964 they placed bolts of wood from freshly felled Douglas-fir near healthy second-growth Douglas-fir. Fifteen of 100 "baited" standing trees and eight others in the near vicinity were attacked and killed by DFB. This was the first experimental demonstration that healthy Douglas-firs in coastal forests could be killed if enough beetles were attracted to them. In addition, they found a correlation between distance and number of beetle attacks per tree based on 200 trees within 35 feet of attractive material. Very few trees beyond 35 feet of the attractive material had any beetle attacks. In trees with attacks, beetles construct longer galleries, produce more larvae and consequently destroy more tissue on those portions of the bole above the basal 5 feet.

Initiation of a Beetle Outbreak

In western Oregon and Washington, windthrow is common in the fall and winter months due to windstorms combined with presence of saturated shallow soils. Occasionally, these storms are severe and result in extensive windthrow over large areas. Factors that favor DFB population increases include large numbers of windthrown trees, felled trees and logging slash, and other diseased and weakened trees.

A critical threshold of felled trees that will result in bark beetle population increases substantial enough to result in subsequent attacks on living trees is not known with certainty. However, based upon experience in Westside forests, when the number of windthrown trees reaches or exceeds 3 per acre, the numbers of DFB produced by these down trees is high enough to result in infestation and mortality of standing live Douglas-firs the spring following initial infestation of the down trees. West of the Cascade Crest, DFB generally infest trees greater than 12 inches in diameter at breast height. If all the trees in a stand are smaller than this, the probability of DFB caused tree mortality is very low. This probability will increase with an increasing proportion of trees greater than 12 inches in diameter.

Storms during the winter of 1995-1996 resulted in blowdown ranging from small patches to generally scattered in areas west of the Cascade Crest. The lack of large patch blowdown does not mean that DFB will not cause any future mortality of standing green trees. Infested down trees covered by partial to full shade will produce more beetles than trees fully exposed to the sun. Thus, a down tree in a scattered, shaded blowdown situation will produce more beetles in the subsequent generation than a similar size tree within a large patch of blowdown exposed to higher levels of solar radiation.

Information on Past Westside Outbreaks

The two largest recorded outbreaks of DFB within Westside forests occurred following the windstorms of the winter of 1949-1950 combined with the severe windstorm of December 4, 1951, and following the "Columbus Day Storm" which occurred on October 12, 1962. Even though the Columbus Day Storm is the most damaging windstorm ever recorded for the Pacific Northwest, the volume of trees killed was less than one-third that following the events of 1949-1951. In the earlier outbreak, started by wind damage during the winter of 1949-1950, the severe storm in 1951 added much host material for DFB. In addition, severe drought during the growing seasons of 1951 and 1952 helped maintain high beetle numbers by speeding brood development and by lowering tree resistance. In contrast, only normal windthrow occurred following the 1962 storm and the summers of both 1963 and 1964 were wet and cool. The effect of the weather was (1) to keep the trees vigorous because of favorable moisture conditions with the result that only with overwhelming numbers of beetles could attacks be successful and (2) to restrict beetle population by slowing developments of broods so that fewer beetles survived the winter (from Johnson and Belluschi 1969).

Based on experience following the Columbus Day Storm, the disturbance events of 1949-1951, and other smaller wind events, the following rules-of-thumb were developed. It is imperative to remember that there are many factors that influence DFB brood production and tree resistance to the beetles. Thus, the outcomes may be quite different than predicted for any specific area and/or year.

> For every 2 down, infested trees (which would have been infested the first spring following the wind event), the beetles emerge and attack 1 green standing Douglas-fir the second spring following the wind event. For every 4 standing trees infested the second spring, beetles emerge and infest 1 tree the third spring. The fourth spring following the wind event, beetles will infest 1 standing green tree for every 25 infested the previous spring. Given no additional windthrow, Douglas-fir mortality from DFB attack generally subsides to background levels by the fourth year. Thus, during the several years following a wind event, the number of standing green trees infested and killed will be about 60% of the number of infested down trees.

Standing green trees infested and killed by DFB will exhibit discolored foliage primarily in late spring and summer following the year of infestation. Thus, by the time one can estimate numbers of trees killed by DFB, the beetles have already emerged from these trees and infested other trees.

Based on the rules of thumb described, the following table is an hypothetical example of the numbers of trees infested and discolored during each year following a wind event. This example assumes a starting number of 200 down infested trees.

Spring Following Blowdown	Number of Currently Infested Trees	Number of Newly Infested Trees	Number of Trees with Discolored Foliage
First	0	200	0
Second	200	100	0
Third	100	25	100
Fourth	25	1	25
Fifth	0	0	1

Consequences of Felling and Leaving Trees

The creation of CWD by felling live Douglas-firs and leaving them on the ground can lead to DFB-caused mortality of residual standing trees. To date, no data have been collected from areas where these methods were employed. Thus, any prediction of effects must be based on information from other situations. There is no question that these freshly felled trees will be attractive to DFB, and it is likely that many or all of them that are large enough will be infested. Infestation levels both in numbers of trees infested and density of beetles within trees will depend in part on population levels of DFB in the general area. This, in turn, depends on the recent history of blowdown, logging activity, or other tree stressors or disturbance events in the general area.

Currently in western Oregon and Washington, the population levels are most likely at quite low levels based on the number and severity of recent disturbance events and on numbers of DFB-killed trees detected during annual aerial surveys. However, even at these "normal" background population levels, DFB may be adequate to infest many or all of the trees felled for CWD.

Even at "normal" background levels, beetles in down trees are likely to produce enough progeny to result in DFB-caused mortality of some standing green trees both within project areas and in adjacent areas. The number of trees killed in the overstory will be directly related to the number of felled trees per acre. Thus, if 30 Douglas-firs per acre are felled to generate CWD, the probability of an overstory tree being killed will be significantly higher than if 5 Douglas-firs per acre are felled.

Douglas-fir beetles can fly to and infest trees several miles from where they emerge. Thus, if large beetle populations are generated in down trees, beetles will certainly infest some trees within the project area, but will also infest and kill some trees in surrounding areas. This may be of particular concern if the management objectives of the surrounding areas are compromised due to this additional mortality.

Guidelines

Based on our current knowledge of DFB, the following guidelines have been developed to reduce the probability of DFB-caused mortality of residual standing trees in Westside forests where live Douglas-firs are being felled for CWD.

- **Fell and leave the minimum number of trees possible that will allow achievement of CWD objectives.** Remember, the rule-of-thumb is that the number of standing trees killed will be about 60% of the number that are felled.

- **Fell the trees no earlier than July and no later than the end of September -- the later they can be felled during this period, the better.** This will help insure that the trees are felled after the primary flight of DFB and that some drying of logs will occur so that the logs will be less suitable as host material the following spring.

- **Staggering the years in which trees are being felled may be beneficial if large numbers of trees are being felled and if enough time is left between felling.** The time period between tree falling should be at least 3 years; 4 would be better. Otherwise, the situation may be exacerbated by allowing beetles to build to even higher population levels.

- **Monitor what is happening in these stands regarding infestation of down logs, and infestation and killing of standing live Douglas-firs.** To date, no data have been collected from areas where silvicultural practices such as this have been used, and any information gathered will be useful under the principles of adaptive management.

- **If DFB populations are at high levels in the general area because of large amounts of recent blowdown, it would be prudent to postpone felling of CWD trees until populations subsided.** This would be 2 years from the summer in which many discolored trees are present (or 4 years after the first spring following the blowdown), unless there are large amounts of blowdown in subsequent years. If this is the case, one should wait longer. Once the infested trees discolor, the extent and intensity of the previous year's DFB activity can be estimated using the Annual Aerial Insect Detection Survey maps.

- **If possible, fell tree species other than Douglas-fir for CWD.**

<u>References</u>

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APPENDIX 7.7: SPECIES LISTS

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES,
CANDIDATE SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR
IN THE AREA OF THE PROPOSED
BIOLOGICAL ASSESSMENT - SIUSLAW NATIONAL FOREST

<u>LISTED SPECIES[1/]</u>

<u>Birds</u>		
Marbled murrelet	*Brachyramphus marmoratus*	CH T
Documented Siuslaw National Forest		
Aleutian Canada goose	*Branta canadensis leucopareia*	T
Western snowy plover	*Charadrius alexandrius nivosus*	T
Documented Siuslaw National Forest		
Peregrine falcon	*Falco peregrinus*	E
Documented Siuslaw National Forest		
Bald eagle	*Haliaeetus leucocephalus*	T
Documented Siuslaw National Forest		
Brown pelican	*Pelecanus occidentalis*	E
Northern spotted owl[2/]	*Strix occidentalis caurina*	CH T
Documented Siuslaw National Forest		
<u>Invertebrates</u>		
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	CH T
Documented Siuslaw National Forest		
<u>Plants</u>		
Western lily	*Lilium occidentale*	E
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

<u>PROPOSED SPECIES[/]</u>

<u>Fish</u>		
Umpqua River cutthroat trout[3/]	*Oncorhynchus clarki*	PE
Coho salmon[4/]	*Oncorhynchus kisutch*	PT
Documented Siuslaw National Forest		

<u>CANDIDATE SPECIES[/]</u>

None

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Documented Siuslaw National Forest	
California wolverine	*Gulo gulo luteus*
Documented Siuslaw National Forest	
Pacific fisher	*Martes pennanti pacifica*
Documented Siuslaw National Forest	
Long-eared myotis (bat)	*Myotis evotis*
Documented Siuslaw National Forest	
Fringed myotis (bat)	*Myotis thysanodes*
Documented Siuslaw National Forest	
Long-legged myotis (bat)	*Myotis volans*
Yuma myotis (bat)	*Myotis yumanensis*
Pacific western big-eared bat	*Plecotus townsendii townsendii*
Documented Siuslaw National Forest	

Birds

Little willow flycatcher	*Empidonax traillii brewsteri*

Amphibians and Reptiles

Tailed frog	*Ascaphus truei*
Documented Siuslaw National Forest	
Northwestern pond turtle	*Clemmys marmorata marmorata*
Documented Siuslaw National Forest	
Red-legged frog	*Rana aurora aurora*
Documented Siuslaw National Forest	
Foothill yellow-legged frog	*Rana boylii*
Southern torrent salamander	*Rhyacotriton variegatus*

Fish

Green sturgeon	*Acipenser medirostris*
River lamprey	*Lampetra ayresi*
Pacific lamprey	*Lampetra tridentata*
Millicoma dace	*Rhinichthys cataractae* ssp.

Invertebrates

Newcomb's littorine snail	*Algamorda newcombiana*
Vertrees's ceraclean caddisfly	*Ceraclea (=Athripsodes) vertreesi*
Documented Siuslaw National Forest	
Roth's blind ground beetle	*Pterostichus rothi*
Documented Siuslaw National Forest	
Haddock's rhyacophilan caddisfly	*Rhyacophila haddocki*
Documented Siuslaw National Forest	

Plants

Pink sand verbena	*Abronia umbellata* ssp. *breviflora*
Documented Siuslaw National Forest	
Saddle Mountain bittercress	*Cardamine pattersonii*
Documented Siuslaw National Forest	
Tall bugbane	*Cimicifuga elata*
North Coast bird's beak	*Cordylanthus maritimus* ssp. *palustris*
Documented Siuslaw National Forest	
Frigid shootingstar	*Dodecatheon austrofrigidum*
Coast Range fawn-lily	*Erythronium elegans*
Documented Siuslaw National Forest	
Queen-of-the-forest	*Filipendula occidentalis*
Moss	*Limbella fryei*
Silvery phacelia	*Phacelia argentea*
Saddle Mountain saxifrage	*Saxifraga hitchcockiana*
Cascade Head catchfly	*Silene douglasii* var. *oraria*

(E) - Listed Endangered *(T) - Listed Threatened* *(CH) - Critical Habitat has been designated for this species*
(PE) - Proposed Endangered *(PT) - Proposed Threatened* *(PCH) - Critical Habitat has been proposed for this species*

Species of Concern - Taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

(CF) - Candidate: National Marine Fisheries Service designation for any species being considered by the Secretary for listing for endangered or threatened species, but not yet the subject of a proposed rule.
*** Consultation with National Marine Fisheries Service required.*

1/ U. S. Department of Interior, Fish and Wildlife Service, August 20, 1994, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12.
2/ Federal Register Vol. 57, No. 10, January 15, 1992, Final Rule-Critical Habitat for the Northern Spotted Owl
3/ Federal Register Vol. 59, No. 130, July 8, 1994, Proposed Rule-Umpqua River Cutthroat Trout
4/ Federal Register Vol. 60, No. 142, July 25, 1995, Proposed Rule-Coho salmon

Species Listed by the Oregon Natural Heritage Program Which Are Not Officially Managed by State and Federal Agencies

Often called "Watch List Species", this includes species on the Oregon Natural Heritage Program's List 3 (= more information is needed before status can be determined) and 4 (= species of concern which are not currently threatened or endangered). Typically, these species do not get listed as sensitive or assessment species by the federal agencies. Plants on List 3 are listed as "Tracking Species" by the BLM and are supposed to be monitored as much as budget and personnel allow. Forest Service and BLM Botanists do document information about known populations.

Scientific Name	Common Name
Adiantum jordanii	maidenhair fern
Barbilophozia barbata	liverwort
Castilleja ambigua	johnny-nip
Cephaloziella spinigera	liverwort
Cyperus acuminatus	short-pointed flatsedge
Cyperus bipartitus (= *C. rivularis*)	flatsedge
Darlingtonia californica	California pitcher-plant
Dulichium arundinaceum	dulichium
Eleocharis parvula var. parvula	spike rush
Elodea nuttallii	water-weed
Encalyptra brevipes	moss
Erythronium revolutum	coast fawn lily
Honkenya peploides	sea purslane
Lloydia serotina	alpine lily
Metzgeria temperata	liverwort
Myrica gale	sweet gale
Najas guadalupensis	water nymph
Poa marcida	weak bluegrass
Poa unilateralis	
Polygonum punctatum	water smartweed
Rhinanthus crista-gallii	yellow rattle
Rhytidium rugosum	moss
Samolus parviflorus	
Scirpus subterminalis	water club rush
Stellaria humifusa	spreading starwort
Synthyris schizantha	fringed kittentails
Subularia aquatica	awlwort
Tofieldia glutinosa	tofieldia
Vaccinium oxycoccos	swamp cranberry

BLM Assessment Plant Species

These are equivalent to the Oregon Natural Heritage Program's List 2 species (= species which are threatened, endangered, or possibly extirpated in Oregon, but are more common or stable elsewhere), and only include species which are not listed on appendix C-2.1. Generally, these species will be added to USFS Sensitive Species Lists when these lists are officially updated by the Regional Forester. BLM management directions state that presence of populations of these species may not necessarily affect a proposed project, but, where possible, steps should be taken to protect the species.

Scientific Name	Common Name
Calypogeia sphagnicola	liverwort
Carex livida	
Eriophorum chamissonis	Chamisso's cotton grass
Lophozia laxa	liverwort
Microseris bigelovii	coast microseris
Polystichum californicum	fern
Polytrichum strictum	moss
Tetraplodon mnioides	moss

APPENDIX 7.8: SPAWNING POPULATIONS

Peak counts of spawners returning to Rock Creek were available for 1957 to 1967 and for 1985 to 1995. Data on the duration of surveys, number of times surveyed, and individual survey counts were not available. Populations were approximated by assuming that total spawners was 2.5 times the peak count. The realiability of this data is poor, however in the absence of the data needed to estimate populations using the area under the curve method used by ODFW (Cooney and Jacobs 1993) this is an approximation of relative run size. Individual year estimates are not reliable, however mulit-year aggregations are approximations of run size.

Table 7.8-1. Estimated spawning populations** for naturally produced coho for Rock Creek.

Year	Peak Adult /Mile	Peak Jacks/Mile	Est. Rock Adult pop.	Year	Peak Adult /Mile	Peak Jacks /Mile	Peak Adult /Mile	Peak Jacks /Mile	Est. Rock Adult pop. from index[1]	Est. Rock Adult pop. from all surveys[2]
1957	22	4	358	1985	16	7	29	2	260	366
1958	7	36	114	1986	12	2	17	4	195	236
1959	56	7	910	1987	7	1	26	3	114	268
1960	6	11	98	1988	5	1	4	1	81	73
1961	30	9	488	1989	6	0	17	3	98	187
1962	64	20	1040	1990	2	1	10	3	33	98
1963	5	6	81	1991	11	1	20	2	179	252
1964	23	7	374	1992	0	0	2	0	0	16
1965	3	0	49	1993	6	0	17	0	98	187
1966	19	---	309	1994	13	1	31	3	211	358
1967	4	0	65	1995	3	0	16	2	49	154
1957-1967	22	10	358	1985-1995	7	1	17	2	114	196

**See explanation in text.

[1] Estimates from the same surveys reaches surveyed in 1957-1967 [2] Estimates including additional surveys performed in 1985-1995.

APPENDIX 7.9: FISH HABITAT PARAMETERS

Table 7.9-1 Summary of Stream Channel Fish Habitat Parameters in the Drift (Siletz) WA Area

HUC[1]	Subwatershed Name	% Pool[2]	Miles Surveyed	LWD/ Mile[3]	Pools/ Mile	% Back Water[4]	% Gravel[5]	% Sand[6]	%Pools > 1m deep[7]
1710020447A	L SCHOONER	32%	2.02	8	33	2%	26%	0%	1%
1710020447B	ERICKSON	24%	3.85	50	47	0%	45%	0%	3%
1710020447C	N FORK SCHOONER	34%	1.50	5	45	0%	31%	7%	6%
1710020447E	U DRIFT1	17%	1.34	5	30	0%	6%	0%	0%
1710020447G	SAMPSON	38%	1.20	17	38	0%	30%	0%	0%
1710020447H	WILDCAT	39%	1.87	87	72	2%	75%	10%	19%
1710020447J	QUARRY	66%	1.81	26	47	52%	75%	25%	0%
1710020447K	GORDEY/L DRIFT	46%	12.55	8	19	0%	20%	0%	7%
1710020448B	ROCK1	41%	3.84	47	63	9%	80%	6%	15%

[1]USGS Hydrologic Unit Code include NFS watershed and subwatershed ID. [2]Percent of surveyed area in pool habitat type. [3]Pieces of LWD >24" dia.x 50' or 2 channel widths long. [4]Percent of surveyed area in beaver ponds, dam pools, or side channels. [5]Percentage of total survey area of riffle habitat units having gravel as a dominant substrate. [6]Percentage of total survey area of riffle habitat units having sand as a dominant substrate. [7]Percent of surveyed area in pool habitat type deeper than 1m.

Habitat parameter values for stream inventories completed form 1990 to 1996 for stream reaches with less than 4% gradient designated on the B2 survey form. The entire mainstem Drift Creek is included in the Gordey/L Drift row.

Table 7.9-2 Stream Channel Habitat Rating (from USDC 1995, OR Coast Province Level-I Fishery Biologists 1996)

HUC	Subwatershed Name	Substrate	Large Woody Debris	% Area in Pools	Pool Quality	Off-Channel Habitat
1710020447A	L SCHOONER	A	N	A	N	N
1710020447B	ERICKSON	A	A	N	N	N
1710020447C	N FORK SCHOONER	A	N	A	N	N
1710020447E	U DRIFT1	N	N	N	N	N
1710020447G	SAMPSON	A	N	A	N	N
1710020447H	WILDCAT	A	P	A	A	N
1710020447J	QUARRY	N	N	P	N	P
1710020447K	GORDEY/L DRIFT	A	N	A	N	N
1710020448B	ROCK1	A	A	A	A	A

P - "Properly Functioning" A - "At Risk" N - "Not Properly Functioning"

Criteria used to rate stream habitat (Table 7.9-2) and develop reference conditions: Only stream reaches with less than 4% channel gradient were used to develop habitat ratings.

Large Woody Debris (LWD)

Each piece of woody debris must be at least 24" x 50' or 2 times the channel width.

Properly Functioning - 80+ pieces LWD per mile
At Risk - Less than 80 but more than 30 pieces LWD per mile
Not Properly Functioning - Less than 30 pieces LWD per mile

Substrate

Properly Functioning	- More than 50% of riffle unit areas have gravel as dominant substrate and less than 5% of riffle unit areas have sand as dominant substrate.
At Risk	- Less than 50% of riffle unit areas have gravel as dominant substrate or more than 5% of riffle unit areas have sand as dominant substrate.
Not Properly Functioning	- Less than 20% of riffle unit areas have gravel as dominant substrate or more than 10% of riffle unit areas have sand as dominant substrate.

Percent area in pools

Properly Functioning	- More than 50% of habitat unit area is pool habitat.
At Risk	- Less than 50% and more than 30% of habitat unit area is pool habitat.
Not Properly Functioning	- Less than 30% of habitat unit area is pool habitat.

Pool Quality

Properly Functioning	- More than 20% of habitat unit area is pool habitat greater than 1m deep.
At Risk	- Less than 20% and more than 10% of habitat unit area is pool habitat greater than 1 meter deep.
Not Properly Functioning	- Less than 10% of habitat unit area is pool habitat greater than 1 meter deep.

APPENDIX 7.10: STREAMSIDE VEGETATION

Table 7.10-1. Total Acres by Size Class for Managed and Natural Stands Within 200' of Stream Channels in Each Subwatershed.

Subwatershed	Stand Type[1]	Size Class[1] 1	2	3	4	5	6	7	8	9	10	11	12	13	Grand Total
ERICKSON	MGD	0	3	44	36	50	253	40	3	17	0	0	0	0	446
	NAT	0	0	0	0	4	7	5	39	80	102	56	0	0	293
GORDEY/L. DRIFT	MGD	147	46	0	13	26	38	132	101	60	79	0	4	0	646
	NAT	0	0	0	0	4	28	14	49	68	219	165	0	0	547
L. SCHOONER	MGD	38	0	12	38	129	272	204	61	45	0	0	0	0	799
	NAT	0	0	0	0	3	1	26	74	83	229	152	20	9	597
LINCOLN CITY/DEVILS LAKE	MGD	15	7	18	23	14	194	77	0	60	89	0	0	0	497
	NAT	0	0	0	0	0	19	11	24	9	19	232	13	0	327
NORTH	MGD	0	22	51	16	68	216	57	16	4	28	0	0	0	478
	NAT	0	0	0	0	0	1	0	13	79	355	84	4	0	536
NORTH FORK SCHOONER	MGD	0	0	32	6	21	73	96	0	34	1	0	5	0	268
	NAT	0	0	0	0	0	1	0	6	61	173	185	0	0	426
QUARRY	MGD	0	19	48	24	20	47	69	0	0	4	0	0	0	231
	NAT	0	0	0	0	15	18	37	16	113	220	89	16	0	524
ROCK1	MGD	4	16	37	61	38	372	215	11	0	1	0	37	0	792
	NAT	0	0	0	0	0	0	2	55	37	157	49	51	0	351
SAMPSON	MGD	0	8	27	72	62	822	610	141	55	0	0	14	0	1811
	NAT	0	0	0	0	4	5	0	68	11	150	5	25	25	293
SMITH	MGD	0	0	0	15	3	181	139	48	22	0	0	0	0	408
	NAT	0	0	0	0	0	0	32	7	47	52	19	0	0	157
SOUTH FORK SCHOONER	MGD	0	6	3	9	169	211	113	16	30	0	0	0	0	557
	NAT	0	0	0	0	0	0	31	63	53	185	95	0	20	447
U. DRIFT1	MGD	0	56	126	27	63	396	217	25	60	34	0	0	0	1004
	NAT	0	0	11	0	0	15	52	65	142	295	19	0	0	599
WILDCAT	MGD	0	67	44	11	31	31	0	39	41	0	0	0	0	264
	NAT	0	0	0	0	0	23	24	44	108	359	166	6	0	730
Grand Total		204	250	453	351	724	3224	2203	984	1319	2751	1316	195	54	14028

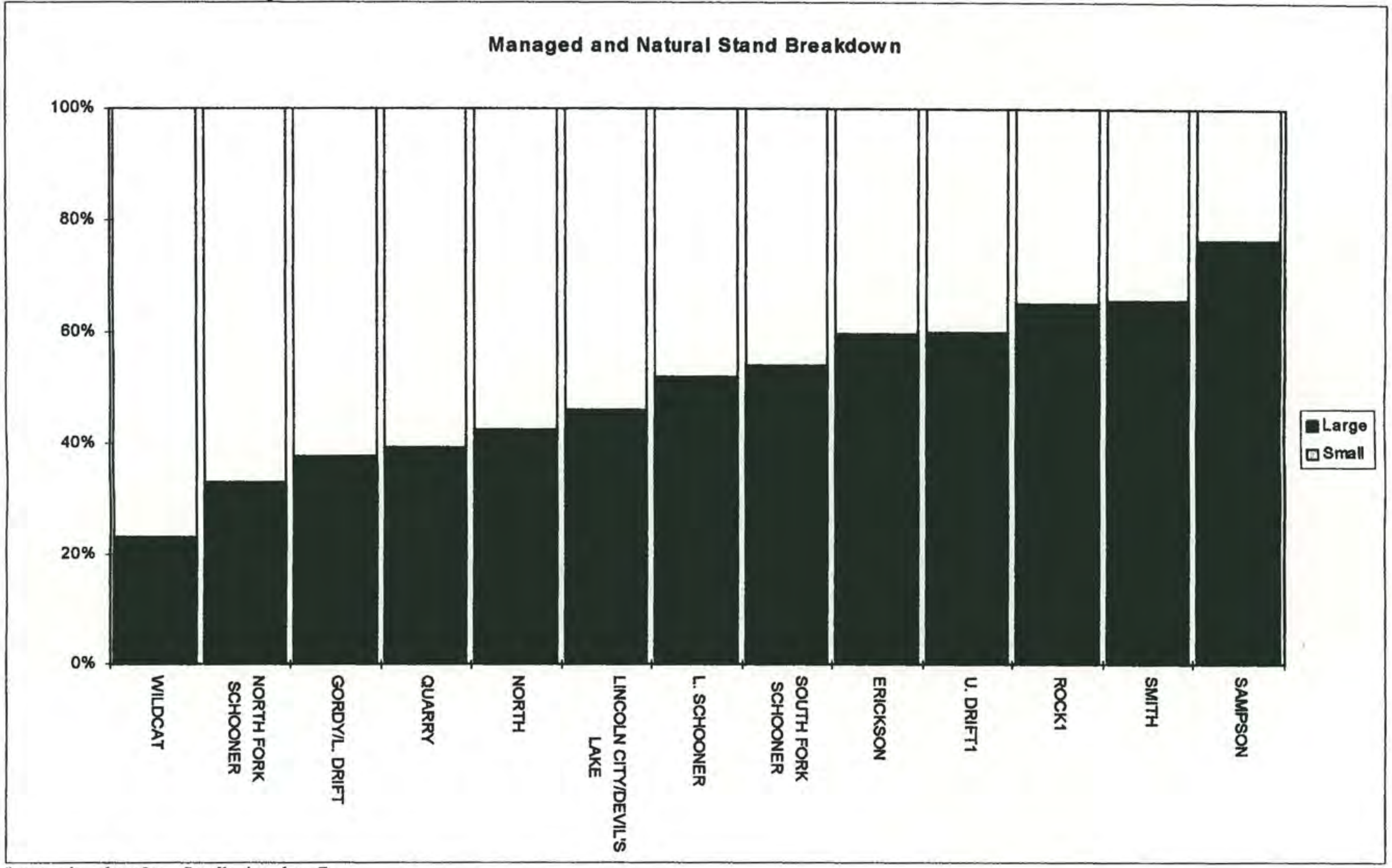
[1] Size class and stand type based on Siuslaw NF GIS data dictionary definitions

Table 7.10-2. Total Acres by Dominant and Subdominant Species For Managed and Natural Stands Within 200' of Stream Channels In Each Subwatershed.

		Dominant and Subdominant Species[1]																	
	Stand	ALRU					PISI			PSME					THPL		TSHE		Grand
Subwatershed	Type[1]	ACMA	PSME	THPL	TSHE	None	PSME	THPL	None	ALRU	PISI	THPL	TSHE	None	PISI	PSME	ALRU	PSME	Total
ERICKSON	MGD	0	25	0	0	18	0	0	0	150	0	0	107	146	0	0	0	0	446
	NAT	0	0	0	0	6	0	0	0	0	145	0	128	14	0	0	0	0	293
GORDEY/L. DRIFT	MGD	0	47	0	0	2	0	0	0	121	0	0	204	268	2	2	0	0	646
	NAT	0	20	0	0	9	17	0	0	16	115	7	324	29	0	0	0	10	547
L. SCHOONER	MGD	12	69	0	2	69	0	0	0	292	0	0	212	143	0	0	0	0	799
	NAT	0	28	0	0	30	106	0	0	1	190	0	159	83	0	0	0	0	597
LINCOLN CITY	MGD	0	4	0	0	16	12	0	0	129	89	0	193	45	0	0	9	0	497
/DEVILS LAKE	NAT	0	5	0	0	0	32	0	0	0	267	0	17	13	0	0	0	6	340
NORTH	MGD	0	12	0	0	11	0	0	0	288	0	0	71	96	0	0	0	0	478
	NAT	0	0	0	0	0	23	0	4	0	179	0	277	53	0	0	0	0	536
NORTH FORK	MGD	0	11	0	0	27	0	0	0	44	1	5	105	75	0	0	0	0	268
SCHOONER	NAT	0	0	0	0	0	4	0	4	1	224	0	107	86	0	0	0	0	426
QUARRY	MGD	0	0	0	0	25	0	0	0	26	0	0	117	71	0	0	0	0	239
	NAT	0	0	0	0	16	42	0	7	19	111	2	321	6	0	0	0	0	524
ROCK1	MGD	0	18	0	0	23	37	0	0	107	0	0	430	176	0	0	1	0	792
	NAT	0	0	0	0	0	39	0	0	0	197	0	113	0	0	0	0	0	349
SAMPSON	MGD	4	434	0	16	23	0	0	0	302	20	0	977	18	0	0	17	0	1811
	NAT	0	0	0	0	0	30	0	0	4	72	6	150	0	0	31	0	0	293
SMITH	MGD	0	59	0	0	1	0	0	0	71	0	0	277	2	0	0	0	0	410
	NAT	0	13	0	0	0	0	0	0	8	7	0	108	0	0	21	0	0	157
SOUTH FORK	MGD	0	86	0	0	36	0	0	0	299	3	2	27	101	0	3	0	0	557
SCHOONER	NAT	0	2	0	0	0	5	0	0	0	127	11	230	72	0	0	0	0	447
U. DRIFT1	MGD	7	100	0	0	23	0	0	0	322	34	0	409	124	0	0	0	0	1019
	NAT	0	7	28	0	16	0	0	0	28	201	58	160	23	0	72	0	0	593
WILDCAT	MGD	0	31	0	0	12	0	0	0	115	0	32	20	54	0	0	0	0	264
	NAT	0	16	0	0	0	63	6	1	0	399	57	135	47	0	7	0	0	731
Grand Total		23	987	28	18	363	410	6	16	2343	2381	180	5378	1745	2	136	27	16	14059

[1] Size class and stand type based on Siuslaw NF GIS data dictionary definitions.

Figure 7.10-1. Size classes[1] of vegetation in stand types NAT and MGD within 200' of stream channels from aerial photo interpretation.



Large: size class 8+. Small: size class 7-.

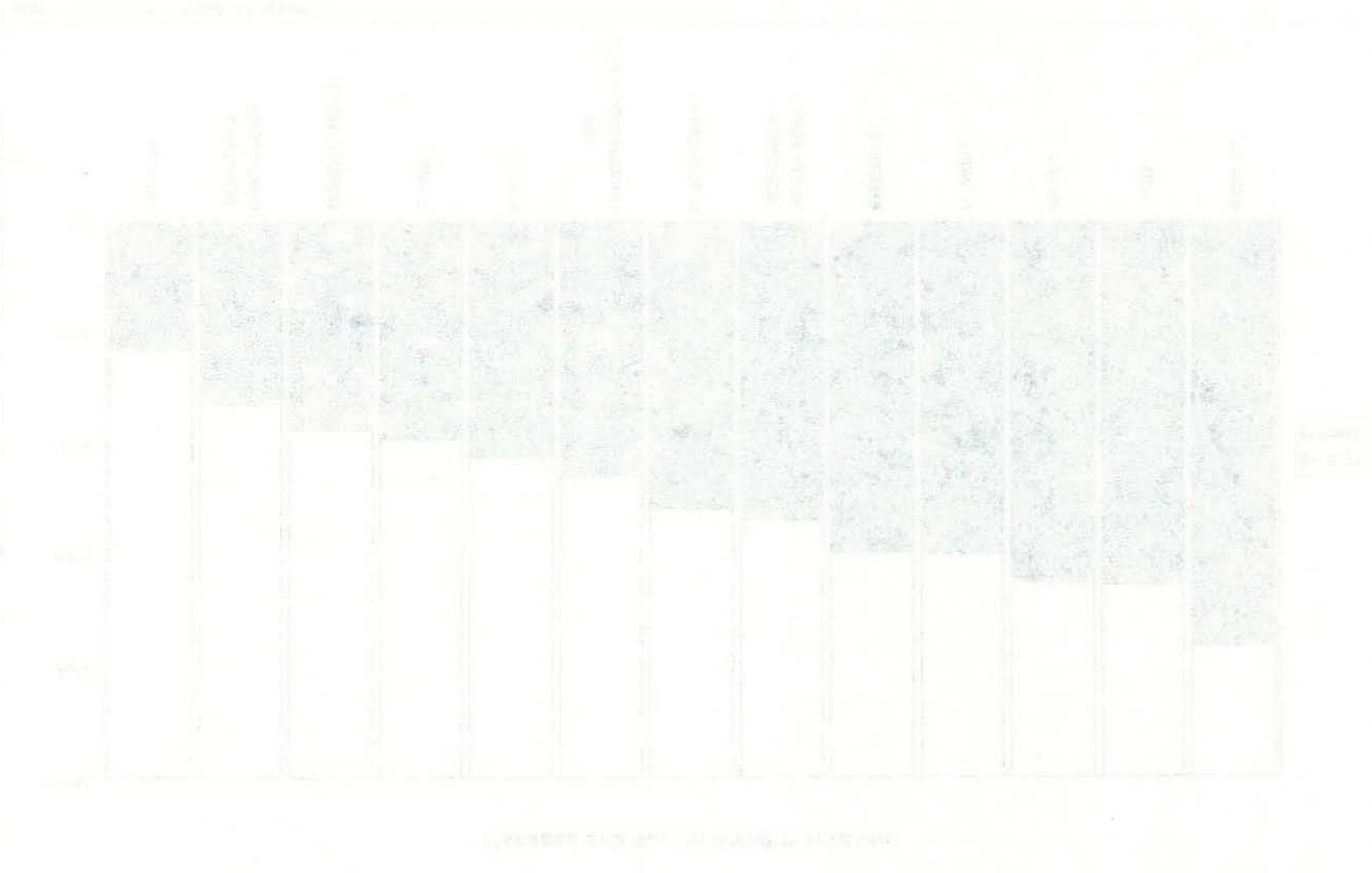
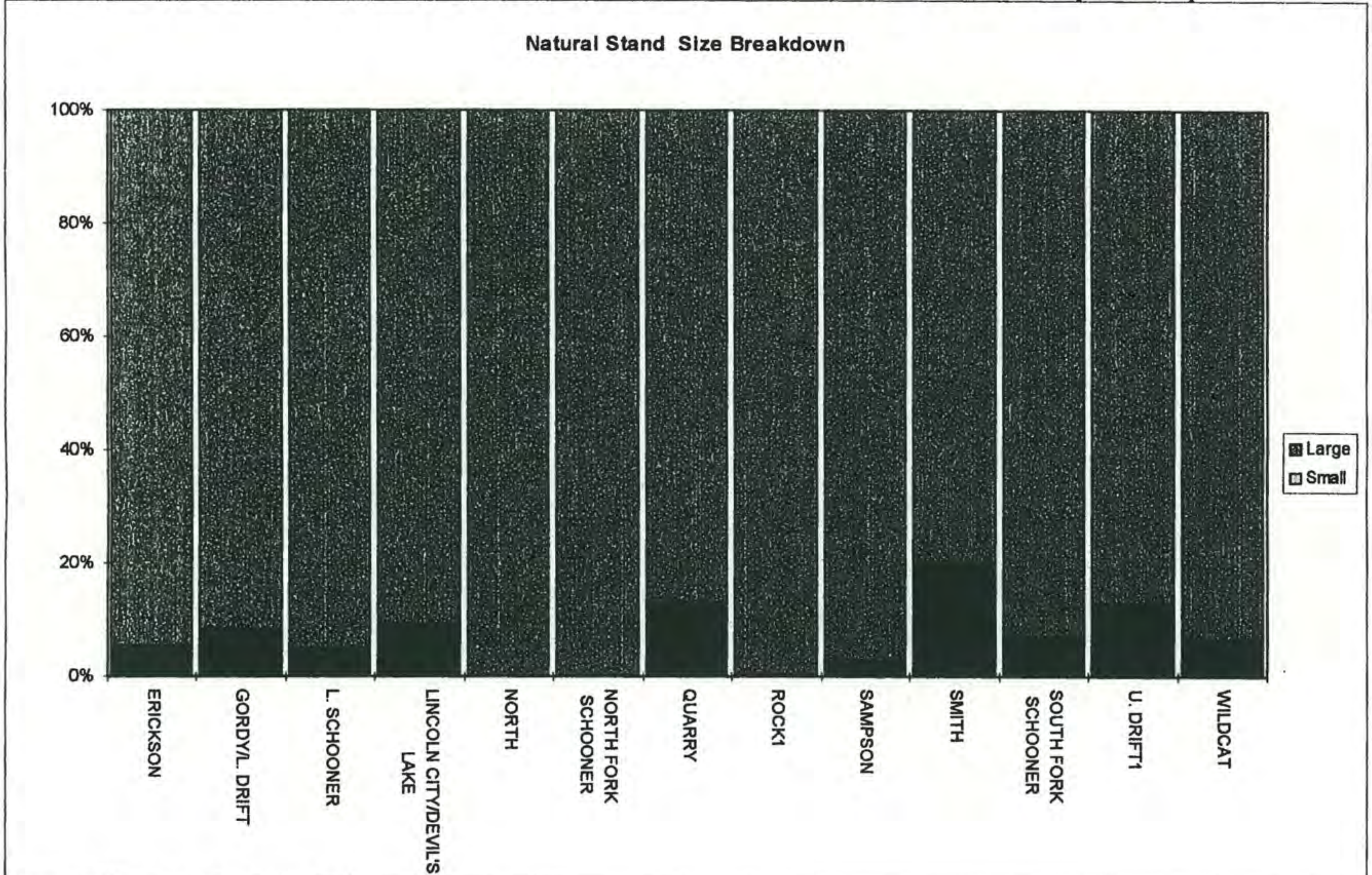
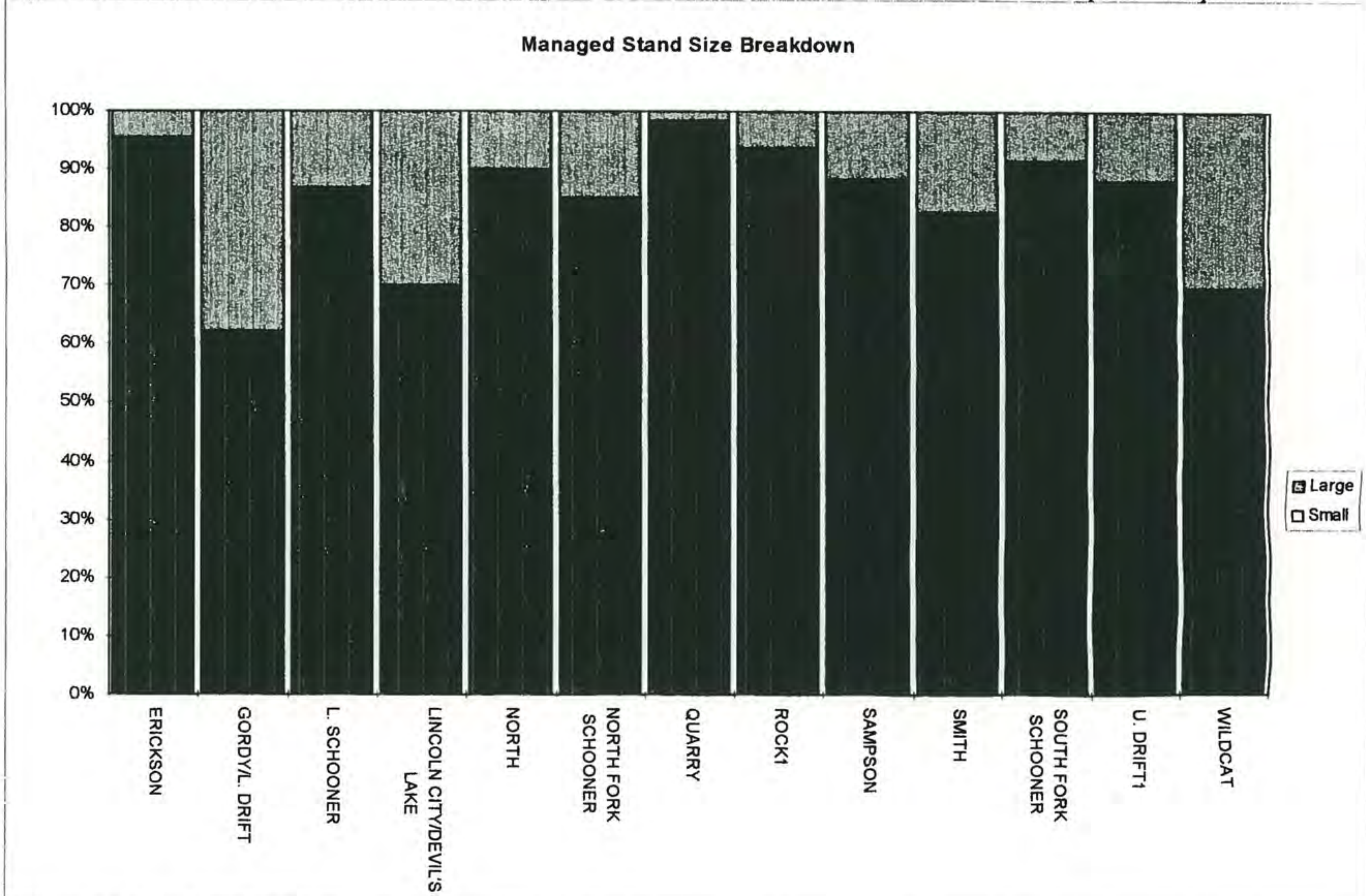


Figure 7.10-2. Size classes[1] of vegetation in stand types NAT within 200' of stream channels from aerial photo interpretation.



[1]Large: size class 8+. Small: size class 7-.

Figure 7.10-3. Size classes[1] of vegetation in stand types MGD within 200' of stream channels from aerial photo interpretation.



[1]Large: size class 8+. Small: size class 7-.

APPENDIX 7.11: MAP COVERAGES AND FEATURES

SUBWATERSHEDS: appears on maps 2, 3, 8, 9, 10, 13, and 14.

Scale of Source Data: 1:24000

Source of Original Data:

This layer was assembled in 1992. The broader watershed areas were put in as directed by the Washington Office following national designated lines.
Watersheds were further subdivided under direction of the Forest fish biologist and the Forest soil scientist. A combination of 1:24000 topo maps, and orthophotos and stream data was used for finer interpretations.

Unique Data: cover type polygon

Table of unique attributes and values:

HYDROREG	- hydroregion
HYDROSYB	- hydrosubregion
RIVBASIN	- riverbasin
RIVSUB	- riversubasin
WSHED	- watershed
SUBWSHED	- subwatershed
WSHED-NAME	- watershed name

FOG ZONE: appears on map 2

Scale of Source Date: 1:24000
Source of Original Data:

This was developed from the Plant association layer.

Unique Data: cover type polygon

Table of unique attributes and values:

GRID-CODE	1 = out of fog zone
	5 = part of fog zone

NORTH WEST FOREST PLAN: appears on map 3

Scale of Original Date: 1:50000

Source of Original Data:

This coverage was developed from President's Forest Plan for the Pacific Northwest. Map was checked with BLM and USDA sources for accuracy.

Unique Data: cover type polygon

Table of unique attributes and values:

MA	4 or 15
OWNER	SNF
ALT9_CODE	A, M, L or R
ALT9_NAME	Forest Service LSR, R0269;L0269
	BLM LSR
	BLM AMA
	BLM AMR

OWNERSHIP: appears on maps 4, 8, 17 and 18

Scale of Source Data: 1:24000

Source of Original Data:
Oregon State University
Local Timber Industry
Lincoln County Assessors
Siuslaw Nation Forest Lands Department

Unique Data: cover type polygon

Table of unique attributes and values:
GENOWN
PVT
OWNER
table of values:
- BLM
- Boise
- Georgia Pacific
- Hampton

Miami
Private
Simpson
State Park
Stimson
USFS
National Wildlife Refuge
Northwest Hardwood

Table of values for GENOWN:

PVT
PRIVATE
USFS
LSR
AMA
AMR

Table of values for PVT:

OTH
FOR

GEOLOGY : appears on map 5

Scale of Source Data: (1:250000)

Source of Original Data:

This layer is based on the West half of the Vancouver 1 degree by 2 degree Quadrangle map by R.E. Wells. Preliminary map that was published by the USGS in 1983 as Open File Report 83-591. Specific bibliographic references for this portion of the Geology Layer are:
Wells, R.E., Niem,A.R., MacLeod, Snavely,P.D., and Niem,W.A.

Unique Data: cover type polygon

Table of values: for LITHOLOGY

TSRB - Siletz River Volcanics basaltic sill
TY - Yamhill Formation
TYT - Yamhill- Tyee Formation, Undivided
QS - Quaternary Sediments
QT - Quaternary Terrace Deposits
TA - Alsea FM
TN - Nestucca FM
TT - Tyee FM
TI - Tertiary Intrusive Rocks (Mafic Intrusions)
TIA - Igneous Intrusion
TSR - Siletz River Volcanics

LAND TYPE ASSOCIATION: appears on map 5 ,6, and 7

Scale of Source Data: 1:12000

Source of Original Data:

This layer developed from geology classified into unique zones by the soil scientist.

Unique Data: cover type polygon

Table of values: for TYPE
- 2Z
- 2P2
- 2B
- 2PSR2
- 3Z

LANDSLIDE RISK: appears on map 6

Scale of Source Data: 1:12000

Source of Original Data:

Several layers were used to assign risk factors by looking at important features that make up the model. The layers were soils, geology, and DEM's.

Unique Data: cover type polygon

Table of values:
- Low Landslide Hazards
- Moderate Landslide Hazard
- High landslide Hazard

LOCATION OF LANDSLIDES BY TYPE: appears on map 7

Scale of Source Data: The landslide layer was mapped on Resource Orthophoto Quads at a scale of 1:12000.

Source of Original Data:

Landslides were located on aerial photos in 1996 and transferred to Resource Orthophoto Quad overlays. Photos from 1962, 1966, 1968, 1972, 1979, and 1984 were used. No ground checking was done. All measurements were done from photos.

Unique Data: cover type line

Table of unique attributes and values:
SLIDE-SURV
Table of values
RS - Rotational Slump
DT - Debris Torrent

ROADS: appears on maps 7, 8 and 18

Scale of Original Data: 1:12000
Source of Original Data:

The original data was provided through the Cartographic Features Files (CFF) supplied by the Geometronics Service Center (GSC) in Salt Lake City, UT. These features were digitized off the Primary Base Quadrangles meeting map standard accuracy with applicable coding based on type of road feature.

Unique Data: cover type line
Table of unique attributes and values:

GSCCODE	- GSC designation code for road segment
ROUTE	- Road number linked to transportation information database
CLASS	- Classification of road , ie; Arterial, Collector, Local
MAINT	- Maintenance level of road segment
MAPNO	- Attribute of road number used for display road number
NEW	- Code to denote updates
PHOTO_ YEAR	- Year road appears
JURSI	- Jurisdiction

ATM values
- Secondary Forest Roads - Low Clearance
- Secondary Forest Roads - High Clearance
- Other Roads
- State Hiways

STREAMS: appears on maps 1, 9, 10, 11, 12, 13, 14, 19 and 20.

Scale of Source Data:

The stream gradient is estimated from 1:24000 USGS topo maps. Gradient categories follow Washington State Forest Practices Board Standard Method for Conducting Watershed Analysis, Version 2.0, 1993.

Source of Original Data:
Original data was obtained from the Geometronics service center. Many of the class 3 and 4 streams were added from data obtained from Jim Kiser.
As part of the watershed analysis, all of the stream segments within the analysis area should be attributed with Stream Gradient and Channel Confinement. The protocols follow Montgomery & Buffington/TFW guidelines.

Unique Data:

Table of unique attributes and values:
- GSCCODE
- STRM_SOURCE
- STRM_NAME
- STRM_ORDER
- STRM_CLASS
- COHO
- CHINOOK
- STEELHEAD
- CUTTHROAT
- DACE
- SCULPIN
- YEAR_SURVEY
- CON_TYPE
- CODE

Stream Gradient Categories
- 0 - 1%
- 1 - 2%
- 2 - 4%
- 4 - 8%
- 8 - 20%
- >20%

Stream Confinement
- U - Unconfined - Valley width greater than 4 times bankful channel width
- M - Moderately confined - Valley width between 2 and 4 times bankful channel width
- C - Confined - Valley width less than 2 times bankful channel width

VEGETATION: appears on maps 7, 15, 16, 17 and 18

Scale of Source Data: 1:12000

Source of Original Data:

A contractor typed the watershed area using 1993 color aerial photos. A set of criteria was used to delineate the area into unique classes of forest or nonforest vegetation types. A unique stand identifier was assigned to each unique polygon.

Unique Data:
Table of unique attributes and values:

STAND_TAG
SERAL_CLAS
LAY_TYPE
YR_ORIG
TOT_CLOS
L1_CLOS
L1_SZCL
L1_SPP1
L1_SPP2
L1_SPP3
L1_CLUMP
L1_SNAG
L2_CLOS
L2_SZCL
L2_SPP1
L2_SPP2
L2_SPP3
L2_CLUMP
L2_SNAG
L3_CLOS
L3_SZCL
L3_SPP1
L3_SPP2
L3_SPP3
L3_CLUMP
L4_CLOS
L5_CLOS
REMNANTS
REM_DIST

SERAL CLASS :_There are 18 unique classes identified as follows:
To assign each polygon an unique seral class was a nine step process.
Step one: There can be more than one species in each layer, therefore each layers species has to be classified either as a 'C' or 'H' depending if it is a conifer or hardwood.

Step two: Classify each layer as a 'C', 'H', 'CH', or 'HC' dependent upon the distribution of 'C's and 'H's in each layer.
Step three: Assign base percentages for hardwood and conifer within each layer. These base percentages are as follows:

Layer classification	Base percentages
C	90% conifer/ 10% hardwood
H	90% hardwood/10% conifer
CH	65% conifer/35%hardwood
HC	65% hardwood/35%conifer

Step four: Calculate the total conifer percent cover and total hardwood percent cover for each layer.

Step five: Add together the total percent CC conifer that was figured in step four for all layers to arrive at percent conifer cover for the stand as a whole. Do the same for total percent CCHW cover.

Step six: Add an adjustment column to database. This adjustment column will pro-rate up the percentages of canopy cover occupied by the tree component of the stand to equal 100%.

Step seven: Calculate the percentage of total conifer cover and percentage of total hardwood cover for the stand by multiplying the adjustment column by the two columns created in step 5. This indicates if a stand itself is to be classified as a conifer or hardwood stand. This is one of the main item of classification of seral stages.

Step eight: Determine the stand classification by using the two columns created in step seven to examine the proportion of the canopy occupied by either hardwood or conifer and classify the stand as follows:

H = 80% hardwood
C = 80% conifer
HC = between 50% and 80% hardwood
CH = between 50% and 80% conifer

Step nine: Classify into seral stages using the following age/sizeclass criteria:

Early - LAY_TYPE = XBR or L1_szcl = 1,2, or 3 or YR_ORIG > 1984
Grass - LAY_TYPE = XAD or XME
Conpole - stand = C and YR_ORIG le 1984 and YR_ORIG ge 1971
Hardwood - stand = H
Hardwood mix pole - stand = HC and YR_ORIG le 1984 and YR_ORIG le 1971
or stand = HC and L1_szcl = 4 or 5
Late - L1_szcl >= 11 and L2_szcl or L3_szcl gt 3 and no pure hardwood in under story
Mature conifer - stand = C and L1_szcl > = 8
Mature hardwood mix - stand = CH and L1_szcl > = 8
Mature mix - stand = CH and L1 szcl > = 8
Mix pole - stand =CH and L1 szcl = 4 or 5
Non forest - listing of non-forest codes in LAY_TYPE
Riparian - LAY_TYPE = RIP
Rock - LAY_TYPE = XRO
Water - LAY_TYPE = XWA
Young conifer - stand = C and L1_szcl = 6 or 7 or stand = C and YR_ORIG le 1970 and YR_ORIG ne 0
Young conifer mix - stand = CH and L1_szcl = 6 or 7 or stand = CH and YR_ORIG le 1970 and YR_ORIG ne 0
Young hardwood mix - stand = HC and L1_szcl = 6 or 7 or stand = HC and YR_ORIG le 1970 and YR_ORIG ne 0

Table of values for LAY_TYPE:

XAD	Forest service administrative sites
XAG	All agriculture (excluding pastures and orchards)
XBR	Brush
XBT	Buildings in forested areas
XCT	Campgrounds in forested settings
XME	Natural occurring meadows, grasslands
XOR	Orchards
XPA	Pastures (irrigated and non-irrigated)
XRE	Residential (other than forested settings; except farm houses)
XRN	Natural occurring rock, cliffs, talus, etc.
XRP	Rock pit, quarry
XRT	Residential areas in forested settings
XWL	Transmission lines
XWA	Lakes > 10 acres
XWL	Wetlands, riparian areas
XWP	Ponds < 10 acres
XWS	Streams, rivers
NAT	Natural stands
MGD	Managed stands some harvest activity of clearcut has taken place since 1940

APPENDIX 7.12: MOU-96-06-12-030

MOU-96-06-12-030

DRAFT (6/6/96)

MEMORANDUM OF UNDERSTANDING
between
THE CONFEDERATED TRIBES OF SILETZ INDIANS OF OREGON
and
THE USDA FOREST SERVICE -SIUSLAW NATIONAL FOREST
for
COORDINATION OF NATURAL AND HERITAGE RESOURCES MANAGEMENT ISSUES

WHEREAS, the Confederated Tribes of Siletz Indians of Oregon, as all Native people, feel great concern over the environment and the natural resources that surround us. Our heritage teaches us that we are to be stewards of the land and all that Mother Earth provides. In our modern society our course remains the same, and we are compelled to be involved in any and all things politically that affect the environment. The Confederated Tribes shall always exercise our sacred national sovereignty in order to achieve the highest of all goals: to preserve our traditional cultural ways that have existed for centuries in harmony with our homeland; and, to provide for the well-being of our people for the many centuries that lie ahead.

We shall, as we always have, live in balance with the land and never use more of our precious natural resources than can be sustained forever. We shall, as we always have, give respect to all persons; acknowledge the special wisdom of our elders and religious leaders; nurture the bright hopes for the future that reside within our young people; and accept full personal responsibility for all of our actions, as our basic religious teaching is that we are fully accountable to the Creator for our conduct.

WHEREAS, the United States Department of Agriculture, Siuslaw National Forest was established in 1907 and contains aboriginal and reservation lands of the Confederated Tribes of Siletz Indians within its administrative boundaries. The Siuslaw National Forest has served as a land steward for the American people from that time forward using conservation principles and democratic processes. As Federal land managers, we believe that this forest, which has been entrusted to our care, is a special and unique place. This temperate rainforest is one of creation's most productive environments. It is home to a wide diversity of species, some unique, and is capable of satisfying many human needs, both physical and spiritual. We take seriously our responsibility to manage the forest in a way that fosters trust from those we serve.

Although we have a relatively short history with the forest, we think these principles are timeless: as humans, we are part of the forest and our well-being is dependent on the health of the forest; the land will provide if we take only what we need, with humility and an appreciation for the needs of those who will succeed us; people who have a stake in outcomes make the best decisions. We will do our best to abide by these principles.

Therefore, this Memorandum of Understanding is made and entered into between the Confederated Tribes of Siletz Indians (hereinafter "CTSI") and the Siuslaw National Forest (hereinafter "SNF"). The U.S. Forest Service, as an executive agency of the Department of Agriculture, shares in honoring the federal government's trust responsibility in regard to all Federally recognized Indian Tribes.

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I. Purpose

To provide a mutually beneficial process for the CTSI and the SNF to jointly identify, communicate and coordinate actions of common concern relating to management of lands and resources, and to provide a mechanism for continuing involvement in the development and revision of land management plans. The Confederated Tribes of Siletz Indians is also protected under the trust responsibility (Government to Government relationship) which the United States Government (and all branches thereof) has toward Indian Tribes. This trust responsibility has recently been more specifically defined and reaffirmed by the Executive Memorandum issued by President Bill Clinton on April 29, 1994.

II. Authority

A. The CTSI:

1. The United States Constitution –Art. 1, Sec. 8 (Commerce Clause) recognizes Indian Tribes as Governmental Sovereigns.

2. Ancestors of the Confederated Tribes of Siletz Indians signed seven treaties with the United States Government which were ratified by the Senate. These treaties are as follows:

a.	Treaty with the Rogue River Tribe –1853	10 Stats., 1018
b.	Treaty with the Cow Creek Umpqua –1853	10 Stats., 1027
c.	Treaty with the Rogue River Tribe –1854	10 Stats., 1119
d.	Treaty with the Chasta, Scoton & Grave Creeks –1854	10 Stats., 1122
e.	Treaty with the Umpquas and Kalapuyas –1854	10 Stats., 1125
f.	Treaty with the Willamette Valley Bands –1855	10 Stats., 1143
g.	Treaty with the Molala –1855	10 Stats., 981

3. Executive Order November 9, 1855 –Established the Coast Reservation, pursuant to the stipulations of the ratified treaties of Western Oregon.

4. The Siletz Indian Tribe Restoration Act of 1977 –Pub. L 95–195,91Stat. 1415 –Restored the Siletz Tribe to Federally recognized status.

B. The SNF:

1. Multiple Use Sustained Yield Act of 1960

2. National Historic Preservation Act of 1966, Amended 1980

3. National Forest Management Act of 1976

4. Federal Land Policy and Management Act of 1976

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III. Objectives of Both Parties

A. To ensure that notice of SNF policy and program recommendations, actions, and/or information having potential affect on land or resources of interest to the CTSI are routinely transmitted to the CTSI. In the event of emergency actions, notification may not be timely.

B. To ensure that policy and program recommendations or other information about proposed actions undertaken by the CTSI affecting resources administered by the SNF are routinely transmitted to the SNF.

C. To eliminate duplication of efforts by both parties and achieve maximum effectiveness between the parties in the use of funds and personnel.

D. To discuss policies and attempt to resolve management differences.

E. To enhance relations through communications early and frequently in the process of activity planning.

IV. Project Coordination

A. Environmental Planning

1. The SNF shall confer with the CTSI early enough in the planning process so that appropriate adjustments can be made prior to public notification for specific Northwest Forest Plan, SNF Forest Plan, watershed analyses, and project planning efforts. Such contacts will originate from the SNF Supervisor's Office or from any Ranger District administering lands within areas of CTSI interest.

2. The CTSI shall be given the opportunity to review and comment on the SNF Forest Plan amendments and project level plans including but not limited to habitat plans, timber plans, coordinated management plans, heritage (cultural) resources management plans, and riparian/fishery enhancement plans.

3. At the earliest possible time, the CTSI will be notified of all heritage resource issues arising from SNF managed lands, including ARPA (Archaeological Resources Protection Act) violations, inadvertent discoveries, collection of artifacts, and site vandalism.

4. The CTSI shall be given the opportunity to comment on SNF issuance of permits and contracts involving matters of interest to the CTSI.

B. Procedure

1. The SNF agrees to:

a. Designate Phyllis Steeves, Forest Archaeologist, or a duly appointed successor, as the SNF's primary contact for initiation of consultation on natural and heritage resource issues and management proposals pertaining to the CTSI.

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b. Inform the CTSI, by means of Summaries of Proposed Actions (SOPAs) and other communications, of projects, developments or proposed activities at regular intervals, in a spirit of open cooperation and communication.

c. Include at a minimum the following information with each project notification:

   1. Identity of applicant;

   2. Description of the proposed planning or development activity, or proposed use of lands and resources as to purpose, size, impacts, etc., as appropriate;

   3. Geographic location of proposal, including maps if necessary, to clarify location or proposal affect; and

   4. Anticipated time frame for various stages of implementation.

d. Respond to CTSI comments within thirty (30) calendar days following receipt of notification of adverse comments or reaction to notices previously distributed. Alternative responses time frames and/or procedures may be established when more appropriate to the review process. Such response will initiate necessary discussions where inconsistency or incompatibility of programs is apparent.

e. In the absence of CTSI review responses, the SNF will assume no adverse or unfavorable CTSI reaction to that particular notice and will proceed accordingly after the following periods:

   1. Thirty (30) calendar days after date of receipt of the SNF notice, if no review responses are received, and if within this period the CTSI have not specifically requested additional time to complete the review, or

   2. If no review responses are received by the end of the specifically requested additional review period.

   3. If an emergency or other circumstance necessitates rapid project implementation, the SNF will notify CTSI and attempt, in good faith, to be receptive to their concerns.

2. The CTSI agree to:

   a. Designate [to be appointed by the Tribal Council] as the CTSI's primary contact for initiation of consultation on natural and heritage resource issues and management proposals pertaining to the SNF.

   b. Annually, by January 1, prepare or update a list of the types of activities upon which they wish to receive information and the level of plans (Forest Plan or project level) in which they are interested.

   c. Distribute SNF notifications and coordinate CTSI review.

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d. Provide review comments to the originating SNF office within thirty (30) calendar days from the date of receipt of the SNF notice, or within the time specifically requested to complete the review.

e. Assist in resolving conflicts identified during CTSI review of SNF notices.

V. Cooperative Opportunities

The following areas have been identified by the parties to this agreement as topics of interest. These programs may be considered for more detailed definition at a future date.

A. Public Interpretation and Employee Training

1. The coordination of CTSI and SNF training and employment programs, including cooperative education opportunities for CTSI members.

2. The coordination of CTSI and SNF interpretation projects including on–site and off–site interpretation, brochures, pamphlets, and signs, and training of those in contact with the public.

3. The identification of opportunities for partnerships in Heritage and Natural Resource Education efforts.

B. Land Tenure

1. The identification of lands within and adjacent to reservation boundaries that would enhance land acquisition and consolidation goals of the CTSI.

2. The identification by the CTSI and SNF of land exchange potentials.

C. Heritage Resources Management

1. Consultation between the CTSI and SNF concerning Heritage Resource use permit applications allowing removal of artifacts from public lands through surface collection or excavation for areas of Tribal interest.

2. Consideration by the SNF of the use of CTSI members as archaeological assistants as opportunities arise.

D. Information Sharing

1. Identification of opportunities for sharing resource databases and personnel.

2. Coordination of transportation planning documents for timber sales.

3. Inclusion of the CTSI on lists of SNF contract opportunities.

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VI. Terms and Conditions

A. Direct contacts between members of the CTSI and SNF are in no way limited by this agreement. Such contacts are encouraged to promote more effective communication and coordination.

B. This agreement in no way supersedes other policies, authorities, treaties, court decisions or jurisdictions of the CTSI or SNF, nor requires either party to expend any sum in excess of its respective appropriations, nor does this Memorandum of Understanding create any new rights or responsibilities for either party regarding existing treaties, laws, statutes, or regulations.

C. This agreement will become effective on the date of latest signature as evidenced below.

D. Amendments, supplements or revisions to this Memorandum of Understanding may be proposed by either party to the agreement and shall become effective upon formal approval of both parties.

E. No member of or delegate to congress, or resident commissioner, shall be admitted to any share of this agreement, or to benefit arising from it. However, this clause does not apply to the agreement to the extent that it is made with a corporation for the corporations general benefit.

F. Representatives of the CTSI and SNF will meet annually during the month of January to discuss the terms of this document and other matters of mutual concern and benefit.

G. Either party to this Memorandum of Understanding may terminate it by providing thirty (30) calendar days notice to the other party provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination.

H. The parties shall comply with all Federal statutes relating to nondiscrimination and all applicable requirements of all other Federal laws, executive orders, regulations and policies.

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SIGNATURES

USDA Forest Service, Siuslaw National Forest

By:____

JAMES R. FURNISH, Forest Supervisor

(Date)______________________________________

Confederated Tribes of Siletz Indians of Oregon
(As per Tribal Council Resolution #)

By:____

DELORES PIGSLEY, Chairman

(Date)______________________________________

APPENDIX 7.13: SOURCES AND REFERENCES CITED

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