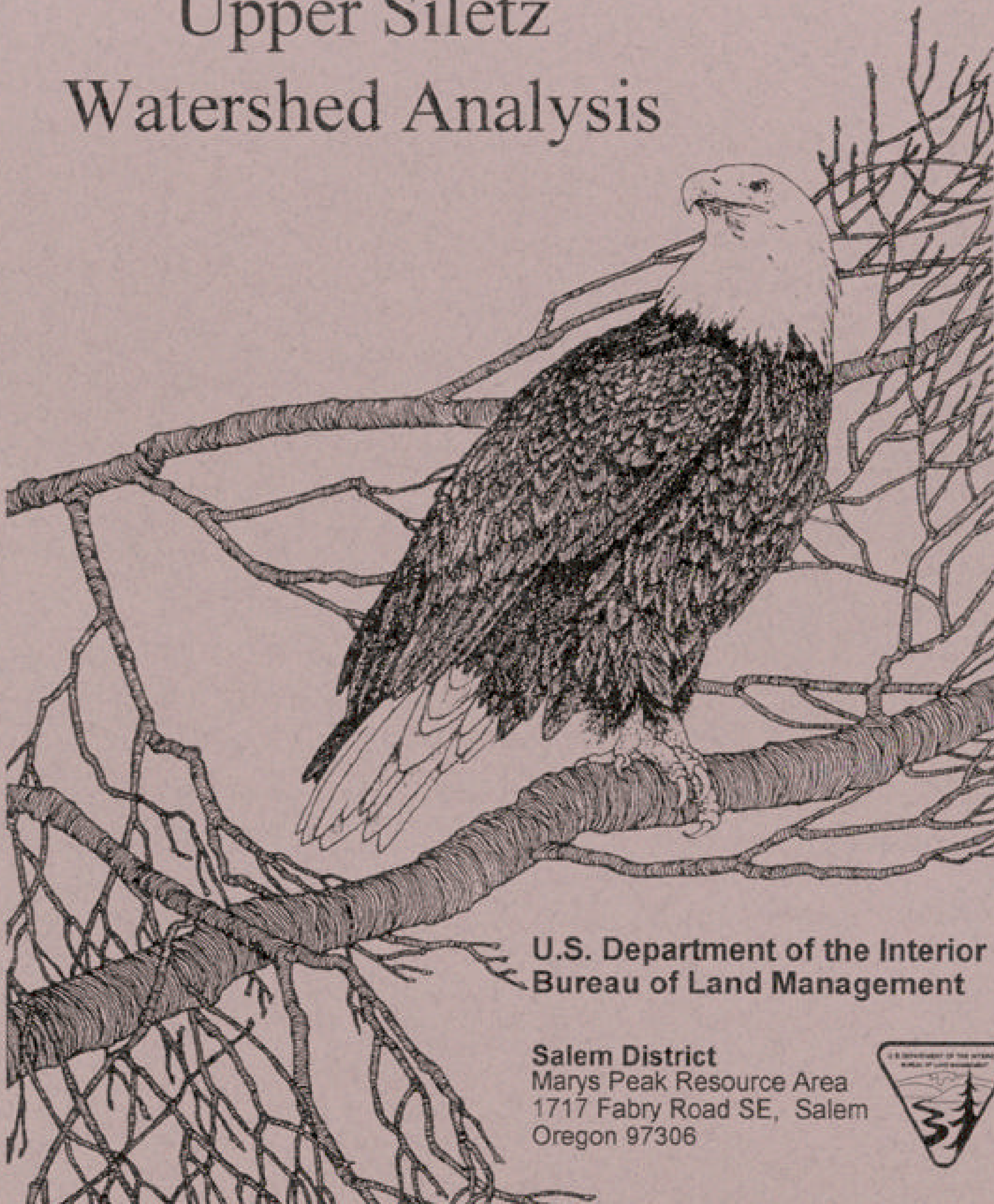
Upper Siletz Watershed Analysis



U.S. Department of the Interior
Bureau of Land Management

Salem District
Marys Peak Resource Area
1717 Fabry Road SE, Salem
Oregon 97306

Upper SiletzWatershed Analysis

Marys Peak Resource Area
Salem District, Bureau of Land Management
1717 Fabry Road
Salem, OR 97306
503-375-5646

December, 1996

Team Members:

Roger Monthey	**Team Leader**
Patrick Hawe	**Hydrologist**
Gary Humbard	**Forester**
Gary Licata	**Wildlife Biologist**
Bill Power	**Soil Scientist**
Garth Ross	**Fisheries Biologist**
Tom Tomczyk	**Fire/Fuels Specialist**

Support Team:

Steve Cyrus	**Road Engineer**
Dave Haney	**GIS Analyst**
Phil Sjoding	**GIS**
Sara Worsham	**Hydrology, GIS**

John P. Bacho
John Bacho, Area Manager
Marys Peak Resource Area

Date: 12-01-96

The analysis portion of this project was done from Fall, 1995 through Spring, 1996. A first draft of this documentation was completed in May, 1996. The analysis generally follows the federal guide for watershed analysis (Version, 2.2, August 95) although some modifications were made such as combining chapters to reduce redundancies. This is a document which is still evolving and will be updated as new information becomes available. The data in this document was the best available; though in some cases there was little relevant data available. Management opportunities for this watershed must be considered in light of the checkerboard land ownership pattern of BLM-administered lands. Cooperative programs with adjacent ownerships are necessary to achieve optimum results in restoration opportunities for this watershed. No warranty is made as to the accuracy, reliability or completeness of the data or maps contained herein.

Table of Contents

List of Figures and Tables

Tables	*Page*

EXECUTIVE SUMMARY

The Upper Siletz watershed is located in the central Oregon Coast Range (Coast Range Province) approximately 7 miles west of Falls City and 16 miles east of the Pacific Ocean. The geology of the watershed is composed of a mixture of volcanic and sedimentary rocks. It is highly dissected by intermittent and perennial streams which feed into the South Fork and North Fork of the Siletz River. The northern two-thirds of the watershed generally consists of streams with high gradients and intervening steep, high ridges. The southern third of the watershed generally consists of a broad, flat alluvial bottom (South Fork Siletz subwatershed). The southern third was the focus of the earliest logging and some minor homesteading. The current ownership in the watershed is dominated by large corporate timber holdings.

The high precipitation and mild climate of this watershed provide ideal growing conditions for a wide variety of plants, creating one of the most productive timber zones in the world. Trees and shrubs are abundant, dense, and fast growing.

The major factors affecting ecosystem dynamics within the Upper Siletz watershed are large, infrequent, high intensity fires; heavy rainfall; high intensity winds; and storms that cause flooding and landslides.

As a result of fire history and past intensive timber management practices, the Upper Siletz watershed currently provides very little habitat for those species which depend upon the following late-successional forest characteristics:

- large old trees with thick bark, large branches, and broken tops or decay pockets suitable for cavities;

- a mixture of younger trees of a wide variety of ages, sizes, and species which add to multistory structure;

- numerous large snags and decaying logs on the ground.

Based on Spot imagery data, approximately 41 percent of the watershed is comprised of 50-70 year-old conifers; 30 percent is smaller conifers about 10-40 years old. About 5.6 percent of the forest is mature (50+ years) hardwoods or mixed stands; and about 3 percent is young (10-40 years) hardwoods-mixed stands. Open/bare ground classes comprise about 4.8 percent of the watershed; and the grass/forb stage comprises about 7.5 percent. Only about three percent of the watershed is in old-growth condition (200 years and older). The majority of the mature forest habitat is fragmented except for a small (643 acre) block of interior forest in the Valley of the Giants area.
Three federally threatened or endangered wildlife species (i.e., the northern spotted owl, marbled murrelet, and American bald eagle) are known or suspected to occur in the Upper Siletz watershed. These species are closely associated with late-successional forest

habitat.

Terrestrial issues are focused around the concern for species which are closely associated with late-successional forest characteristics; their long-term survival in a landscape which is dominated by early to mid-seral stands; and the ways in which current stands will achieve the characteristics of older forests. The Upper Siletz watershed (i.e., the northern half) contains one of the largest blocks of interior old-growth forest left on BLM-administered lands in the northern Coast Range. There are viable opportunities to expand the size of this block by land exchanges with private land owners and by density management prescriptions.

The Siletz River system is one of the most productive anadromous fisheries in Oregon. However, many of the anadromous salmonid fish stocks have declined throughout the Coast Range including those in the Siletz system. Many conditions have contributed to this decline, including conditions outside of this watershed or beyond the control of the Bureau of Land Management.

The Upper Siletz watershed includes a summer steelhead run which is the only native run in the Oregon Coast Range north of the Umpqua River. Siletz Falls is a major factor affecting fish resources in the watershed. This falls occurs on the main Siletz River to the west of the Upper Siletz watershed. Only summer steelhead and fall/spring chinook are currently allowed to pass the falls.

Analysis of fish habitat concludes that existing conditions are generally good in the northern two-thirds of the watershed and in poorer condition in the southern one-third. Sedimentation and high stream temperatures are concerns throughout the watershed but especially in the South Fork Siletz subwatershed. These factors potentially affect spawning conditions and early smolt survival. Low levels of large woody debris is a problem in response reaches especially in the South Fork Siletz subwatershed; the North Fork Siletz River seems to have adequate structure in the form of large boulders and associated deep pools. Riparian enhancement projects involving re-establishment of conifers for long-term large woody debris recruitment are proposed for the response reaches. As these projects will not be effective until the trees grow to a large size and begin falling into the streams, an analysis of in-stream structural improvement projects is recommended. Such projects have proven to be successful in this and other watersheds. However, in-stream structural projects are short-term, "stop gap" measures intended to help the fisheries to survive and function until the riparian zones recover.

Potential landsliding is another major concern in this watershed. The enclosed analysis characterizes the sediment sources in the watershed and identifies potential landslide areas.

This analysis identifies issues and key questions, evaluates reference and current conditions, and addresses findings and recommendations which can help return the watershed to reference conditions. Data gaps and monitoring needs are also addressed.

The following table summarizes some of these factors.

TABLE #1. MANAGEMENT SUMMARY FOR UPPER SILETZ WATERSHED

Issue	Findings	Recommendations
Erosional Processes: #1 - Mass Wasting	1) Moderate to severe landslide potential areas occur on 2,200 acres of BLM-administered lands in the watershed (total of 6,800 acres including all ownerships). The number of existing landslide areas identified by inspection of aerial photographs is 186.	Lands>75% slope gradient: ntain maximum root structure. rade roads to reduce mass wasting potential. w no new road construction. egotiate existing road access agreements. ommission roads not required for other uses or other lands. struct outslopes and deep dips over existing Lands with 60-75% slope gradients: lement BMPs. ommend total suspension over convex slopes. long rotations on unstable slopes. Lands < 60% slope gradients: lement BMPs. id unstable areas.
#2 - Soil Surface Erosion	1) On 6,800 acres within the watershed, soil surface erosion is greatly accelerated from clearcutting/burning and road construction on hillslopes steeper than 60%.	id vegetation disturbance on slopes > 90% gradient. ntain maximum root structure on slopes > 75% ve surface debris and use cool season burns on om 60-75% gradient. id soil compaction adjacent to streams.
		trict use of ground-based equipment.

Issue	Findings	Recommendations
#3 - Soil Productivity	1) Approximately 4,000 acres of compacted soils occur within the watershed.	id wet season non-suspension yarding. id tilling the soil except where soils are compacted little or no vegetative cover. id scarification except where soils have A-horizons s. n on only moist soils or reduce fuel loads to reduce loss of soil duff.
Vegetation: #1 - Vegetation Management	1) 1,708 acres of 80 year-old and older stands occur on BLM-administered stands; or about 3.9% of the entire watershed compared to an estimated 60% in presettlement times. 2) 10,470 acres of stands less than 80 years old occur on BLM-administered lands. These stands and those on private lands occupy about 87.5% of the entire watershed compared to an estimated 40% in presettlement times. 3) Logging on private land in the southern third of the watershed has been extensive creating high fuel loads. Fire hazard is high. 4) Five plant association types were identified based on their importance to ecosystem management. 5) Five species of noxious weeds are known to occur and they have impacted native plant communities.	80 year and older stands: w stands with currently suitable older forest istics to continue growing with minimal disturbance. e roads. Stands < 80 years: her evaluate stands with western hemlock as t/subdominant species for potential density nent (2,877 acres). ate any additional stands with hemlock seedling nt for potential density management. her evaluate single-story stands lacking structural and identified as potential for density management lentified acres of which 5,782 acres occur in Re-serves). ritize above stands to benefit wildlife habitat and onservation goals. 5-15 Year old Stands: thinning down to 100-200 trees per acre (using 1 or sive thinning regimes) Recent Harvest Units: planting at 300-400 trees per acre. Fire Ecology ntain an adequate road system for fire control . ly hazard/risk reduction techniques. Plant Associations/Noxious Weeds

Issue	Findings	Recommendations
		st in the development of a plant association layer at ncial level. ow RMP guidelines for noxious weeds. trol access to high fire hazard areas during high fire eriods. ly hazard/risk reduction techniques to high hazard
# 2 - Special Status Plants	1) Two special status plan species (*Filipendula occidentalis* and *Poa laxiflora*) and one special attention plant species (*Hypogymnia duplicata*) occur within the Late-Successional Reserve.	ect habitat for these species according to Salem RMP. ate surveys for SEIS species; record and store in a database.
#3 - Special Plant Communities	1) An estimated 1,636 acres (1,500 acres on BLM-administered lands) of special plant communities occur.	elop and/or maintain small meadows to increase ersity. ate inventory and field review process of special nmunities.
Riparian Reserves:	1) Conifer forests 80 years and older comprise about 3.5% of the acreage within 100 feet of active streams, compared to an estimated 60% in presettlement times; 50 to 70 year-old conifer forests comprise about 39% of this zone; and 10 to 40 year-old conifer forests comprise about 28%. 2) Approximately 2,083 acres of BLM-administered, stream-adjacent vegetation have low potential for LWD recruitment. The large proportion of stream segments with low and moderate LWD potential has likely: a) altered the rate of LWD delivery; and b) reduced the size and quantity of organic material entering stream systems relative to reference conditions.	ease the amount of older conifer forest in riparian here feasible and in accord with the Aquatic ation Strategy. us riparian enhancement projects in response especially the South Fork Siletz; avoid increasing cruitment potential in the North Fork Siletz shed. Evaluate other projects to promote large tree nent and to develop desirable vegetative structure.
Hydrology:	1) Eleven percent of the watershed has a high potential for cumulative hydrological effects. Fifty percent of these areas are managed by the BLM in Upper NF Siletz and Boulder Creek subwatersheds. As a result of past forest	trict road construction and vegetation disturbance in h high cumulative effects. rade roads in areas with moderate cumulative out slope when safe; increase # of cross drains or

Issue	Findings	Recommendations
	management, the timing, quantity , size of material , and rate of inputs (water, sediment, organic material) into the Upper Siletz channel system have probably been altered in comparison to reference condition.	v berms; prevent diversions of stream flows. ign new roads to reduce their width; construct new ridges or flats.
Stream Channel:	1) Eighty-nine percent of the total stream mile-age in the watershed is classified as Asource@ or Atransport@ reaches. These are predominantly bedrock channels with cobble-boulder beds and banks and appear to be functioning close to reference condition. Since these channels are stable and highly resistant to change, the trend is for continued proper functioning.	nplete a field inventory and evaluation of the 7.2 response type reaches. nplete a field review of selected source and transport o confirm Aproper functioning@. rove the stream map coverage for GIS by capturing al channels and quality control on existing mapped
Water Quality:	1) Stream temperatures in portions of the South Fork Siletz subwatershed may possibly be in the lethal range for salmonids from July to September. This may reduce the availability of high quality aquatic habitat during this period by 30% (13 stream miles)	BLM project should proceed unamended if ; in stream temperature are likely.
Fish Species and Habitat:	1) The summer steelhead run in this watershed is unique. Summer steelhead have declined in re-cent years. Average yearly runs of summer steel-head in the 1960s and early 1970s indicate a run size that was many times larger than currently observed. 2) Watershed streams that contribute key sum-mer steelhead habitat include the North and South Forks of the Siletz River and their larger tributaries. Habitat within the South Fork system has been intensively managed and is recovering; habitat in the North Fork system generally contains good habitat consisting of stable, rocky instream habitats.	get restoration efforts on summer steelhead. and/or initiate surveys for this species. Identify o migration, and control access to areas with a high for poaching. ow RMP guidelines and Aquatic Conservation objectives within planning management activities. tify and rehabilitate areas of the transportation hat induce mass wasting and resulting sedimentation.
Wildlife Species and Habitat:	1) There is very little interior old-growth forest habitat remaining (<600 acres) in the watershed; old-growth connectivity has been greatly reduced both within the watershed and with adjacent watersheds. 2) The existing LSOG habitat on BLM-administered lands in the Valley of the Giants LSR is being used on a consistent basis by	rove the condition of the LSOG habitat in the Valley ants area (LSR) by focusing density management g stands adjacent to remaining LSOG. rove the condition of LSOG connectivity between ds by focusing density management in relevant ease the condition of LSOG in the Upper and

Issue	Findings	Recommendations
	marbled murrelets (8+ occupied sites, several known nest sites since 1988) and bald eagles (1 breeding pair since 1989), but not by the northern spotted owl (only two known fledglings over the past 17 survey years since 1975). 3) Most of the early and mid-seral habitat (90% of the watershed) is deficient in snags and large, hard woody debris based on field observations. 4) The South Fork Siletz subwatershed is home to a large elk herd (200+ individuals) and part of this subwatershed is managed intensively by the state as a special elk hunting area. 5) Special habitats appear to be a relatively minor component of this watershed, but provide important attributes to certain wildlife species. 6) There are no known sites for special attention species expected to occur within the boundaries of the watershed.	orth Fork Siletz by land ex-changes. ntory for the presence of snags and down woody stands considered for density management. tands proposed for density management with less hard snags per acre, create snags at least 50 feet tall g live conifers at least 24 in. dbh. tands with less than 400 feet of hard, downed wood or greater dbh) per acre, cut live conifers to create . tinue as a partner in the road closure agreement State of Oregon and private land-owners; manage iletz subwatershed for optimal elk habitat. k with State game biologists to ensure that BLM he SF Siletz subwatershed pro-vide habitat ole on private lands in the subwatershed. ate inventory and field review process of special eatures. ect and buffer all known special habitats on BLM-ered lands. vey for all Special Attention Species follow on of the survey protocols.
Human Uses: #1) Timber	(For timber products potential, see Vegetation section for density management opportunities to enhance late successional forests.)	(See Vegetation section for density management opportunities to enhance late successional forests.)
#2) Special Forest Products	1) Special forest products are harvested lightly within the watershed. The major products include Noble fir boughs, cones, and mushrooms. Current information indicates no particular problems with this harvest.	ow management guidance in the RMP and other licy/procedural documents. program should be sensitive to requirements of land use allocations. ntain vehicular access to all known harvest areas.
#3) Roads	1) Many BLM-administered roads are in poor condition due to lack of regular maintenance and	elop transportation management plan to identify ntrolled by BLM that could be closed or gated to

Issue	Findings	Recommendations
	are contributing to soil erosion and water quality problems.	resource values in the watershed. List of roads for closure is listed in Appendix 21. elop transportation management plan to classify o "high, medium, or low" risk categories to indicate ential for adversely affecting water quality. on projects to mitigate resource damage will begin h-risk" roads.
#4) Recreation	1) The Valley of the Giants ACEC/ONA is a recreation attraction in the watershed. Legal public access is not available to the site, visitors have a difficult time finding the site, and the site receives minimal management. 2) The Luckiamute Travel Management Agreement provides quality walk-in hunting areas and seems to be well accepted by current users.	elop MOU with private landowners to develop a e of public access. rove information sources about access to and use of the Giants ACEC/ONA. elop a trail head where the road intersects the Valley ants trail. rove the footbridge across North Fork Siletz River. ease BLM recreation operations and maintenance the Valley of the Giants ACEC/ONA (e.g., garbage rail maintenance). mprove road maintenance, incorporate access roads ad maintenance agreement with Willamette s. tinue the Luckiamute Travel Management (LTM) nt. trict vehicular access and operations in the LTM n Nov. 1-Nov. 30 each year to preserve hunter e.
#5) Research	1) Section 31 of T8S, R7W (Sand, McFall, and Callahan Creek block) is being used for ecosystem research by the National Biological Survey in association with BLM and OSU. Research will continue into the near future.	mote additional research in this block only if it is le with current research. en all proposed management projects against the plan and allow projects which are compatible with re monitoring is accomplished and assist the Biological Survey staff as appro-priate.
#6) Land Tenure	1) The watershed contains one large (5,827 acres) fairly contiguous block of land located in	k lands in the North Fork Siletz and Boulder Creek enhance development of interior older forest

Issue	Findings	Recommendations
	the the North Fork Siletz subwatershed. The South Fork Siletz subwatershed contains interspersed BLM ownership and is being intensively managed on a 50-year rotation by Boise Cascade with approximately 75% of Boise land presently in early seral stage forest. BLM-administered land will provide the majority of late seral forest. Overall management is more efficiently per-formed by blocking ownership.	ıs, and to provide dispersal corridors for wildlife Private lands which would be considered for federal on through exchange include: Section 30, T7S, ections 15, 16, 18, 19, 20, 21, 22, 24, 26, 28, 29, 32, 33, 34, 36, T7S, R8W; Sections 12,T8SR8W. The first priority for exchange private lands in Section 28 and 29, T7S, R8W. ain all BLM-administered lands in the watershed ly Sec. 31, T8S, R7W because of on-going).

Chapter 1 - Characterization

Introduction

This chapter provides a Asnapshot@ of the Upper Siletz watershed, what it currently looks like as well as a brief historical perspective. BLM-administered land within the Upper Siletz watershed comprises about 27% of the land area with the remaining acreage dominated by large industrial landowners. The entire drainage is managed forest land; urban and agricultural land are absent. The logging town of Valsetz, Oregon formerly existed in the southern half of the watershed, but it has since been dismantled. The former Valsetz Lake was drained, and the dam removed at about the time the town was dismantled.

Location & Size

The approximately 44,583 acre Upper Siletz watershed is located in the central Coast Range (Coast Range Province) of western Oregon. It is approximately seven miles west of Falls City and 16 miles east of the Pacific Ocean (Figure #1) . Roughly 90% of the watershed is in Polk County; and 10% in Lincoln County. The watershed is about 11 miles from north to south and varies from about 3-9 miles east to west. Within the watershed are two major tributaries of the Siletz River, the North Fork and South Fork. The two tributaries join at the western edge of the watershed forming the mainstem Siletz River, which flows into Siletz Bay at Lincoln City, Oregon.

Topography/Geology

With few exceptions, the terrain is generally mountainous, with steeply incised ridges in the northern two-thirds of the watershed; the southern third of the watershed contains much flatter terrain with an elevation of 1,125 feet at the former Valsetz Lake (Map #1). Elevations within the entire watershed range from about 700 feet at the confluence of the South Fork and North forks of the Siletz River to the highest point, 3,589 feet, at Laurel Mountain, which is on the eastern edge of the watershed. Additional mountains in the watershed include Sugarloaf Mountain at 3,450 feet, Fanno Peak at 3,333 feet, and Rooster Rock at 2,213 feet .

The rocks exposed in the Upper Siletz watershed range in age from 55 million years to recent alluvium. They include extrusive and intrusive igneous rocks and marine sedimentary rocks. Eocene rocks (45-55 million years old) are predominant with only minor areas of recent alluvium found as valley filling.

Figure #1. Vicinity map for Upper Siletz watershed.

The Eocene rocks are divided into two formational units:

(1) the Siletz River volcanic series, composed of volcanic flows formed in a marine setting, is the Abasement rock@ (no lower-lying rocks have been exposed) in the Coast Range. This rock is predominant in the northern two-thirds of the watershed (along the North Siletz River); and,

(2) the Tyee formation, a sedimentary rock composed of sandstone and siltstone, which was deposited in a shallow sea overlying the Siletz River volcanic series. The Tyee formation is predominant in the southern one-third of the watershed (along the South Fork Siletz River).

Intruding into the Eocene rocks are more recent igneous rocks in the form of dikes and sill-like masses. A dike forms the base rock at the site of the former Valsetz Lake dam. Fanno Ridge is the most prominent sill-like feature in the area, although most of the major ridges and peaks are capped by resistant, intrusive rock.

Overlying the thicker Eocene deposits, recent alluvial deposits of sands and gravel are found in low gradient stream valleys. These are most prominent in the Valsetz basin and former Valsetz lake bed (South Fork Siletz subwatershed).

Streams

The watershed includes about 572 miles of first-to-sixth-order streams, of which the BLM manages approximately 146.7 miles (25.6%; map #2). About 55.5% of these streams are first-order streams, 21.7% second-order, 12% third-order, and about 6.1% fourth-order. Streams in the northern two-thirds of the watershed are generally characterized by higher gradients and more abundant summer flows; in the southern third, by generally lower-gradient streams and reduced stream flows. To expedite analysis of its condition, the Upper Siletz watershed was divided into four subwatersheds: Boulder Creek, Lower North Fork (NF) Siletz, South Fork (SF) Siletz, and Upper NF Siletz. Stream miles by ownership for each subwatershed are displayed below.

Subwatershed	Ownership	Miles
Boulder Creek	BLM	62
	Other	66.4
Lower NF Siletz	BLM	12.1
	Other	58.5
SF Siletz	BLM	24.2
	Other	227.4
Upper NF Siletz	BLM	48.5
	Other	73.1

Climate & Precipitation

The Siletz Basin has a marine-influenced climate typical of the coastal area of Oregon. Winters are cool and wet, summers are warm and dry, and precipitation falls primarily as rain. Winter precipitation is very high, with average rainfall at former Valsetz about 120 inches; 175 inches per year have been recorded at other points within the watershed. In most years, snow remains for one-to-two months at elevations above 1,500 feet and is subject to rain-on-snow events. Also at higher elevations, precipitation intensities can be expected to exceed five inches in 24 hours roughly every two years.

Vegetation

The Upper Siletz watershed lies within the Western Hemlock Vegetation Zone, named for the climax species which hypothetically will dominate the forested plant community in the long-term. Douglas-fir is currently the dominant tree species within the watershed because it is a long-lived species which regenerated after historic wildfires. Major disturbances such as wildfires, windstorms, landslides, floods, insects, pathogens, and human activity contribute in determining the successional pathways within the landscape. As a result of these disturbances, each plant community within the watershed has vegetation that occurs over a range of successional stages.

Ownership

There are about 44,583 acres within the watershed, reflecting the following ownerships:

BLM: about 27% (12,178 acres: 9,924 acres of O & C and 2,254 acres of public domain)
Private industrial forest landowners: 73% (32,400 acres)

Although federal and private ownerships are somewhat intermingled in the watershed, large blocks of consolidated private lands also occur. BLM-administered land is concentrated in the northern half of the watershed. The majority of private land in the watershed is managed for timber production by Boise Cascade and Willamette Industries. Smaller areas are managed by Georgia-Pacific West, Inc., Simpson Timber Co., Miami Corporation, and International Paper Company.

Timber Harvest & Management

Timber harvest in the watershed began in the 1950s and 1960s when significant areas of mature and old-growth timber were harvested in the drainage. During this time, most of the old-growth in riparian zones was also removed. Harvested lands are generally characterized by healthy and rapidly growing, even-aged Douglas-fir stands, although noble fir associations occur at higher elevations (above 2500 feet). Alternative species are often absent or limited in these regenerated stands; in addition, snags, defective trees, and downed wood are largely absent or greatly limited in extent.

Forest management activities and the associated roads have significantly affected the character of the stands within the watershed and the ecosystem of the larger landscape. Forest harvesting has left a fragmented landscape comprised of a variety of seral stages. Recent harvesting of the SF Siletz subwatershed has removed many of the second-growth conifer stands. As a result, there are currently large acreages of grass-forb and shrub stages along with young second- and third-growth conifers, hardwoods, and mixed stands. Old-growth stands are largely depleted in the watershed, except for about 1,150 acres on BLM-administered land located primarily in the Upper NF Siletz and Boulder Creek subwatersheds. The spatial distribution of these various seral stages is not uniform throughout the watershed and is heavily dependent upon several factors, including fire history and past management. Young conifer stands (less than 70 years old) are generally dominant along streams and rivers within the watershed.

Land Use Allocations

This section summarizes very briefly information found in the *Salem District Resource Manage-*

ment Plan (RMP), Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (commonly called the ANorthwest Forest Plan@) and its AAquatic Conservation Strategy@ (Appendix A of the Northwest Forest Plan).

The RMP allocates BLM-administered land to specific purposes and establishes management actions/direction for each allocation. The RMP incorporates all of the relevant decisions made in the Northwest Forest Plan. The land allocations and management actions and direction in the RMP provide the basic management guidance for this watershed analysis area.

All federal lands within this watershed fall into one of three categories: Late-Successional Reserves (LSRs), Adaptive Management Areas (AMAs), or Late Successional Reserves within the Adaptive Management Area (AMR; map #3). The acreage of major land use allocations in the watershed is approximately as follows: LSR = 5,825; AMA = 2,337; and AMR = 4,011.

Riparian Reserves (Abuffers@) have been identified within the LSRs and AMAs according to the hierarchy established in the Northwest Forest Plan. Within the Upper Siletz watershed, some 10,809 acres (89%) of BLM-administered lands have been identified as Riparian Reserves; this figure will likely increase as additional intermittent streams are located in the field.

Also within the major BLM land allocations are sites and areas which have been allocated for specific purposes. For example, roads are allocated for present and future transportation of commodities, visitors, residents, and other landowners/managers. Unless they are closed for watershed restoration or other purposes, they will remain open and available for vehicular use. Another example is the Valley of the Giants, which is a BLM-administered area allocated as an Area of Critical Environmental Concern/Outstanding Natural Area.

Management actions and/or direction for the major land allocations of the Upper Siletz watershed are summarized as follows (additional discussion can be found in Chapter 5; details can be found in the RMP):

(1) *LSRs* will be managed to retain or re-establish, develop, maintain and enhance a functional, interacting late-successional and old-growth forest ecosystem that contributes to healthy wildlife populations. Density management in stands less than 80 years of age and other appropriate management activities may be undertaken to achieve Late-Successional Reserve objectives. LSRs overlaying AMAs (or AMRs) may also be managed by density management prescriptions in conifer stands up to 110 years in age.

(2) *AMAs* will be managed to develop and test new management approaches to integrate and achieve ecological and economic health and other social objectives. These approaches will contribute substantially to the achievement of SEIS record of decision objectives, including: restoration and maintenance of late-successional forest habitat outside reserves, consistent with marbled murrelet guidelines; retention of key structural elements of late-successional forests on lands subjected to regeneration harvest; restoration and protection of riparian zones; and provision of a stable timber supply.

(3) *Riparian Reserves* will be managed to support Aquatic Conservation Strategy objectives and provide habitat for special status species and record of decision special attention species.

Resource Programs

This section summarizes the major resource programs and management actions/directions for BLM-administered land in the Upper Siletz watershed. (See the RMP for additional details.)

Wildlife, Threatened and Endangered (and other Special Status) Species Habitat will be managed in a manner that protects species (and their habitats) that are federally listed or proposed for federal listing. Further, all lands will be managed in a manner that avoids contributing to the need to list formally federal candidate species, Supplemental Environmental Impact Statement (SEIS) special attention species, state (ODFW) listed species, BLM sensitive species and BLM assessment species.

Special Areas will be managed to maintain, protect, and/or restore their relevant and important values. Such special areas include areas of critical environmental concern (ACECs), outstanding natural areas (ONAs), research natural areas (RNAs), and environmental education areas (EEAs).

Visual Areas will be managed in accordance with the objectives of the four management classes stated in the RMP.

Stream/Riparian/Water Quality/Fish Habitat will be managed so that activities which retard or prevent attainment of the Aquatic Conservation Strategy objectives will be prohibited or regulated. Through watershed analysis, watershed restoration projects will be planned and implemented to aid in the recovery of fish habitat, riparian habitat, and water quality.

Recreation sites, trails, and special recreation management areas will be managed to enhance visitor recreation experiences and produce satisfied public land users.

Chapter 2 - Issues and Key Questions

Introduction

This chapter identifies the specific issues that are relevant to the Upper Siletz watershed. These issues were used to develop key questions which focus the analysis on particular types and locations of cause-and-effect relationships, and discern conditions as they relate to values, uses, and key ecosystem components and processes of the watershed.

A variety of sources provided insight into the values and uses which were used to formulate issues and key questions for this watershed analysis. Questionnaires were mailed to landowners and other interested groups and individuals (Appendix #1). Public comments were summarized (Appendix #2), and a mailing list was developed (Appendix #3). Other documents were analyzed; especially useful were the Northwest Forest Plan (see USDA Forest Service and USDI BLM 1994a, 1994b) for providing a regional perspective, and ODFW=s ASiletz River Basin Fish Management Plan@ (1995) which provided a watershed perspective. Interactions with landowners and state and federal resource specialists also helped to identify issues and key questions.

Erosional Processes

Issues

Road construction and past timber harvest activities have increased landslide and general sedimentation rates beyond natural levels, and have adversely impacted water quality, aquatic species habitat, and soil productivity.

Key Questions

C What were the historical erosion processes (e.g., mass wasting, surface erosion processes)?

C What are the current conditions and trends of the dominant erosion processes?

C What are the natural and human causes of changes between historical and current erosion processes?

C What are the influences and relationships between erosion processes and other ecosystem processes (e.g., vegetation, woody debris recruitment)?

C What are the opportunities to manage soil resources in order to maintain or enhance desired future conditions?

Soil Productivity/ Associated Compaction and Displacement Effects

Issues

Road construction and past timber harvest activities have affected soil productivity by increasing soil compaction and displacement in parts of the watershed. These have adversely impacted water quality, aquatic species habitat, and soil productivity.

Key Questions

- What were the historical patterns of soil productivity and related compaction and displacement effects?

- What are the current conditions and trends of soil productivity, and associated compaction and displacement effects?

- What are the opportunities to manage soil resources in order to maintain or enhance desired future conditions?

Vegetation

Issues

Ecological succession, coupled with human-caused and natural disturbances, has created a mosaic of vegetation types which are quite different from vegetation patterns of the past. Although vegetation patterns are never static, the rate and intensity with which these patterns change can be greatly affected by management activities. Several non-native plant species have been introduced to this ecosystem, and some native plant communities are now declining.

Key Questions

- What was the historical array and landscape pattern of plant communities and seral stages? What processes caused these patterns?

- What are the current conditions and trends of the prevalent plant communities (including riparian), seral stages, and special plant species in the watershed? What activities and processes (e.g. recreation, noxious weeds, logging) threaten the biological integrity of sensitive botanical areas (ACEC's/Outstanding Natural Areas)?

- What are the natural and human causes of change between historical and current vegetative conditions? What are the influences and relationships between vegetation and seral patterns and other ecosystem processes (e.g., hydrologic maturity, channel stability)?

- What are the opportunities to manage vegetation in order to maintain or enhance desired future conditions (given the guidance in the Northwest Forest Plan)? What silvicultural practices or other methods will be necessary to attain the desired future conditions?

Riparian Reserves

Issues

Riparian area modifications such as road construction, physical alteration of the channels, and removal of riparian vegetation, large woody debris and complex structure, have adversely impacted fisheries habitat and water quality. Flood plains have been restricted, and riparian area microclimates have been altered. Many riparian areas are deficient in the large conifers which are future sources of large woody debris.

Key Questions

- What were the historical and landscape patterns of riparian ecosystems in the watershed?
- What are the current conditions and trends of processes which affect riparian ecosystems within the watershed?
- What management opportunities and activities exist within Riparian Reserves (given the guidance in the Northwest Forest Plan)?

Hydrology

Issues

Modifications of hillslopes and riparian areas from road construction and harvest may have altered the timing, duration, and quantity of stream flows in the Upper Siletz watershed.

Key Questions

- What were the historical hydrological characteristics (e.g., total discharge, peak flows, minimum flows) and features (e.g., cold water seeps, ground water recharge areas) in the watershed?
- What are the current conditions and trends of the dominant hydrologic characteristics and features prevalent in the watershed?
- What are the natural and human causes of change between historical and current hydrologic conditions?
- What are the influences and relationships between hydrologic processes and other ecosystem processes (e.g., sediment delivery, fish migration)?
- What are the opportunities to manage hydrologic characteristics in order to maintain or

enhance desired future conditions (given the guidance in the Northwest Forest Plan)?

Stream Channels

Issues

Alteration in stream channel morphology and function may have occurred. Potential causal agents for these alterations include: modifications of the stream flow regime, changes in sediment delivery, removal of riparian vegetation, and alteration of large woody debris and complex structure on the flood plain and in the channel. Some channels may have been altered by installation of bridges and culverts or by operating heavy equipment in or adjacent to the channel.

Key Questions

- What were the historical morphological characteristics of stream valleys and general sediment transport and deposition processes in the watershed?

- What are the current conditions and trends of stream channel types, and sediment transport and deposition processes prevalent in the watershed?

- What are the natural and human causes of change between historical and current channel conditions?

- What are the influences and relationships between channel conditions and other ecosystem processes in the watershed (e.g., inchannel habitat for fish and other aquatic species, water quality)?

Water Quality

Issues

Quality of water refers to the inherent characteristics of the water body in question and the uses and users of the water. The State of Oregon is responsible for establishing the uses (called beneficial uses) and standards applicable on all waters in the state, as well as the monitoring and enforcement of these standards. The State of Oregon also regulates the legitimate users of water resources through a system of water rights. There is a need to identify the beneficial uses of the Upper Siletz watershed, the historic and current conditions of these waters with regard to the applicable standards, and any trends which may be influenced by our land management decisions.

Key Questions

- C What were the historical water quality characteristics of the watershed?

- C What beneficial uses dependent on aquatic resources occur within the watershed? Which water quality parameters (e.g., pH, DO) are critical to these uses?

- C What are the current conditions and trends of beneficial uses and associated water quality parameters?

- C What are the natural and human causes of change between historical and current water quality conditions? What are the influences and relationships between water quality and other ecosystem processes?

- C What opportunities exist to:

  1) manage streamside vegetation to improve stream temperatures?

  2) modify road/trail and hill slopes to reduce sediment delivery to streams?

  3) meet desired water quality standards (pH, DO)?

  4) manage watershed vegetation to augment/reduce flow regimes?

Fish Species and Habitats

Issues

Co-existing populations of at least four kinds of highly valued anadromous salmonids (coho and Chinook salmon, and steelhead and cutthroat trout) inhabit the Upper Siletz watershed. Some are considered to be threatened and declining, and may be at risk of extinction. Coastal coho salmon and coastal steelhead, including those found in the Upper Siletz drainage, have been petitioned and are currently under review for federal listing under the Endangered Species Act.

Habitat for anadromous and resident fish species, and other aquatic species has been degraded and/or declining. Habitat problems include stream sedimentation, lack of large woody debris, lack of quality pools and spawning gravels, reduced stream flows, elevated water temperatures, and low dissolved oxygen (DO) levels.

Key Questions

- What was the historical relative abundance and distribution of species of concern and the condition and distribution of their habitats?

- What is the relative abundance and distribution of species of concern that are important in the watershed (e.g., threatened or endangered species, special status species, species emphasized in other plans)? What is the distribution and character of their habitats?

- What are the current habitat conditions and trends for the species of concern?

- What are the natural and human causes of change between historical and current species distribution and habitat quality for species of concern? What are the influences and relationships of species and their habitats with other ecosystem processes?

- What are the opportunities to manage habitats in order to maintain or enhance desired future conditions (given the guidance in the Northwest Forest Plan)?

Wildlife Species and Habitats

Habitat: Issues

The forest landscape has changed from a late-seral/old-growth matrix to an early/mid-seral matrix.

The forest landscape pattern has been fragmented by timber harvesting, creating a greater density of patches which are smaller in size than those created under the natural disturbance regime of large-scale forest fires.

The natural disturbance regimes of fire and wind left large amounts of dead woody debris in the riparian zones and forest uplands, while human activities during the last 100 years have cleaned the forest of this special habitat component.

Special habitats such as caves, cliffs, and wetlands are unique and important breeding and foraging areas for a number of wildlife species.

Habitat: Key Questions

- What was the historical condition and distribution of habitats?

- How have changes in the landscape pattern of seral stages from the natural range of conditions affected composition, origin, stability, contrast, edge, grain, patch shape and size, connectivity, porosity, and patchiness?

- What ecological roles do federal and non-federal lands play in the watershed?

- How have changes in the landscape pattern of seral stages from the natural range of conditions affected coarse woody debris levels and recruitment?

- What are the contributions of special habitats to biodiversity and ecological function in the watershed?

Species: Issues

Special Status Species must be considered when any federal action is taken that may affect the species or the habitat upon which they depend (Endangered Species Act). Special Attention Species must be considered when any federal action is taken that may affect the species or the habitat upon which they depend (USDA Forest Service and USDI BLM 1994a, 1994b). The welfare and management of big game species are a concern to many Oregonians.

Species: Key Questions

- What was the historical abundance and distribution of species?

- What is the existing distribution of special status species and their habitats in the watershed; how should these habitats be managed?

- What special attention species are located in the watershed; where are they and what are appropriate steps for management of their sites?

- What are the species for which there are social goals, and what is the current condition of the species relative to these goals?

Commodity Forest Products

Issues

Historically, the federal forest lands within the watershed have been managed primarily for timber production. Local economies partially sustained themselves on the employment and revenue that was generated by the areas' supply of timber. Under the Northwest Forest Plan, emphasis is placed on the restoration and maintenance of aquatic resources and late-successional forest habitat.

Key Questions

- What were the historical patterns of forest product use?

- What are the current conditions and trends of commodity forest products (commercial timber and special forest products)?

- What level of timber/special forest products harvest can be sustained for the next 10-20 years while still supporting the goals set for other resource levels?

Transportation Management

Issues

To facilitate timber harvest, extensive road systems were developed throughout the watershed. Early construction standards for roads and bridges have left legacies that in some cases contribute to adverse environmental conditions. Reciprocal rights-of-way agreements with industrial forest landowners will require continued maintenance and use of certain road systems, and new construction on others.

Key Questions

- What were the historical transportation patterns?

- What are the current conditions and trends of the transportation system?

- Do the conditions of roads in the watershed meet future needs of the transportation system?

Recreation

Issues

Historically, dispersed recreation such as fishing, hunting, and mushroom picking has been the primary recreational use throughout the watershed. Currently, there is one designated Area of Critical Environmental Concern/Outstanding Natural Area (i.e.,Valley of the Giants) within the watershed, providing a trail through old-growth forested habitat. Access to Valley of the Giants has been restricted due to an untenable bridge, but money has already been allotted to improve this situation. Other recreational opportunities have not been identified for the watershed possibly because of its remoteness from urban areas. Some recreational uses may result in conflicts with other resources, between different types of recreation users, and between recreationists and local landowners.

Key Questions

- What were the historical patterns of recreational use?

- What are the current conditions and trends of recreational resources?
- How can we enhance the recreational opportunities in the watershed?

Land Tenure

Issues

Ecosystem management is most efficiently conducted on lands with contiguous ownership. BLM-administered lands in this watershed are generally scattered or checker-boarded. There is the opportunity to block up lands in the watershed, especially in the north half because BLM ownership is less scattered in this area. Blocking up lands in the northern half would help to create linkages with older-forest habitat to the east of this watershed. Exchange of BLM-administered lands in the southern half of the watershed would likely reduce the amount and condition of thermal cover for Roosevelt elk in this area.

Key Questions

- What are the opportunities for land tenure adjustments?

Chapter 3/4 - Reference and Current Conditions

The timelines used in the following discussion of Reference Conditions refer to presettlement (or that time period before 1900), post-settlement (1900-1950), and current conditions (1950-present). Research findings pertaining to historical evidence of reference conditions may cite specific years other than 1900 (e.g., see Ripple's 1994 study on old-growth conditions in the Coast Range which pertains to estimates made prior to 1850), but their context should be viewed in the framework of presettlement, post-settlement, and current conditions as defined above.

Erosional Processes

A. Reference Conditions

Erosional processes that occurred prior to 1900 are assumed to be the same as those that occur today. Watershed hillslopes intercepted water and routed it to channels. Watershed health was directly related to the condition of the soil and associated vegetation on these slopes, which affected the contribution of soil and water to streams. Natural hillslope processes affected the delivery of soil sediments and water to streams. Prior to 1900, soils in the region and watershed probably varied in their characteristics, behavior, and productive capacity just as they do today. This variation was primarily due to differential resistance to weathering of soil parent materials, which influences slope gradients and shapes, and has the greatest impact on soil types. Erosional processes are discussed in more detail in Appendix #4.

B. Current Conditions

Soils in the Upper Siletz watershed are highly erosive, but due to their high infiltration and percolation rates, little overland flow occurs except on convex slopes and when soils are frozen or compacted.

Mass wasting and dry-raveling of loose materials are the primary erosion processes in the watershed. Natural instability to avalanche mass failures is primarily a function of hillslope gradients and peak precipitation events. For slump-earthflows, type of parent material, parallel bedding plains, and the contact of sedimentary with impermeable materials impact stability (Swanston 1981).

There are no known sediment yield data for the Upper Siletz watershed. However, there are some regional studies that provide data for similar *forested* watersheds. Sediment yield data from debris slides have been measured for 10 to 15 years in the Coast Range near Mapleton, Oregon (Swanson and Lienkaemper 1985). These watersheds generally have steeper slope gradients and lower precipitation intensities than in the Upper Siletz watershed. Measured sediment yields ranged from 0.28 to 0.37 cu. meters per hectare per year. Sediment yield data from dry-raveling and surface erosion from overland flow have been measured in the lower western Cascade Range (Swanson and Grant 1982). This study was conducted for 10 years following clearcutting and burning. Data showed that sediment yields in streams increased about 22 times on 31-60 percent slopes (from 0.014 to 0.32 cubic meters per ha per year) and eight times on slopes greater than 60 percent (from 0.2 to 1.6 cu. meters per hectare per year) compared to pre-treatment levels. Sediments typically reached confined streams such as first and second-order tributaries, especially where there is little hillslope vegetative cover or debris barriers.

The following information was compiled from aerial photos, computer-generated data, and personal experiences. Map #4 shows locations on the hillslope where mass wasting is likely to occur. The severe hazard area (red map color) occupies about one percent of the watershed. Hillslopes are typically convex, with gradients steeper than 90 percent. Natural stability is very low, and any disturbance will result in a debris avalanche. Dry-raveling of loose materials is high. Soils are shallow and very shallow gravelly loams; rock outcrops are common. The density of vegetative cover is low.

The high hazard area (yellow map color) occupies about three percent of the watershed. Hillslopes are typically convex, with gradients ranging from 76 to 90 percent. These hillslopes become unstable after large precipitation events (typically >5 inches in 24 hours) in combination with clear cutting or road construction that adds water to the convex slopes. Dry-raveling of loose materials is typically moderate to high. Soils are typically shallow loams and gravelly loams. Ground cover is moderate.

The moderate hazard area (green map color) occupies about 11 percent of the watershed. Hillslopes typically have gradients ranging from 60 to 75 percent. Stability is primarily impacted from road construction practices that include excess sidecast of road materials, runoff diverted over side of road, and inadequate culvert design. Dry-raveling rates are low. Soils are moderately deep loams and gravelly loams. Ground cover density is high.

Map #4a shows existing landslides that were found on aerial photographs during the period beginning 1956 and ending in 1993. No fieldwork was done to confirm the placement of slides in the different hazard areas as described above. Landslides are color coded by probable cause: red = slides in clearcuts; black = road-related slides; and green = slides in forested areas.

Table #2 shows the miles of roads by landslide hazard level and ownership. Table #3 shows the number of landslides by hazard level and activity. About 34% of the landslides in this watershed resulted from roads and clearcuts on slope gradients >76% (about 4% of the watershed). About 82% of landslides occurred on slopes with gradients steeper than 60% (about 15% of the watershed). About 21% of the slides occurred from roads in high-and-severe hazard areas (Table #3). Landslide frequency increased by eight times from roads and five times from clear-cuts compared to forested areas. Sediment yields from road-related landsliding are expected to be larger than yields from either clear cuts or from forests. This is because of additions of side-cast-and-fill failures which will contribute to the volume.

Table #2. Miles of Roads by Landslide Hazard Level and Ownership.

	Ownership		
Landslide Hazard Level	Public (mi.)	Other (mi.)	Total (mi.)
Low (<60% slope)	74.8	226.4	301.2
Moderate (60-75% slope)	5.6	11.6	17.2
High (76-90% slope)	0.7	2.3	3.0
Severe (>90% slope)	0.02	0.4	0.4

Table #3. Number of Landslides by Hazard Level and Activity.

	Landslide Hazard Level				
Activity	Severe (>90% slope)	High (76-90% slope)	Moderate (60-75% slope)	Low (<60% slope)	Total/(%)
Road	16	23	37	26	102/54.8%
Clearcut	8	17	37	8	70/37.6%
Forest	5	5	4	-	14/7.5%
Total/%	29/15.6%	45/24.2%	78/41.2%	34/18.3%	186/100%

Table #4 shows the number of slides which reached streams by activity from 1956-1993. These landslides have both positive (e.g., introductions of large wood, boulders, and gravels to benefit stream structure) and negative effects (e.g., fine silts smothering spawning beds). Approximately 78% of all slides (road-related, within clearcuts, and in forested areas) reached the stream. Since 1962, the rate of landsliding appears significantly lower than the period before 1962. The proportion of landslide scars younger than 30 years of age is about 25% of all slides. This lower frequency could be from less disturbance, fewer major storm events, and/or improved harvest practices. Maximum erosion rates from roads appear to be during the first five years following construction. Maximum landsliding potential occurs within 10 years following clearcutting. This is due to loss of root strength in unstable areas. Sediment yields from clearcuts appear to return to forested levels after 20-30 years.

Table #4. Number of Landslide Types Impacting Streams and Uplands Between 1956 and 1993.

	Landslide Types						
	Road-related		Clearcut-related		Natural (Forested)		
Aerial Flight Year	Stream Incursions (#)	Other (#)	Stream Incursions (#)	Other (#)	Stream Incursions (#)	Other (#)	Total
1956	53	8	43	5	6	2	117
1962	14	1	6	1	1	1	24
1967	1	0	1	0	1	1	4
1974	10	3	1	0	0	0	14
1978	2	0	4	0	2	0	8
1988	8	2	3	5	0	0	18
1993	0	0	0	1	0	0	1

A cursory fly-over assessment of landsliding in this watershed was conducted shortly after the February 1996 flood. There were six landslides observed: three were road-related, two clearcut- related, and one in a natural (undisturbed) forested area. Thus, watershed disturbances contributed to five of the six slides. A more thorough analysis of landslides caused by the February 1996 storms is currently being conducted by the Salem BLM district. Aerial photographs will be taken in the summer of 1996 to document landsliding effects.

A highly erosive area within the watershed occupies the lower slopes of Fanno Ridge (see red hatch area in Map #4a). The mixed soil deposits of this lower slope area have resulted from mass wasting of sediments; these sediments are in contact with a diorite dike associated with the upper slopes of Fanno Ridge. Streams are actively downcutting through these soil deposits, resulting in steeply incised channels and high sediment loads.

Soil Productivity and Associated Compaction and Displacement Effects

A. Reference Conditions

Soil productivity in this watershed was largely determined by soil organic-matter levels and soil nitrogen levels (availability of trace minerals was also important). Soil organic-matter levels remained fairly constant over time except in areas with surface soil disturbance. Soils on ridgetops (>1,750 feet) had lower organic-matter levels than at lower elevations. Soil nitrogen levels were maintained by additions through precipitation, nitrogen-fixing plants, and decomposition of organic matter in soil. These levels likely declined after severe fires, or after complete removal of trees, ground cover, and duff at intervals less than 90 years. Soil nitrogen levels in soils on ridgetops were naturally low; and topsoil disturbance or wildfire further reduced these levels. Soil compaction, except for a few trails from humans and animals, was assumed to be minimal prior to 1900. Soil displacement occurred in the form of a background level of natural landslides and surface erosion (see above) aided by climatic conditions such as heavy rainfalls, windstorms, wildfires and other factors.

B. Current Conditions

Map #5 displays soil resource conditions affecting soil productivity for BLM-administered lands in the watershed. The following activities have reduced soil productivity: 1) soil compaction and/or displacement from ground-based yarding equipment; 2) scarification and site preparation; and 3) organic matter losses from soil displacement. Most serious productivity losses from compaction, scarification and site preparation occur on the most productive lands where timber management activity is concentrated; soil productivity losses from soil displacement and depleted organic matter occur on shallow and moderately deep soils. The TPCC data show about 3,075 acres of shallow, gravelly soils, and about 3,530 acres of nutrient-deficient soils on BLM-administered lands in the watershed. Any activity that reduces organic materials on these soils will result in a reduction of soil nutrient levels. About 5,220 acres, including about 530 acres of BLM-administered lands, have been yarded by ground-based equipment during the past 50 years in the watershed. Dyrness and Swanston (1973) reported that about 35 percent bare soil and 26 percent compacted soils are typical for areas yarded by ground-based equipment. Since the 1970s, steeper terrain and operating restrictions have greatly reduced the use of ground-based equipment. Since 1980, most of the soil compaction has been mitigated on new harvest areas.

Vegetation

A. Reference Conditions

Fire has been the primary large scale disturbance factor influencing vegetation in the Oregon Coast Range. The nature of the Coast Range forests prior to 1900 was largely determined by the intensity, frequency, and extent of the natural fire regimes associated with particular areas (Walstad et al 1990, Agee 1993). The predominance of Douglas-fir in this region at the time of Euro-American settlement was largely due to disturbance by fire as well as the longevity of this species (Agee 1991). Catastrophic fires occurring at intervals of 150-400+ years likely affected the Upper Siletz watershed similar to other areas in the Coast Range, although the high rainfall in this watershed may have resulted in even longer fire-return intervals. For a discussion of natural fire processes in the Coast Range and in the watershed, refer to Appendix #5. For a discussion of long-term historic vegetation patterns in the Oregon Coast Range, refer to Appendix #6. The natural successional processes following disturbance events such as fire are discussed in Appendix #7.

Catastrophic fires within the Upper Siletz watershed produced large (> 100 acres) clearings within areas of older forest. However, there were many factors that interacted to determine which existing vegetation survived fire events. These included fire intensity, prefire stand composition and age, fire frequency, and location. For example, the fire-caused clearings likely had individual and groups of trees remaining alive in locations with north aspects, in wet areas, and in places where the fire burned with less intensity, which often occurs during late evening-early morning hours. The general landscape of the Upper Siletz watershed prior to 1900 likely included: openings which were most prevalent on upper slopes and ridgetops because of relatively drier soil and fuel conditions; forested riparian areas because of their relative protection from fire due to moist soils with more lush vegetation; and large areas of even-aged conifer forests which resulted from historic stand replacement events. Conifer forests with uneven-aged forest characteristics also likely occurred in an unknown percentage of the forest, probably as a result of the natural variability of fire-induced tree mortality related to variations in fire intensity as a result of the factors listed above. Thus, in a given stand, pulsations of disturbances caused by a series of wildfires (e.g., two or three fires in sequence) resulted in only partial stand destruction. The resultant openings in these stands enabled them to attain old-growth forest characteristics at a more rapid rate than those stands where crown fires decimated the total stand, resulting in sub-sequent densely-stocked, regenerating stands with relatively few openings to enable light penetration and thus more multiple-canopy development. The structure of these stands was diverse due to the presence of large snags and large downed wood. Hardwood stands were likely pre-sent as well on wet sites and in disturbed areas.

Based on information gathered from old vegetation type-maps (1901, 1936), old aerial photos, and analysis of old stumps and existing timber stands, it appears that the majority of this watershed was in mid-to-late seral forested condition at the time extensive logging began about 1918. Prior to this time, there is mention of only one large fire that occurred in the south end of the watershed in 1908. (Size of the area burned was not mentioned, although several thousand acres of private timber were destroyed.) Subsequently in 1916, the Valley and Siletz Railroad constructed a line into the area. A dam was constructed across the SF Siletz River, creating Valsetz Lake to serve as a log pond for the lumber mill and town built for the purpose of harvesting much of this burnt timber. The mill commenced operations about 1918 and continued until 1984 when the mill and town were demolished and the lake drained. Aerial photos taken in 1956 and 1974 show three patches of timber in the north portion of the watershed that appear to be the result of fires. Age of this timber dates the fires to around 1900-1910; cause of these fires is unknown. They appear to have burnt to the ridges and gone out or reduced in intensity to that of a moderate under-burn with considerable overstory timber surviving. The photos also show a few scattered patches dating to the mid-1800s. Due to extensive clearcutting throughout much of this watershed, a detailed picture of past fire history is difficult if not impossible to obtain. Perhaps over the centuries, due to the wetter than average climate in this watershed, many fires that were ignited tended to burn only a few hundred to a few thousand acres before encountering a change in fuel type or moisture regime and then going out. This may account for the higher than average proportion of late-seral forest in this watershed. Other fires occurring within this watershed involved some reburns of portions of the old Valsetz fire area: 5,000 acres south and west of the lake in 1937 and 1938, and 1,800 acres north of the town in 1943. In the summer of 1945, a 13,000 acre fire burned in the northeast portion of this watershed and the adjacent drain-ages; approximately 8,000 acres burned in the Upper Siletz watershed. The fire burned mostly logged-over lands, although about 1,700 acres of mature timber were also lost.

Other natural disturbances also influenced vegetation within the Upper Siletz watershed. Sporadic windstorms similar to that observed in the December 12, 1995, storm occurred in the past with similar consequences for stand development. Such coarse-scale disturbances as wind (and fire as discussed above) produced extensive areas of early-seral vegetation. However, it was probable that some wind (and fire-caused) disturbances did not necessarily result in the complete mortality of stands. For example, the December 12 windstorm resulted in only partial blow downs of many stands. (Similarly, recent fires in the western Cascades of Oregon killed only 25-50 percent of trees within the areas burned.) Natural background levels of disease and insect infestations also affected the forest. These were finer-scale forest disturbances which resulted in small patches of early-seral vegetation embedded within the older forest. The high soil moisture levels in western Oregon reduce plant stress and increase vigor. This may have partially prevented major outbreaks of insect infestations and associated tree mortality that we currently see in eastern Oregon.

The estimated percentage of late-seral forest in the Coast Range prior to 1850 was 61 percent (Ripple 1994); the amount of early-seral forest possibly ranged from 20 to 40 percent. Due to the high rainfall experienced in the Upper Siletz area, the percentage of late-seral forest may well have been higher in the watershed, perhaps in the 60 to 80 percent range. (Depending on how large an area is analyzed and on the frequency and intensity of fire events, the range could have been 0 to 100 percent of the forest in late-seral stage forest. This is especially likely when smaller areas are considered.)

Special plant communities such as dry and wet meadows, wetlands, and cliff and talus habitats occurred within the watershed prior to 1900, but in an unknown amount and distribution. However, the ecological and physical processes that produced these communities are assumed to be the same as those that are occurring now. For a discussion of these ecological and physical processes, refer to Appendix #8.

B. Current Conditions

Vegetation

The current composition and seral-age-class of the vegetation summarized across all plant communities is shown in Table #5. Vegetation is also displayed in Map #6. The vegetation classes reflect a combination of vegetation types (e.g., conifers, hardwoods, grass/forb) and seral stages (roughly equivalent to age-classes) within a vegetation type. Conifer forests make up the majority of the current vegetation classes (74.3%) within the watershed. Hardwood stands, which account for about five percent of the watershed, are usually interspersed within the conifer stands or occur as linear-shaped habitats along the larger streams. It is important to note that the oldest-seral stages (forest stands >80 years old) currently represent only about four percent of the watershed, while the younger-seral stages (non-forest habitats and forests < 80 years old) account for almost 88% of the watershed.

Table #5. Acres of Vegetation Categories Within the Upper Siletz Watershed.

Vegetation Category	Total Watershed	BLM
Open - road, quarry	3.9 (.01)	3.9 (.01)
Open - recent clearcut	2,082.9 (4.7)	.01 (.01)
Open - exposed rock	40.8 (.1)	8 (0.1)
Grass/forb - grassland	68.7 (0.2)	.01 (.01)
Grass/forb - recent clearcut	3,357.7 (7.5)	21 (0.2)
Shrub/open sapling - persistent	182.8 (0.4)	7 (0.1)
Shrub/open sapling - clearcut	1,874.2 (4.2)	.01 (.01)
10-40 Yr Conifer	13,228.6 (29.7)	3,459 (28.4)
50-70 Yr Conifer	18,128.1 (40.7)	6,457 (53)
80-120 Yr Conifer	490.3 (1.1)	477 (3.9)
130-190 Yr Conifer	30.6 (.01)	0
200+ Yr Conifer	1,230.3 (2.8)	1,227 (10.1)
10-40 Yr Mixed	526.1 (1.2)	109 (0.9)
50+ Yr Mixed	1,155.7 (2.6)	33 (0.3)
10-40 Yr Hardwood	801.3 (1.8)	88 (0.7)
50+ Yr Hardwood	1,344.9 (3.0)	271 (2.2)
Open Water	17.4 (.01)	17.4 (0.2)
Total	**44,564**	**12,178**

The current condition of vegetation is that of greatly reduced structural diversity and species composition. This is primarily due to previous activities such as: short-harvest rotations (80 years or less); leaving only two snags per acre after regeneration harvest; retaining small riparian buffer zones (in contrast to the Northwest Forest Plan); prioritizing harvest on oldest stands; and removal of suppressed trees, downed woody debris, snags (safety hazard), and minor species. The general condition of vegetation with respect to wildlife needs is discussed in the wildlife section.

The current trends are improving conditions for the composition of older forest stands as well as structural diversity. This is largely due to the adoption of the Northwest Forest Plan. Industrial forest lands in the watershed are continuing to be managed on 40-to-60 year rotations, depending on the owner.

The major plant associations thought to be represented within this watershed are listed in Appendix #9. These associations were defined by Hemstrom and Logan (1986) for the Siuslaw National Forest, which is in close proximity or intermingled with Salem District BLM-administered lands in the Oregon Coast Range. Plant association types are useful in predicting the potential effects of timber management actions and in determining possible silvicultural prescriptions for the site. The plant associations within the Upper Siletz watershed were further simplified by mapping of plant indicator species that have management implications; i.e., thin leaf huckleberry (*Vaccinium membranaceum*), rhododendron (*Rhododendron macrophyllum*), salal (*Gaultheria shallon*), and sword fern (*Polystichum munitum*). The following is a description of these management categories:

Thin Leaf Huckleberry

This management category occurs at elevations primarily >2750 feet on northerly exposures (300 to 120 degrees azimuth) and 3000 feet on southerly exposures (120 to 300 degree azimuth). Soils remain cold for much of the year, with a mean annual temperature of 44 ^{o}F and a mean summer temperature of 48 ^{o}F. Mean annual precipitation exceeds 100 inches. Soils are typically moderately deep loams and gravely loams with a thin topsoil.

The overstory consists of western hemlock, Douglas-fir, and noble fir. Noble fir is never dominant and occurs sporadically. Western hemlock comprises the dominant regeneration layer. Thin leaf huckleberry is the major plant indicator; density of this species increases with elevation. Rhododendron and beargrass are also important especially on convex slopes and droughty soil areas. Salal and dwarf Oregon grape are common on convex slopes. Salal rapidly increases when the overstory is removed. Sword fern and oxalis occur in the concave and northerly exposures.

Management concerns are related to the short growing season. Bud burst is delayed until after June 1. Frost in depressions is common and causes plant stress. Soil organic matter is primarily stored at the soil surface and in the litter. Soil nitrogen levels are typically low. Salal and Douglas- fir typically have low vigor and show evidence of low nutrients. The soils productive capacity is easily reduced from soil surface disturbance. Plant competition from alder, big leaf maple, and salmonberry are not considered to be a problem. Noble fir appears to be the fastest growing conifer and best suited to the site.

Rhododendron/Bear Grass

This management category occurs at elevations primarily between 1750 and 2750 feet on northerly exposures (300 to 120 degree azimuth) and 2000 to 3000 feet on southerly exposures (120 to 300 degrees azimuth). Soils are cool for much of the year with mean annual temperatures of 46 degrees F. and mean summer temperatures of 52 degrees F. Mean annual precipitation exceeds 100 inches. Soils are typically moderately deep to shallow loams and gravelly loams with thin topsoils.

Western hemlock and Douglas-fir are dominant in the overstory. Western hemlock comprises the dominant regeneration layer. Indicator species of this community are rhododendron and beargrass. These plants tend to be in higher densities on convex slopes. Beargrass is more common where there is little shrub cover. Both species tolerate moderate burns. Salal and Oregon grape are common on convex portions, with swordfern and oxalis in the concave and northerly positions. Salal rapidly increases when the overstory is removed. Conifer productivity is typically moderate to low.

Management concerns are related to the cool temperatures that limit soil nutrient production. Bud burst is delayed until after May 15. Soil organic matter is stored primarily at the soil surface and in the litter layer. Soil nitrogen levels are typically low. Soil productive capacity is easily reduced from soil surface disturbance. Plant competition from alder, big-leaf maple, and salmonberry is not considered to be a problem in the plant community.

Dwarf Oregon Grape/Salal

This plant community occurs on steep, convex hillslopes, narrow ridgetops, and ridge noses. It occurs at elevations typically below 2000 feet on southerly exposures (120 to 300^{o} azimuth) and below 1750 feet on northerly exposures (300 to 120^{o} azimuth). Mean annual soil temperatures range from 48 to 50 ^{o}F. and mean summer temperatures range from 54 to 55 ^{o}F. Mean annual precipitation is >70 inches. Soils are moderately deep to shallow loams and gravelly loams with thin topsoils.

The overstory and reproduction consists primarily of Douglas-fir. Big-leaf maple is sporadic throughout the community. The key species are dwarf Oregon grape and salal (with the absence of oxalis). Dwarf Oregon grape is more shade-tolerant than salal and is more common on northerly aspects. Salal, being typically shallow rooted, is frequently killed by moderate burns whereas Oregon grape is more resistant. After canopy removal, salal grows vigorously and is nearly eliminated by the overstory until natural pruning of lower limbs occurs. Included in this category is low vigor sword fern occurring primarily on northerly aspects.

Management concerns are primarily related to droughty soils. Soil nutrient storage-and-supply is moderate to low. Nitrogen is typically low to moderate. The soil productive capacity is easily reduced from surface disturbance. Competition from salal is common. Dry-raveling and droughty soils are a hazard to reproduction. Plant competition from alder and salmonberry is not considered to be a problem.

Salal

This category occurs primarily on moderately-sloping, southerly exposures (120 to 300^{o} azimuth), benches, broad ridgetops, and flats at elevations <2000 feet. Mean annual soil temperatures range from 48 to 50 ^{o}F, and mean summer temperatures range from 54 to 55 ^{o}F. Mean annual precipitation is >70 inches. Soils are typically deep loamy and clayey textured, with thick topsoils.

The overstory and reproduction consists primarily of Douglas-fir; big-leaf maple is sporadic. Salal is the key species (with an absence of oxalis). Salal has low tolerance to shade. Salal, being typically shallow rooted, is frequently killed by moderate burns. After canopy removal, salal grows vigorously and is nearly eliminated by the overstory until natural pruning of lower limbs occurs. Included in this community is sword fern, which occurs primarily in concave areas and on northerly aspects, and dwarf Oregon grape on convex slopes.

Management limitations are related to rapid regrowth and competition by salal, which impacts the growth of natural and introduced species. Soils are typically highly productive. Soil compaction and disturbance from ground-based yarding on benches often results in an alder invasion. Plant competition from big-leaf maple is a problem primarily on southerly-facing slopes where soil droughtiness is also a problem. Soil nitrogen is frequently low to moderate on broad ridgetops. Soil-related root diseases are the most common in the plant community. Vine maple increases in these openings.

Sword Fern

This management category primarily occurs on northerly exposures (300 to 120^{o} azimuth) on concave hillslopes, toe slopes, and flats adjacent to wet areas at elevations <2000 feet. Mean annual soil temperatures range from 48 to 50 ^{o}F, and mean summer temperatures range from 54 to 55 ^{o}F. Soils are typically deep to moderately deep loams and gravelly loams, with thick top soils.

The overstory primarily consists of Douglas-fir and western hemlock. Reproduction is primarily western hemlock; big-leaf maple is sporadic. The primary key species are dense, vigorously growing sword fern and oxalis. Sword fern is highly shade tolerant and tolerates moderate burns. Salal often occurs in the community on southerly aspects and convex slopes. Vine maple increases when there are openings created by blowdown or disease.

Management concerns are related to the invasion of red alder and salmonberry when sword fern has been killed or when there is surface soil disturbance. Soils are highly productive and provide for a variety of well suited conifer plantations. Soils remain moist for much of the year and are subject to deep disturbance from equipment when moist.

Several special plant communities exist in the Upper Siletz watershed, including seasonal and permanent wetlands, wet and dry meadows (grass balds), and/or shallow soil/rocky areas (see Map #7). These special plant communities offer unique habitats for both plants and wildlife, thus increasing ecosystem diversity within the watershed. However, the extent of these habitats in the watershed is poorly understood. Preliminary estimates for BLM-administered lands, based on TPCC data, are as follows: 440 acres of seasonal wetlands (including some riparian hardwood communities); 93 acres of permanent wetlands; 112 acres of dry meadows; 26 acres of surface water; and 829 acres of shallow soil/rocky areas. Estimates for private lands are largely conjectural but there are an estimated 136 acres of permanent wetlands/surface water in Sec. 15-16 of T7S R8W.

Fire

The natural fire regime across the Coast Range landscape has been greatly influenced since settlers began moving into this region in the mid-1800s. With settlement also came logging. These two factors have had a major effect on the seral stage distribution, species composition, patch size, and spatial configuration of the current forests in the watershed. In the last 50 years, the incidence and effect of wildfires within and around the Upper Siletz watershed has been minimal as fire suppression policies have acted to minimize all non-prescribed fire.

Over several decades, the absence of both wildfires and the burning of pasturage for livestock have resulted in the natural transformation of the Afern openings@ and mountain top Agrassy balds@ back to forest. This transformation can be observed at many locations throughout the watershed. The forest edges are encroaching upon the open areas, converting them from grass, ferns, and low shrubs back to forest. In some areas, this process has been hastened by planting of conifers by landowners.

The major ignition sources for fires in the watershed since 1900 have been directly related to timber harvest activities or recreational use. Outside of prescribed burning, fires caused by equipment malfunction or careless use resulted in most of the acreage burned since 1900. Prior to the time extensive logging began about 1900, there is mention of only one large fire that occurred in the south end (Valsetz area) of the watershed, in 1908 (Boise Cascade 1953). A different source listed the size of the area burned as 4,000 acres of private timber, with the date of the fire listed as August 1910 (Seall 1992). Other historic fires in this watershed involved some reburns of portions of the old Valsetz fire area, along with new acreage; 5,000 acres south and west of the lake burned in 1937 and 1938, and 1,800 acres burned north of the town in 1943. In the summer of 1945, a 13,000 acre fire started on private timber land and burned in the northeastern portion of this watershed and in the adjacent drainages; approximately 8,000 acres burned within the Upper Siletz watershed. The fire burned logged-over lands for the most part, although about 1,700 acres of mature timber were also lost (Baldwin 1982).

Prescribed fire has been the preferred method for treatment of logging slash and brush following clearcut harvests. In some respects, the logged units can be compared to past catastrophic fire events. The patch size of these modern Astand-replacement events@ has corresponded to that of harvest units. During the past three decades, federal clearcut units have ranged from about 10 to 70 acres, with 30 acres being about average. On private and state lands, the unit size is generally much larger, often exceeding 100 acres, with an average around 50 acres. Smoke management restrictions have steadily forced reductions in unit size, fire intensity (tons/acre consumed), and total acres burned. Twenty years ago, nearly all burning was done in the fall when the large fuels were dry, resulting in high fuel consumption and severe effects on soil and coarse woody debris. Since about 1980, the preferred burning season has shifted to the spring, resulting in much less impact to these resources. In the first half of this century, extensive, fairly contiguous logging created large, open patches, and left behind significant amounts of cull material and large snags. Many of these areas were subsequently burned over. These early, large, contiguous burns could be considered a much closer replication of natural processes than the more recent practice of smaller harvest units and associated reductions in the amount of coarse, woody material. However, creation of some smaller patches at a specified level (as replicated by modern logging practices) would seem to be in accordance with the creation of small natural openings as described under reference conditions. The recent practice of leaving significant numbers of standing trees and snags along with down logs in harvest units results in conditions that very closely match a natural fire of moderate to high intensity. Average size of harvest units on federal land is now too small to replicate expected, large-scale catastrophic conditions, but opportunities exist with limits of ownership boundaries to adjust size upwards if desired. Any such actions would need to consider actual and expected harvest on adjacent private lands.

Overall, acreage burned in the decade of the 1990s has fallen, due in large part to smoke management constraints and rising costs. Many units, especially on private land, are now planted following harvest, with little or no treatment of the slash. Large blocks of unburned fuel accumulations do pose an increased risk for a large fire event in the future that could spread into mature timber reserves on federal land. The emphasis on leaving snags and down logs on federal land will increase rates of spread and resistance to control if any fires break out. Previously burned clear-cut units, roads, and the general patchwork nature of stands within the watershed may mitigate this increasing fire risk somewhat.

Forest Health Considerations

The current forest health conditions in the Upper Siletz watershed are considered within the probable range of historic conditions (USDI-BLM 1995). Disease and insects are natural components of the watershed. Various root diseases likely occur within the watershed (including *Phellinus weirii*, or laminated root rot, which is known to occur) but have not had significant effects on stand mortality. Historically, insects have not been a significant problem, although windstorms may increase insect problems such as the Douglas-fir bark beetle. Outbreaks of Douglas-fir beetles typically last only three years, with the beetles attacking and killing fewer trees each year. Openings produced by these beetles can be beneficial by allowing increased light to the forest floor, and thus higher plant diversity and enhanced development of multi-storied canopies over time.

Threatened, Endangered, and Sensitive Plant Species

No threatened or endangered species are presently known to occur within the Upper Siletz watershed. The loose-flowered bluegrass (*Poa laxiflora*), a BLM sensitive species (Tracking), is known to occur at one site in the watershed. The Oregon Coast Range represents the center of distribution for this species and contains the majority of known sites. Threats to this species are now minimized on federal lands due to reduced clearcutting of forests.

Queen-of-the-Forest (*Filipendula occidentalis*), formerly a federal candidate species, and a state candidate species, is known to occur at six sites in the watershed. This species prefers cool, moist, shady areas along rock riverbanks on the west side of the Coast Range. It grows just above high water on boulder-strewn washes and rocky north-facing cliffs overlooking streams where seeps and crevices provide moisture. The populations of this species are in relatively inaccessible sites and are stable as assessed by monitoring.

Noxious Weeds

Certain invasive plant species, listed as Noxious Weeds by the Oregon Department of Agriculture (USDI-BLM 1994), are known to occur in the Upper Siletz watershed. These include Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), Scotch broom (*Cytisus scoparius*), St. Johnswort (*Hypericum perforatum*), and tansy ragwort (*Senecio jacobaea*). Canada and bull thistles, St. Johnswort, and Scotch broom are well established and widespread throughout the Marys Peak Resource Area. Eradication is not practical using any proposed treatment methods. However, treatment emphasis has been (and will likely continue to be) on use of biological control agents. Populations of tansy ragwort have been partially contained as a result of these efforts. Populations primarily occur in disturbed areas, such as along roadsides and on landings.

Species in the Record of Decision

Appendix #10 lists the likelihood of occurrence for Northwest Forest Plan ROD species within the Upper Siletz watershed. These species will be protected by the application of survey and manage procedures, as designated in the Northwest Forest Plan. A complete understanding of the current condition is unavailable for many of these species, particularly the non-vascular plants (lichens and bryophytes) and fungi. Currently, only one species, *Hypogymnia duplicata*, is known to occur in the watershed, and only at one site in a Late Successional Reserve. The following factors have contributed to our limited knowledge about these species:

- Survey and inventory has predominantly been limited to vascular plants.
- Sightings are few and widespread for some species, indicating large gaps in range information.

- Only the most rudimentary of ecology data is available for many species; therefore, habitat requirements are essentially unknown for most of these species.

C Sighting location information is often general, lacking specific information.

Unique or Uncommon Plants

The Upper Siletz watershed contains plant species that are considered uncommon and of special interest. Some of these species are protected under the Oregon Wildflower law (State of Oregon 1963) which makes it unlawful to export or sell or offer for sale or transport certain plant species. Some of these species likely to occur in the Upper Siletz watershed include *Calochortus* spp., *Calypso* spp., *Erythronium* spp., and *Rhododendron* spp.

Private vs. Public Lands Considerations

Private forest lands within the watershed will be managed in accordance with the state of Oregon=s Forest Practices Act (FPA) standards in place at the time of harvest. Private ownership in the Upper Siletz watershed is restricted to large corporate managers. To our knowledge, there are no known small woodlot owners in the watershed. The general trend on industrial forest lands within the watershed is to manage all stands under a 40-to-60 year rotation and to control competing vegetation by the application of herbicides. On these lands, approximately two trees per acre are retained for use by wildlife. These trees are commonly located on the edge of units and/or next to riparian buffers. Under the existing FPA standards, the riparian buffers may decrease in size (width) in the future. This is because riparian widths are based unpon the amount of tree volume (especially conifer basal area) adjacent to the stream channel. As trees adjacent to the stream grow larger (volume increases), trees can be cut and consequently, riparian buffer zones may decrease in width.

In the past, vegetation on public lands has been managed typically on short rotations (60 to 80 years). Approximately two snags per acre were retained for wildlife, although this was not always achieved in harvest units; riparian buffer strips approximating 80 feet were retained. The primary factor impacting future vegetation patterns within the watershed is the change in management direction on federal lands from timber production (primarily through clearcut harvesting) to the development of late-successional habitat.

Riparian Reserves

A. Reference Conditions

Riparian vegetation condition prior to 1900 was estimated based on Ripple=s study (1994) which concluded that late-seral forest in the Coast Range prior to 1850 occupied about 61 percent of the landscape. In the Upper Siletz watershed, there is a distinct possibility of a higher percentage due to high rainfall. Accordingly, we assume that the vegetation condition within riparian areas prior to 1900 likely included at least 60 percent late-seral forest. Hardwoods occupied an unknown percentage of riparian areas (but likely less than 40 percent of the watershed) due to their preference for wet soils and disturbed sites. The longevity of hardwood stands is also much less than conifers, with current data suggesting 80 to 100 years.

The shade condition and amount of large woody debris in riparian areas prior to 1900 can be deduced from the percentage of late-seral forest estimated to occur prior to 1850. We estimate that the shade and large woody debris conditions were likely within the natural range of conditions for at least 60 percent of the riparian acreage.

Impacts associated with transportation systems prior to 1900 are assumed to be minimal.

Bank stability prior to 1900 likely varied within a range of natural variability largely determined by natural stream processes and interactions of the stream with riparian vegetation. Floods such as recently observed in 1996 likely resulted in periodic disturbances which greatly affected bank stability for certain time intervals during and subsequent to the disturbance. Except for these periods of catastrophic disturbance, intact riparian vegetation likely resulted in significant amounts of stable streambanks (with few areas of active cutting and soil loss).

For an in-depth discussion of ecological and physical processes affecting riparian areas, refer to Appendix #11.

B. Current Conditions

Riparian Vegetation

Riparian vegetation was analyzed by interpretation of Spot Imagery (1988). Harvesting between 1989 and the present was digitized after referral to logging plans submitted to the Oregon Department of Forestry (Dallas, Oregon Field Office). Table #6 displays acreages of vegetative categories within 100 feet of streams by subwatershed .

The broad vegetative patterns within 100 feet of streams for the entire watershed include:

- 80+ year conifer forest comprises about 3.5% of the total acreage within the 100 foot zone.

- 50-70 year conifer forest comprises about 39%.

- 10-40 year conifer forest comprises about 28%.

Vegetative patterns within 100 feet of streams for specific subwatersheds include:

- Dominant vegetative types in Boulder Creek include 50-70 year-old conifer forest, followed by 10-40 year conifer.

- Dominant vegetative types in the Lower NF Siletz include 50-70 year-old conifer forest, followed by 10-40 year-old conifer and 10-40 year-old mixed forests.

- Dominant vegetative types in the Upper NF Siletz include 10-40 year-old conifer, followed by 50-70 year-old conifer and 200+ year-old conifer.

- Dominant vegetative types in the SF Siletz include 50-70 year-old conifer, followed by 10-40 year-old conifer, grass/forb/recent clearcut, 50+ year-old hardwood, shrub/open sapling, and open/recent clearcut.

Table #6. Acres of Vegetation Categories Within 100 Feet of Streams by Subwatershed.

	Subwatersheds				
Vegetation Category	Boulder Ck	Little NF Siletz	Upper NF Siletz	SF Siletz	Total Watershed
Open - road, quarry	0.6 (0.02)	0.00	0.4 (0.01)	0.00	1.0 (.01)
Open -recent clearcut	12 (0.4)	69 (4.5)	15.5 (0.6)	464.5 (8.2)	561 (4.3)
Open - exposed rock	9.7 (0.3)	0.00	1.7 (0.1)	0.00	11.4 (.09)
Grass/forb - grassland	11.1 (0.4)	0.00	0.00	0.00	11.1 (.09)
Grass/forb - recent clearcut	0.00	0.00	48.3 (1.7)	863.9 (15.2)	911.2 (7.0)
Shrub/open sapling - persistent	9.3 (0.3)	5.2 (0.3)	48.2 (1.7)	0.00	62.7 (0.5)
Shrub/open sapling - clearcut	30.8 (1.1)	18.5 (1.2)	31.7 (1.1)	522.7 (9.2)	603.7 (4.7)
10-40 Yr Conifer	533.3 (18.2)	377.8 (24.5)	1,705 (60.7)	890 (15.7)	3,506.1 (27.0)
50-70 Yr Conifer	2,140.9 (72.9)	745 (48.4)	537 (19.1)	1,612 (28.4)	5,034.9 (38.8)
80-120 Yr Conifer	15.1 (0.5)	0.00	76.3 (2.7)	0.00	91.4 (0.7)
130-190 Yr Conifer	0.00	0.00	0.00	12.1 (0.2)	12.1 (.09)
200+ Yr	39.9 (1.4)	29.9 (1.9)	277.7 (9.9)	0.00	347.5 (2.7)

	Subwatersheds				
Conifer					
10-40 Yr Mixed	3.8 (0.1)	174.5 (11.3)	19.8 (0.7)	32.8 (0.6)	230.9 (1.8)
50+ Yr Mixed	71 (2.4)	34 (2.2)	0.00	410.9 (7.2)	515.9 (3.9)
10-40 Yr Hardwood	26.5 (0.9)	19 (1.2)	30 (1.1)	230 (4.0)	305.5 (2.4)
50+ Yr Hardwood	31 (1.1)	67.2 (4.4)	8.6 (0.3)	650.5 (11.4)	757.3 (5.8)

Riparian Shade Condition

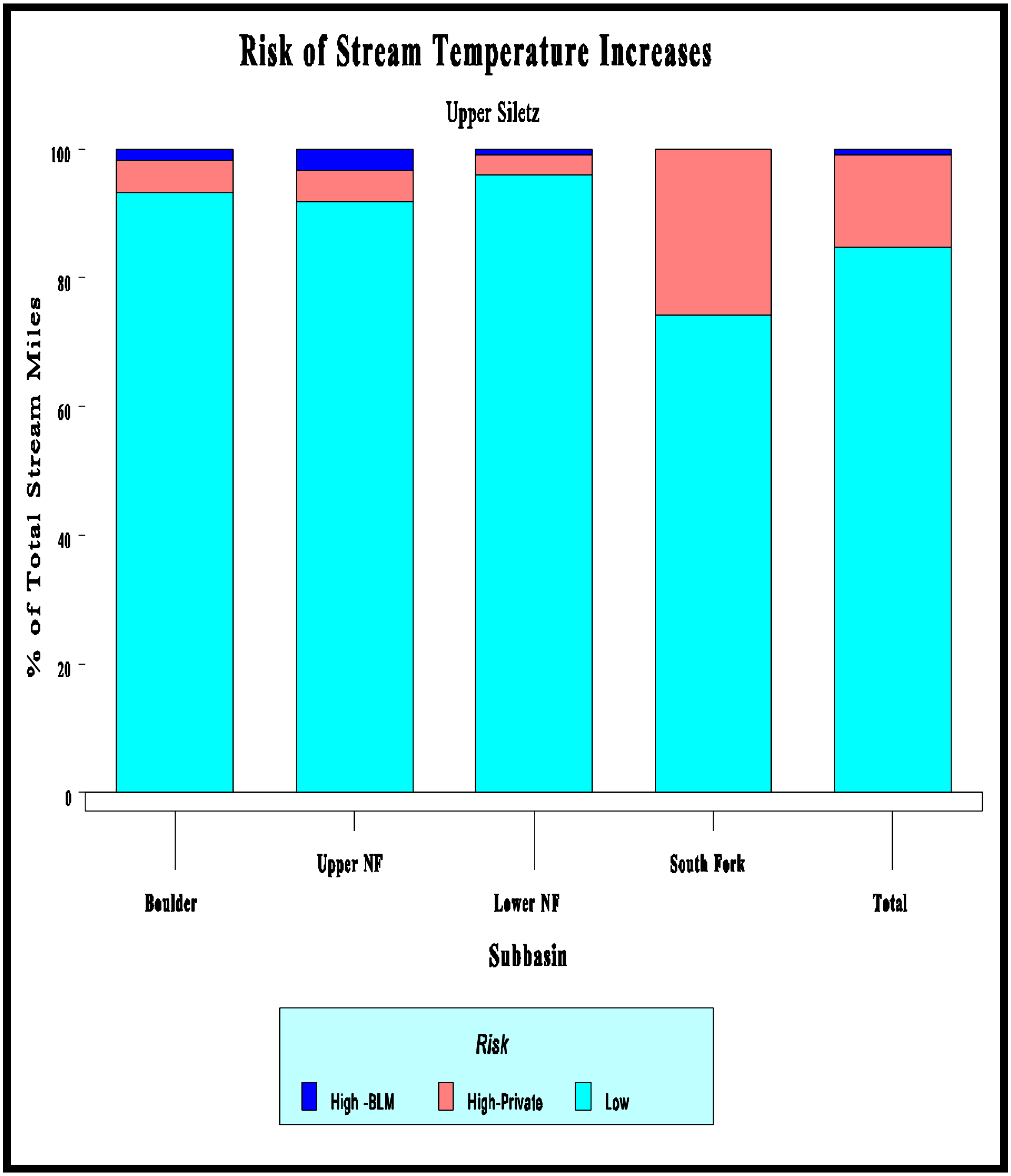
A risk analysis was conducted to evaluate the potential for increases in stream temperatures in response to inadequate streamside vegetative cover. The analysis is based on an assessment of canopy closure in the adjacent riparian zone as measured from satellite imagery (Landsat thematic mapper). Refer to Appendix 11a for the methodology used in this analysis.

Perennial stream segments with riparian vegetation that included either open brush or recently burned fields and recently planted conifer (within 100 feet of the stream) were rated as AHigh Risk@ for increases in stream temperature at baseflow due to exposure to solar radiation and lack of insulating cover. All other vegetation types were assumed to be ALow Risk.@ Intermittent streams, in this case all first-order streams, are assumed to have no flow during critical periods for high stream temperature and therefore were not evaluated. Map #9a displays perennial and intermittent streams in the Upper Siletz watershed.

In streams with poor shade levels, there is risk of an altered temperature regime which can push stream temperatures into a range that is potentially detrimental to anadromous fish reproduction and survival (generally, temperatures above 60 ^{o}F; see Water Quality and Fisheries sections in this report). Map #8 displays streams at risk for high temperatures during summer base flow in the Upper Siletz watershed.

There are 41 miles (15% of total) of high-risk stream sections in the Upper Siletz watershed; 38 miles (93%) are on private lands and about 3 miles (7%) are on BLM (Figure #2).

Figure #2. Streams at Risk of High Stream Temperatures.



Approximately 31.3 miles (82%) of the high-risk mileage are in the SF Siletz subwatershed, and 13 miles (42%) of these are response reaches with potentially high-quality aquatic habitat. These reaches constitute about 30% of the high-potential aquatic habitat in the SF Siletz subwatershed and are potentially unusable as habitat during summer base flow due to stream temperatures in the lethal range. Altogether, there are 18.2 miles of response reaches (or 28% of the 64 mile total) that are potentially exposed to direct solar radiation and high temperatures during base flow. These reaches are candidates for stream temperature monitoring during summer base flows and for projects to help speed recovery of riparian vegetation and cover.

Large-Woody-Debris Recruitment Potential

Potential for recruitment of large woody debris (LWD) to stream channels and flood plains was estimated using vegetation seral-stage data from satellite imagery (Landsat thematic mapper). High recruitment potential was assumed for riparian stands that are within 100 feet (30 meters) of the stream channel and dominated by conifer or mixed conifer-hardwood stands greater than 120 years. Riparian zones with open, semi-open, brush, agricultural fields, or hardwood-dominated vegetation were assumed to have low LWD potential. Recruitment potential is summarized in Figure #3 and Table #7 (and displayed as Map #9 in the map packet). Refer to Appendix 11a for methodology.

Table #7. Acres of Vegetation with Low LWD Recruitment Potential Within 100 Feet of Streams in Upper Siletz Watershed.

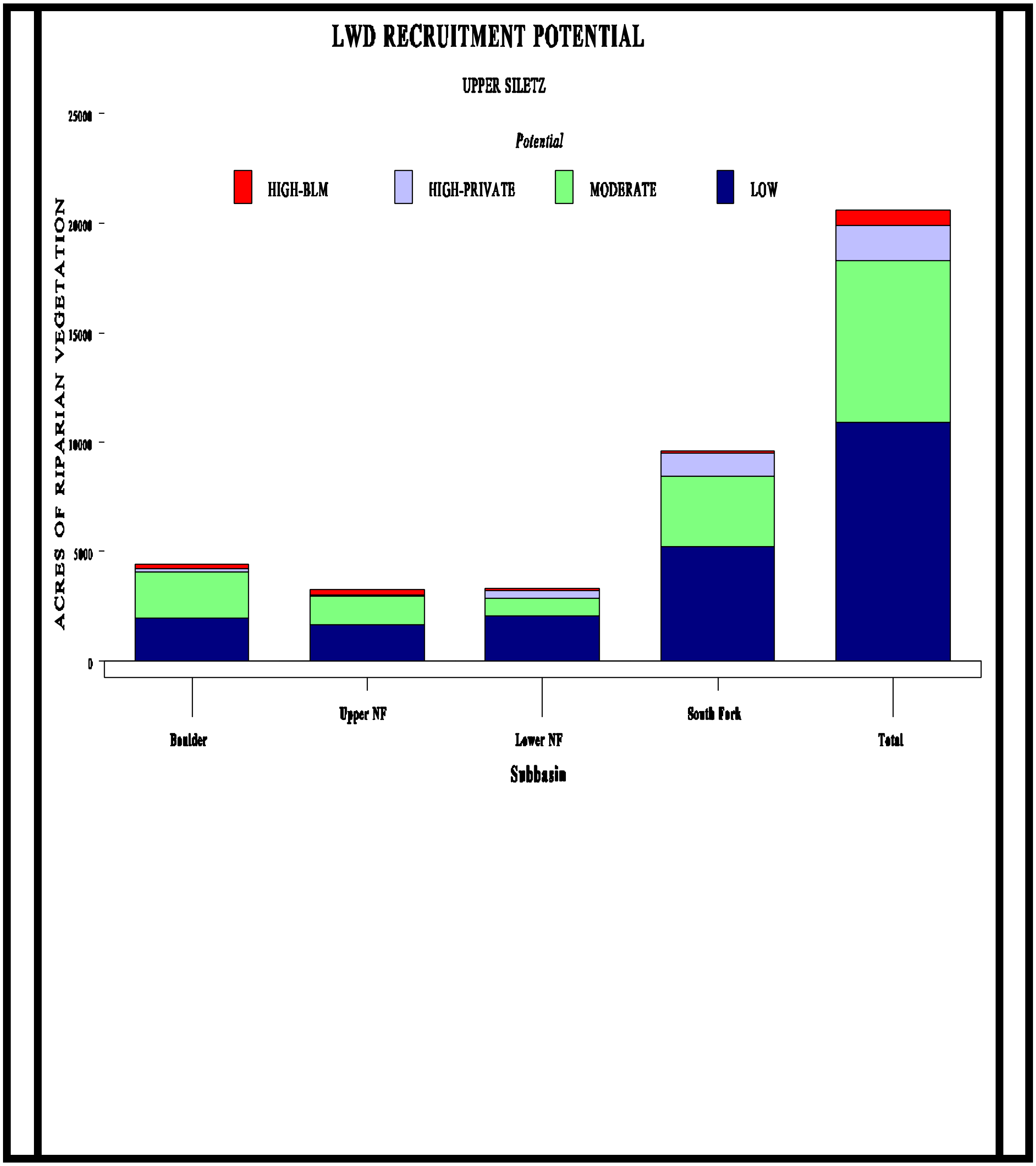
Subwatershed	BLM	Private	Total
Boulder Creek	876	1,079	1,955
Upper NF Siletz	696	979	1,675
Lower NF Siletz	295	1,760	2,055
SF Siletz	216	5,015	5,231
Total	2,083(19%)	8,833(81%)	10,916

There is a total of about 20,602 acres of riparian vegetation within 100 ft of stream channels in the Upper Siletz watershed; BLM manages about 4,918 acres (24%) and private loandowners about 15,684 acres (76%). About 10,916 acres (53%) of the total have low LWD recruitment potential; 2,083 acres are managed by BLM and 8,833 acres by private landowners. BLM-managed areas with low LWD recruitment potential are candidates for enhancement projects.

Riparian stands with low LWD potential ranged from 44% of total acres (i.e., 1,955 acres of the total riparian acreage within the subwatershed) in Boulder Creek to 62% (2,055 acres) in the

Lower NF Siletz subwatershed. The SF Siletz subwatershed has the largest overall acreage with low potential for LWD; about 5,231 acres (48% of the total) of which about 5,015 acres (96%) are privately managed. About 1,572 acres (75%) of the low potential acreage on the BLM is in the Boulder and Upper NF Siletz subwatersheds.

Figure #3. Large Woody Debris Recruitment Potential by Subwatershed.



Hydrology

A. Reference Conditions

Historical stream-flow processes were assumed to be the same as those currently observed. Hydrologic characteristics of the Upper Siletz watershed varied prior to 1900 (as well as during the Holocene) with short (annual to decadal) to long-term (century to millennia) climatic patterns interacting with the natural disturbance regime.

Drier periods likely resulted in a tendency towards reduced peak flows, flooding effects, and summer base flow (due to reduced levels of water storage). However, this was likely offset by increases in the frequency and intensity of fires (with alterations in vegetational patterns), which resulted in a tendency toward higher summer base flows (due to reductions in evapo-transpiration) and increases in surface runoff following subsequent rainfall with earlier and larger peakflow events. Simultaneously, following fire events, the stage was set for increases in sediment production and delivery to streams through mass wasting and surface erosion; however, this was likely offset during dry periods by reductions in the size and frequency of storm and flooding events which precipitated mass wasting and transport of the material. During wetter periods, the situation was reversed but the results, contrasting processes interacting to partially offset the effects of the other, continued in dynamic equilibrium.

B. Current Conditions

Discharge on the Siletz River

This report utilized summary data from the USGS (USGS 1984) and the most current discharge data from the USGS Watstore program. The Siletz River has been gaged at the town of Siletz (river mile 42.6) since 1906. This site gages stream discharge on a 204 mi^2 portion (66%) of the 308 mi^2 Siletz River drainage. It includes several miles of the main stem of the Siletz River, the Upper Siletz watershed (70 mi^2 or 34% of the gaged drainage), and the Rock Creek and Gravel Creek watersheds. For the period of record (1906 - 1982), the average annual water yield for the entire Siletz system was estimated at 1,131,000 acre-feet per year with an average mean-annual-discharge of 1,561 cubic feet per second (cfs). Over 50% of the annual flow came in the months of November though February. Monthly mean flows ranged from a low of about 660 cfs, occurring in late summer, to a high of 2,337 cfs during typical winter months. Maximum monthly flows generally occurred during the months of December, January, and February, with a second peak (associated with spring snowmelt) occurring in April. Extreme flows for the period of record ranged from a low of 48 cfs in the fall of 1965 and 1967 to an instantaneous peak flow of 34,600 cfs on November 22, 1909.

For the Siletz River as a whole, an underlying base of fine-grained sedimentary and volcanic rock of low porosity and permeability significantly limits groundwater resources. Groundwater resources are generally poor except for the marine terraces and possibly some sand dune areas bordering the coast. Some alluvial terrace and flood plain deposits bordering streams in the

Upper Siletz watershed, notably in the area of the former Valsetz lake, serve as fair aquifers which are critical to the maintenance of riparian and wetland habitat during summer base flow.

Peakflow

Significant flood events have occurred historically on a fairly regular basis throughout the coastal region (Bodhaine 1961). At the Siletz River gauge, there have been 13 peak events with a greater than five-year-recurrence interval during the period of record (Figure 4). These peak flow events were measured for the Siletz River from 1906 to 1996 at the town of Siletz. Five of these events exceeded the ten-year-recurrence interval, and three (1909, 1931, 1965) were greater than 25-year events. For comparison, the recent peak flow event (February 7, 1996) crested at 28,500 cfs which has approximately a five-year-recurrence interval.

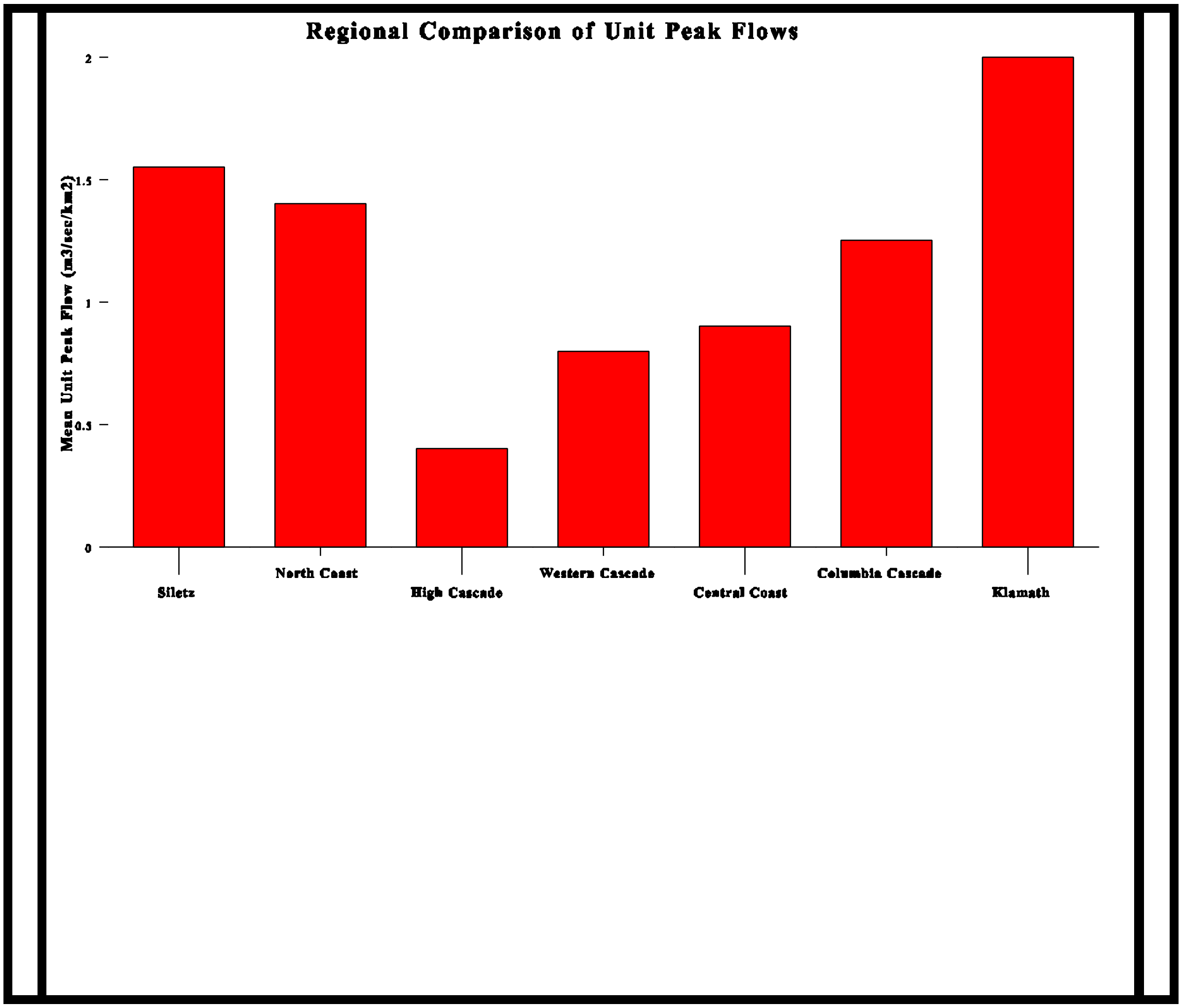
Unit Peak Flow

Figure 5 displays the unit peak flow (instantaneous peak flow for a ten-year event per unit area) for the Siletz River in comparison to the mean unit peak flow in North Coast Range watersheds and other regions of the Pacific Northwest (Frissell 1992).

Unit peak flow describes the intensity of storm events as a ratio that can be compared across regions or watersheds. Unit peak flow in the Siletz River (1.55) is higher than the regional mean of 1.4. Watersheds in the North Coast Range (including the Siletz River) are second only to the Klamath Mountains of southwest Oregon and northwest California, a region known for the intensity of its peak flow events. Unit peak flow has been correlated with stream channel instability and failure rates of fish habitat enhancement projects (Frissell 1994).

Figure #4. Siletz River Peak Discharge.

Figure #5. Regional Comparison of Unit Peak Flow.



Transient Snow Zone and Peak Flows

Siletz River flood events are similar to other documented floods in the region. These peak flow events occur during the rainy season in the "transient snow zone" (TSZ) following a rapid and substantial depletion of the snowpack during a prolonged rain-on-snow period. The TSZ is estimated to average approximately 1,800 feet in elevation. Below this elevation, precipitation is predominantly rainfall (Arain-dominated zone@). Approximately 26,000 acres (60%) of the Upper Siletz watershed lies within the TSZ. Of this area, the BLM manages 8,612 acres (33% of the total).

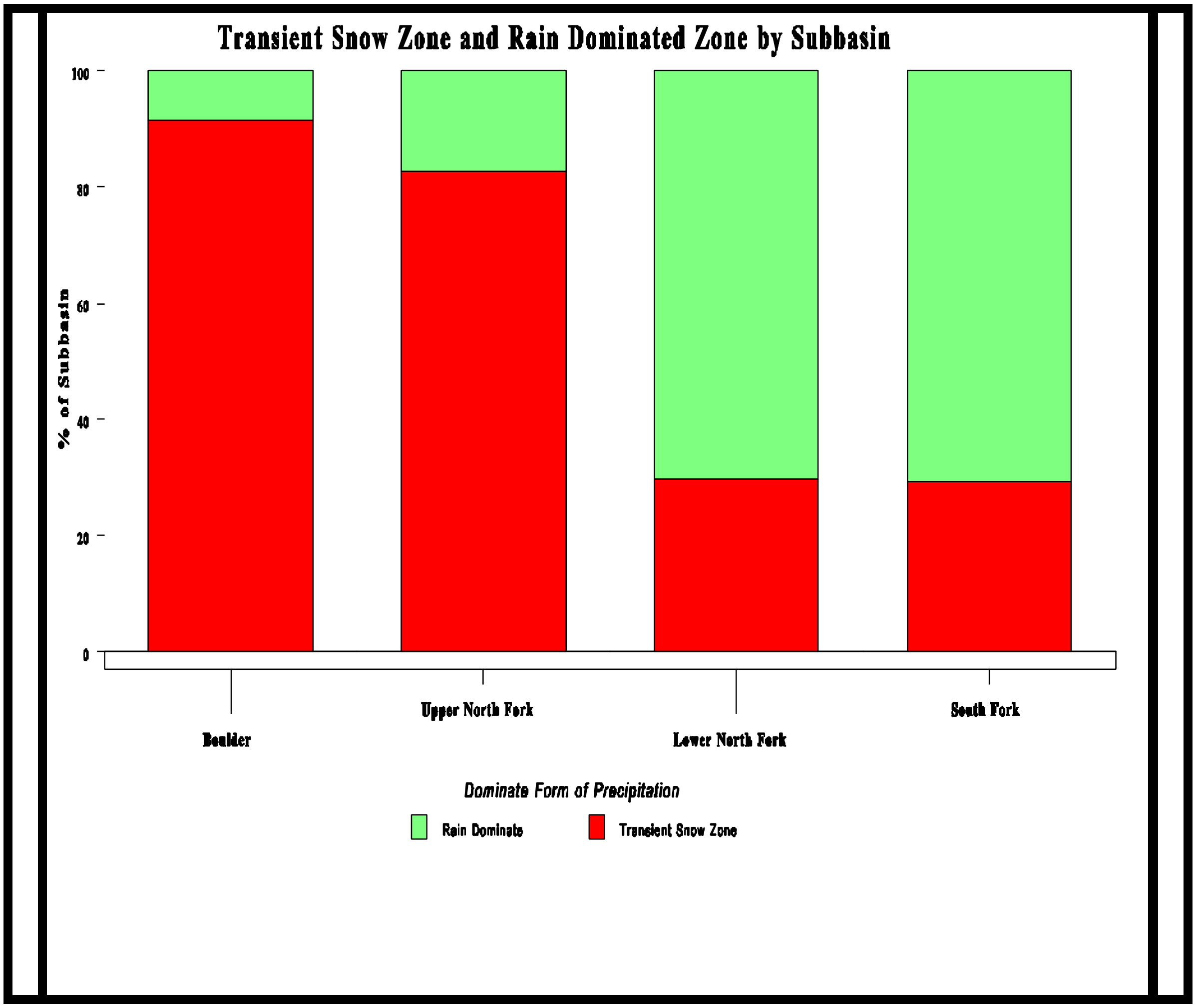
Figure 6 displays the proportion of each subbasin in the TSZ and rain-dominated zones. About 91% of the Boulder Creek subwatershed (10,243 acres) and 83% of the Upper NF Siletz subwatershed (9,577 acres) are in the TSZ. The TSZ is particularly vulnerable to extremes in storm events, and represents areas of high risk for road construction and timber harvest. Roads in this area, particularly on unstable sites, are a high priority for decommissioning. In contrast, approximately 12,226 acres of the SF Siletz subwatershed (71% of the total) are in the rain-dominated zone. However, much of the TSZ in this subbasin lies on Fanno Ridge, on or just above a high mass-wasting-prone site, and is heavily dissected by roads.

Forest Management and Discharge

While controversy continues to surround the issue of forest management effects on stream discharge, the most recent research in the region indicates that peak discharge increases by as much as 100% in harvested basins approximately the size of the Upper Siletz watershed (Jones and Grant 1995). These increases are attributable to changes in flow routing due to roads, and changes in water balance due to treatment effects and vegetation succession. In addition, studies have found long-term reductions in summer baseflow in managed basins, which were attributed to alterations of riparian vegetation and degradation of flood plains and wetlands.

No analyses of peak flow increases or reductions in summer baseflow in the Upper Siletz watershed were conducted for this document. However, it seems reasonable to assume that the timing and quantity of peak flows are likely to have been altered in the watershed as a result of the extensive harvesting and road construction in this basin. Future iterations of watershed analysis may employ computer modeling to test this hypothesis. Reductions in baseflow resulting from conversion of riparian vegetation to hardwoods and the degradation of wetlands and flood plains are most likely to occur in the SF Siletz subwatershed, because of limited federal ownership. The following sections summarize current conditions in the watershed that are likely to affect stream discharge.

Figure 6. Transient Snow Zone and Rain-dominated Zone.



Roads and Peak Flow

Figure 7 displays road densities for the watershed. The Upper Siletz watershed has 562 miles of road for a total road density of 4.6 miles/mile^2 of surface. This is probably an underestimate because data on private road mileage are poor. Highest road densities occur in the Upper NF Siletz subwatershed with 5.9 miles/mile^2 followed by the Lower NF Siletz subwatershed with 4.9 miles/mile^2. About 65% of total road mileage exists in the Upper NF Siletz and SF Siletz subwatersheds (107 and 103 miles, respectively). A total of 39 miles of road (48% of total road length) is currently located within riparian zones (based on interim riparian widths) on BLM-administered lands in the Upper Siletz watershed. The Aquatic Conservation Strategy requires that these roads be closely evaluated in terms of their impact on aquatic functioning; these sections of road are candidates for closure/decommissioning (see Human Uses - Roads in Chapter 3&4). A total of 17 miles of road are currently located on moderate to high risk landslide terrain in the Upper Siletz watershed. These sections of road on BLM-administered lands have been inventoried and evaluated as candidates for closure/decommissioning (see Human Uses - Roads in Chapter 3/4).

Extension of the stream network at road intersections is cited as the principal causal agent in the alteration of peak flow timing and amplitude (Jones and Grant 1995). Mechanisms of channel extension include the capture and routing of precipitation and snow melt from compacted road surfaces to streams, and the interception of groundwater at road cutbanks and subsequent routing to streams. Analysis of roads and stream crossings with regard to the expansion of the channel network indicates that effective channel lengths appear to have increased by 90.7 miles (16% overall within the watershed) (Figure 8). This is a conservative estimate compared to the overall 57% increase in effective stream length measured in a study on forested lands in the Cascades (Wemple 1994). Confidence in this estimate is low due to the use of a generalized factor (400 ft. extension/stream crossing), undercounting of private road mileage, and the lack of field verification.

Vegetation and Discharge

A secondary causal agent for alterations in the timing and amplitude of peak flows is the temporary conversion of mature forest to early-seral stages following harvest. The mechanisms most often cited for this effect are the reduction in evapotransporation, increases in surface flow, and increased snow packs associated with openings. These effects are expected to last approximately ten years. Currently, 7,612 acres (17%) of the Upper Siletz watershed are in vegetation classes less than 10 years in age. About 83% of this acreage is in the SF Siletz subwatershed on private lands. In this subwatershed, about 6,314 acres (36%) of the vegetative cover are less than 10 years old. The SF Siletz subwatershed currently has the greatest risk for increases in peak flows as a result of forest harvest.

Figure #7. Road Density by Subwatershed Contrasted with the N.F. Alsea Watershed.

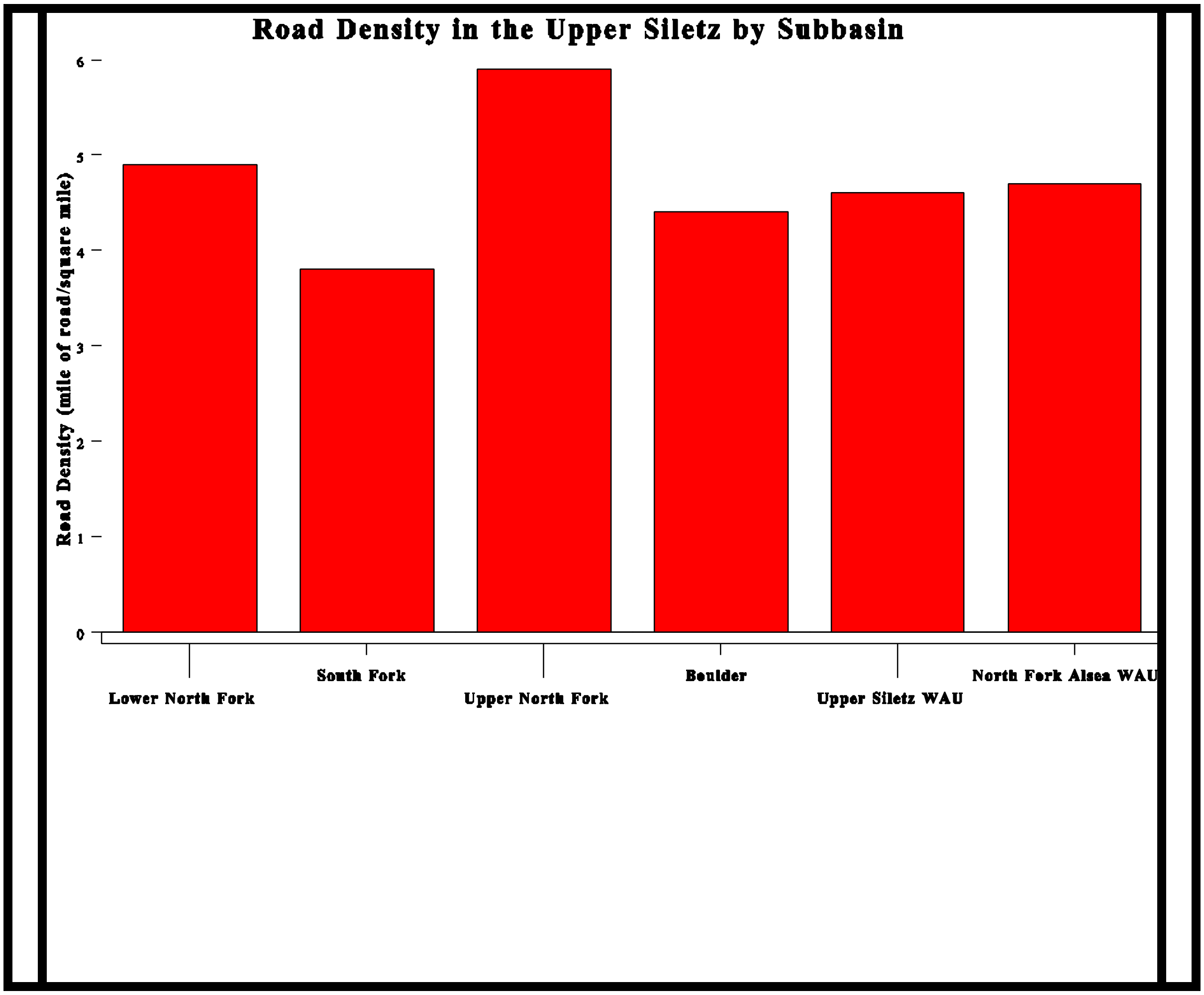
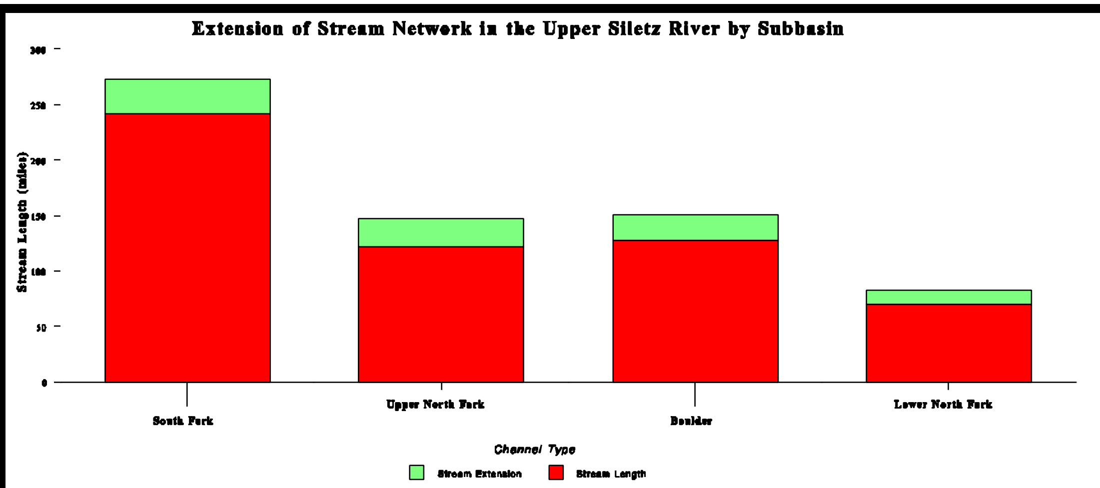


Figure #8. Extension of Stream Network by Roads.



Cumulative Effects

Potential for cumulative effects was assessed by integrating forest age class, landslide potential, stability of surficial geology, TSZ, and precipitation. A Arisk assessment@ was conducted by combining these variables in a matrix and assigning values of high, moderate, and low. The results are displayed in Map #10, AHydrologic Cumulative Effects.@

Figure 9 and Table #8 provide a statistical breakdown of the potential for cumulative effects by ownership and subbasin.

Table #8. Acres with High Risk for Hydrologic Cumulative Effects.

Subwatershed	BLM	# Stream Crossings	Private	Total
Boulder	850	8	740	1,590
Upper NF Siletz	606	2	357	963
Lower NF Siletz	71	2	301	372
SF Siletz	54	2	194	248
Total	1,581	14	1,592	3,173

In this instance, Ahigh risk@ indicates an area that has a very high potential for an acceleration of the rates and quantities of inputs (sediment, water, and LWD) to the channel system as a result of disturbance (either natural or human based). There are 3,173 acres (7% of the total watershed) with high risk in the Upper Siletz watershed; about 50% of these acres are in the Boulder Creek subwatershed. About 1,581 acres (50% of the total) are on BLM-administered lands with the majority in Boulder and the Upper NF Siletz subwatersheds. In addition, there are 14 stream/road intersections within areas for high risk of cumulative effects on BLM-administered lands. These intersections are potential hotspots for road-related inputs to streams.

Baseflow

At the Siletz gaging station, average monthly flows in August are 132 cfs with lowest recorded base flows of 48 cfs measured in 1965 and 1967. Measurements below the former Valsetz dam on the SF Siletz River suggest that summer baseflow in this reach averaged below 15 cfs and

Figure #9. Risk of Cumulative Effects.

frequently fell below 10 cfs prior to removal of the dam (Hardin-Davis 1985). Measurements since dam removal were not located.

The SF Siletz subwatershed is most likely to exhibit reductions in base flow due to the conversion of vegetation to hardwoods in riparian zones, and degradation of flood plains and wetlands. About 94 acres (or 30%) of the riparian vegetation adjacent to perennial streams are dominated by red alder. In addition, much of the extensive wetlands and flood plains appear to have been highly altered from presettlement conditions (see Channel Condition section in this report). Hypothetically, this subwatershed is vulnerable to measurable reductions in summer base flow as a result of these alterations, but this has not been tested.

In addition to the low summer baseflows of the Siletz River related to seasonal fluctuations, two legal components **C** water rights and minimum flow requirements **C** significantly diminish the availability of natural flows. The volume of water involved in these rights and diversions has resulted in conflicting demands for the available resource, particularly during the low flow season.

Water Withdrawal Rights

Oregon State's water appropriations doctrine is based on first-in-time/first-in-right. Holders of water rights are granted priority dates corresponding to the date of application. These rights are held as long as state requirements continue to be met. At the end of 1977, active surface water rights in the Siletz River system as a whole totaled 90.8 cfs, of which 67.2 cfs was for consumptive purposes. This included 3.8 cfs for domestic, 16.3 cfs for municipal, 33.1 cfs for industry, and 14.0 cfs for irrigation use. The nonconsumptive rights included 11.0 cfs for power and 12.6 cfs for fish life.

Water rights in the Upper Siletz watershed, as of February 1996, are limited to two holdings in the SF Siletz subwatershed; Boise Cascade Corporation (1955, .01 cfs) on Fanno Creek and A. J. Parrish (1930, .05 cfs) on Sand Creek. Whether these water withdrawal rights are being actively used at this time is unkown.

In June 1966, the Oregon State Water Resources Board (now the Water Policy Review Board) established minimum flow reservations "for the purpose of maintaining a minimum perennial streamflow sufficient to support aquatic life and recreation." The minimum flow criteria were modified in 1975 and are shown in Table #9.

Table #9. Siletz River Minimum Perennial Streamflows (In Cfs from River Mile 42.6 to Mouth).

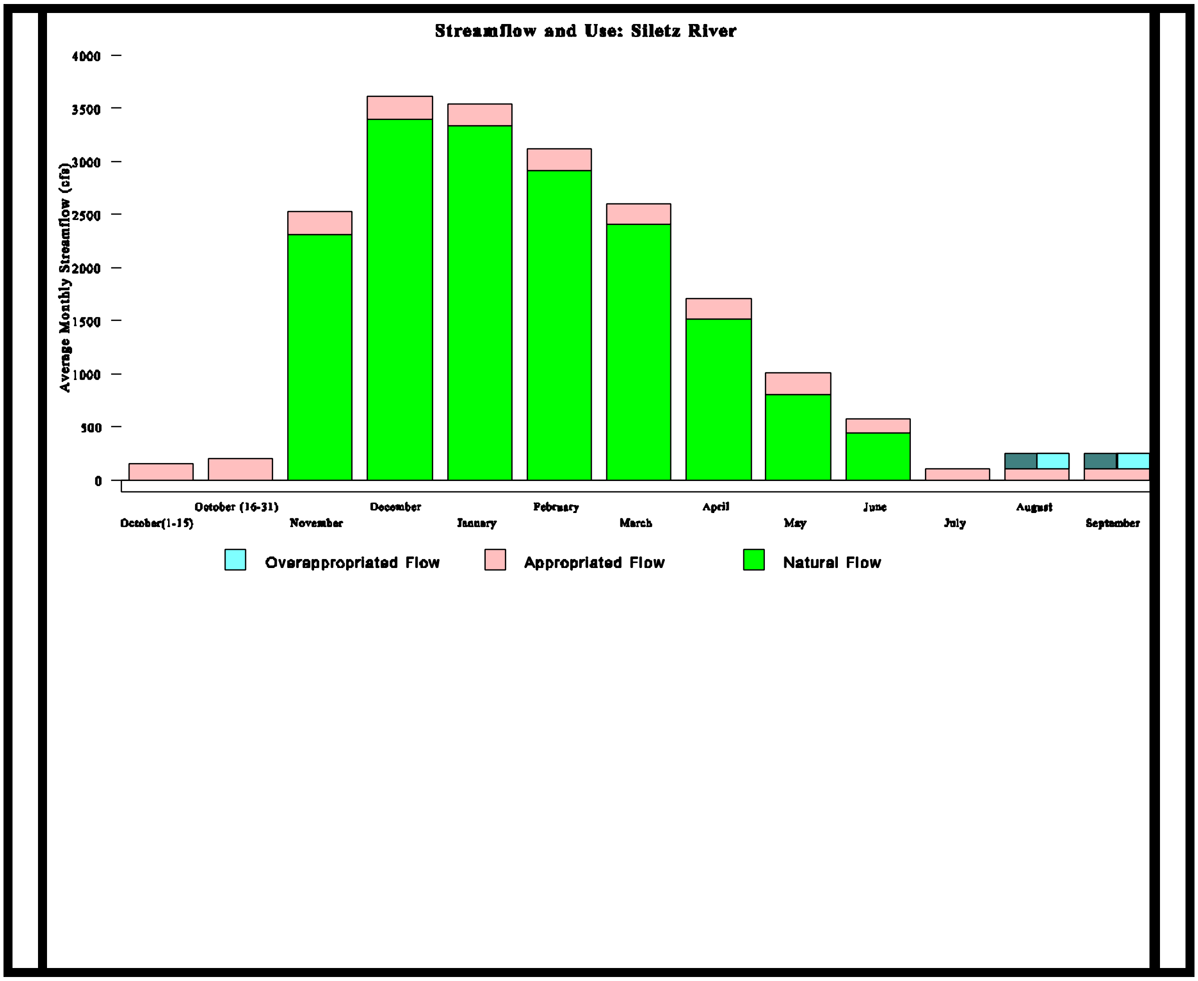
Oct (1-15)	Oct (16-31)	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
150	200	220	220	200	200	200	200	200	135	100	100

All water rights granted after the June 1966 date are subject to the minimum flow reservations. This has resulted in the appropriation and utilization of essentially all available streamflows on the lower Siletz River during the late summer and early fall period of critical years (Figure 10). The limited withdrawal rights in the Upper Siletz watershed are less than 1% of the total and are unlikely to significantly affect streamflow during this period. However, this watershed is a critical source of discharge for maintenance of summer base flows and water quality in the lower river. This value to the lower Siletz system may have been compromised as a result of alterations to the aquatic environment in the SF Siletz subwatershed. Data to substantiate this was not located for this analysis.

Confidence in Hydrology Analysis

There is high confidence in the Siletz River streamflow data from the USGS. Hypothetical alterations in stream flow from Areference conditions@ are based on professional estimates, deductions, and extrapolations from regional research. Overall, the material in this section is adequate for broad planning purposes, but site-specific data and recommendations are necessary to apply conclusions from this section.

Figure #10. Siletz River Monthly Streamflow Appropriations.



Stream Channels

A. Reference Conditions

Processes which controlled stream-channel morphology and sediment transport in the past are assumed to be the same as those currently observed. Characteristics of stream channels and sediment transport in the Upper Siletz watershed varied prior to 1900 (as well as during the entire Holocene) with short (annual to decadal) to long-term (century to millennia) climatic patterns interacting with the natural disturbance regime.

Drier periods, with significant reductions in precipitation, likely resulted in a tendency towards channel aggradation (increased storage of sediment and organic material in the channel), which probably resulted in pool filling, an increase in braided channels, and flood plain deposits. However, increased sediment supply was likely offset by reduced streamflow competence (ability to transport material) due to reductions in peak-flow events. This likely resulted in an overall dampening of variability in channel conditions and a slow down in the process rate. During wetter periods, the inverse situation was likely with a tendency towards increased variability, faster rate of processes, and a tendency toward channel cutting. Former flood plains were abandoned as streams mobilized and transported earlier deposits, entrenched into the streambed.

These processes were further altered in a spatial dimension. The SF Siletz River had an overall tendency (due to the low gradients and unconfined setting) toward greater storage of water and sediment on flat, alluvial flood plains and in the channel. Stream velocities were lower and the potential for pools, backwaters, and alcoves was greater in this area. Overall, the diversity of habitat types (both in channel and on adjacent flood plains) was high for the SF Siletz River. These conditions were likely to be highly conducive for beaver colonization. Beaver dams likely further reduced stream velocities, sediment, and water movement through the system, while increasing flooding. Dams were also highly influential for aquatic habitat types and conditions. These channel types were inherently susceptible to a higher range of variability in response to changes in the precipitation, sediment, and discharge regime.

In contrast, the NF Siletz River tended toward confined-and-deeply-entrenched, steep-gradient channels over bedrock, and large boulders or cobble. Due to the high resistance of bed-and-bank materials, these channels had a smaller range of variability in sediment transport and morphology in response to alterations in the discharge and sediment supply. The range of available aquatic habitat was smaller than in the SF Siletz River, and beaver colonization and influence in most of these channels was likely to have been rare.

Refer to Appendix #12 for a more detailed discussion of the ecological and physical processes affecting stream channels in the Upper Siletz watershed; for a discussion of the Rosgen stream classification (Rosgen 1994) see Appendix #12.

B. Current Condition**s**

Channel Morphology and Classification

As a first step in stratifying, the stream network was broken into segments based on gradient and valley confinement, following the classification of Montgomery and Buffington (1993). Channel classification is useful in identifying reaches of streams that are most sensitive to changes in water flow, sediment, and wood input (or removal). It is also useful for identifying those reaches that have the potential to provide the best fish habitat or have the greatest potential for response to enhancement projects.

Stream Channel Response Types

In general terms, the routing of stream flow, sediment, and organic material can be described by dividing the stream network into Asource,@ A transport@, and Aresponse@ reaches. Source reaches have gradients that are greater than 20%, and are found primarily in head walls and along steep side slopes. These reaches are the primary source for much of the water, inputs of organic material, nutrients and sediment. They have no flood plain development, and typically the riparian area is dominated by conifer.

The sensitivity of source, transport, and response reaches to disturbance varies widely with local surface geology and soil types:

Stream Type	Sediment Supply	Riparian Vegetation	Peak Flows
Source	Low-High	Low-High	Low-High
Transport	Low	Moderate	Low
Transport/Response	High	High	High

These reaches are subject to periodic scour by debris torrents (see Erosional Processes section of this report). Periodic, catastrophic disturbances in these reaches are typically a normal part of watershed ecology in the Coast Range and critical processes in the maintenance of the aquatic ecosystem (Benda, 1990). Many source reaches are intermittent or ephemeral channels (they have surface flow primarily in response to storm events).

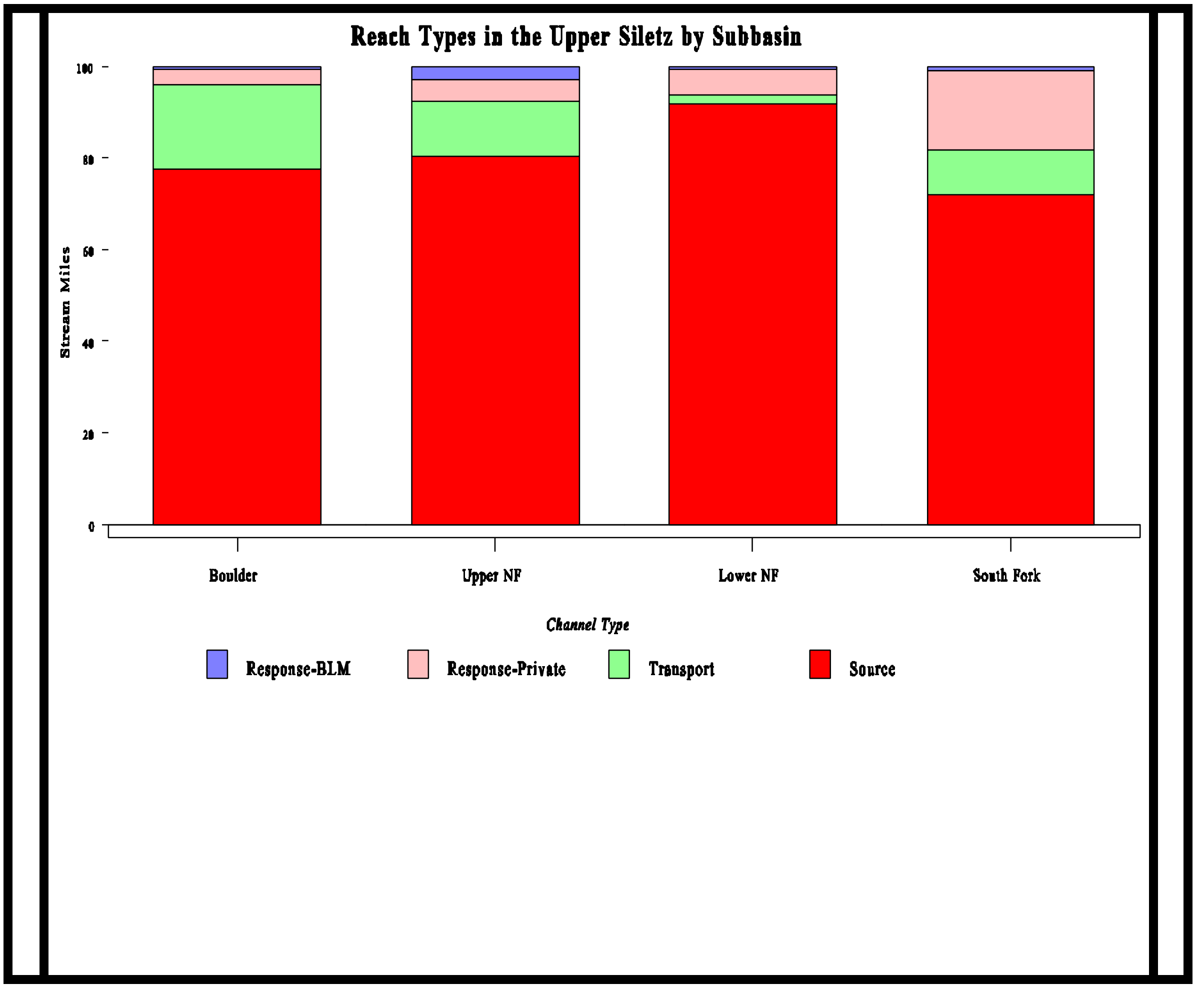
About 435 miles (78% of total stream mileage) of source-reach stream channels occur in the Upper Siletz watershed; 140 miles (32% of the total) of these are on BLM-administered lands (see Figure 11). The current, functional condition of source reaches on BLM-administered lands in the Upper Siletz watershed is largely unknown, because they are rarely investigated and no standard criteria for establishing condition on these channels is available. However, these channels are likely to be functioning properly due to the resistant nature of channel substrate and bedrock. Field investigations to date have confirmed this assessment although additional investigations are recommended (see Chapter 5/6).

Transport reaches have a relatively high gradient (4-20%), are fairly resistant to changes in stream morphology, and tend to act as conduits for material from high-gradient reaches to depositional, response reaches. These reaches typically have a cascade morphology, a large cobble or boulder substrate, and resistant banks with little or no flood plain development. Riparian vegetation is variable but tends to be dominated by conifers. There are approximately 64 miles (11% of total stream mileage) of transport-reach stream channels in the Upper Siletz watershed; 22 miles (34% of the total) are on BLM-administered lands (see Figure 11). As with source reaches, the current functional condition of transport reaches on BLM-administered lands is largely unknown; however, these reaches are also likely to be functioning near their reference condition.

Response reaches have low gradients (less than 4%), are unconfined or moderately confined, and are areas of sediment deposition, stream meander, and high diversity and abundance of aquatic habitat. These reaches can experience significant changes in stream morphology if sediment supplies increase, riparian soils and vegetation are disturbed, flow regime is altered, or channel elements (substrate, large woody debris, meander geometry, width-to-depth ratio, etc.) are disturbed.

Identifying response reaches that are sensitive to disturbance is important because these reaches may be the most critical for anadromous fish habitat. In addition, the high water tables, large inputs of nutrient rich organic material, and the protected valley settings of these reaches combine to produce diverse and productive riparian habitat on the flood plain. Finally, these reaches are critical for the buffering of stream flows (they reduce floods and support summer base flow) and the maintenance of water quality.

In general, reaches that are sensitive to changes are low-gradient, unconfined channels, in



uncohesive alluvium (gravelly, sandy or sandy-loam soils) especially at confluences with transport reaches. Transport reaches often enter response reaches at nearly right angles. This, in combination with low gradients, rapidly reduces the stream=s ability to transport sediment and flows. Channel meander and flood plain development are the stream=s natural response to these conditions, and therefore, it is critical for the functioning of response reaches that proper channel geometry be maintained. The same elements that maintain stable channel geometry (substrate,

Figure #11. Reach Types in the Upper Siletz Watershed.

large woody debris, meander geometry, width-to-depth ratio, etc.), are also critical for the maintenance of biological processes.

Approximately 64 miles (11% of total stream mileage) of response-reach stream channels occur in the Upper Siletz watershed; about 7 miles (11% of the total) are on BLM-administered lands (see Figure 11). The majority of response reaches (43 miles, 67% of the total) are on private lands along the SF Siletz River. It is critical for maintenance of the aquatic ecosystem in the SF Siletz subwatershed that these reaches are functioning properly, but based on limited field observations, most are probably in poor condition. This has likely changed the composition of aquatic populations in these areas (and perhaps has shifted some populations to adjacent reaches where conditions are better, if less than ideal). Some of these reaches are on BLM-administered land in the areas around Callahan Creek.

The functional condition of response reaches on BLM-administered lands is also largely unknown at this time. Limited field investigation indicates that the response reaches in the Callahan Creek project area are adjusting to heavy inputs of sediment from unstable hillslopes along Fanno Ridge (see Callahan Creek Environmental Assessment 1996). For this reason, in-channel projects to enhance fisheries habitat would likely have poor success in these channels.

Response reaches in the NF Siletz and Boulder Creek subwatersheds appear, from limited field observation, to have been improperly identified as response types. Identification of reach types based solely on topographic maps does not account for bedrock-channel systems. In this case, these channels are deeply cut into bedrock and constrained by the valley gorge; they function more as transport reaches. Channel inventory from the early 1900s indicates that these reaches were likely exposed to frequent log jams and catastrophic debris-dam-break floods during winter storms. These events are likely to have scoured the channel for hundreds of yards before piling up at another constriction point. Currently, these channels appear to have low levels of LWD and these types of events are probably less frequent relative to reference condition.

There are also short sections of response reaches on BLM-administered lands located on level areas higher up in the watershed above the inner gorge. These reaches are unavailable to anadromous fish due to waterfalls and cascades blocking passage. Many of these reaches, such as in the upper portion of Warnick Creek, are intermingled with wetlands and swampy zones with high water tables. The functional condition of these reaches has not been investigated.

Confidence in Analysis

Since this analysis was mostly office-based with few field visits, determination of stream types could only be completed qualitatively to a broad level classification. The categories cited in this analysis are general representations of the reaches described, and may include shorter sections with different response potential. Channel gradient and entrenchment were determined using topographic maps followed by selected field visits, and channel response types were then determined from gradient classes. Stream bed-and-bank materials were estimated using soil survey and geologic maps or based on qualitative field estimates. Aerial photos were used to determine sinuosity and channel condition when channels were visible. When possible, field verification was conducted. Existing stream surveys were used and extrapolated to similar channels in other parts of the watershed when appropriate. Overall, the material in this section is adequate for broad planning purposes. Site-specific data and recommendations are necessary to apply conclusions from this section.

Water Quality

A. Reference Conditions

Processes which determined water quality conditions prior to 1900 were assumed to be the same as those currently observed. Characteristics of water quality in the Upper Siletz watershed likely varied prior to 1900 (as well as the entire Holocene period) with short to long-term climatic patterns interacting with the natural disturance regime.

Drier periods with significant reductions in precipitation likely resulted in a tendency towards decreases in stream flow, sediment transport, and vegetation shading the stream. This likely resulted in greater variability in stream temperatures (higher in summer, lower in winter) and lower variability in the sediment regime. Increased sediment storage, reduced flow velocities, and increased temperatures likely resulted in a series of cascading effects on water chemistry and physical properties, which likely affected the distribution and quantity of aquatic species. Alternatively, wetter periods with increased stream flow and sediment transport, together with the resulting effects on stream channel and the morphology of riparian areas, likely reduced stream temperature variability; and pushed water chemistry and physical properties in the opposite direction. Sediment transport rates and stream turbidity would increase under these conditions.

These characteristics were further altered in a spatial dimension. The SF Siletz River had an overall tendency (due to the low gradients and unconfined setting) toward lower stream velocities, greater sediment storage, and a high amount of wetland habitats. This likely resulted in higher overall variability in stream physical and chemical characteristics as channel and riparian conditions changed. Aquatic communities consisting of both plants and animals were likely to have heavily influenced and been influenced by water quality conditions in the SF Siletz subwatershed. The NF Siletz subwatershed likely experienced a smaller range of variability in stream physical and chemical characteristics in response to alterations in stream discharge, channel and riparian morphological characteristics, and sediment supply. Aquatic communities were less influential, and beaver were likely not an important factor in water quality conditions.

Refer to Appendix #13 for a more detailed discussion of the ecological and physical processes affecting water quality.

B. Current Conditions

The State of Oregon=s water quality standards and rules to protect the designated beneficial uses of state waters apply to all streams in the Siletz River including permanent, ephemeral, and intermittent headwater streams under BLM jurisdiction. These standards are set forth in the Oregon Administrative Rules (Chapter 340, Division 41). Very little site specific data concerning water quality in the entire Siletz River system or the Upper Siletz watershed was located for this analysis. The BLM has monitored stream temperature at three sites on the Upper Siletz system. USGS has recorded some basic water quality parameters and temperatures at the town of Siletz on a limited basis. Additional water quality data from private sources, University of Oregon, DEQ, or other public agencies may be available, but were not located for this analysis.

The DEQ=s draft 1996 303(d) list of water quality limited water bodies (ODEQ, 1996) does not list the Siletz River. However, concern for non-point sources of sediment, pesticides and flow modification has been identified in the Siletz River (from Rock Creek to headwaters, inclusive of the Upper Siletz watershed) which indicates that these parameters may be exceeding state standards but have not been adequately investigated. This concern was highlighted in DEQ=s 1988 assessment of non-point sources of water pollution.

Despite limited data availability, existing temperature, water quality, and channel condition (see stream channel section of this report) assessments imply that water quality in the Upper Siletz has probably deteriorated relative to reference conditions.

Water Quality Parameters of Concern

Sediment and Turbidity

As previously indicated, sediment has been identified as a parameter of concern in the Siletz River both by the DEQ and ODF&W. However, sediment production, delivery to streams, and transport through streams are poorly quantified throughout the Coast Range, including the Upper Siletz watershed. Sediment processes are understood in a generic sense, but site-specific data are rarely available. Although sites of sediment delivery to streams were identified in this report (see Erosional Processes section) no measurements of quantities of sediment delivered or transported, scour and deposition, or the infiltration of gravels by fine materials (sands, silts, and clays) were located for this analysis.

Forest Management and Stream Sedimentation

Based on research results from other forests (Grant and Wolff 1991), it is probable that past and current forest management activities have triggered landslide failures with delivery of sediment to streams. Roads and clearcuts in the Upper Siletz watershed were identifed in the soils section of this report as major sources of mass wasting with delivery to stream channels. Under these conditions, the timing and quantity of sediment delivery to streams in the Upper Siletz watershed has likely been accelerated relative to reference conditions.

Routing of this material through the stream system is primarily controlled by stream energy. Generally, the NF Siletz River within the Upper Siletz watershed is a Ayoung@ channel system which has cut deep canyons into basalt bedrock, and is dominated by cobble-to-boulder-size material that is resistant to high streamflow energy (see Channel Condition section of this report). The river has high gradients and narrowly-confined reaches which quickly transport sediment, particularly fines, out of the basin to lower reaches of the Siletz River.

Hypothetically, degradation of water quality due to increased turbidity and any consequent degradation of spawning gravels would most likely be evident outside of the NF Siletz subwatershed. Since turbidity and gravel embeddedness measurements were not located for this analysis, it is not currently possible to confirm or refute this.

In the SF Siletz subwatershed it appears that, in addition to a high natural or background sediment load, increases in sediment delivery have occurred as a result of forest management activities (see Erosional Processes section). Field reviews of the stream system in winter 1996 (during development of the Callahan Creek EA) indicate that these channels are subject to high sediment inputs from hillslope failures. Due to low gradients, the stream system lacks the energy to transport much of this material, resulting in aggrading reaches. High levels of turbidity were also measured. Since this is predominately a low-gradient, depositional stream system, consequent degradation of water quality and any impacts to aquatic organisms should be evident in these streams near the sediment sources. The consequences of high sediment levels for aquatic organisms in general terms is discussed in Appendix #14.

Some potential sources of accelerated sediment delivery to streams were identified during the BLM's summer 1995 road inventory. Recommendations for treatment of these sources are listed under restoration opportunities (see Chapter 5/6 Human Uses - Roads section and in Appendix 20). In addition, road segments on BLM-administered lands were evaluated for risk to water quality (see Human Uses - Roads section). Roads built on slopes that are at risk for landsliding are a high priority for closure. When kept open for access or due to right-of-way agreements, these sections of road need to be monitored on a regular basis during winter-storm events and given highest priority for maintenance.

Additional sediment sources (both in stream and from roads), especially on private lands, are likely within the watershed but remain unidentified for this analysis. Based on current data, it is not possible to state with confidence whether or not accelerated stream sedimentation is degrading water quality in the Upper Siletz watershed (or the Siletz River) with impacts to beneficial uses such as coldwater fisheries. A comprehensive, site-specific, and documented understanding of sediment delivery and routing in the Upper Siletz watershed requires substantial investments in data collection, training, and analysis to provide for a high level of confidence in our understanding of this critical process. Towards this end, some future sediment monitoring is recommended in this report (see Chapter 5/6)

Microbiology

Concern over the potential for introduction of pathogenic microorganisms has risen in recent years, due in part to: 1) increased human use associated with unmanaged, dispersed camping and recreation occurring in riparian areas adjacent to coastal streams, and 2) livestock grazing in lower river valley reaches.

High levels of bacteria in forested areas will usually be associated with inadequate waste disposal by recreational users, presence of animals in the riparian zone, and septic systems (EPA 1991). Forest harvest is not thought to influence the levels of pathogenic bacteria in streams. Dispersed camping and recreation occurs along streambanks in portions of the watershed, and may result in unsanitary disposal of human fecal matter in the riparian zone. Bacterial contamination of streams may result from elk and other wild animals including beaver and deer. In addition, incidences of giardia, cryptosporidium, and *E. coli* contamination of surface and spring water have been reported in coastal streams (O=Shea, pers. comm.).

The existence or extent of water-borne disease contamination of Upper Siletz watershed surface waters appears to be unknown; the BLM has not sampled for giardia or other water-borne disease organisms. Nevertheless, giardia is considered an endemic species, and is commonly found in beaver and even domestic dogs throughout the state. All surface waters utilized for domestic purposes should be disinfected and filtered. Domestic water users may have their drinking water quality tested for a nominal fee by the Microbiology Department at Oregon State University in Corvallis.

Stream Temperatures and Dissolved Oxygen

Solar radiation is a principal factor controlling stream temperatures. Solar energy inputs to streams are affected by the quality and quantity of shade-producing vegetation, topography, season, flow, and channel form. Natural disturbance agents such as fire, windthrow, and storm-induced channel scour, and human activities such as timber harvest, road construction, and riparian-based recreation have the potential to influence stream temperature by altering streamside vegetation, summer base flow regime, and channel form. Small, headwater streams are particularly at risk for increases in stream temperature as a result of disturbance. Dissolved oxygen concentration is linked to stream temperature and together these parameters are critical to the reproduction and survival of anadromous fish.

Figure #12 displays Ahistoric@ stream temperature ranges for the North Coast compared with the current stream temperature ranges on the main stem of the Siletz River, and the Alsea and Nestucca river basins (FEMAT 1993). Temperature ranges for the mainstem Siletz River are not considerably different from the Ahistoric@ range. However, this conflicts with DEQ reports which indicate the Siletz has elevated summer temperatures (ODEQ 1996).

Figure #13 displays 1994 summer stream temperatures (7-day moving maximum) collected by the BLM near the confluence of the NF and SF Siletz Rivers within the Upper Siletz watershed. These data support the DEQs= assessment that temperatures exceed the 18E C standard for the mid-coast during periods of summer low flow (summer 1995 data was unavailable for this analysis). Stream temperatures on the SF Siletz River are consistently 1-2 degrees higher than those on the NF Siletz River, and exceeded state standards 33 days out of 39 from early July to early August, 1994, peaking at over 20E C (close to the range that is considered lethal for coldwater species). NF Siletz River temperatures exceeded state standards ten days during this period.

Stream reaches with potential for temperature increases (due to inadequate cover from adjacent riparian vegetation) were identified in the riparian vegetation section of this report. The SF Siletz River, in the area of the former Valsetz Lake, is at risk for increases in temperature due to inadequate riparian vegetation. SF Siletz temperatures displayed here were measured after having flowed through over three miles of channel (providing a potential cooling effect) past the former Valsetz dam. This implies that stream temperatures in the former Valsetz lake are likely to be much higher than those measured at the confluence of the NF and SF Siletz Rivers, and potentially exceed lethal thresholds for periods of summer base flow. However, data in support of this hypothesis was not located for this analysis, and temperatures in this part of the SF Siletz were reported to be above 20^{0} C at times during summer low flow prior to removal of the dam (Hardin-Davis 1985).

Figure #12. Historic Stream Temperature Ranges in Contrast with Current Temperature Ranges for Selected Coastal Watersheds.

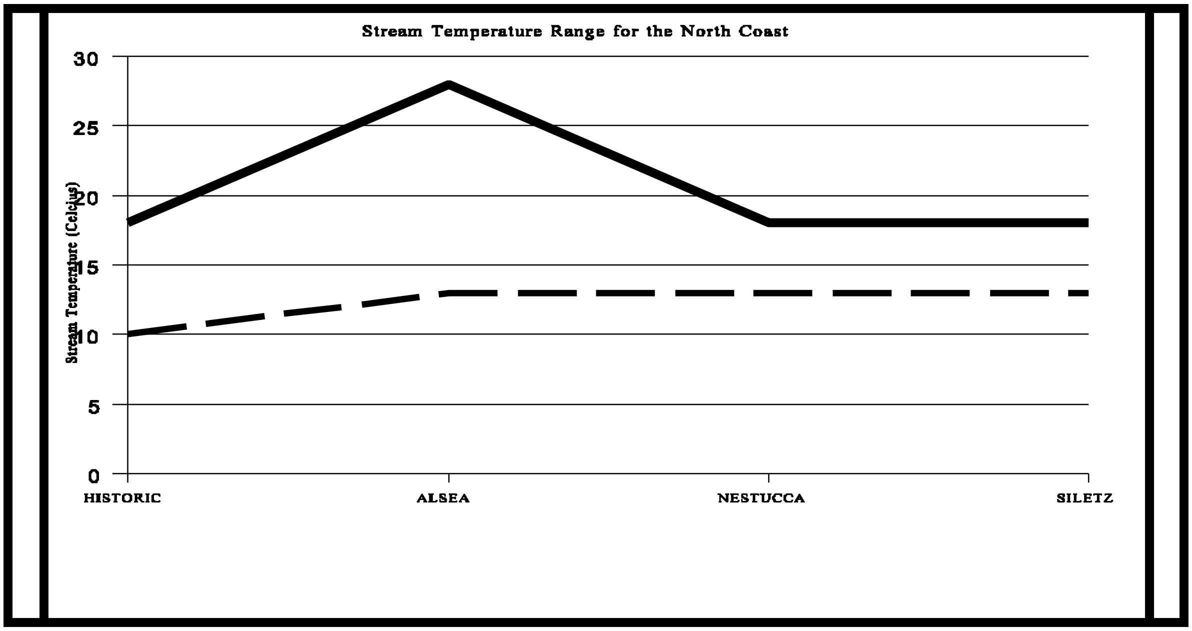


Figure #13. Stream Temperatures in the Upper Siletz Watershed.

NF Siletz River temperatures also exceed state standards during summer base flow, but no obvious sources of temperature increase due to inadequate riparian shading were identified. However, the main NF Siletz channel is over 50 feet wide, and summer flows are over exposed basalt bedrock and boulders. This could partially account for higher stream temperatures.

Stream temperatures were collected at these sites in 1993, and on the mainstem Siletz below the confluence of the NF and SF Siletz Rivers. Despite questionable data for the NF Siletz River (it appears that the probe was out of the stream for periods of the summer), trends are similar to 1994. Mainstem temperatures appear to lie midway between the NF and SF Siletz Rivers until July (when NF Siletz data becomes questionable). Excluding the NF Siletz data, temperatures exceeded the standard for a shorter period of time in 1993 (approximately a ten-day period in late July - early August). Implications of these data for the aquatic ecosystem are discussed in the fisheries section of this report.

Dissolved oxygen data was not located for this analysis. Where stream temperatures exceed state standards, it is likely that levels of dissolved oxygen will be depressed, further stressing aquatic communities. In addition, heavy concentrations of organic materials, such as logging debris and hardwood leaf fall in the autumn, may cause local, short-term reductions in dissolved oxygen which can be lethal to salmonids.

Other Water Quality Parameters

Water quality data was collected by USGS on 12 dates between 1972 and 1974 at the Siletz gaging station. A brief discussion of this data and additional water quality parameters that are potentially influenced by forest management follows:

Aquatic Invertebrates **-** No data have been located for this analsysis.

pH - All samples were within the range (5.0- 9.0) set by the EPA as necessary to protect aquatic life (EPA 1991).

Conductance - No standards have been established. Sample values are at the low end of natural variability. This is expected in streams of the Pacific Northwest.

Dissolved Oxygen - In western Oregon basins with salmonids, Afreshwaters shall not be less than 90% of saturation at seasonal low, or less than 95% of saturation in spawning areas during spawning.@ No data was located for this analysis.

Nutrients - Nutrients were sampled at the Siletz gage. Values appear to be in the ranges expected of freshwater streams. Phosphorus is somewhat higher than the 0.05 mg/l standard for lakes (which are subject to eutrophication), but no standard exists for flowing freshwater streams.

Herbicides and Pesticides - Monitoring data for organic chemicals have not been located for this analysis. Organic chemicals are not currently used on BLM-administered lands but may be extensively employed on adjacent private lands.

Confidence in the Analysis

Water quality data is extremely limited in the Upper Siletz watershed. Based solely on the data located for this analysis, it is not possible to state with confidence whether or not water quality in the Upper Siletz watershed consistently exceeds or meets state water quality standards, or if water quality is a factor in the degradation of aquatic ecosystems. In particular, we lack data to support conclusions with regard to stream temperature, dissolved oxygen, and sediment; all critical factors for the aquatic community in this watershed that have potentially been altered by forest management. While stream temperature data for 1993 and 1994 indicate a problem probably exists, particularly in the SF Siletz subwatershed; followup data is needed to clarify trends and further identify sources of heating. Conclusions are mostly hypothetical and are based on professional estimate, deduction, and extrapolation. Overall, the material in this section is adequate for broad planning purposes; particularly for suggesting water-quality monitoring activities. Site-specific data and recommendations are necessary to apply conclusions from this section to specific projects.

Fisheries Species and Habitat

A. Reference Conditions

Prior to 1900, the summer steelhead was apparently the only native anadromous fish species present in the Upper Siletz watershed (i.e., above the Siletz Falls at river mile 64.5; large populations of chinoook salmon, coho salmon, winter steelhead and searun cutthroat trout occurred in the lower Siletz Basin). The abundance of all these salmonid populations likely varied within an unknown range of natural variability. On average, the abundance of these stocks was likely larger than currently observed due to reduced fishing pressure. However, natural events such as ocean warming, drought periods, etc. likely influenced the yearly return of salmonids. For a general discussion of the ecological and physical processes affecting fish habitat see Appendix #14.

Prior to 1900, fish habitat was within the natural range of variability with levels varying according to such factors as stream-channel processes, interactions with riparian vegetation, and as a result of major periodic disturbances caused by flooding, windstorms, etc. These latter disturbances (as evidenced by the Flood of 1996) can greatly increase the amount of fish habitat as a result of large tree and boulder inputs from upslope sources. They also can adversely affect fish habitat by removing debris that existed in the channels prior to the disturbance or by sedimentation of spawning gravels. Thus, in general, fish habitat existed in a dynamic equilibrium with natural processes both increasing and reducing the amount and overall distribution of fish. A major factor affecting the usability of fish habitat by salmonids in the Upper Siletz watershed was the presence of natural barriers.

B. Current Conditions

Species

In the post-settlement period to current time, fish from the entire upper Siletz basin (larger than just the Upper Siletz watershed) were and continue to be important to the economy of the Siletz Bay area, and the greater coastal area. The upper basin has helped to support a substantial commercial net-fishery harvest of spring and fall chinook salmon (*Oncorhynchus tshawytscha*), coho salmon, and steelhead (*O. mykiss*). The entire basin also provides plentiful recreational fishing opportunities for salmon, steelhead, and trout with most activity concentrated in Siletz Bay and the main stem Siletz River. Recreational opportunities in the Upper Siletz watershed are currently restricted to summer steelhead, chinook salmon, and resident cutthroat. Prior to the construction of the Siletz Hatchery by the Oregon State Fish Commission in 1937, wild populations of winter and summer steelhead, coho, sea-run cutthroat (*Salvelinus clarki*) and lamprey were presumably present in all tributaries unimpeded by natural barriers; spring and fall chinook were present in the mainstream Siletz and its larger tributaries, except where natural barriers precluded adult passage. Following hatchery construction and release of hatchery fish, competition between hatchery and wild runs likely ensued. Recent concerns over the decline of wild fisheries, in part due to competition from hatchery fish, have become widespread. The genetic status of the original wild runs is of major concern (ODFW 1995).

Numerous native anadromous salmon and trout stocks in the Pacific Northwest are considered to be threatened and declining and may be at risk of extinction. The coastal coho and steelhead, including those found in the Siletz basin, have been identified as Astocks at risk@ (Nehlsen et al. 1991). Coastal steelhead and coho salmon were petitioned (in 1994) for federal listing under the Endangered Species Act, and recently (1995) the coho salmon has been proposed by the National Marine Fisheries Service for listing as A threatened@ under the Endangered Species Act.

The Siletz River currently contains the only summer steelhead run native to the Oregon Coast Range north of the Umpqua basin. The presence of large rainbow trout, which were assumed to have been summer steelhead, was documented several times prior to the 1950s. This stock presumably evolved in the Upper Siletz watershed because Siletz Falls is only passable to anadromous fish during summer low flows. Historically, the falls excluded other anadromous fish from passage, including chinook and coho salmon and winter steelhead. The construction of a fish ladder around Siletz Falls in the 1950s and a hatchery program initiated in the 1960s allowed chinook, coho salmon and winter steelhead access to the habitat above the falls. However, due to concerns for the native summer steelhead run, the ODFW currently allows only the summer steelhead and chinook salmon to pass Siletz Falls into the Upper Siletz watershed. The largest anadromous fisheries concern in the Upper Siletz watershed is the status of the summer steelhead. This species spends an extended amount of time in the watershed during the summer months and thus is susceptible to elevated stream temperatures.

Resident cutthroat trout populations are found throughout the watershed, including above barriers to anadromous fish and in second-order streams. They are found in approximately 250 miles of streams within the watershed. Other freshwater species occurring in the Upper Siletz watershed include lamprey, dace, and sculpins. Crayfish are also found in the basin.

The distribution of fish species in the watershed is displayed in Map #11.

Habitat

Factors affecting the regional decline of salmonids (as noted above) include: farming, the use of pesticides and fertilizers, ocean conditions, log jam removal (stream cleaning), logging of streamside vegetation, landslides, fish hatcheries, major flood events, splash dams, and power dams. Some of these factors are beyond the control of the BLM to affect any improvements in salmonid abundance; however, the condition of the aquatic and riparian *habitat* can be addressed and managed.

Habitat for anadromous and resident fish species, and other aquatic species is degraded and/or declining in many areas of the Pacific Northwest as a result of the factors listed above. Typical habitat problems include excessive stream sedimentation, lack of large woody debris, lack of quality pools and spawning gravels, reduced stream flows, and elevated water temperatures. Similar to the regional situation, reductions in habitat conditions have also occurred in the Upper Siletz watershed.

Known barriers affecting availability of habitat to anadromous fish include Siletz Falls (which is located outside of the watershed boundary), Warnick Creek, and Boulder Creek falls.

Species Accounts (Species Distribution and Abundance/ Habitat Distribution and Condition)

The Oregon Department of Fish and Wildlife has been gathering data from commercial net fisheries, and angler catch and spawning surveys for many years, in some cases as far back as the 1920s. This information as well as data summarized in a recent ODFW report, ASiletz River Basin Fish Management Plan@ (1995) provide much of the substance for the following species accounts.

The following is a species account of: 1) current species distribution 2) current relative abundance and distribution/trends; and 3) current condition and distribution of habitat/trends.

<u>Fall and Spring Chinook Salmon</u>

<u>Species Distribution</u> - Fall and spring chinook are native to the Siletz River, but probably not the NF and SF Siletz Rivers. Fall and spring chinook in the Siletz River spawn primarily in the mainstem below Siletz Falls (RM 64.5), although some fish do pass the falls and inhabit the Upper Siletz watershed. Spawning habitat for fall and spring chinook salmon include Drift Creek, Cedar Creek, Euchre Creek, Rock Creek, Sunshine Creek, and the mainstream Siletz River above Moonshine Park. Juvenile fall chinook use the mainstem Siletz and estuary for rearing. They typically enter the ocean during late summer of their first year of life.

Fall chinook salmon (adult) generally appear in the Siletz River around the first part of October (depending on river conditions) and run through November. Spring chinook enter the river from May through July. Fall and spring chinook salmon inhabit approximately 10.8 miles of stream within the Upper Siletz watershed. Habitat requirements include large beds of spawning gravels in mainstem and major tributaries, and large deep pools for resting and juvenile rearing. Most juvenile chinook leave the stream and rear in estuaries.

Relative Abundance - The wild fall chinook salmon population is healthy and relatively abundant with an estimated population size of 5,000-10,000 adult fish per year. Angler harvest of spring chinook has been less than 100 fish in recent years except for a peak around 1990 of about 200 fish. The small harvest indicates a small run size. Both species appear to be stable in the Siletz River.

The ODFW direction for fall and spring chinook management in the Siletz basin is to maintain the current populations and management. Chinook salmon are allowed to pass Siletz falls with ODFW discretion. Current ODFW management is to maintain the habitat above the falls for summer steelhead use (ODFW does not consider chinook salmon to be direct competitors with summer steelhead).

ODFW has conducted angling and harvest-and-spawning area surveys for Siletz River chinook. However, these population estimates are thought to have been inflated to an unknown extent by stray hatchery stock from private salmon hatcheries. Currently there is no hatchery releases for chinook salmon in the Siletz River.

Habitat Distribution - The Upper Siletz watershed does not contain a large amount of high quality habitat for fall and spring chinook salmon. Chinook salmon prefer third-order and larger streams with gradients less than 4 percent; the watershed contains about 11 miles of stream that are considered suitable for chinook salmon spawning. The BLM manages approximately 23 percent (2.5 miles) of this habitat. The mainstem NF Siletz River contains approximately 4.5 miles of chinook spawning habitat. Warnick Creek, a tributary of the North Fork, contains about two miles of habitat in the lower reaches. The SF Siletz River contains about 4.5 miles of stream that is suitable for chinook salmon.

Habitat Condition - Only a small number of chinook salmon are allowed to pass above the falls. Habitat conditions that affect chinook salmon are not well understood. However, the stable status of chinook salmon in the Siletz River indicates that habitat for this species is currently being met.

Coho Salmon

Species Distribution - The Siletz River contains an important run of coho salmon and is stocked with hatchery fish produced at the Salmon River Hatchery. Coho are widely distributed in low and medium-gradient streams below Siletz Falls. Coho are no longer allowed to pass over the falls and into the Upper Siletz watershed.

Adult coho salmon usually appear in two runs. The first run starting in October and ending in late November is mostly of hatchery origin. The second run starting in early December and ending in early February is mostly wild stock. Coho salmon inhabit approximately 65 miles of the mainstem Siletz River. All major streams have some available habitat for coho salmon. Habitat requirements of this species are clean spawning gravels in low-to-medium-gradient mainstems and tributaries. Rearing habitat is primarily in dammed pools and backwaters.

Relative Abundance - Wild runs of coho are severely depressed over much of its range and are being considered for listing under the Endangered Species Act. Historic runs of coho include an average catch during 1923-1940 of approximately 17,000 fish. This equates to an estimated run size of approximately 50,000 adult fish. A survey in 1954 estimated the run size to be 18,000 adult fish. This indicates a coho population that has been progressively declining.

Wild coho in the Siletz River have been influenced by hatchery strays from both the private hatchery at Newport and the ODFW hatchery in the Siletz Basin. The extent of strays from both hatcheries is unkown. Hatchery production of coho salmon is currently being phased out in the Siletz Basin.

Habitat Distribution - No coho salmon are currently allowed to enter the Upper Siletz watershed. Map #11 display potential coho habitat in the watershed as formerly used by this species prior to ODFW=s recent action of preventing their use of the watershed.

Winter Steelhead

Species Distribution - Winter steelhead follow a similar pattern as the coho salmon, with early hatchery runs entering the river in mid-December to mid-March while the later "wild stock"runs from March to April. Winter steelhead inhabit approximately 65 miles of stream below Siletz Falls. Winter steelhead are also not allowed to pass over the falls. Winter steelhead have a varied spawning distribution, from mainstem to the smallest accessible tributaries including high gradient streams. The distribution of winter steelhead trout is similar to coho salmon. Winter steelhead fry rear primarily in riffles; juvenile winter steelhead usually rear in riffles and well-oxygenated pools. Adult steelhead require suitable gravel beds for spawning, but relatively deep water with cover for holding and resting. The coastal winter steelhead has also been petitioned for federal listing under the Endangered Species Act.

Relative Abundance - The Siletz Basin has been stocked with Alsea Hatchery winter steelhead for the purpose of contributing to the winter steelhead fisheries. The annual target number for release within the Siletz mainstem has been approximately 80,000 smolts per year.

ODFW interpretation of data gathered over an extensive period is that production of both wild and hatchery steelhead has declined in recent years.

Habitat Distribution - No winter steelhead are allowed to enter the Upper Siletz watershed.

Summer Steelhead

Species Distribution - The Siletz River contains the only native summer steelhead run within the Oregon Coast Range, north of the Umpqua Basin. Important habitat for this species is found above Siletz Falls. The summer steelhead is the only anadromous fish native to the Upper Siletz watershed. Siletz Falls is only passable to anadromous fish during summer low flows. The construction of a fish ladder around the falls in the 1950s allowed other anadromous fish to pass and added competition for summer steelhead habitat.

Adult summer steelhead generally return to the Siletz River from May through November. Spawning occurs in the Upper Siletz watershed during January through May. The early return time and extended freshwater residency is the primary characteristic that distinguishes them from winter steelhead. Juvenile summer steelhead have life histories similar to winter steelhead. Summer steelhead inhabit approximately 61 miles of stream within the Upper Siletz watershed.

A summer steelhead hatchery program was initiated in 1958 in the Siletz basin using Siletz River broodstock. The annual target release number for the Siletz basin is 80,000 smolts. Brood fish for the hatchery program are collected by trapping adults at the falls.

Sumer steelhead have a varied spawning distribution, from mainstem to the smallest accessible tributaries including high-gradient streams. Adult steelhead require suitable gravel beds for spawning, but relatively deep water with cover for holding and resting.

Relative Abundance - Wild summer steelhead have declined in recent years. A recovery plan has been initiated, including control of competing anadromous fish at the falls and reserving the Upper Siletz watershed for summer steelhead.

From l969 to 1972 all fish going over the falls were trapped and counted. Average hatchery and wild run sizes during this time were 5,039 and 842, respectively. Wild steelhead comprise about 16% of the total return. Trapping and creel data since that time has shown a steady decline in wild steelhead numbers. Trapping at the falls in 1992 through 1994 averaged less than 100 wild fish per year.

Habitat Distribution - Summer steelhead inhabit approximately 61 miles of stream within the Upper Siletz watershed. The majority of the fish travel up the NF Siletz River to spawn in Boulder and Warnick Creeks. The SF Siletz River and its tributaries also contain important spawning and rearing habitat for summer steelhead.

Habitat Condition - The best summer steelhead habiat within the Upper Siletz watershed is in the NF Siletz River and its larger tributaries. These large, high gradient streams have very high quality spawning and rearing habitat, consisting of stable, rocky instream structure. This habitat is very productive for juvenile steelhead. The SF Siletz River also contains some high quality habitat for summer steelhead, but does not contain the steep, rocky habitat found throughout the NF Siletz River and major tributaries.

Because of the small amount of BLM-administered lands within this watershed and quality of existing habitat, instream restoration activities aimed at benefitting summer steelhead are limited. Efforts to improve steelhead habitat on federal lands could be directed at improving riparian areas. This could be done by : (1) establishing conifers along those streams that are dominated by hardwoods and (2) identifying and rehabilitating those sections of the road network that could induce slides in the future.

<u>Cutthroat Trout</u>

Species Distribution - Cutthroat trout are distributed widely throughout all Oregon coastal basins including the Upper Siletz watershed. Sea-run cutthroat trout appear in the Siletz River possibly as early as late August and run to late April (depending on river conditions), but do not reach above Siletz Falls. Wild, resident cutthroat trout are the only indigenous salmonid above the falls and are assumed to be present in nearly all perennial and some intermittent streams. Cutthroat trout spawn in low-to-medium-gradient tributaries in relatively fine gravels. Sea-run cutthroat trout (adults) rest in pools and relatively deep slots. Cutthroat trout (fry) rear primarily in riffles and small pools. Juvenile cutthroat trout rear in small and large pools. All cutthroat trout depend on good instream structure and heavy cover.

<u>Relative Abundance</u> - There have been no studies conducted on sea-run cutthroat within the Siletz basin. In nearby basins where sea-run cutthroat have been monitored, there has been a substaintial decline in both hatchery and wild sea-run cutthroat over the last 20 years. This decline is thought to be due to the same factors that have caused the decline of steelhead and other anadromous fish.

The Siletz basin has been stocked with hatchery cutthroat trout form the Alsea Hatchery since 1962. The current program targets and annual release of 10,000 yearling cutthroat per year.

<u>Habitat Distribution</u> - Resident cutthroat are found throughout the Upper Siletz watershed in approximately 250 miles of stream.

<u>Habitat Condition</u> - Resident cutthroat trout migrate to the smallest perennial streams within the watershed. Most of the headwater streams within the watershed contain suitable habitat for resident cutthroat trout. Temperatures, instream flows, and sediment are generally within productive limits for cutthroat trout. Restoration efforts for cutthroat trout are currently not being considered. Restoration activities for anadromous fish should also benefit cutthroat trout.

<u>Lamprey Eels</u>

Pacific lamprey are found along the Pacific coast of North America from Alaska south to Southern California. Pacific lamprey migrate into all major river systems, often reaching headwater streams. Lampreys have been designated as a sensitive species by the state of Oregon. Pronounced declines in lamprey numbers have been noted statewide. Factors responsible for lamprey decline are not well known, but are assumed to be the same factors that have caused the decline of other anadromous fish.

It is unknown if Pacific lampreys inhabit the Upper Siletz watershed.

Wildlife Species and Habitat

A. Reference Conditions

Habitat Conditions

Presettlement

The most significant presettlement forest-stand-replacement event in the Oregon Coast Range was fire. Experts suggest that catastrophic fires occurred at 150 to 500+ year intervals and that lightning-caused fires in the Coast Range were very rare. The fire return interval for this watershed was probably closer to the 500-year cycle due to its very wet conditions, and its significant distance from the Willamette Valley where Kalapuyan Indian burning had a much greater impact on adjacent, east-slope, forested watersheds.

The landscape pattern is commonly defined by the presence of the following three elements; matrix, patches, and corridors. In the pre-settlement period, the Upper Siletz watershed most likely had a matrix of old-growth (200+years old) forest habitat consisting primarily of Douglas-fir, western hemlock, and western redcedar. The patch element had a low density of large patches of either early (0-39 years old), mid (40-79 years), or late-seral (80-199 years) habitat, depending upon the time of the last fire event. A moderate density of smaller patches (<1000 acres) of any seral stage could be found scattered temporally and spatially throughout the watershed as a result of wind, flood, soil movement, disease, and insects. The riparian zones which occurred throughout the watershed defined the corridor element.

Forests in the watershed likely had large stands of interior habitat with small amounts of edge habitat and minimal amounts of high-contrast edge (late-seral stands adjacent to early-seral stands). As a result, connectivity would have been high, allowing interior habitat species to disperse through the watershed without passing through high-contrast edges. Fires occurring in moist coniferous late-seral forest habitats left both unburned patches of varying sizes, and individual live trees scattered throughout the burn area. These fires left partially burned fuels, which resulted in large amounts of standing (snags) and down coarse woody debris. As a new forest regenerated after a typical large fire, old-growth remnants, snags, and large, down woody material provided special habitat components throughout the early and mid-successional stages.

The only Aroads@ in the watershed were probably big game trails used by the Native Americans as travel routes connecting the coast and interior valleys.

Special habitats, such as caves, cliffs, talus, and wetlands, are usually the results of local geomorphological features, and are not generally impacted by typical forest management practices. Special habitats which occurred in the watershed during reference conditions are assumed to be present today in a comparable state of condition; although some meadows may have experienced brush encroachment due to reduced fire occurrence as a result of fire-control measures (see Vegetation section).

Postsettlement

The potential for man-caused fires in the Coast Range increased significantly after about 1850 as the province saw an increase in trapping, hunting, and settlement of interior valleys. Many large man-caused fires have been documented since this time. However, in this watershed timber harvest most likely replaced natural-caused fires as the primary stand disturbance event somewhere between 1910 and 1940. As a result, the forest landscape during the postsettlement period began to change to a much younger matrix with a higher density of small-to-medium-sized, younger patches lacking old-growth remnants and coarse woody debris.

Access to and within the watershed increased during this time as railroad lines and logging trails/roads were constructed.

Species Conditions

Presettlement

Species requiring old-growth forests (or the structure associated with old-growth forests such as large diameter green trees, snags, or down woody debris) and/or large patches of early, mid, or late-seral forests were probably common in this watershed. Species preferring edge habitat, high-contrast edges, or patches of different seral stages in close proximity were probably less common.

Postsettlement

Species diversity probably did not change significantly until the second quarter of this century. Around this time, as harvesting intensified and access by humans increased significantly, the habitat began to shift from old-growth to mid-seral stage habitat. Snags and down wood were salvaged, and the disturbance interval was reduced from 500 to about 40-80 years (as disturbance changed from wildfire to timber harvest). Species requiring early-seral stages and edges experienced an increase in available habitat, while species needing late-seral habitat, interior habitats, and snags and large, down woody debris encountered less suitable habitat.

B. Current Conditions

Habitat

The Upper Siletz watershed (44,584 ac.) is located within the Oregon Coast Range Physiographic Province (6,358,400 ac.). The majority of land (32,407 ac. or 73% of the total) in the watershed is owned by private timber companies and managed for timber production. Forests under private ownership are typically harvested during the mid-seral stage (40-79 years old) of forest development. Only 27% (12,177 ac.) of the lands in the watershed are controlled by the BLM, and they are managed to protect, maintain, or enhance late-seral and old-growth forests and their characteristics.

The watershed was stratified by seral stage and age class into the following seven wildlife habitat types:

Conifer Early-seral (0-39 yrs) 47% (21,079 ac.)
Conifer Mid-seral (40-79) 43% (19,292 ac.)
Conifer Late-seral (80-199) 1% (521 ac.)
Conifer Old-growth (200+) 3% (1,231 ac.)
Hardwoods 5% (2,147 ac.)
Special Habitats 1% (310 ac.)
Non-forest < 1% (4 ac.)

Refer to Map #6 for a display of these vegetation types, including interior old-growth forest. Map #13 displays nesting/roosting/foraging habitat (i.e., conifer old-growth according to above chart) for the spotted owl ; roosting/foraging (i.e., conifer late-seral); dispersal (i.e., conifer mid-seral); and nonsuitable habitat (i.e. conifer early-seral).

The most significant habitat characteristics in the watershed are the deficiency of late-seral/old-growth (LSOG) habitat; the isolation of the little existing LSOG habitat; the lack of coarse woody debris (both standing and fallen) in the early and mid-seral types (90% of the watershed); and the paucity of interior forest (643 ac.) in the late-seral and old-growth habitat types. These conditions are primarily the results of past and present forest and fire management practices.

The watershed is well roaded at this time, averaging 4.6+ miles per section (current data underestimate miles on private lands). Using 30 feet as an average width, a mile of road converts to about 3.6 acres of forest habitat; about 17 acres of habitat per section of forest land have been lost to roads in the watershed.

Special habitats such as caves, cliffs, meadows, and wetlands provide unique breeding and/or foraging opportunities for wildlife. A broadscale inventory of all wetlands has been completed for the watershed. Some cliff habitat is scattered throughout the watershed with most occurring in the Boulder Creek subwatershed. There are no other identified special habitats on BLM-administered lands in this watershed, however, a thorough inventory of special habitats has not yet been completed.

Species

The number of terrestrial vertebrate species expected to occur in this watershed is as follows: birds - 116 native species, 4 introduced species; mammals - 58 native, 5 introduced; amphibians - 13 native, 1 introduced; reptiles - 10 native. Refer to the Oregon Department of Fish and Wildlife publication *Oregon Wildlife Diversity Plan* (ODFW 1993) for a complete list of all species occurring in the Oregon Coast Range.

Only **Special Status Species**, **Special Attention Species**, and **big game species** will be addressed in this watershed analysis. Special Status Species are defined here as those species protected under the Endangered Species Act and includes federally listed (endangered=FE, threatened=FT), federally proposed (proposed endangered=FPE, proposed threatened=FPT), and federal candidate (FC) species. Special Attention Species were identified in the Final Supplemental Environmental Impact Statement (USDA For. Serv. and USDI-BLM 1994) and accompanying Record of Decision (USDA For. Serv. and USDI-BLM 1994) as species which may not be adequately protected by the Northwest Forest Plan; thus they require further analysis. For a species to be considered in this analysis, the Upper Siletz watershed must be within its geographic range and the watershed must have the potential to provide suitable breeding and/or foraging habitat for the species. The following conditions refer only to BLM-administered lands within the watershed.

Special Status Species

Arthropods

Fender=s Blue Butterfly (*Icaricia icarioides fenderi*) Federal Candidate

The **Fender=s blue butterfly** prefers natural balds (shallow soil types, usually on mountain ridges, where grasses, herbs, and forbs dominate) and meadows. There are no known sites for this insect, and no general inventories have been conducted in suitable habitat.

Amphibians

Western Spotted Frog (*Rana pretiosa*) Federal Candidate

The **western spotted frog** prefers aquatic/riparian habitat, but it is believed that this species has been extirpated from the Coast Range. There have been no sightings of the frog in western Oregon for over 20 years (Blaustein et al. 1995).

Birds

American Peregrine Falcon (*Falco peregrinus*) Federal Endangered
Bald Eagle (*Haliaeetus leucocephalus*) Federal Threatened
Marbled Murrelet (*Brachyramphus marmoratus*) Federal Threatened
Northern Spotted Owl (*Strix occidentalis*) Federal Threatened

The **American peregrine falcon** breeds along the Oregon coast, in the Columbia Gorge, and in the Cascade Range (Gillman et al. 1994). There is no known nesting habitat for the falcon in the Coast Range. Some of the cliffs in the watershed have been inventoried for cliff-nesting species, but the cliffs appear to be too small to provide suitable habitat. However, falcons could use the watershed for foraging during the nonbreeding season since their preferred prey species, the band-tailed pigeon and mourning dove, are common residents.

A pair of **bald eagles** has been nesting near the confluence of Boulder Creek and the NF Siletz River since 1989. Bald eagles are most commonly found close to their preferred foraging habitat which, in western Oregon, includes the coast, large bodies of water, and large rivers. It is unusual to find these birds nesting in the upper reaches of a watershed. The adults have been observed around their nest stand on a year-round basis. There are no other known bald eagle sites in the watershed.

The watershed lies completely within **marbled murrelet** Zone 1, or between 12 and 25 miles from the Pacific, and there are 1,752 acres (refer to Map #12) of suitable nesting habitat within its boundary. The LSOG habitat located on BLM-administered lands in the watershed is the most heavily used area by murrelets in the northern Oregon Coast Range. Refer to Table #10 for a summary of the current status of the marbled murrelet and its habitat in the watershed.

There is one inactive **northern spotted owl** site in the watershed. The site occurs on BLM-administered land in the NF Siletz subwatershed and has 32% suitable habitat within its provincial home range (i.e., the 4,700 acres around the nest tree). Pairs have been reproductively successful at this site in the past; however, due to the isolation of this site from other significant stands of LSOG in adjacent watersheds, single birds that may find the site may have difficulty finding mates. Refer to Table #10 and Map #13 for a summary of the current status of the spotted owl and its habitat within the analysis area.

Table #10. Habitat and Population Status of the Northern Spotted Owl and Marbled Murrelet Within the Upper Siletz Watershed.

	TOTAL PROTECTED (% of total)	**TOTAL UNPROTECTED (% of total)**	**TOTAL**
Acres w/ithin Watershed Boundary	12,177 (27)	32,407 (73)	44,584
Acres of BLM	12,177 (100)	0 (0)	12,177
Acres of BLM with forest potential	11,850 (100)	0 (0)	11,850
Acres of existing suitable owl habitat	1,704 (97)	48 (3)	1,752
Known owl sites	1 (100)	0	1
Owl sites with >40% suitable habitat within MHR*	0	0	0
Owl sites with 30-40% suitable habitat	1	0	1
Owl sites with <30% suitable habitat	0	0	0

Acres of existing marbled murrelet suitable habitat	1,704 (97)	48 (3)	1,752
Known occupied marbled murrelet sites	8	0	8
Marbled murrelet sites with presence only	0	0	0

* MHR: median home range, a circle defined by a 1.54 mile radius from a site center, equivalent to approximately 4,700 acres.

Special Attention Species

Mollusks

Blue-gray Tail-Dropper (slug) (*Prophysaon coeruleum*)
Evening Fieldslug (*Deroceras hesperium*)
Oregon Megomphix Snail (*Megomphix hemphilli*)
Papillos Tail-Dropper (slug) (*Prophysaon dubium*)

These four mollusks may occur in damp areas in late-seral and old-growth forests within the watershed. There are no known sites in the watershed, no surveys have been done, and survey protocols are not yet available.

Mammals

Fringed Myotis (*Myotis thysanodes*)
Long-Eared Myotis (*Myotis evotis*)
Long-Legged Myotis (*Myotis volans*)
Silver-Haired Bat (*Lasionycteris noctivagans*)
Red Tree Vole (*Arborimus longicaudas*)

The **fringed** and **long-eared myotis** require caves or cave-like structure (mine shafts and abandoned buildings) for maternity roosts and hibernacula (winter roosts) (Christy and West 1993). This type of structure is probably lacking in the watershed.

The **long-legged myotis** and **silver-haired bat** may use cave-like structures for maternity roosts and hibernacula, but have also been found roosting under bark and in snags (Christy and West 1993). This type of habitat can be found in existing late-seral and old-growth patches in the watershed.

The **red tree vole** is expected to occur in its preferred habitat; the wettest late-seral and old-growth stands in the watershed.

There are no known sites within the watershed for any of these mammals; however, no surveys have been done, and approved survey protocols are not available (a draft survey protocol for the red tree vole is currently under review).

Big Game Species

Black Bear (*Ursus americanus*)
Black-Tailed Deer (*Odocoileus hemionus*)
Cougar (*Felis concolor*)
Roosevelt Elk (*Cervus elaphus*)

Elk, **deer**, **black bear**, and **cougar** have populations that are either stable or increasing within the watershed. For elk and deer there is a need for maintaining well distributed (both temporally and spatially) foraging areas adjacent to hiding cover in the watershed. Black bear and cougar numbers are expected to increase in western Oregon due to current hunting restrictions (no baiting or hounds allowed).

Human Uses

A. Reference Conditions

Presettlement -American Indians

The ecosystem of the Upper Siletz has perhaps been influenced by humans for more than 8,000 years. However, nothing specifically is known about prehistoric use of the watershed by American Indians.

Since 1976, archaeological and historic site field surveys (cultural resource inventories) have been conducted over approximately 1% of the federally-managed land within the Upper Siletz watershed. Archeologists currently consider the uplands of the Oregon Coast Range to have very low potential for prehistoric site occurrence. Few historic sites have been found in these uplands as well, and the likelihood for finding additional sites is low.

American Indians probably used the watershed prior to the arrival of non-Indian settlers. When non-Indian settlers entered western Oregon, the Tillamook tribe on the Coast and the Yamhill and Luckiamute Bands of the Kalapuya tribe in the Willamette Valley, were the nearest native inhabitants to the west and east of the watershed, respectively.

Members of these tribes may have used the area periodically during their seasonal rounds. The majority of the artifacts found in the Coast Range indicate incidental use for hunting and travel between the coast and Willamette Valley. Large occupation sites, unknown elsewhere in the Oregon Coast Range, are also unknown in the Upper Siletz watershed. Small camps or use sites are very rare in the Coast Range uplands, and none have been located in the watershed. Evidence of Indian activities in the watershed include only a few trails and occasional isolated chipped stone artifacts, such as projectile points.

The Tillamook Indians lived primarily along the coast and coastal estuaries and had plentiful supplies of fish. The Siletz River, as well as smaller coastal rivers and creeks, were fished for salmon. Due to shortages of food, the Tillamook tribe possibly used the Upper Siletz watershed for deer and elk hunting. The watershed also could have provided for the collection of beargrass to make baskets, berries to supplement their diet, and yew wood to make their bows. Flood waters from the watershed certainly delivered western red cedar logs to the Tillamooks to build their canoes and other needed carving materials.

Although the Kalapuya were primarily a Willamette Valley tribe, they traded with coastal tribes to obtain seafood, and other coastal and marine products in exchange for camas, meat, and hides. A well-defined Indian trail linking the coast and the Willamette Valley ran along the Salmon River, located to the north of the Upper Siletz watershed. The Kalapuya are known to have systematically burned in the Willamette Valley and adjacent foothills to create and enhance plant and animal habitat for species central to their subsistence. Since deliberately-set Indian fires as well as escaped ones were permitted to burn until they went out naturally, fires set near the valley edge could possibly have burned into the watershed.

Indian influences in the ecosystem could have included possible impacts to animal populations from hunting and fishing activities, and impacts to plant populations from gathering. Indian dogs may also have had an impact on game animals. The extent of any deliberate burning done by native people in the Upper Siletz watershed is unknown. The Tillamook are not known to have purposefully burned. However, it is possible that burning (from fires deliberately set to drive game, clear brush, or enhance habitat for preferred plant species, as well as, from escaped campfires) could have played a role in creating and maintaining the ecosystem.

Extensive data are unavailable concerning use of the Upper Siletz watershed by American Indians in general, so it is speculative to suggest whether they used this area for Arecreation.@ Their subsistence lifestyle probably left little time or energy for recreation in the modern sense. However, a few of the activities in which they engaged, e.g., hunting and fishing, must have provided some of the participants with satisfaction similar to that enjoyed by modern recreationists.

Presettlement - Non-Indian

Settlement in the watershed was late, slow, and limited in extent. For the most part, settlement west of the Willamette Valley was delayed until adequate transportation routes were developed. Non-Indian settlement of the watershed was also limited by the 1855 establishment of the Coast Indian Reservation, and the 1857 establishment of the Grand Ronde Indian Reservation. The entire Upper Siletz watershed was located within the original boundaries of the Coast Indian Reservation.

Between 1854 and 1858, the government began moving the Indians off their lands on the coast and onto the reservations. In 1865, under pressure from Willamette Valley settlers, the Coast Reservation was divided into two parts, and the area between Moolack Beach and the Alsea River was opened up for non-Indian settlement. The northern part of the divided Coast Reservation extended from two miles south of the town of Siletz to Cape Lookout and was called the Siletz Reservation. In 1875, Oregon Senator John Mitchell succeeded in getting an amendment to the annual appropriations bill which was intended for fulfilling treaties with Indian Tribes. This amendment resulted in the entire southern portion of the Coast Reservation from Cascade Head to Cape Lookout (700,000 acres) being opened to white settlement. Ben Simpson, who was the Indian Agent at Siletz during the 1865 and 1875 reductions of the Coast Reservation, left the Indian Service immediately after the 1875 reduction and became surveyor General of Oregon. In 1877, Mr. Simpson tried to collaborate with Senator Mitchell again to get approximately 100,000 acres surrounding the Siletz Agency headquarters opened to settlement, but failed.

From 1875 to 1892, 225,000 acres remained of the original 1.1 million acre reservation. In 1892, 551 tribal members were identified as living full time on the reservation at that time. Portions of the reservation were surveyed into 40-to-80 acre parcels and assigned to those individuals. After the 551 allotments were assigned, the Secretary of the Interior declared the remainder of the Siletz Reservation surplus and sent a team of negotiators to Siletz to arrange for the cession of those lands by the tribe (Robert Kenta CTSI).

Transportation into the area in the 1860's was by crude wagon roads and trails. Around 1860, while in command at Ft. Hoskins, Lt. Phil Sheridan built a wagon road across the Coast Range from King's Valley to Siletz. Trails remained the major form of access into the area up until logging railroads were introduced beginning in the 1900s. The lumber to build Fort Hoskins was made at Carroll's Mill in King's Valley in 1856. However, large, commercial timber harvest did not begin in the watershed until after the turn of the century. At that time, several railroad lines were built into the Coast Range to facilitate logging and hauling of timber to mills.

Postsettlement - Homesteading

After 1892 and lasting up until 1917, homesteading in this region was fairly slow. There were at least six cabin sites located in the Upper Siletz River basin of which five were located in the NF Siletz basin and one located near Fanno Creek. There were also two old horse trails located within the watershed. None of these sites have been located within the past 20 years.

Homesteading in the watershed continued at a slow pace up until the 1930s when Congress repealed the Homestead Act. The watershed=s remote location, dense timber, and lack of natural farmland presented natural barriers to homesteading. Over the years, many of the original homesteads were acquired by logging companies, most notably Cobbs and Mitchell, Boise Cascade, and the C.D. Johnson Lumber Company.

Postsettlement - Transportation and Timber Harvest

By 1904, the Salem, Dallas, Falls City and Western Railroad reached to Black Rock (located a few miles east of the Upper Siletz watershed) and served the Willamette Valley Lumber Company (later Willamette Industries) mill in Dallas. This railroad was taken over by Southern Pacific in 1915. The logging camp at Black Rock flourished between 1905 and 1940 as the logging headquarters for several companies operating in that part of the Coast Range. Black Rock grew into a small town and logging spur lines were extended in several directions from there. A main railroad logging spur was constructed approximately 6 miles west from Black Rock to Old Camp. As logging of the old-growth timber continued west two additional camps (K Line and Boulder) were built to temporarily house logging crews. Several logging spurs branched off the main ridges. Because of deteriorating railroad trestles, truck logging had replaced railroad logging by 1937. The majority of the upper watershed was harvested by the 1960s.

The earliest harvest in the SF Siletz valley began as a salvage logging operation following a fire in August of 1910. The burn consumed approximately 4,000 acres of old-growth forest which was centered around the future location of the town of Valsetz, with the main fire burning toward Black Rock. To access the burned timber, the landowners, Cobbs and Mitchell, built the Valley and Siletz Railroad which connected Independence to the Siletz River Valley on January 1, 1918. Extensive logging railroad spurs spread out from Valsetz with numerous smaller logging camps scattered on the hillsides to provide houses for the cutting and yarding crews. The line carried timber, passengers, mail, and sometimes freight on its three daily trips (Culp 1958).

The majority of the earliest railroad logging of the SF Siletz subwatershed occurred on the valley floor and eastern slopes with numerous lines running up many of the smaller drainage=s on the south side of Fanno Ridge. A separately operated railroad was extended down the SF Siletz River for approximately four miles, with numerous railroad spurs branching up the narrow tributary. Between 1918 and 1920, a new sawmill was constructed; and a timber crib dam across the SF Siletz River was installed to create a storage pond, later named Valsetz Lake (Culp 1958). During a storm in November 1921, the dam broke and the flood that ensued destroyed every bridge downstream on the Siletz River. The dam was immediately rebuilt and the lake was restored.

A town capable of accommodating 1,000 people was completed at Valsetz and the last Alogging camp@ was dismantled in 1937. During the depression years between 1931 to 1937 the mill was closed and the future of Valsetz was in doubt. In 1937, truck logging began with many of the current roads being located on former railroad grades. In 1947, Cobbs and Mitchell sold to Herbert Templeton who kept the town operational and renamed the company the Valsetz Lumber Company. Passenger service and mail was discontinued in 1952 on the Valley and Siletz Railroad. In 1956, Boise Cascade bought the land, town and obsolete mill, immediately removed the sawmill and the worst houses, and built a new peeler plant.

In 1977, log storage in the pond ended and dry land storage was utilized by filling in the pond with long runways. The lower portion of Fanno Creek was rerouted to accommodate the log sorting facility. Due to unfavorable economic conditions, the Valley of the Siletz Railroad was closed and dismantled in 1979. The plywood plant was closed in 1983 and the town of Valsetz was dismantled in 1984.

Fish ladders were built adjacent to the dam in 1969. Due to deterioration and concern for public safety in and around the lake, the dam was removed and site reclamation began in 1988. The former townsite of Valsetz was scarified, planted with conifers, and closed to public entry in 1985.

Records of the O & C Administration, and its successor, the BLM, show that the U.S. government was selling timber in the Upper Siletz Watershed starting in 1923. The majority of the first timber sold included areas burned by the fire of 1910. The first significant timber management began in the 1930s and continued until the 1970s, during which time, most of the old growth and mature timber was removed within the watershed including that in riparian zones.

Fire Lookouts

Fire detection and prevention was an important concern for timber companies, homesteaders, and the federal government in the watershed. A lookout built on Fanno Mountain by the Civilian Conservation Corps in 1936 was destroyed in a windstorm in 1942, rebuilt in 1944, and destroyed again by the 1962 Columbus Day Storm. This lookout was accessed and supplied from pack trails. A lookout was built on Stott Mountain in 1954 and was used until 1972. The 32 ft. tower was dismantled in 1980 (LSR Assessment # R0807 1995).

Recreation

The watershed has long been popular for the following recreational activities: motorcycle riding; dispersed camping; photography; birding; target shooting; photography; and wildflower identification. AConsumptive@ recreational activities have included berry picking and commercial collection of mushrooms, moss, bear grass, rhododendrons and other plants. Hunters harvest both big and small game in the watershed while the NF and SF Siletz Rivers provide fishing for summer steelhead, chinook salmon, and cutthroat trout.

Grazing

A small portion of the SF Siletz subwatershed is periodically grazed by cattle during the winter and spring months. The majority of the unauthorized grazing occurs on Boise Cascade land near Sand, McSherry, and Potter Creeks. The grazing occurs on a limited basis with a herd of approximately 10-12 animals, which are naturally confined to the more gentle terrain and available forage near the former townsite of Valsetz.

B. Current Conditions

1) Commodity Forest Products (Timber)

The BLM manages 12,178 acres (27%) of the 44,583 acre Upper Siletz watershed. Approximately 6,351 acres of the Upper Siletz watershed is located within the Northern Coast

Range Adaptive Management Area . The Northwest Forest Plan and Salem District RMP designated four land use allocations (LUAs) within the Upper Siletz watershed; i.e., Late Successional Reserves (LSR), Adaptive Management Reserves (AMR), Adaptive Management Areas (AMA), and Riparian Reserves. These LUAs directly impact the amount and type of timber and special forest products (SFP) that can be harvested for the next 10-20 years while still supporting the goals set for other resource values.

The objectives for each LUA are based on traditional-or-experimental management including silvicultural practices which will be necessary to attain the conditions desired for each LUA. For a discussion of experimental silvicultural practices such as density management see Appendix #19. (Density-management treatments refer to silvicultural treatments which manipulate stand-stocking levels to promote desired habitat features commonly associated with old-growth or late-seral stands.) The following is a discussion of LUAs and management implications for each in the Upper Siletz watershed:

Late Successional Reserves

According to the RMP, (Chapter 2 - 27), Late Successional Reserves should be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems as potential habitat for species dependent or associated with these types of ecosystems. Commercial thinning, timber salvage, and regeneration timber harvest are restricted on LSR land. LSR lands encompass about 5,825 acres or 47% of BLM-administered land in the Upper Siletz watershed. Density-management treatments may be used in LSRs in stands less than 80 years-old to enhance old-growth characteristics in younger, homogenous stands.

According to the RMP (Chapter 2 - 114), a management assessment will be prepared for each LSR or group of LSRs before habitat manipulation activities are designed and implemented. Among other things, this management plan will develop criteria for developing appropriate habitat manipulation treatments, and identify specific areas that could be treated. Therefore, this analysis was limited to identifying only an initial list of potential areas where density-management treatments might be used to promote the development of old-growth or late-seral habitat characteristics.

Figure 14 indicates that LSR lands encompass a large majority of the 107-200+ year-old acres in the watershed. There is also a significant portion in the 10-46 year-old class due to regeneration harvest from the 1950's to the 1980's.

GIS analysis determined available potential acreage for density management within LSRs, using the following criteria: 1) stand age = 16-80 years; 2) 40% and greater stocking; 3) contains conifers; and 4) outside Riparian Reserves and fragile sites. The analysis indicated that 1,407 acres are available for density management (see Map #14).

The same analysis for land inside Riparian Reserves indicated that an additional 2,327 acres are potentially available for density management. As previously noted, density management could only be conducted here if it meets or enhances the objectives of the Aquatic Conservation Strategy.

Applying the same stand criteria, except changing stand age to 10-20 years, provides a forecast of future density-management opportunities. Within 10 years, there will potentially be an additional 133 acres inside and 85 acres outside Riparian Reserves available for density management.

Figure 14. Overall Age Class Distribution Within Various Land Use Allocations in the Upper Siletz Watershed.

Adaptive Management Reserve

Adaptive Management Reserves are managed to protect and enhance late-successional and old-growth-forest ecosystem conditions. To meet these objectives, density-management practicesin age classes up to 110 years may be required. There are approximately 4,011 acres of BLM-administered lands designated as AMR in the watershed.

GIS analysis determined available potential acreage for density management on AMR, using the following criteria: 1) stand age = 16-110 years; 2) 40% and greater stocking; 3) contains conifers; and 4) outside Riparian Reserves. The analysis indicated that 1,463 acres are available for harvest (see Map #14).

The same analysis for land inside Riparian Reserves indicated that an additional 2,192 acres are potentially available for density management. Management here could only be conducted if it meets or enhances the objectives of the Aquatic Conservation Strategy. Applying the same criteria, except for changing stand age to 12-20 years, provides a forecast of potential density-management opportunities in the future. Within 8 years, there will potentially be an additional 140 acres inside and 87 acres outside Riparian Reserves that are available for density-management treatments.

Adaptive Managment Areas (AMA)

Adaptive Management lands are managed to restore and maintain late-successional forest habitat outside reserves; restore and protect riparian zones; and produce a sustainable supply of timber (RMP 1995). Limited, traditional harvest-and-management practices may be necessary to attain the conditions desired for this LUA. There are approximately 2,337 acres of BLM-administered lands designated as AMA in the watershed.

Using the following criteria, GIS analysis determined the acres available for density management on Adaptive Management lands: 1) stand age = 16-110 years; 2) contains conifer; and 3) outside Riparian Reserves. This analysis revealed that 623 acres are potentially available for harvest (see Map #14). The majority of this acreage is located in the SF Siletz subwatershed.

The same analysis for land inside Riparian Reserves indicated that an additional 1,263 acres are potentially available for density management. Management here could only be conducted if it meets or enhances the objectives of the Aquatic Conservation Strategy.

Riparian Reserves

Riparian Reserves are managed to meet Aquatic Conservation Strategy objectives. There are approximately 10,809 acres (89% of BLM-administered lands) designated as Riparian Reserves in the watershed (Map#15). Riparian Reserves overlay all other LUA designations. Experimental harvest-and-management practices may be necessary to restore and maintain the health of Riparian Reserves.

Other Considerations

Western hemlock appears to be a key species in the development of multi-storied stands. According to Barbara Schrader of Oregon State University, A...western hemlock occurrence and distribution directly affects forest structural development. Forests lacking hemlock will be much slower to develop into multi-structural forests than those containing hemlock. Hemlock occurrence appears related to disturbance history, presence of seed source and seedbed, and is also influenced by landscape topographic factors.@ GIS analysis of BLM-administered lands in the watershed revealed that approximately 272 acres contain western hemlock as the dominant tree species of which 169 acres are inside and 103 outside riparian reserves. Approximately 2,605 acres contain western hemlock as a subdominant species within the watershed. Such stands may possibly be prioritized for density management treatments.

2) Special Forest Products

There are many types of special forest products (SFP) which are gathered in the Upper Siletz watershed. Special forest products include any wood or other forest product gathered in the forest, excluding timber. SFP contracts sold in the Marys Peak Resource Area include a variety of products including firewood, moss, floral greenery, mushrooms, medicinal herbs and barks, grasses, seeds, roots, bark, berries, tree seedlings, transplants, poles, conifer boughs, and firewood. Little is known of the current condition of many of the special forest products in the resource area.

From 1986 to 1995, 39 contracts were sold in the Upper Siletz watershed, creating $6,511.00 in government revenues. The majority of SFP contracts and revenues in the Upper Siletz watershed are due to the sale of boughs, cones, and edible mushrooms (Figure 15).

Figure #15. Percent Revenues from Special Forest Products in the Upper Siletz Watershed (1986-95).

The RMP outlines new standards and guidelines with respect to the harvest of special forest products, which have a direct bearing on the Desired Future Condition of the SFP program. These guidelines apply mostly to the harvest of wood products, and are specific to each land-use allocation as addressed below:

Late-Successional Reserves and Adaptive Management Reserves

Standards and guidelines for LSRs and AMRs limit the harvest of special forest products to a greater extent than on Adaptive Management lands. LSR-and-AMR lands are set aside to protect and promote older-forest ecosystem types. Some of the guidelines affecting harvest of special forest products include:

1) Firewood gathering is limited to existing cull decks, thinning areas, and timber sale areas where excess down wood impedes future activities or creates a large-scale disturbance hazard, and where blowdown trees block roads.

.2) Harvest of any special forest product must be evaluated for possible adverse effects on LSR-and-AMR objectives, resource sustainability, or other resource values.

In addition to these restrictions, (see RMP Chapter 2-61), the RMP calls for additional analysis to determine whether existing levels of SFP harvest constitute a significant effect on late-successional habitat within the LSR and AMR. This analysis should be addressed in the management assessment which will be completed for each LSR (see RMP Chapter 2-114).

Adaptive Management Areas

Adaptive Management Areas will constitute the areas where the majority of SFP contracts will be issued. The AMA is provided to implement, restore, and monitor experimental activities. The AMA will develop and test new managment approaches to integrate and achieve ecological and social health. Riparian areas within the AMA will be protected consistent with other land-use allocations.

Riparian Reserves

Riparian Reserves are located in all of the RMP allocations. Riparian Reserve widths range from the height of one site-potential tree on each side of intermittent-or-seasonally flowing stream, to the height of two site-potential trees on each side of fish-bearing, perennial streams. Harvest of wood products is limited in Riparian Reserves (see RMP, Chapter 2-61). Where catastrophic events result in degraded riparian conditions, fuelwood cutting is allowable if required to attain Aquatic Conservation Strategy objectives. Harvest of other special forest products is limited to certain sites, seasons, or amounts in Riparian Reserves.

Protection Buffers

Under the RMP, Protection Buffers will be established to protect rare-and-locally endemic species. No special forest products of any kind may be harvested within Protection Buffers. These areas have not yet been identified, and so the extent of the impacts from these buffers is unknown. However, the areas protected are expected to be small (e.g., in the tens of acres).

An effectively managed SFP program benefits both the BLM and the public interests in many ways. Some of these benefits include: (1) complement other resource programs managed by the BLM; (2) contribute to the economic stability in local communities; (3) resolve some of the conflicts created by increased commercial and recreational harvesting of these forest products; (4) develop baseline inventory data for species now in demand; (5) form partnerships with groups concerned with the harvest and management of these products; (6) educate the public as to the value of our natural, renewable resources; and (7) provide the product source for research and medical purposes.

3) Roads

The majority of the Upper Siletz watershed is accessed from theValsetz and Black Rock mainlines, both of which originate from Falls City County Road #0006. A network of discontinuous roads originates from these two primary roads. Most roads within the watershed are surfaced with crushed rock. Approximately 81 miles of roads in the watershed are controlled by BLM and 238 miles by the industrial timber companies (Table #11). Unsurfaced roads account for three miles (2%) of the total transportation system in the watershed. About 2.5 miles of unsurfaced roads are controlled by BLM and 0.5 miles are under private control. Roads located within interim Riparian Reserves include 39 miles on BLM-administered lands, and six miles on industrial timber land. Roads located outside Riparian Reserves include 33 miles on BLM-administered lands and 77 miles on industrial timber land.

Table 11. Road Summary Statistics.

ROAD STATUS	Surface type (miles) Rock	Natural.	Total Miles	Total Miles (%)	Road Density (mi/sq mi)
Total Roads in Watershed	319	3	322	100	4.6
BLM-Controlled Roads on BLM	79	2	81	25.1	1.2
BLM-Controlled Roads on Private	0	0	0.0	0	0
Privately Controlled Roads on Private	83	0	83	25.7	1.2
Privately Controlled Roads on BLM	1	0	1.0	0.3	.01
Private Non-Inventoried Roads *			157	48.8	
BLM Non-Inventoried TRZ Roads **			NA		
BLM-Controlled Roads Providing Access to Private Lands	69	0	69	21.4	1
BLM Roads Restricted by Gates	0	0	0	0	0
BLM Roads Closed by Temporary Barricades ***	1	0.5	1.5	0.5	.02

* Unknown Status or Surface Type
** Skid Roads, Jeep Roads, Trails, etc.
*** Ditches, Earthberms, Vegetation, Logs/Debris

The transportation system in this watershed is used for managing BLM-administered and private timber lands. Historically, the primary use has been managing and transporting timber. Other common uses of the road system include recreation (hunting, fishing, camping, hiking, and sightseeing), and harvest and transportation of special forest products. Although logging has decreased on federal lands, private landholders continue to manage their land primarily for timber production, and therefore, there is a need to maintain access through federal lands.

Primary-or-secondary roads (see Appendix #16 for a discussion of road types) constructed from 1950 to 1975 used construction practices ranging from poor (e.g., inadequate compaction of road surface) to over construction (e.g., oversized subgrade widths), to excellent construction using good, high quality techniques. Road locations and designs were often planned for logging a particular setting while attempting to avoid other land owners. In some cases, thisresulted in excess roads to be constructed, sometimes on marginal terrain, where they could have been avoided. Fortunately, because of the overall stability within the area, few failures of significance have occured as a result of poor, road placement. The problems that occur are often associated with inadequate or failing drainage structures, or occasionally by lack of ditch or culvert maintenance. Since 1975, transportation planning for location and design of new road construction has generally considered the entire watershed. Roads constructed since 1975 have produced fewer impacts in the watershed, because they have been designed to follow the natural contours of the landscape, to avoid placing embankment material on the steeper sideslopes, and to more carefully consider drainage needs.

A field inventory of current BLM road conditions in the watershed , including drainage structures, was completed in 1995. Most roads are rock surfaced with vegetated slopes. Drainage structures such as culverts and log fills installed during the 50's and 60's are beginning to fail with some showing significant deterioration. Many of the pipes are inadequately sized and placed too infrequently to route flows. Approximately three miles of unsurfaced roads are located on BLM-administered lands. A major information gap is lack of road/culvert data and condition on approximately 157 miles of privately controlled roads.

A Transportation Management Plan (TMP) to establish objectives for the transportation system in the Upper Siletz watershed is currently being developed (see *Appendix17* for the process). The future management status of roads in the watershed will be determined in this plan. This plan will be based on data collected from a 1995 field inventory of roads and drainage structures in the watershed. The TMP will provide data and resource information necessary to support decisions made during in an interdisciplinary resource process. Decisions to rock or obliterate roads will be based on the (TMP) recommendations. Other decisions may include improving existing roads, drainage structures, limiting access, road obliteration, or no action. The interdisciplinary approach evaluates resource constraints and primary uses of roads to determine the preferred road management action.

TheTMP classifies roads into high, medium, or low risk categories to indicate their potential for adversely affecting water quality. "High-risk" roads could have some of the following characteristics: 1) no surfacing, 2) inadequately maintained, 3) occur in highly erosive soils or unstable areas, 4) improper drainage or undersized culverts, 5) inadequate stream crossings, or 6) high traffic flow.

Road Closures

Historically, roads controlled by BLM have remained open at all times for public use except during periods of extreme fire danger. Unless the BLM has acquired an exclusive easement across private lands, guaranteed public access is limited to the few federally-controlled roads that are located exclusively on BLM lands. Approximately 73 miles of BLM-controlled roads (90% of total) are encumbered by access documents (i.e., Reciprocal Agreements or Non-exclusive Easements) with private landholders. Management of BLM and privately-controlled roads in areas affected by these agreements or easements must be agreed upon by both parties.

Approximately 256 miles (79.5% of total road network) of private roads occur in the watershed, and most are currently open at all times (see Table 11). However, public use of primary private roads is subject to the interest of the private landholder, and the majority of private roads are controlled by gates (some are currently closed by a variety of devices). Public access could be severely restricted in the future.

Temporary barriers to ease hunting pressure are installed annually in a portion of the watershed through a cooperative agreement between the Oregon Department of Fish and Wildlife, Boise Cascade, and the Bureau of Land Management. This Cooperative Travel Management Area limits access on some secondary and local roads. Several roads in the watershed are utilized as travel corridors for wildlife, mainly deer and elk.

Road Maintenance

Maintenance on the majority of roads in this watershed has traditionally been accomplished by private contractors on BLM-controlled and on privately-controlled roads. Roads are generally only maintained during periods of high use or unless serious problems are known to exist. Primary and secondary BLM-controlled roads are maintained to provide access for management of federal lands. Many "local" BLM-controlled roads have been closed by vegetation which has reestablished through lack of use. The trend of reduced harvests from BLM-administered lands is causing additional deteriorating conditions of BLM-administered roads. Only main roads providing access to private timber harvest operations are being adequately maintained. Recent severe winter storms have increased the need for road surface and drainage repair or maintenance; if left undone, there is a high likelihood that roads will experience subgrade, fillslope, or drainage structure failures.

Many roads in this watershed are aging and beginning to experience problems. The greatest causes for concern include: 1) drainage structures unable to adequately carry waterflows, 2) deteriorating or insufficient sizes and numbers of culverts, and 3) inadequate ditch and surface maintenance. These factors have resulted in the following: 1) raveling of cut slopes into ditches and road surfaces, 2) mass wasting of some fill slopes on steep hillsides, and 3) erosion of other earth fills from poor culvert installations or lack of maintenance. Many culverts in perennial and intermittent streams are too small in diameter, causing them to plug easily and resulting in water over flowing the road during major storm events. Several local and some secondary roads have not been used recently and are now revegetated and largely inaccessible. Some of these still have drainage structures in place that could fail and cause downstream sedimentation.

Quarries

Rock quarries have been developed in the watershed to provide road surfacing material. There is one inactive quarry known to exist on BLM-administered land in Section 29, T.7S. R.8W. Current guidance requires that impacts to adjacent resources be reviewed, and that mining laws and regulations are followed prior to any extraction from this quarry.

4) Recreation

Centrally located between the Pacific Ocean and Willamette Valley with small communities on either side and a rapidly growing metropolitan area (Salem) within an hours drive, the Upper Siletz watershed is situated for day-use recreation activities. This watershed has long beeen popular for motorcycle riding, dispersed camping, photography, birding, target shooting, photography, and wildflower identification. Consumptive recreational activities include berry picking and commercial collection of mushrooms, moss, fuelwood, bear grass, rhododendrons and other plants. Hunters harvest big and small game in the watershed while the NF and SF Siletz Rivers (and some tributaries) provide fishing for trout, steelhead and salmon. The NF Siletz River provides the only native summer steelhead fishing opportunities beween the Umpqua River and the Columbia River. The NF Siletz River also has scenic qualities which vary from dense, mature-to-immature timber with steep, rocky outcrops descending into the river. Timber management activities on private ownership have created moderate impacts along the lower stretches of the river.

The Recreational Opportunity Spectrum (ROS) provides a framework for stratifying and defining classes of outdoor recreation opportunity (experience). While the goal of the recreationist is to obtain satisfying experiences, the goal of the recreation planner becomes one of providing the opportunities for obtaining these experiences. By managing the natural resource setting and the activities which occur within them, management is providing opportunities for recreation experiences. Therefore, the planner, recreationist, and recreation opportunity can be expressed in terms of three principal components:

Setting Opportunity: What are the area=s characteristics in terms of physical, social, and managerial?

Activity Opportunity: What do folks do in the watershed?

Experience Opportunity: What do folks feel about their experience?

For management and conceptual convenience, possible mixes of activities, settings, and probable experience opportunities have been arranged along a spectrum, or continuum known as ROS. This spectrum is divided into seven classes as described in the RMP.

The Oregon State Parks and Recreation Division, in their 1988 publication entitled, the Statewide Comprehensive Outdoor Recreation Plan or SCORP, discussed a shortage of non-motorized ROS categories and recreational areas accessible to the disabled. The Upper Siletz watershed is within SCORP Region 8, which has a non-motorized shortage of the following categories: camping; camping (dispersed); hiking/mountain biking/equestrian trails; nature activities; and designated off-highway vehicle areas.

Roads: See Human Uses - Roads section for a more extensive discussion of present road conditions. To summarize briefly here, the road network in the watershed is extensive. The majority of the roads are rocked, timber haul roads. Some roads in the area are reverting back to their natural state due to the lack of maintenance and vehicular use.

Restricting road access has a significant impact on recreational opportunities by limiting certain activities such as driving, sightseeing, road hunting, and other activities. Conversely, restricting road access can also provide for new types of opportunities. For example, closed roads can also become trails and provide new opportunities for horse, mountain bike, and hiking trail development. Road access may be restricted by the closure of roads by design (by various methods) or by growth of vegetation in less traveled areas. The current decrease in funding for maintainence of BLM-administered roads will likely lead to additional road closures either by design or through vegetation blockages caused by lack of use**.**

There are two bridges restricting access to the Valley of the Giants Outstanding Natural Area. One bridge is restricted by load limits and another entirely closed to vehicles near the confluence of Boulder Creek and the NF Siletz River. These bridges are located in Section 32, T. 7 S., R. 8 W., approximately one and one-half miles south of the Valley of the Giants trailhead. Both bridges are planned for replacement during the summer of 1996.

Dispersed Recreation: The dispersed recreation activities that presently occur within the watershed include: hunting using a gun or bow; camping (dispersed); picnicking (dispersed); fishing; collection of tree boughs, mosses, mushrooms, and other SFP=s, and birding near the former site of Valsetz Lake. Due to their isolated location and private access, the NF and SF Siletz Rivers are very lightly used recreation resources. There are no trails along the rivers, and hiking is difficult. Fishing from spring through fall is the primary recreation use of the rivers.

There are many privately controlled roads in the watershed, and the majority are open to the public except for periods of high fire danger and other private land activities.

Developed Recreation The only developed recreation site within the watershed is the Valley of the Giants Outstanding Natural Area created in 1976. A one-mile-long trail crosses the NF Siletz River, and meanders through a 400-500 year-old stand of Douglas-fir and western hemlock trees. The trailhead is located near the confluence of Warnick Creek and the NF Siletz River in Section 30, T. 7 S., R. 8 W.

Off-Highway Vehicles (OHV) Pursuant to the RMP, the majority of BLM-administered lands will be available to off-highway vehicle use. Off-Highway Vehicle (OHV) use on BLM-administered lands is regulated to minimize adverse impacts: to resource values; conflicts between visitors; and to promote public safety (Executive Orders 11644 and 11989, and 43 CFR 8340).

Recreational Driving The Valsetz and Black Rock Mainline are the most heavily used roads within the watershed. The Valsetz Mainline road serves as a route to the NF and SF Siletz Rivers. The Black Rock Mainline provides access to the Laurel Mountain Radar Station (which is presently operated by the Federal Aviation Administration) and the Valley of the Giants Outstanding Natural Area.

The highest vehicular use of forest roads occurs during the summer and autumn months (firewood cutting; fishing; and hunting: deer, elk, bear, grouse, quail, and pigeon).

5) Research

Section 31 of T8S, R7W is currently being used for ecosystem research by the National Biological Survey in conjunction with the BLM and USFWS (Callahan Creek Study Plan 1995). Plans are to monitor this study area into the near future (20 years). Density-management prescriptions are being evaluated for their impacts on various components of the ecosystem.

6) Land Tenure Adjustment

Three land tenure zones are currently identified for BLM-administered lands in the Salem District:

a) Zone 1 includes lands and other areas identified as having high, public resource values. These lands would generally be retained under BLM administration.

b) Zone 2 includes lands that meet criteria for exchange because they form discontinuous ownership patterns, are relatively inefficient to manage, and may not be accessible to the general public. These lands could be blocked up in exchange for other lands in Zones 1 or 2, transferred to other public agencies, or given some form of cooperative management.

c)Zone 3 includes lands that are scattered and isolated with no known unique resource values. These lands would be available for use in exchanges for inholdings in Zone 1 or Zone 2. They are also potentially suitable for disposal, but this would only occur if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified, and no viable exchange proposals for them can be identified (Salem District RMP).

The Upper Siletz watershed is comprised of Zone 2 lands. Right-of-ways have been granted for logging roads. Ecosystem management is most efficiently conducted in lands with contiguous ownership. BLM-administered lands in this watershed are more contiguous in the Boulder and Upper NF Siletz River subwatersheds, but are more scattered or checker-boarded in the SF Siletz and Lower NF Siletz subwatersheds. Ecosystem management would also be well served by the availability of control watersheds from which to gauge the effects of forest management in other watersheds. Ownership of the entire watershed or subwatershed would facilitate the establishment of these control areas.

7) Tribal Interests

Contacts were made with the Confederated Tribes of the Siletz Indians of Oregon with reference to their current interests or concerns in the watershed (Kenta, personal communication). No major interests or concerns were expressed except for their support of a proposed study on lamprey eels in the Siletz River.

Chapter 5/6 Findings, Interpretation, and Recommendations

(BLM will work cooperatively with private landowners whenever and wherever feasible to implement the intent of the following recommendations.)

Erosional Processes

1) **Findings**: Potential moderate-to-severe, landslide areas (i.e., slopes above 60%) occur on 2,200 acres of BLM-administered lands in the watershed (total of 6,800 acres including all ownerships). The number of existing landslide areas (between 1956 and 1993) identified by inspection of aerial photographs is 186.

Although the landsliding processes that we see today are the same as those under reference conditions, landsliding characteristics of the watershed (e.g., the intensity and rate of landsliding) likely vary substantially between the two periods. Although data on the intensity and timing of landsliding prior to 1900 are unavailable, we may infer from current data that effects of landsliding today are greater than under reference conditions. Road construction and logging are the major factors for this increase. The trend may be improving with adoption of the Northwest Forest Plan, but continued road maintenance is necessary to reduce the possibility of road-related landslides in the future.

Map: see Map #4.

Recommendations (for BLM-administered lands only):

ŒFor all lands: Follow BMPs and TPCC-management guidance.

ŒFor lands with greater than 75% slope gradients:

- Maintain maximum amount of root structure in ground (i.e., minimize vegetation disturbance).

- Study all roads within landslide potential areas and consider the following:

  - Upgrade roads necessary for land management activities to reduce the potential for slope failure.

  - Decommission roads not required for other uses or access to other lands.

  - Construct outslopes and deep dips over existing culverts to reduce potential culvert blowouts.

- Avoid new road construction across these slopes.

- Renegotiate existing road access agreements on roads crossing through unstable slopes.

- Develop a road maintenance program to protect other resources.

C On lands with slope gradients of 60 to 75%:

- Where appropriate, achieve total suspension logging over convex slopes.

- If necessary, use long timber harvest rotations on unstable slopes.

C For lands with less than 60% slopes:

- Avoid unstable areas for roads and landings.

2) **Findings**: On 6,800 acres with hillslopes steeper than 60%, soil-surface erosion is greatly accelerated from forest management practices (regeneration harvests to a greater degree than thinnings) and road construction.

See discussion under Erosional Processes Finding #1. Continued road maintenance and retention of vegetative cover in high risk, erosional areas are necessary to reduce the possibility of erosion in the future.

Map: see Map #4.

Recommendations:

C Avoid vegetation disturbance on hillslope gradients steeper than 90%.

C Maintain maximum amount of root structure (i.e., minimize vegetation disturbance) on hillslope gradients steeper than 75%.

C Leave surface debris and use cool-season burns on convex slope gradients from 60 to 75%.

3) **Findings**: Approximately 5,220 acres (530 acres of BLM-administered land) of ground-based tractor yarding occur within the watershed. This has resulted in about 1,360 acres of soil compaction (see Chapter 3/4 - Erosional Processes).

Compaction and related loss of soil productivity has increased in the postsettlement period in contrast to reference conditions. This has been largely due to the effects of logging practices (road building has increased compaction within road prisms). The trend is improving because of the increase in one-end and full-suspension yarding and mitigation of compaction. Adoption of the Northwest Forest Plan with reduced logging impacts will also improve this situation.

Map: see Map #5.

Recommendations:

CLimit the use of ground-based equipment.

CAvoid wet season, non-suspension yarding.

CAvoid tilling the soil except where soils are compacted and have little or no vegetative cover.

CAvoid scarification except where soils have thick A-horizons (greater than 8 inches).

CBurn on only moist soils or reduce fuel loads left after yarding to reduce the potential loss of soil duff.

Vegetation

1) **Findings**: 1,751 acres of stands at least 80 years-old occur on BLM-administered lands within the Upper Siletz watershed (all within the Late Successional Reserve). These stands occupy about 3.9% of the entire watershed compared to about 60% in presettlement times (see Ripple 1984).

About 14.4% of BLM-administered lands is classified as late-successional forest (80 years and older).

The decline in this habitat was largely due to intensive forest management. The amount and rate of clearcutting on BLM-administered land has declined due to concerns over the northern spotted owl eventually culminating in the Northwest Forest plan. The emphasis on management of older forest conditions on BLM-administered lands in this watershed was recently adopted in the Salem District Record of Decision (1995). Clearcutting on private lands in this watershed continues.

Some of these stands currently provide suitable characteristics of older forests (i.e., multiple canopies; large, standing snags; large downed woody debris; etc.). Others are currently thought to be on a satisfactory trend to provide suitable old-growth characteristics in the future.

Map: see Map #6.

Recommendations:

CAllow continued growth and minimize disturbance of forest stands with currently suitable older forest characteristics or which are on a satisfactory trend for eventual attainment of old-growth forest conditions.

ŒClose selected roads in these stands.

ŒConduct stand exams in a selected sample (i.e., which incorporates the stand variability found in this watershed) of these stands to determine structural characteristics that would provide goals for management of younger aged stands; and for possible density management (i.e., stands between 80 and 110 years old).

2) **Findings**: 10,470 acres of stands less than 80 years-old occur on BLM-administered lands (AMR = 4,012 acres; AMA = 2,339 acres; LSR = 4,119 acres) within the Upper Siletz watershed. These stands, and those on private lands as well, occupy about 87.5% of the entire watershed compared to an estimated figure of less than 40% in presettlement times (see Ripple 1994).

There are approximately 9,275 acres of land within the watershed which could benefit from density management treatments (see Appendix #18 for the Regional Ecosystem Office draft exemption criteria for silvicultural treatments in LSRs; also see Appendix #19 for additional information on density management and methodologies) to achieve old-growth characteristics more rapidly. Of these, 5,782 acres are located inside Riparian Reserves and 3,493 acres are located outside Riparian Reserves.

The increase in forest stands less than 80 years-old has been largely due to intensive forest management but some is also due to natural disturbances such as wildfire. The amount and rate of clearcutting on BLM-administered land has declined due to concerns over the northern spotted owl (see above). The emphasis on management of older forest conditions on BLM-administered lands in this watershed was recently adopted in the Salem District Record of Decision (1995). Clearcutting on private lands in this watershed continues to produce this habitat.

Map: see Map #6.

Recommendations:

ŒFurther evaluate stands with western hemlock as a dominant tree species (272 acres) or a subdominant species (2,605 acres) for possible density management treatments. (These stands have been identified by querying the FOI database and mapped by GIS methods - see Map #16.) According to Barbara Schrader of Oregon State University, Awestern hemlock occurrence and distribution directly affects forest structural development. Forests lacking hemlock will be much slower to develop into multi-structural forests than those containing hemlock. Hemlock occurrence appears related to disturbance history, presence of seed source and seedbed, and is also influenced by landscape topographic factors.@

- Locate any additional stands which may contain an understory (1-12 feet high) of western hemlock or other conifer regeneration which could benefit immediately from density management. (These stands can not be queried in the FOI database. For now, they must be identified in the field.)

- Further evaluate stands between 15 and 79 years-old that are even-storied, densely stocked, and which lack diversity. (These stands have been identified by querying the FOI database and mapped by GIS methods - see Map #14.)

- Conduct stand exams in all the stands listed above to determine characteristics and feasibility of density management.

- Prioritize the stands including those in Riparian Reserves for density management treatments to benefit wildlife and aquatic habitat and meet aquatic conservation goals. Prioritize younger stands first (15 to 50 year age class) because of their greater responsiveness to density management treatments than 51-79 year-old stands.

- Implement density management on high priority areas first, however include low priority areas which are in need of density management and are economically feasible (i.e., timber by-product receipts will pay the cost of the project).
- In recent harvest units, experiment with planting densities to determine which are most appropriate for achieving old-growth forest characteristics more rapidly. Try planting at 300-400 trees per acre; monitor their survival over time.

- In densely stocked stands currently between 5 and 15 years old, experiment with thinning densities to open up the stand. Try thinning down to 100-200 trees per acre (perhaps over two successive thinning treatments); monitor tree growth and development of older-forest characteristics over time.

3) **Finding**: An estimated 1,636 acres (1,500 acres on BLM-administered lands and 136 acres on private) of special plant communities occur within the Upper Siletz watershed.

There is not enough data available to confidently predict a trend in the amount of this habitat over time. The best estimate is that the current acreage is less than in presettlement times due to brush encroachment on meadow sites subsequent to establishment of effective fire control methods.

Map: see Map #7.

Recommendations (for BLM-administered lands only):

- Develop and/or maintain small meadows which are important habitats for a diverse array of plant species.

- Consider a prescribed fire research plan to learn more about control of brushy and/or competing non-native species in small, selected areas where such treatment may be necessary.

4) **Findings**: Two special status plant species (*Filipendula occidentalis* - 7 sites; *Poa laxiflora* - 1 site) and one special attention plant species (*Hypogymnia duplicata - 1 site*) (as identified in the Northwest Forest Plan) occur in the Late Successional Reserve within the watershed.

Map: see Map #7.

Recommendations:

- Protect habitat for these species according to Salem District RMP.

- Initiate surveys for SEIS special attention plant species; record and store locations in a database; and eventually develop a GIS map theme. Follow RMP guidance when these species are found.

5) **Findings**: Logging in the southern third of this watershed has been extensive. Much of the slash created by recent logging activity has not been treated, resulting in a higher than normal fuel loading of light-and-medium size fuel. Precommercial thinning and brushing of young plantations on public and private lands have contributed to increased fuel loading in the watershed.

Untreated slash increases fire hazard, i.e., the intensity and difficulty of controlling the fire should one occur. The likelihood of fire occurrence is tied closely to human activity. In the past century, most fire ignitions in the northwestern part of the Coast Range were the result of human activity.

Increasing human use and high fuel loading increases the likelihood of a high intensity, fire occurrence in the watershed. Over time (1-2 decades), fuel risk will moderate in these areas as fuels break down. However, increases in fire hazard risk will occur in other locations as new forest management activity creates additional fuel and potentials for wildfire.

Since developing and maintaining older forest types is a goal for BLM-administered land in this watershed, any large scale loss (from fire or any other cause) would be counter productive. Rapid suppression action is necessary to keep fires (and losses) small. A good road system is important for providing access for fire vehicles, but also provides access to many users which can increase fire starts.

Map: Not specifically mapped as of June 1996.

Recommendations:

- Maintain an adequate road system for fire control measures.

CControl access to high, fire hazard areas during high, fire danger periods; work with and encourage private land owners to do the same.

CApply hazard/risk reduction techniques to high hazard fuels. Techniques include prescribed fire, fuel reduction, signing, etc.

6) **Finding**: Five plant association types were identified for the watershed based on their importance to ecosystem management.

Map: Draft map is available in Marys Peak Resource Area files.
Recommendations:

CAssist in the development of a GIS-based, plant association theme at the provincial level. The BLM should help fund efforts to produce this layer at the provincial level; upon its completion assess the suitability of this layer at the watershed level. Such information will enable us to make better predictions on future stand compositions and conditions, as well as addressing potential managment problems and opportunities.

7) **Findings**: Five species of noxious weeds are known to occur in the Upper Siletz watershed. They have impacted recent, harvested areas, and some special vegetative communities.

Map: Not specifically mapped as of June 1996.

Recommendations:

CFollow RMP guidelines to control noxious weeds.

CUse genetically local, native plant materials in the revegetation of disturbed areas, especially in and adjacent to wetlands and other special habitats. If these materials are not available, use revegetation methods that do not encourage the introduction or spread of invasive non-native plant species.

Riparian Reserves

1) **Finding**: Conifer forests 80 years-and-older comprise about 3.5% of the total acreage within 100 feet of active streams, compared to an estimated 60% in presettlement times; 50 to 70 year-old conifer forests comprise about 39% of this zone; and 10 to 40 year conifer forests comprise about 28% (see Chapter 3/4 - Vegetation section for methodology used in this analysis).

The decline in 80 year-and-older forest stands was largely due to extensive forest clearcutting. The amount and rate of clearcutting on BLM-administered land has declined since the northern spotted owl controversy began (see above). The emphasis on management of older forest conditions on BLM-administered lands in this watershed (including riparian areas) was recently adopted in the Salem District Record of Decision (1995). Therefore, the trend for BLM-administered land in the watershed is for increasing amounts of older forest in riparian zones. Forest harvesting on private lands in this watershed is regulated by the Oregon Department of Forestry under the Oregon Forest Practices Act.

Map: see Map #9.

Recommendations:

- Increase the amount of older conifer forest in riparian zones where appropriate (see Finding 2 below) and in accord with the Aquatic Conservation Strategy (see Salem District RMP).

2) Finding: Approximately 2,083 acres of BLM-administered, stream-adjacent vegetation have low potential for LWD recruitment; and about 8,833 acres have low potential on private lands. This represents 53% of the total stream-adjacent acreage in the watershed. The large proportion of stream segments with low-and-moderate LWD potential in the Upper Siletz watershed has likely: a) altered the rate of LWD delivery; and b) reduced the size and quantity of organic material entering stream systems relative to reference conditions.

LWD was likely an influential parameter in the determination of channel conditions and aquatic habitat in the SF Siletz subwatershed, because it is predominantly a response or alluvial basin. However, the role and influence of LWD in channel processes in the Upper NF Siletz (which is predominantly a source or transport subwatershed) is not clear. LWD in these channels may actually have the potential to degrade aquatic habitat. This degradation is associated with the breakage of large, debris accumulations (splash dam effect) after flood events and subsequent scouring effects.

The trend is for continued low recruitment potential in the Upper Siletz watershed for several decades until early seral stage vegetation adjacent to streams matures.

Map: see Map #9.

Recommendations:

- Target riparian enhancement projects (with the objective of speeding attainment of older seral stage vegetation) along response reaches, particularly in the SF Siletz subwatershed. Suitable hardwood stands (i.e., stands with a high potential for conversion to conifers) should be considered for underplanting with appropriate conifer species following removal of some overstory in patches. Densely stocked conifer stands should also be considered for treatment. However, due to the steepness of topography along some streams (especially in the Boulder Creek and Upper NF Siletz subwatersheds), opportunities may be limited. Riparian areas with currently suitable conditions for LWD recruitment or on an upward trend should be allowed to mature with minimal disturbance.

CTransport and source reaches in the NF Siletz subwatershed are a low priority for projects designed to increase the LWD recruitment potential of stream-adjacent vegetation. This is because of the steepness of this area, and the presence of adequate instream structure contributed by large boulders and associated deep pools. Avoid increasing LWD recruitment potential and LWD loading on steep, debris-torrent-prone headwalls and unstable areas of ephemeral streams.

Hydrology

1) Finding: Eleven percent of the Upper Siletz watershed has a high potential for cumulative hydrological effects. Fifty percent of these areas are managed by the BLM in the Upper NF Siletz and Boulder Creek subwatersheds. As a result of forest management, the timing, quantity, size of material, and rate of inputs (water, sediment, organic material) into the channel system of the Upper Siletz have probably been altered in comparison to reference condition. Roads are the major contributor to these effects. The trend is for continued high probability of cumulative effects unless road improvement efforts are pursued.

Map: see Map #10.

Recommendations:

CRestrict road construction and vegetation disturbance in areas with high potential, cumulative effects. Decommission roads already in these areas.

CUpgrade roads in moderate cumulative effects areas:

a) Out slope when safe and where it will not destabilize the fill or hillslope;

b) Increase the number of cross drains for ditch relief or install low berms;

c) Upgrade stream crossings to either:

- Prevent diversions of streamflow. (These are low priority crossings where the potential for damage to downstream facilities is considered low. The cost of upgrading is relatively low.)

. - Withstand severe mass wasting processes that occur during large events. (These are high priority crossings where the potential for damage to downstream facilities is considered high. The cost of upgrading is relatively high.)

CDesign any new roads to reduce their width and follow recommendations above. Construct new roads on ridges or flats and avoid crossing Asource@ stream reaches.

Stream Channel

1) Finding: Eighty-nine percent of the total stream mileage (500 miles) in the Upper Siletz watershed is classified as Asource@ or Atransport@ reaches. These reaches are predominantly bedrock channels with cobble-boulder beds and banks, and appear to be functioning close to reference condition. Since these channels are stable and highly resistant to change, the trend is for continued proper functioning. These channels offer little opportunity for projects to improve channel function and condition. Of the remaining 64 miles of response reaches, the BLM manages only 7.2 miles (11%). Current condition and trend in these reaches has not been fully evaluated.

Map: See Response Type Map #7a.

Recommendations:

CComplete a field inventory and evaluation of the 7.2 miles of response-type reaches managed by the BLM. This should include a prioritized list of recommendations for these channels and identification of in-channel project needs/potential.

CComplete a field review of selected Arepresentative@ source and transport reaches to confirm proper-functioning-condition hypothesis.

Water Quality

1) Findings: Stream temperatures in portions of the SF Siletz subwatershed could potentially be in the lethal range for salmonids from July to September. This could reduce the availability of high quality aquatic habitat during this period by 30% (13 stream miles). Trends are most likely toward decreasing, summer stream temperatures in these reaches as riparian vegetative cover is reestablished. However, the influence of alterations in channel condition and base flow have not been evaluated and could negate the beneficial effects of increasing shade. In addition, information on summer steelhead presence and use of these stream reaches is poor. (Based on denser forest cover along streams, NF Siletz subwatersheds are not expected to have stream temperature problems. Monitoring of temperatures should be ongoing in these subwatersheds as well.)

Map: See Map #6.

Recommendations:

CProjects on BLM-administered lands in the SF Siletz subwatershed should address the potential for increasing stream temperatures. No project should proceed unamended if it is likely to cause an increase in stream temperature above the State of Oregon water quality standard (64 ^{o}F).

- Stream temperatures on Callahan or Sand Creek should be monitored during summer base flow.

2) **Findings:** Stream sedimentation in the northern 2/3 of the Upper Siletz watershed is generally not a problem because of high gradients and narrowly confined reaches which quickly transport sediments out of the system. However, field observations suggest that forest management has apparently increased stream sedimentation in the SF Siletz subwatershed. This situation is aggravated by low stream gradients which lower the capability of the system to transport sediment resulting in aggrading reaches.

- Reduce impacts from sedimentation (see recommendations for Erosional Processes, Hydrology, Fish Species and habitat, and Human Uses-Roads; Chapters 5/6).

3) Finding: The existence or extent of waterborne disease contamination of Upper Siletz watershed surface waters is unknown. However, based on previous studies, contamination by forest harvesting is not thought to be a significant factor in the watershed. We are unaware of any data available for dissolved oxygen and herbicide/pesticide levels.

Water quality data is extremely limited for the watershed. Currently, it is not possible to state with certainty whether or not water quality meets or exceeds state water quality standards.

Recommendations:

- Encourage the Oregon Department of Environmental Quality to acquire water quality information in the watershed.

FISH SPECIES AND HABITAT

1) **Finding**: The summer steelhead run in this watershed is unique. Summer steelhead have declined in recent years. Average yearly runs of summer steelhead in the 1960s and early 1970s indicate a run size that was many times larger than currently observed.

The occurrence of anadromous fish resources in the watershed is controlled by the Oregon Department of Fish and Wildlife (ODFW) at Siletz Falls located about five miles below the watershed boundary. All anadromous fish that attempt to pass Siletz Falls are trapped and selectively passed or blocked. Historically, the watershed contained only summer steelhead and resident cutthroat trout. All other anadromous fish were blocked by Siletz Falls, which is the only summer barrier to anadromous fish in the Oregon Coast Range north of the Umpqua basin. The ODFW constructed a fish ladder around the falls in the 1950s which allowed chinook and coho salmon and winter steelhead access to habitat within the watershed. This ladder has since been removed and replaced with a trap that allows only summer steelhead and chinook access. Currently, the upper basin is managed primarily for summer steelhead in a strategy intended to return to the reference conditions.

Map: see Map #9.

Recommendations:

- Because of the uniqueness of the summer steelhead run, restoration efforts should be targeted at this species. These efforts should be conducted cooperatively with ODFW and private landowners where necessary.

- Surveys for summer steelhead should continue and/or be initiated on those streams that are used by summer steelhead.

- Barriers to summer steelhead migration should be identified.

- Access to areas that have a high potential for poaching should be monitored and controlled if possible.

- Determine if stream temperatures are a critical limiting factor in the reproductive cycle of summer steelhead especially in the SF Siletz subwatershed.

2) **Findings**: Watershed streams that contribute key summer steelhead habitat include the NF and SF Siletz Rivers and their larger tributaries. Habitat within the SF Siletz system, including the Valsetz lake bed, has been intensively managed (roading and clearcutting) and is recovering. The NF Siletz system generally contains good habitat consisting of stable, rocky, instream habitat.

Habitat conditions in the SF Siletz subwatershed are considered of lower quality than under reference conditions, primarily because of extensive forest harvesting in this watershed, including removal of riparian vegetation, and increased sedimentation and water temperatures due to roading and logging. Habitat conditions in the rest of the Upper Siletz watershed are believed to still provide quality habitat conditions similar to reference conditions (although road impacts are still a concern). This is largely due to the presence of large boulders and associated deep pools which provide high quality habitat year-round. The presence of this rocky structure compensates for the timber harvesting effects in this portion of the watershed which have also resulted in removal of much of the riparian tree cover in the past.

Map: See Map #2.

Recommendations:

- Follow RMP guidelines and Aquatic Conservation Strategies Objectives when planning management activities within the watershed.

- Continue and/or initiate monitoring for stream temperatures, turbidities, and instream flows.

- The priority for improving fish habitat should be to identify and rehabilitate areas of the transportation system that induce mass wasting and resultant sedimentation impacts within the watershed (see Chapter 5/6 - Human Uses). Cooperate with private landowners where necessary to improve road conditions.

- Consider instream improvements (e.g., boulder and log placement) in the SF Siletz subwatershed; however, because of the limited amount of BLM-administered land in this subwatershed, these improvements are not a priority. Instream habitat improvements in the rest of the watershed are not recommended at this time, because of the high quality rocky structure that already exists.

- Conduct riparian silvicultural projects in the SF Siletz subwatershed to establish conifers within suitable riparian areas dominated by hardwoods (some hardwood riparian areas have no evidence of previous conifer growth and may not be suitable for these projects; see Riparian Reserve section).

- Identify barriers to fish passage and analyze for removal.

Wildlife Species and Habitats

1) **Findings**: There is very little interior old-growth forest habitat remaining (< 600 acres) in the watershed; old-growth connectivity has been greatly reduced both within the watershed and with adjacent watersheds.

The historic, more contiguous, old-growth forest (estimated at 26,750+ acres or 60% of the watershed) has been converted over the past 100 years into a few isolated old-growth patches (1,231 total acres in 11 stands averaging 112 acres and ranging from 4 to 882 acres) within a forest dominated by young conifer forests.

The trend of old-growth condition (quantity and quality) in the watershed over the past 100 years has been one of great decline. The trend over the next 100 years will show a slow but steady improvement of old-growth conditions on BLM-administered lands with no change from current conditions anticipated on private lands.

Map: see Map #6.

Recommendations:

- Improve the condition of the existing late-seral/old-growth (LSOG) habitat in the Valley of the Giants LSR by concentrating habitat manipulation/density management treatments on the adjacent early-seral stands.

- Improve the condition of LSOG connectivity between watersheds by concentrating habitat manipulation/density management treatments on the early and mid-seral stands which occur between Valley of the Giants LSR and the LSOG in the Lower Mill Creek watershed. Refer to Appendices 18 and 19 for detailed descriptions of the objectives for density management in LSRs and AMAs.

- Increase the quantity and quality of LSOG in the Upper and Lower NF Siletz subwatersheds through land exchange of scattered BLM tracts (which occur either inside or outside the Upper Siletz watershed) for private lands adjacent to BLM-administered lands within these subwatersheds (see Human Uses - Land Tenure section).

2) **Findings:** The existing LSOG habitat on BLM-administered lands in the Valley of the Giants LSR is being used on a consistent basis by marbled murrelets (8+ occupied sites, several known nest sites since 1988) and bald eagles (1 breeding pair since 1989) but not by the northern spotted owl (only two known fledglings over the past 17 survey years since 1975).

Murrelets and eagles are not as dependent as the spotted owl on interior LSOG since they forage in the ocean or other larger bodies of water and use trees in the forest only for nest sites. The spotted owl requires interior forest habitat to meet all its needs and, as a result, maintain viable populations.

The trend in the quantity and quality of murrelet, eagle, and owl habitat in the watershed over the past 100 years has been one of significant decline due to LSOG destruction and fragmentation. The trend over the next 100 years will show a slow but steady improvement on BLM-administered lands with no change from current conditions anticipated on private lands.

Map: see Map # 12 and 13.

Recommendations:

- Refer to Finding #1 and Recommendations above.

3) Finding: Based on field observations, most of the early and mid-seral habitat (90% of the watershed) is deficient in snags and large, hard woody debris.

This current condition contrasts sharply with the reference conditions where historic natural disturbance regimes of fire and wind left extensive amounts of large woody debris in the riparian zones and forest uplands. Timber harvesting in the Pacific Northwest during the last 100 years has reduced the amount of this special habitat component (Maser et al. 1988). The trend in the amount of this habitat over the next 100 years will be a slow but steady improvement on BLM-administered lands as recruitment of this material ensues. No change from current conditions is anticipated on private lands where stands are cut in the mid-seral age classes.

Map: see Map #6.

Recommendations:

- Inventory for the presence of snags and down woody debris in stands under consideration for habitat manipulation/density management treatments.

CIn stands proposed for density management treatments with less than two hard snags per acre, create snags at least 50 feet tall by topping live, green conifers which are at least 24 inches dbh.

CIn stands proposed for density management treatments with less than 400 feet (approximately two site-potential trees) of hard, downed wood per acre (24 in dbh or greater), create at least this target level by cutting live conifers which are at least 24 inches dbh.

4) Finding: The SF Siletz subwatershed is home to a large elk herd (200+ individuals) and part of this subwatershed is managed intensively by the state as a special elk hunting area.
The BLM is a partner with the state and other private land owners in a permanent road closure in a portion of the subwatershed. Existing and future LSOG habitat on BLM-administered lands in the subwatershed provides important breeding, thermal, and escape/hiding cover to elk as well as other large mammals (deer, bear, and cougar).

Map: see Map #2.

Recommendations:

CContinue as a partner in the Luckiamute Travel Management Agreement (see Human Uses - Recreation section) to reduce hunting pressure on elk.

CManage BLM-administered lands in the SF Siletz subwatershed to provide elk habitat generally unavailable on private lands (such as mature tree cover).

CMonitor elk habitat conditions in the subwatershed to determine the relative contribution of private and BLM-administered lands. If, for example, foraging habitat is declining on private lands due to overstory closure, then it may be appropriate to create some foraging patches on BLM-administered lands currently dominated by LSOG forests.

5) **Finding:** Special habitats appear to be a relatively minor component of this watershed, but provide important attributes to certain wildlife species.

Since most special habitats in the forest environment are a function of the landscape=s geomorphology, there is probably no major difference in the amount of this habitat under current conditions compared to the reference. The trend in the quality of this habitat may be declining somewhat due to brush encroachment as a result of effective fire control measures (see Vegetation section).

Map: see Map #7.

Recommendations:

- Initiate inventory and field review process of special habitat features.

- Protect and buffer all known special habitats on BLM lands.

6) **Findings:** There are no known sites for special attention species within the boundaries of the watershed.
If these species are dependent upon LSOG habitats, then their conditions should slowly improve since all the BLM-administered lands in the watershed will be managed as LSOG habitat.

Recommendations:

- Survey for all special attention species following completion of the survey protocols currently under development.

Human Uses

Commodity Forest Products (Timber and Special Forest Products) -

1) **Finding:** (For timber products potential see Vegetation section for density management opportunities to enhance late-successional forests.)

2) **Finding:** Special forest products are harvested lightly within the watershed. The major products include Noble fir boughs, cones, and mushrooms. Current information indicates no particular problems with this harvest.

Map: Not specifically mapped as of June 1996.

Recommendations:

- Follow management guidance in the RMP and other BLM policy/procedural documents.

- SFP program should be sensitive to requirements of different land use allocations.

- Maintain vehicular access to all known harvest areas.

- Become proactive by selling appropriate special forest products within entire tracts. Tracts could include multiple sections or single sections.

Roads -

1) **Findings**: Many BLM-administered roads are in poor condition due to lack of regular maintenance and are contributing to soil erosion, and water quality problems.

There are some significant needs with regard to road maintenance and the prevention of soil displacement. The majority of the needed maintenance work consists of drainage improvement. The majority of mass wasting within the watershed is occurring because of insufficient drainage. Until these structures are improved the likelihood of failures will continue.

Map: see Map #17 and Appendices #20 and #21.

Recommendations:

CSee Appendix #20 for a list of road improvements and Appendix #21 for a list of potential road closures. Approximately 100 existing culverts or log drainage structures would be replaced with new culverts and numerous draindrips would be installed.

CDevelop transportation management plan to identify additional roads controlled by BLM that could be closed or gated to enhance resource values in the watershed. This plan would also classify roads into AHigh, medium, or low@ risk categories to indicate their potential for adversely affecting water quality. Restoration projects to mitigate resource damage will begin with Ahigh risk@ roads. Work closely with Oregon Department of Forestry in development of this plan.

Recreation -

1)**Finding**: The Valley of the Giants ACEC/ONA) is a recreation attraction in the watershed. Legal public access is not available to the site, visitors have a difficult time finding the site, and the site receives minimal management.

Map: Refer to Salem District RMP for location.

Recommendations:

(The following recommendations are based on an assumption that the bridge on Boulder Creek will be replaced.)

CDevelop memoranda of understanding with private landowners to develop a better guarantee of public access on private roads in the future.

CImprove information sources about access to, and use of, the ACEC/ONA (maps, brochures, road markers, etc.)

CImprove the footbridge across NF Siletz River.

CIncrease BLM recreation operations and maintenance efforts in the ACEC/ONA (e.g., garbage pickup, trail maintenance).

CTo improve road maintenance, incorporate access roads into a road maintenance agreement with Boise Cascade and Willamette Industries.

2.**Finding**: The Luckiamute Travel Management Agreement provides quality walk-in hunting areas and seems to be well accepted by current users.

Map: This map is located in files of the Marys Peak Resource Area.

Recommendations:

ŒContinue the agreement (i.e., keep private vehicles out of the area).

ŒProhibit all vehicular access and operations (including authorized BLM activity) into the area during elk hunting season to preserve hunter experience.

Research -

1) **Finding**: Section 31 of T8S, R7W (Sand, McFall, Callahan Creek block) is being used for ecosystem research by the National Biological Survey in association with BLM and OSU. Research will continue into the near future (20 years).

Map: Not specifically mapped as of June 1996.

Recommendations:

ŒPromote additional research in this block only if it is compatible with current research.

ŒScreen all proposed management projects against the research plan and allow projects which are compatible with research.

ŒInsure monitoring is accomplished and assist the National Biological Survey as appropriate.

Land Tenure -

1) **Finding**: The watershed contains one large (5,827 acres) fairly contiguous block of land located in the NF Siletz subwatershed. The SF Siletz subwatershed contains interspersed BLM ownership and is being intensively managed on a 50-year rotation by Boise Cascade with approximately 75% of Boise land presently in early-seral stage forest. BLM land will provide the majority of late-seral forest. Overall management is more efficiently performed by blocking ownership.

Map: see Map #3.

Recommendations:

ŒRetain the BLM-administered land base in the watershed. The AMA lands within the SF Siletz subwatershed provide important thermal cover for elk and there is long-term research on density management in Sec. 31, T. 8 S., R. 7 W. by the National Biological Survey. Lands within the Upper and Lower NF Siletz subwatersheds provide the largest contiguous block of old-growth forest on BLM-administered land in the central Oregon Coast Range. These lands provide critical habitat for marbled murrelets, elk, and bald eagles. Lands within the Boulder Creek subwatershed provide connectivity between the Valley of the Giants and older forest within Mill and Rowell Creek watersheds to the east.

- Block up lands in the NF Siletz and Boulder Creek subwatersheds by land exchange agreements to enhance development of interior forest conditions and to provide dispersal corridors for wildlife species between Valley of the Giants and the Dorn Peak area. The proposal is to exchange scattered BLM-administered lands inside or outside the watershed (e.g., BLM parcels within the Little and Middle Luckiamute watersheds) to obtain private land in Sections 24, 26, and 34, T7S, R8W.

- Reduce mass wasting and other sediments reaching stream channels in the Boulder Creek subwatershed , by acquiring high risk, landslide areas and midslope roads in Sections 28, 29, and 32 of T7S, R8W.

- Acquire by land exchange the scenic and potential recreation area of the 100-foot high Warnick Falls. This is located in SW1/4 of Section 16 of T7S, R8W; it occurs on Willamette Industries Inc. land which could be exchanged for scattered BLM-administered land outside the watershed.

- Additional private lands which should be considered for exchange (primarily to enhance interior forest conditions and to provide dispersal corridors for spotted owls) include: Section 30, T. 7 S., R. 7 W.; Sections 15, 18, 19, 20, 21, 22, 30, 31, 33, 36, T. 7 S., R. 8 W.; and Sections 1, 2, 3, 11, 12, T. 8 S., R. 8 W.

Note: Data Gaps and Monitoring Needs for resource issues are presented in Appendix #22.

References

Agee, James K. 1991. Fire history of Douglas-fir forests in the Pacific Northwest. In Ruggiero, L.F., et al. (tech. coords.), Wildlife and vegetation of unmanaged Douglas-fir forests: pp. 25-33. USDA For. Serv. Gen. Tech. Rep. PNW-GTR-285.

______________. 1993. Fire ecology of Pacific Northwest forests. Island Press. 493 pp.

Baldwin, Kathryn A. 1982. Making the most of the best. Willamette Industries Inc. Albany, Oregon.

Blaustein, Andrew R., Joseph J. Beatty, Deanna H. Olson, and Robert M. Storm. 1995. The biology of amphibians and reptiles in old-growth forests in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-337. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 98pp.

Boise Cascade Corporation. 1953. Transcript from a tour of the Valsetz area, given to members of the Society of American Foresters on May 9,1953 by Valsetz Lumber Company. Monmouth, OR.

Christy, Robin E., and Stephen D. West. 1993. Biology of bats in Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-308. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 28pp.

Culp, E. D. 1958. The Western Railroader. The Luckiamute River Route. Pp. 3, 11

Dyrness, C. T., and D. N. Swanston. 1973. Stability of steep land. J. of Forestry 71(5).

Frissell, C. A., and R. K. Nawa. 1992. Incidence and causes of physical failure of artificial habitat structures in streams of western Oregon and Washington. North American J. of Fisheries Management 12:182-197.

Gillman, Jeff, Mark Smith, Dennis Rogers, and Alan Contreras, eds. 1994. Birds of Oregon, Status and Distribution. McMinnville, OR: Cinclus Publications. 330 pp.

Grant, G. E. and A. L. Wolff. 1991. Long-term patterns of sediment transport after timber harvest, western Cascade Mountains, Oregon, USA. from Sediment and stream water quality in a changing environment: trends and explanation (Proceedings of the Vienna Symposium, August 1991). IAHS Publication No. 203.

Harden-Davis Consultants. 1985. South Fork Siletz River revised instream flow study. Valsetz Power Company.

Hemstrom, M. A. and S. E. Logan. 1986. Plant association and management guide. Siuslaw National Forest. USDA Forest Service. PNW region. R6-Ecol 220-1986a. 121 pp.

Jones, J. A., and G. E. Grant. 1995. Peak flow responses to clearcutting and roads in small and large basins, western Cascades. In press: Water Resources Bulletin.

Kenta, R. Personal communication. Confederated Tribes Siletz Indians.

Maser, C., and J. Trappe. Tech Ed. 1984. The seen and unseen world of the fallen tree. Pac. NW For. and Range Exp. Stn. USDA Forest Service. Gen. Tech. Rep. PNW-164.

Montgomery and Buffington. 1993. Channel classification, prediction of channel response, and assessment of channel condition. Report TFW-SH10-93-002, Washington State Fish And Wildlife Agreement.

Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Am. Fish. Soc., Fisheries 16(2):4-21.

Oregon Department of Environmental Quality. 1996. Oregon=s proposed 1994/1996 list of water quality limited water bodies under Section (303(d)(1) of the Clean Water Act. Department of Environmental Quality. Portland OR.

Oregon Department of Fish and Wildlife. 1993. Oregon wildlife diversity plan. Prep. by Claire Puchy and David Marshall. Portland, OR 413pp.

____________. 1995. Siletz River basin fish management plan. Prep. by Bob Buckman, Randy Reeve, and John Spangler.

O=Shea. Personal communication.

Ripple, William J. 1994. Historic and spatial patterns of old forests in western Oregon. Journal of Forestry 92:11.

Rosgen, David, L. 1994. A classification of natural rivers. Catena. Vol. 22(3):169-199.

Seall, G. H. 1992. Uniquely Oregon. Pp 93-95.

Swanson, F.J. and G. Grant. 1982. Rates of soil erosion by surface and mass erosion processes in the Willamette National Forest. USDA For. Serv. Willamette National Forest Report.

__________, and G. W. Lienkaemper. 1985. Geologic zoning of slope movements in western OR, USA: In Proc. IVth Int. Conf. and Field Workshop on Landslides. Tokyo, pp. 41-45.

Swanston, D.N. 1981. Watershed classification based on soil stability criteria. In Interior West Watershed management, Proceedings Coop Extension WSU, Pullman, Wash.

USDA Forest Service and USDI Bureau of Land Management. 1994a. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Volume I and II (Northwest Forest Plan). Portland, OR

__________. 1994b. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl (ROD); and standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl (S&G). Portland OR.

USDI Bureau of Land Management. 1995. Salem District record of decision and resource management plan (RMP). USDI-BLM, Salem District, Salem, OR 81 pp. + Appendices.

U.S. Environmental Protection Agency. 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. Prep. by Lee H. Macdonald. EPA/910/9-91-001.

U.S. Geological Survey. 1984. Statistical summaries of streamflow in Oregon. Volume 2. Western Oregon. U. S. Geological Survey Open-File Report 84-454. pp.150.

Wemple, B.C. 1994. Assessing the hydrologic role of logging-access roads in two large forested basins in the western Cascades of Oregon. M. S. Thesis, Oregon State University, Corvallis.

LIST OF APPENDICES

Appendix #1 - Public Letter and Questionnaire for Upper Siletz Watershed

Dear Citizen:

The Bureau of Land Management, Marys Peak Resource Area is in the initial stages of a watershed analysis for the Upper Siletz Watershed. We are interested in public issues and comments that pertain to this particular watershed. Your involvement in Federal land management activities is an integral step in the watershed analysis process.

The approximately 44,600 acre Upper Siletz Watershed includes the Siletz River, two major tributaries, the North Fork and South Fork Siletz, and numerous smaller tributaries. The BLM administers about 12,200 acres (27.4%) in the watershed. Land allocations as prescribed by the Northwest Forest Plan and their approximate acreage and percentages within the watershed are as follows: Late Successional Reserve (i.e., LSR) - 5,800 acres (13.0%), Adaptive Management Area (i.e., AMA) - 2,300 acres (5.2%), and Adaptive Management Late Successional Reserve (i.e., AMR) - 4,000 acres (9.0%). Approximately 1,150 acres of old growth (9.4% of BLM-administered lands or 2.6% of the entire watershed) occur within the drainage. The Siletz River and tributaries are important streams for anadromous salmonids. The summer steelhead run in the Siletz system is unique, because it is the only native summer steelhead run in the Oregon Coast Range. The watershed also includes the Valley of the Giants Area of Critical Environmental Concern/Outstanding Natural Area. Spotted owls, marbled murrelets, and bald eagles inhabit the watershed. The logging town of Valsetz was formerly located within the watershed.

We would like to know if you want to be included on our mailing list for this process. Please use the enclosed historical perspective and questionnaire to help us determine what you see as major issues in this watershed. In addition please identify issues that are important for us to consider in planning for future management activities on **Federally** managed lands.

Under ecosystem management, consideration of issues at the watershed level is important. Management at this scale considers all ecosystem components, social and economic values, and broad requirements of agency land use plans. Synthesis of this data will help us arrive at a desired future condition for the resources in the watershed, and recommendations to federal land managers..
Analysis considers resource conditions in the entire watershed, regardless of land ownership or jurisdictional boundaries. Management objectives for federally managed lands are then based on ecosystem condition and anticipated objectives of other landowners. **The watershed analysis process is not intended, nor will it be used to dictate, influence, or judge management direction on non-federal owned lands.** Our ultimate goal is to work collaboratively with those sharing the watershed to ensure the continued health of the forest ecosystem along with achieving management objectives outlined in the forest plan.

We will use the responses to this letter to complete our mailing list. Please return the questionnaire by November 30, 1995 or contact Roger Monthey at (503) 375-5646 if you wish to remain on this list. No response is necessary if you are not interested in receiving information or participating in the watershed analysis process. We appreciate your efforts to be involved in the management of your public lands.

Sincerely yours,
John Bacho

Marys Peak Area Manager

Four enclosures:
1 - Upper Siletz Historical Perspective
2 - Info. Sheet
3 - Questionnaire
4 - Reference Map

Enclosure 1

Upper Siletz Watershed - Historical Perspective

On April 2, 1994 , President Clinton convened the Forest Conference in Portland, Oregon, to address the human and environmental needs served by the federal forests of the Pacific Northwest, including northern California. The conference ended with the President directing his cabinet to craft a balanced, comprehensive, long-term policy for management of all public lands within the range of the northern spotted owl.

In February 1994, the Final Supplemental Environmental Impact Statement for Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl (FSEIS) was released to the public. The FSEIS, containing the "Northwest Forest Plan", described various alternatives for the management of public lands and selected Alternative 9 as the Apreferred alternative". After reviewing the FSEIS and other pertinent information, the secretaries of Agriculture and Interior finalized the process by issuing a document called the "Record of Decision".

The Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl was signed by secretaries Espy and Babbitt on April 13, 1994. This document formally adopted Alternative 9 as the future land management strategy with some modification. The ROD supplements existing Bureau of Land Management and U.S. Forest Service planning documents. The Salem District Record of Decision and Resource Management Plan (RMP), signed May 12, 1995 by the Salem District Manager, is consistent with the Northwest Forest Plan.

Enclosure 2

WATERSHED ANALYSIS PROCESS

1. What is watershed analysis?

Watershed analysis is one of the principle analyses that will be used to meet the ecosystem management objectives of the RMP management actions/direction. Watershed analysis will focus on collecting and compiling information within the watershed that is essential for making sound management decisions. It is a technically rigorous procedure with the purpose of developing and documenting a scientifically based understanding of ecological structures, functions, processes, and interactions occurring within a watershed. It will serve as a basis for developing project specific proposals and determining monitoring and restoration needs.

2. What is the status of the Upper Siletz watershed analysis?

We have begun to identify issues and collect data specific to the watershed. As we receive public comments we will refine and complete issue identification which will become the focus of the analysis. We will then complete the collection of available existing information to help answer the questions.

3. What is the Aend product@ and will it be available for public review?

The Aend product@ will be a first iteration watershed analysis that will include management recommendations for the watershed. An Executive Summary will be prepared and made available to those who request it. The full document will be available in the district office for public review.

4. When will it be completed?

We hope to complete the analysis in the spring of 1996.

Enclosure 3

UPPER SILETZ WATERSHED

Citizen Interview

1. Name: ______________________________ Date: ____________

Address: ____

____

Telephone: ____

Organization: ____

2. What do you see as the most important issues in this watershed? What do you think needs to be done to resolve these issues?

3. Are there any specific locations within this watershed of particular concern to you? What are those areas and what are your concerns?

4. What kind of watershed restoration work would you like to see planned in the Upper Siletz Watershed and specifically where would that work be?

Mail to: Roger Monthey
Salem District, Bureau of Land Management
1717 Fabry Rd. S.E.
Salem, Oregon 97306

Please return by November 30, 1995

Appendix #2. Public Comments on Upper Siletz Watershed

What do you see as the most important issues in this watershed? What needs to be done to resolve these issues?

1) Comment: The main issue is how to manage the watershed to make available and optimize the utilitarian values of the resources held dear by the multiple users of the watershed.

BLM Response: The management approach on BLM-administered lands will be largely dictated by the Northwest Forest Plan which includes protections for late successional forest and riparian habitat. Private lands, which are dominant in the watershed, are largely dictated by timber market concerns.

2) Comment: Other issues relate to sustained yield timber harvest, maintenance and perhaps enhancement of native fish species and open access to the users of these resources.

BLM Response: Sustained yield timber harvest is a feature of the Northwest Forest Plan provided the mandates for forest and riparian protection are achieved. Maintenance and enhancement of native fish species is also a major component of the Forest Plan with measures for protection of existing riparian habitat as well as measures to improve this habitat such as road closures and silvicultural practices to promote large conifers. Public access on BLM-administered roads is provided except where benefits to riparian and older forest conditions, as well as wildlife considerations, outweigh the values of public access.

3) Comment: All relevant data and information pertaining to the main issues needs to be obtained and fully discussed.

BLM Response: BLM is attempting to gather all relevant data to address the major issues. However, proprietary rights to data gathered by private land owners are recognized.

4) Comment: Landscape scale deforestation and forest cover loss and the attendant problems with water, fisheries, wildlife and plant habitat loss. Irreversible changes in landscape soils, hydrology and climate patterns.

BLM Response: The Upper Siletz Watershed has been impacted intensively by forest management. Little older forest habitat currently exists within the watershed. Effects of this past and current management on issues such as water quality, hydrology, soils, fisheries, wildlife, and plant habitat loss are being evaluated by the watershed analysis team.

5) Comment: Landscape-wide planning across ownership patterns. Anything short of this requires maximum effort by public land managers to mitigate for adverse effects related to deforestation and effects on water, soils, habitats.

BLM Response: BLM recognizes that partnerships between public and private land administrators are crucial to the successful restoration of watersheds. BLM is attempting to build these partnerships, but involvement by private entities varies based on factors specifically affecting these entities. Whether or not private landowners become involved in partnerships to restore watersheds, BLM will follow the guidelines established by the Northwest Forest Plan.

6) Comment: Ecosystem management is the major issue. Need to integrate how all lands (public and private) are being managed, and make adjustments to public land management accordingly. Private lands are being intensively managed for financial short-term benefits, at the expense of wildlife and habitat integrity. Public lands should be managed for multiple use, and make up for deficiencies caused by the private sector.

BLM Response: Ecosystem management is a major feature of the Northwest Forest Plan. A major implication of the Northwest Forest Plan was that protection measures for late successional forests and riparian areas were restricted to public lands.

7) Comment: Old growth and riparian areas should be preserved.

BLM Response: Both of these habitats will be protected according to guidelines established in the Northwest Forest Plan.

8) Comment: Relative low densities of wildlife and species diversity. Habitat and biodiversity should be encouraged within other areas. Benefits to wildlife populations will come naturally with proper habitat management.

BLM Response: It is recognized that wildlife species that depend on older forest and riparian habitat conditions have been adversely affected in forested areas of the Pacific Northwest. It is hoped that these habitat conditions will improveas the Northwest Forest Plan is implemented over time.

9) Comment: BLM should recognize the importance and value of private property within the Siletz Watershed and provide appropriate setbacks on federal lands to protect private lands from inadvertent taking.

BLM Response: BLM does recognize the importance and value of private property within the Siletz Watershed. However, locations for protection of older forest habitat (i.e., LSRs) and riparian habitat (i.e., Riparian Reserves) do not take into account the protection of private lands frominadvertent taking.

10) Comment: Protect and enhance wetlands and riparian areas, creating buffers that enhance and protect the watershed.

BLM Response: Wetlands and riparian areas will be protected under guidelines of the Northwest Forest Plan. These include establishment of buffer areas around wetlands and riparian areas.

11) Comment: Prohibit motorized recreation.

BLM Response: Public access on BLM-administered roads is provided except where benefits to riparian and older forest conditions, as well as wildlife considerations, outweigh the values of public access. In these cases, roads will be closed to motorized recreation.

12) Comment: Encourage low impact forest uses.

BLM Response: The Northwest Forest Plan encourages low impact forest uses. For example, thinnings to improve the late successional forest conditions of stands will be practiced. Measures for green tree retention in regeneration harvest areas within the Matrix are also provided for under the plan. Measures to harvest Special Forest Products must consider the sustainability of these resources as well.

13) Comment: Achieving a balance between conservation and wise use **C** insuring biodiversity where possible; recognizing timber as a renewable resource; making management decisions based on a sustainable future for the watershed.

BLM Response: Biodiversity considerations are addressed in the Northwest Forest Plan by protection measures for currently limited habitats such as riparian areas and older successional forest. Timber will continue to be harvested under the plan in a sustainable fashion provided that mandates for riparian and older forest protection are achieved.

Are there any specific locations within this watershed of particular concern to you? What are those areas and what are your concerns?

1) Comment: Ridgetop protection of sensitive resource sites (Fanno Ridge as an example). Roading of these areas is already heavy and movement of animals and dispersal of lants is greatly interfered with.

BLM Response: Some of these ridgetops occur in LSR or AMR designation. Road closures on ridgetops and elsewhere within these allocations would benefit resource values. Road closures would be made after interdisciplinary review and analysis in the watershed analysis document and associated road management planning process. Road closures in the Matrix are less feasible due to the objectives of this allocation, although dead-end spur roads provide opportunities for closure.

2) Comment: Riparian protection is totally inadequate. Upper Siletz drainages are severely impacted by poor road condition interfering with drainage patterns. Toe slope landslide failures are prevalent and exacerbated by road locations near streams.

BLM Response: The Northwest Forest Plan addresses the protection and enhancement of Riparian Reserves. Road conditions are currently being analyzed on BLM-administered land and measures to improve road condition are being developed. Some private landowners within the watershed have also conducted this analysis on their lands. Toe slope landslide failures have also been evaluated on both public and some private lands within the watershed. Measures to reduce the effects of these landslides have been identified.

3) Comment: Concern about the amount and intensity of relatively recent clearcut observed from Sugarloaf Mountain when looking to the west.

BLM Response: Much of the recent clearcut activity in this basin has been conducted on private forest lands. This activity is regulated in part by the Oregon Forest Practices Act.

4) Comment: Upper reaches of Siletz River and Warnick Creek.

BLM Response: These areas comprise some of the steeper portions of the Upper Siletz Watershed. They also include most of the last remaining old growth forest in the watershed (including Valley of the Giants ACEC). This area is protected under LSR or AMR designation as well as by Riparian Reserves along stream channels.

5) Comment: My big concern is loss of wetlands and riparian buffers by overuse, logging practices and motorized recreation.

BLM Response: Wetlands and riparian areas will be protected by Riparian Reserves under the Forest Plan. Some silvicultural thinning within Riparian Reserves is permissable under the Forest Plan to address the need to produce large conifers as a source of LWD (as long as the Aquatic

Conservation Strategy objectives are achieved).

6) Comment: Your map shows Valsetz Lake which has been drained. How is that area protected now?

BLM Response: The old Valsetz Lake bottom is owned by the Boise Cascade Corporation. The area is currently dominated by a single story stand of red alder perhaps 20 feet high. The area is currently posted as no trespassing by Boise Cascade.

7) Comment: Not informed enough about specific locations but am especially concerned about management objectives and actions that affect salmonid habitat and populations.

BLM Response: The Northwest Forest Plan addresses management objectives for salmonids. The coastal coho stocks are currently proposed for listed by the National Marine Fisheries Service, and federal agencies must consult with NMFS concerning federal agencies which may affect the status of these populations. In addition, the Oregon Department of Fish and Wildlife has completed a fish management plan for the Siletz River basin which identifies specific habitat restoration opportunities.

What kind of watershed restoration work would you like to see planned in the Upper Siletz Watershed and specifically where would that work be?

1) Comment: There is insufficient real information about the resident and anadromous fish populations to make good, reliable habitat restoration decisions.

BLM Response: The Oregon Department of Fish and Wildlife has completed a fish management plan for the Siletz River basin which identifies specific habitat restoration opportunities.

2) Comment: Soil erosion and subsequent adverse effects on fish and their food supply habitats is the major condition limitimg fish production in many streams. In some reaches canopy cover and water heating are major problems as is lack of physical structure from too little LWD, boulders and deep pools. The list is longer if one evaluates specific tributaries and locations.
BLM Response: Limiting factors for fish in the watershed have been described by the Oregon Department of Fish and Wildlife in their fish management plan for the Siletz River basin.

3) Comment: Road removal in high risk, sensitive areas to reduce forest habitat loss and human impacts. (Best road locations are on ridgetops and benches.)

Response: Road removal and closures are a major component of the Forest Plan, especially within Riparian Reserves and Late Successional Forest Reserves (LSR). As a part of this watershed analysis, road conditions are currently being evaluated on BLM-administered land and measures to improve road conditions are being developed. Some private landowners within the watershed have also conducted this analysis on their lands.

4) Comment: Road and forest closures to reduce human access.

Response: Road closures are being considered in LSRs and in Riparian Reserves to reduce the effects of human access. No forest closures are planned except as affected by potential road closures.

5) Comment: Seasonal or permanent road closures on all redundant roads (e.g., BLM could close roads that duplicate industry land road network).

BLM Response: As part of this watershed analysis, the entire road network is currently being evaluated on BLM-administered land and measures to improve the system are being developed. This may well include the closure of redundant roads especially within LSR and Riparian Reserve allocations.

6) Comment: Establish right-of-way agreements as necessary for all resource use access.

BLM Response: BLM currently has right-of-way agreements with private landowners to provide access for resource uses.

7) Comment: Harvesting trees is not restoration work, unless it redirects growth to genetically native/local stock that provides adequate cover in young seral stages.

BLM Response: The Northwest Forest Plan specifically provides for silvicultural activities within LSRs (in stands less than 80 years old) to enhance the rapid development of older forest conditions, and within Riparian Reserves to enhance the development of large conifer trees for future LWD inputs into stream channels.

8) Comment: In general, would like to see much larger buffer zones around all riparian areas, which would be variable in size depending on peak flows.

BLM Response: Riparian Reserves were established under the Northwest Forest Plan ranging from 1 site potential tree height to 2 site potential tree height based on stream flow characteristics.

9) Comment: Would like to see more use of selective cutting practices, and better methods of erosion control (mandatory plantings/seeding of annual grasses in all disturbed areas).

BLM Response: Density management opportunities will be addressed in the watershed analysis.

These involve the use of selective cutting practices, and may include the creation of small canopy gaps. BLM has historically seeded grass species to help control erosion. The use of native species such as red fescue (*Festuca rubra*) is currently being promoted over the use of exotic species such as annual rye grass (*Lolium perenne*) and orchard grass (*Dactylis glomerata*).

10) Comment: Encourage development of natural stands.

BLM Response: Stands within Late Successional Reserves that are above 80 years in age will be allowed to develop naturally according to guidelines in the Northwest Forest Plan. This is also the case for stands older than 110 years in both the AMR and AMA. Stands that are under 80 years (in LSRs) and under 110 years (in AMRs and AMAs) can be treated by density management methods to promote the more rapid development of older forests. As such, they will not be truly natural stands. However, due to potential landslides on steep slopes, logging considerations, etc., some of these stands will be difficult to treat with these methods, and thus will be allowed to develop according to natural successional processes.

11) Comment: Cessation of fish stocking.

BLM Response: The Oregon Department of Fish and Wildlife has released hatchery fish (including winter steelhead, coho, and chinnook) above the falls on the mainstem of the Siletz River in the past. (This falls is located to the west of the Upper Siletz Watershed boundary on the main stem Siletz River.) However, they have since discontinued this practice in order to maintain the summer steelhead run above the falls, which is the only native summer steelhead run remaining in the Coast Range.

12) Comment: Replant as needed for forest cover.

BLM Response: BLM always practices replanting after forest harvesting. However, some new innovations will include underplanting of Douglas fir, western red cedar and western hemlock in riparian areas; and underplanting of western hemlock and Douglas fir in upland conifer stands to promote the development of multicanopy stands.

13) Comment: Protect existing wetlands from both encroachment and detrimental effects by establishing a buffer of natural vegetation for a minimum of 100 feet although 500 feet is preferable. Protect all riparian areas in the same manner.

BLM Response: Wetlands and riparian areas will be protected according to guidelines established in the Northwest Forest Plan and promulgated in the Salem District Record of Decision. Riparian Reserves for wetlands greater than 1 acre (no protection for wetlands less than 1 acre) consist of the wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site potential tree, or 150 feet slope distance from the edge of the wetland, whichever is greatest. The width of Riparian Reserves for streams is equal to the height of one or two site potential trees dependent on the presence of fish and whether they are permanent or intermittent flow.

14) Comment: Restoration should include areas that biologists and others have given priority to and that are Adoable@ in a reasonable time frame.

BLM Response: The watershed analysis process will identify priority areas for restoration and management based on in-depth analysis by the respective specialist (e.g., hydrologist, wildlife, ecosystems, fish, timber). Team recommendations (i.e., synthesis) will then be addressed for areas with restoration opportunities or areas of overlapping and possibly conflicting uses.

15) Comment: Action plans to rehabilitate and manage the watershed should be developed in an open forum atmosphere designed to attract the participation of all stakeholders. Action plans include the design, conduct, analysis and mode of use of all collected data.

BLM Response: Persons who stated an interest to be on the mailing list will be sent summaries of the watershed analysis and proposed restoration opportunities. Since the watershed analysis is not a decision document, these opportunities are only recommendations. However, an action plan to spell out the intended restoration opportunities by priority and Fiscal Year can be accomplished. All selected projects must include an environmental analysis and are dependent on availability of funds.

16) Comment: Establish the rehabilitation program in phases, with time schedules for phases, but no end time for completion of the total project.

BLM Response: See response to question 13 above. These considerations can be made in the proposed action plan for restoration opportunities discussed above.

Appendix #3. Upper Siletz Watershed Mailing List

Oregon Department of Environmental Quality
Attn: Roger Wood
811 SW Sixth Ave.
Portland, OR 97204

Oregon Department of Environmental Quality
Attn: Bob Baumgartner
811 SW Sixth Ave.
Portland, OR 97204

Oregon Department of Fish and Wildlife
Habitat Conservation Division
Attn: Mary Potter
P.O. Box 59
Portland, OR 97207

Oregon Department of Fish and Wildlife
Steve Smith
170 NE Vandenberg Ave.
Corvallis, OR 97330-9446

Oregon Department of Fish and Wildlife
Doug Cottam
170 NE Vandenberg Ave.
Corvallis, OR 97330-9446

Oregon Department of Fish and Wildlife
Chris Wheaton
17330 S.E. Evelyn St.
Clackamas, OR 97015

Oregon Department of Forestry
Jerry Piering
825 Oak Villa Rd.
Dallas, OR 97338

Oregon Department of Forestry
Michael Totey
24533 Alsea Hwy.
Philomath, OR 97370

Lee Oman
801 Gales Creek Rd.

Forest Grove, OR 97116

Oregon Department of Forestry
Attn: Dave Stere
2600 State St.
Salem, OR 97310

Oregon Department of Land Conservation and Development
Attn: Bill Thomas
1175 Court St. N.E.
Salem, OR 97310

Oregon Division of State Lands
Emily Roth
775 Summer St. N.E.
Salem, OR 97310

Oregon Division of State Lands
Bill Parks
775 Summer St. N.E.
Salem, OR 97310

Oregon Water Resources Department
Attn: Jack Donahue
3850 Portland Rd. N.E.
Salem, OR 97310

Oregon Water Resources Department
Dave Jarett
158 12th St. N.E.
Salem, OR 97301

Oregon Department of Fish and Wildlife
Planning and Coordination
170 N.E. Vandenberg Ave.
Corvallis, OR 97330

Oregon Department of Fish and Wildlife
Gary Schilling
170 NE Vandenberg Ave.
Salem, OR 97330-9446

Oregon Department of Agriculture
Natural Resources Division
Dave Wilkinson
635 Capitol St. N.E.

Salem, OR 97310

Oregon Department of Agriculture
Marc Peters
635 capitol St. N.E.
Salem, OR 97310-0110

Oregon Parks and Recreation Department
Jay Schleier
1115 Commercial St. N.E.
Salem, OR 97310

Oregon Parks and Recreation Department
Al Tocchini
1115 Commercial St. N.E.
Salem, OR 97310

Oregon Coastal Zone Management Assn.
P.O. Box 1033
Newport, OR 97365

Oregon Natural Resources Council
1551 Oak St., Suite A
Eugene, OR 97401

Pacific Rivers Council
P.O. Box 10798
Eugene, OR 97405

Coast Range Association
P.O. Box 2189
Corvallis, OR 97339

Associated Oregon Loggers, Inc.
P.O. Box 12339
1127 25th St. S.E.
Salem, OR 97309-0339

Association of Northwest Steelheaders
P.O. Box 3341
Salem, OR 97302

Audubon Society
Jim Fairchild
31540 Homestead Rd.
Philomath, OR 97370

Audubon Society of Salem
Mission Mill Village
1313 Mill St., S.E.
Salem, OR 97301

Sierra Club, Oregon Chapter
4520 S.W. Arnold
Portland, OR 97219

Cathedral Forest Action Group
39599 Ward Rd.
Monmouth, OR 97361

CH2M Hill
P.O. Box 428
Corvallis, OR 97339

Native Plant Society of Oregon
11455 S.E. 35th
Milwaukie, OR 97222

Nature Conservancy
1205 N.W. 25th Ave.
Portland, OR 97210

National Wildlife Federation
921 S.W. Morrison, Suite 512
Portland, OR 97205

Georgia-Pacific West, Inc.
900 SW Fifth Ave.
Portland, OR 97204

Boise Cascade Corporation
450 Pacific Ave., N.
Monmouth, OR 97360

Miami Corporation
410 N. Michigan Ave., Rm. 590
Chicago, IL 60611

Willamette Industries, Inc.
3800 1st Interstate Tower
Portland, OR 97201

Simpson Timber Co.
P.O. Box 308
Albany, OR 97321

International Paper Co.
P.O. Box 843
Gardiner, OR 97441

U.S. Fish and Wildlife Service
Maureen Smith
2600 S.E. 98th Ave., Suite 100
Portland, OR 97226

U.S. Fish and Wildlife Service
Ray Bosch
2600 S.E. 98th Ave., Suite 100
Portland, OR 97226

U.S. Fish and Wildlife Service
Kathryn Barry
2600 S.E. 98th Ave., Suite 100
Portland, OR 97266-1398

U.S. Fish and Wildlife Service
Basket Slough Refuge
10995 Hwy. 22
Dallas, OR 97338

National Marine Fisheries Service
Joanne Wu
525 N.E. Oregon St., No. 500
Portland, OR 97232

Confederated Tribes of Grande Ronde
Attn: Mark Mercier, Tribal Chair
P.O. Box 38
Grande Ronde, OR 97347

Confederated Tribes of Grande Ronde
Eric Anderson
P.O. Box 38
Grande Ronde, OR 97347

Confederated Tribes of Grande Ronde
Cliff Adams
P.O. Box 38
Grande Ronde, OR 97347

Confederated Tribes of Siletz Indians
Attn: Delores Pigsley, Tribal Chair
P.O. Box 549
Siletz, OR 97380

Confederated Tribes of Siletz Indians
Mike Kennedy

P.O. Box 549
Siletz, OR 97380

Bureau of Indian Affairs
Gary Varner
P.O. Box 569
Siletz, OR 97380

Cascade Pacific Resources Conservation and Development
3415 N.E. Granger Ave.
Corvallis, OR 97330

Polk County Extension Service
Bob Lisic
P.O. Box 640
Dallas, OR 97338

Polk County Planning Division
Polk County Courthouse
Dave Perry
Dallas, OR 97338

Polk County Community Development
Polk County Courthouse
Arthur Schlack
Dallas, OR 97338

Polk County Natural Resources Conservation Service
Lois Loop
289 E. Ellendale, Suite 701
Dallas, OR 97338

Polk County Natural Resources Conservation Service
Ken Hale
289 E. Ellendale, Suite 504
Dallas, OR 97338

Polk County Soil and Water District
Charlie Hazel
289 E. Ellendale, Suite 504
Dallas, OR 97338

Farm Home Administration
Annette Payseno
289 E. Ellendale, Suite 502

Dallas, OR 97338

Polk County Commissioners
Commissioner Mike Propes
Polk County Courthouse
Dallas, OR 97338-3174

Ted Molinari
1270 Monmouth Cutoff
Dallas, OR 97338

City of Dallas
Dave Shea
187 S.E. Court
Dallas, OR 97338

John Freeburg
Sileta/Luckiamute Chapter of SOLV
P.O. Box One
Falls City, OR 97334

Lincoln County Commissioners
Commissioner Don Lindly
225 Olive
Newport, OR 97365

Joe Bowersox
Willamette University
900 State St.
Salem, OR 97301

Appendix #4 - Erosional Processes

The Upper Siletz watershed occurs in a temperature and precipitation zone that favors mass wasting (or landsliding), as the most important erosional process. Most of the subwatersheds were formed by past mass wasting events which occurred over many thousands of years when the slopes were much steeper. Two types of landslides occur in the watershed: debris avalanches and rotational slumps. Mass wasting by debris avalanching is the most catastrophic producer of sediment in the watershed; it occurs primarily in headwalls, and on convex portions of resistant parent materials on hillslope gradients steeper than 60 percent. Steeper slopes and a larger source area above the headwall typically increase failure rates. Avalanche events are sudden and triggered by a rapid increase in precipitation (usually > 5 inches in 24 hours) and/or loss of tree root support resulting from intense fire, blowdown, or death. The area of soil lost is usually less than 0.5 acres. Avalanche materials move into depositional areas along second- or third-order streams. Such materials can temporarily dam streams and influence the condition and functioning of adjacent riparian zones.

Mass wasting by rotational slump earth flows occurs over thin, bedded sandstone and siltstone. These formations are permeable to water that allow deep weathering of soil parent material. Slump-earth flows are features that cover many acres of land. They are typically found on hillslopes of undulating topography with gradients less than 60 percent. The process begins by downslope creep of materials that disrupts natural drainage. This disruption increases water in the slide material which speeds creep rates. Slope failure or slumping is initiated when soil-pore water pressure increases in the slide toe and/or when soil weight above the toe reaches a critical level. Sliding hazard is increased from processes that add water to the slump by 1) increasing precipitation due to climatic influences or 2) by reducing transpiration from vegetation as a result of mechanical, climatic, biological factors (e.g., logging, wind, and disease, respectively). Slump-earth flows have a high impact on tree bole straightness and type of vegetation. When slumps reach streams, they become a chronic source of sediments.

Concave hillslope positions accumulate materials by dry raveling, a mechanical process in which materials are detached from the hillslope and move downslope into concave positions. These materials later become gravelly, highly productive soils. In contrast, convex slopes contain rock outcrops and soils with thin surface layers and shallow depths. These shallow soils support little vegetative cover, and are subject to surface erosion from overland flow, the major erosive process on stable hillslopes less than 60 percent. Loss of vegetative cover by fire or removal increases the erosion hazard.

Dry raveling of loose materials is primarily a physical hillslope process that moves materials downslope and delays vegetative growth. This process is slope driven, and this allows areas at high risk for dry ravelling to be delineated by assessing local topography and soil types.

Appendix #5 - Natural Fire Processes

The natural fire regime for the northern portion of the Oregon Coast Range is one of severe fire events that were very infrequent, returning at irregular intervals of 150 to 400 years or more (Agee 1981). These intense fires would likely consume several thousand and possibly hundreds of thousands of acres. Generally, individual trees, groups of trees, and even large forest patches would survive these fires, although the distribution of surviving vegetation on the landscape would vary widely. There are many factors that influence how vegetation survives a fire. Among these factors are: pre-fire stand fuel composition; time of day, weather, and micro-climatic conditions at the time of the fire; and local topography. The amount and distribution of this surviving vegetation plays a key role in the rate of reforestation and in the species distribution in the succeeding stand. Following a major fire event, there could be great difficulty in naturally reseeding large areas devoid of a seed source. This has been confirmed in an early USGS report from the Coast Range that states, "Areas are reported which were burned twenty-five to fifty years ago on which there is no vegetation larger than brush and ferns, trees of any species not yet having obtained a foothold" (Gannett 1902). A preliminary study of stumps in recently logged older stands in the northern Coast Range is currently under way. Information obtained thus far indicates that in many of these natural stands, the initial tree stocking levels were quite low. In other words, during the first 50-to-100 years, the growth pattern as expressed by the tree rings shows very rapid growth similar to that of open grown trees. Furthermore, the study is showing the spacing of the largest and usually oldest stumps to be quite wide, similar to that found in many old-growth stands. There also is commonly found, several distinct or multiple-age groupings in the smaller (usually younger) stumps. These are trees that filled in the canopy gaps by mortality of trees from such agents as wind, subsequent fires, and disease. This may change our definition of Aeven-aged@ stands a bit. Perhaps our concept for the stands we now commonly refer to as Aeven age@ needs to allow for a longer period of stand establishment.

Very little is known about the frequency and extent of lower intensity fires (referred to as under-burns) in the northern Coast Range (Walstad et al. 1990). Being less dramatic, few detailed historic accounts of low intensity fires exist. Within a few decades following a low intensity fire, there is little definitive physical evidence remaining to help date the occurrence(s) and determine the frequency or intensity of such events.

The influence of onshore flow of marine air masses creates a predominantly cool and moist climate in the Coast Range, making the incidence of lightning strikes in this region one of the lowest in North America. This prevailing climatic condition is the primary reason for the infrequent nature of both major fires and underburns. It is hypothesized that human-caused ignitions played a more significant role in fire occurrence in the Coast Range as compared with other areas of the state (Teensma et al. 1991).

Native Americans and Fire

The Native American use of fire in the Willamette Valley is well documented (Boyd 1986, Zybach 1988, Agee 1993). Boyd has reconstructed a probable burning schedule for the Kalapuya:

> In late Spring and early Summer the Indians were probably concentrated at

> Aprimary flood plain@ sites in the wet prairies where root crops such as camas were collected and processed. There was no burning at this time. During mid-summer (July and August), the focus shifted to the dry prairies, and the Anarrow valley plain@ sites were more intensively occupied. Burning in July and August was apparently sporadic, most likely occurring after the harvest of seasonally and locally available wild foods (grass seeds, sunflower seeds, hazelnuts and blackberries), in limited areas. The immediate effect of the early burns would be a Acleaning up@ process; the long-term result would be to facilitate the regrowth, in future seasons, of the plants involved. In late summer, fire was used on the high prairies, as a direct tool in gathering of tarweed and insects. This was followed, in October after acorns had been collected, by firing of the oak openings. Finally, from the Avalley edge@ sites, the Kalapuya initiated large-scale communal drives for deer, which provided a winter=s supply of venison. The sequence ended as they returned to their sheltered winter villages along the river banks.

If late summer and fall fires were ignited prior to the onset of strong east winds, it seems very likely that such fires would have burned up into the higher elevations of the Coast Range (Ripple 1994, Teensma et al. 1991). Pushed by a strong east wind during and following a very dry summer, it is not difficult to envision a late summer fire that started at a valley margin site and carried well into the interior of the Coast Range.

Historic Fire Patterns

Historic fire patterns, and their effect on the landscape pattern of the Coast Range, have become an item of considerable interest to many authors (Zybach 1988, Walstad et al. 1990, Teensma et al. 1991, Agee 1993, Ripple 1994). The information provided by these authors, as well as forest inventory data collected by BLM, allows a picture to be roughly pieced together of how recent historic fires influenced relevant Coast Range watersheds. For example, a very large wild fire, or a series of fires, burned approximately 480,000 acres of the central Coast Range in the period between 1853 to 1868. The Yaquina Fire, as it is called, burned a huge area between present day Corvallis to Yaquina Bay (Gannett 1902, Walstad et al. 1990, Teensma et al. 1991). It is believed that this fire resulted from homesteading activity. This fire burned through most of the western half of this watershed. During that time, it is possible that new starts or holdover fires from a previous year broke out anew in the summer and burned additional acreage (Gannett 1902; Walstad et al. 1990). Historical accounts from the Yaquina fire period tell of people having to "eat their noon day meals by candle light"; and of people describing "It was dark all over for about 10 days", and "the world in flames" (Zybach 1988). As a result of this fire, the western half of the N.F. Alsea watershed became forested with a fairly uniform stand of Douglas-fir dating from the 1860-1890 period. There were scattered inclusions of mixed and older stands within this otherwise relatively uniform forest. Historic fire patterns are important in understanding the current landscape pattern and in envisioning a possible scenario for the future.

Appendix #6 - Historic Vegetation Patterns

Insight into long-term historic vegetation patterns of the Oregon Coast Range has recently been provided in a study by Worona and Whitlock (1995). By analyzing the pollen and plant macrofossils contained in the sedimentary layers of Little Lake (located about 46 miles south of the former logging town of Valsetz, in the upper tributaries of the Siuslaw River), these authors have assessed the vegetation and climatic conditions for the Coast Range for the past 42,000 years. Their work is briefly outlined below:

! from 42,000 to 24,770 years Before Present (B.P.)

- corresponds to the last part of the Olympia non-glacial interval
- climate was cooler and wetter that today
- open forest of western white pine, western hemlock, and true firs

! from 24,770 to 13,500 years B.P.

- corresponds to the full glacial period
- montane forest association develops
- western hemlock, mountain hemlock, pine, and fir are prominent
- Douglas-fir is notably absent from this period

! from 13,500 to 10,000 years B.P.

- initial warming trend in this period featured some temperate tree species including Douglas-fir which becomes a major forest component about 13,500 years B.P.
- a likely cooling trend from 11,000 to 10,500 years B.P.
- western and mountain hemlock, pine, and spruce prominent during cooling trend

! from 10,000 to 4,500 years B.P.

- corresponds to early Holocene period
- Douglas-fir, red alder, and bracken fern are abundant implying more severe summer drought and frequent fires
- pattern of cool moist winters and drier summers appears after 5,600 years B.P. with Douglas-fir, western hemlock, and western red cedar becoming dominant

! from 4,500 years to the present

- Douglas-fir, hemlock, and cedar are dominant species
- 2,800 years ago to the present Douglas-fir increases, while cedar decreases
- past 2,800 years suggest reduced effective moisture in this region

Research by Worona and Whitlock (1995) points to the emergence of the present day western hemlock/Douglas-fir forests in this part of the Coast Range at about 5,600 years B.P. This time line confirms that the ecological processes and disturbance regimes which are characteristic of this major plant community have been operating in this region for several thousand years.

In addition to fire events discussed previously, there were several other natural disturbance factors that affected the vegetation of the Coast Range. Severe wind storms, landslides, insect outbreaks, and disease pockets affected the vegetation at various scales. While the Columbus Day storm of 1962 suggests that wind storms can affect large areas, more often these other disturbance factors had a localized impact on vegetation patterns, and they did not occur as multiple simultaneous events.

Appendix #7. Natural Successional Processes

The natural succession of the plant communities following a disturbance event is dependent on how severe and widespread a disturbance has been. Following severe fires, large patches of the landscape were left completely denuded, often revealing exposed soil. Under such conditions, the succession of plant communities often began with grasses and forbs whose seeds were carried in on the wind. As time progressed, the grass/forb community would usually give way to shrub species and small sapling trees. Most often a young conifer forest would become established and eventually progress to late-seral or old-growth conditions before another disturbance event occurred. The duration of each seral stage could be quite variable. For example, the grass/forb and shrub community was known to persist for a few decades in certain areas of the Coast Range following the intense fires of the mid-1800s. Lack of a seed source, shrub competition, and reburns have all been identified as factors in delaying the regeneration of disturbed areas to a forested condition (Agee 1993).

Successional pathways can be very different following less severe disturbance events. For instance, following a low intensity fire, only shade-tolerant species may be able to establish themselves among the surviving vegetation and overstory trees. In contrast to the even-aged stands regenerating after a severe disturbance, stands that develop following less intense under-burns often have multiple canopy layers and more structural diversity. Local site conditions such as soil conditions and available moisture will also affect the successional pathways of plant communities following a disturbance.

For several thousand years, the western hemlock/Douglas-fir forests of the Coast Range have been dynamically responding to both large scale and localized disturbance events. The condition of the vegetation occupying the landscape at any one time could therefore be quite variable. The enormous acreages affected by major fire events could far surpass the size of any single watershed. Considering this fact, it is easy to conclude that forest conditions within a watershed could naturally have ranged from completely burned over to completely covered in late-seral forest conditions. We know from reconstruction of historic forest inventory records (Teensma et al. 1991), forest vegetation potential (Franklin and Dyrness 1973), and fire return intervals (Agee 1993) that on average, late-seral and old-growth forests occupied 60% to 80% of the Coast Range landscape. Ripple (1994) estimated that 61% of the Coast Range was occupied by late-seral forests prior to 1850. Perhaps 20% to 40% of the Coast Range was typically in early-seral conditions, resulting from recent fires or localized disturbances.

Appendix #8 - Special Plant Communities/Habitats (Ecological/Physical Processes)

Ecological and physical processes produce special habitats within the forest. These processes include the following disturbance regimes: patch and gap dynamics; hydrological cycles; geomorphic and erosional processes; nutrient cycles; energy flows; biomass and resource productivity; vegetation mortality and regeneration rates; herbivory, parasitism, and predation rates; colonization and local extinction; and others. The ecological and physical processes that operated in the past to produce these habitats are presumed identical as those that currently produce these habitats. Special habitats indicate the potential health of special habitat-dependent species, and are closely related to the continued existence of these species. The rate, location, extent, and intensity of natural and induced environmental stressors affect special habitats, and can make their status more or less secure. These stressors include: fire frequency, intensity, and spatial patterns; air and water pollution; climate change; exotic species; large-scale fire frequency and intensity; fire suppression strategies; insect epidemics; floods; road densities; extent and intensity of silvicultural treatments; habitat simplification; siltation in key watersheds; fragmentation and loss of habitat corridors; and secondary effects of restoration activities.

Appendix #9 - Plant Associations

Plant associations have been identified for the Siuslaw National Forest for the western hemlock and Sitka spruce series (Hemstrom and Logan 1986). Because of its proximity to the Siuslaw, these associations also apply for the N. F. Alsea watershed, and in fact, the watershed is comprised of vegetation in the western hemlock series. Due to widespread, intense fire during the past 150 years, much of the western hemlock series is now dominated by Douglas-fir and red alder. A summary of the plant associations for this series follows based on work by Hemstrom and Logan (1986):

- **western hemlock/devil's club** - Douglas-fir and western hemlock dominate the canopy. Many stands contain substantial amounts of western red cedar and red alder. Canopy closure averages 75 percent. Western hemlock and, to a smaller degree, western red cedar are the major regenerating species. The shrub layer is diverse. Devil's club cover is over 5 percent and averages 24 percent. Vine maple, salmonberry, red huckleberry, and fool's huckleberry may be important. Shrub cover averages 56 percent. Oxalis and sword fern are the major herbs. Other herbs indicating wet sites are usually present; especially, lady fern, maidenhair fern, Mexican betony, and mountain wood fern. Several other herbs are common: deer fern, Siberian montia, sweet scented bedstraw, and Pacific trillium. Herb cover averages 74 percent. This association occurs in poorly drained, concave topography and near seeps. Soils are saturated, or nearly so, throughout the year. This type occurs only in small, localized areas in the watershed.

- **western hemlock/salmonberry** - Douglas-fir usually dominates the canopy, closely followed by red alder and western hemlock. Western hemlock is the major regenerating species. Many stands are occupied by nearly pure red alder canopy with scattered, larger Douglas-fir and hemlock. The successional development of red alder stands that lack western hemlock is unclear, since red alder typically senesces at 100-150 years of age and Douglas-fir does not regenerate under a canopy. The climatic and environmental nature of the stands suggests that western hemlock would be the climax if seed sources had not been eliminated by disturbance. Most stands have at least some tolerant conifer seed sources. Salmonberry cover averages 51 percent. Other important shrub species include fool's huckleberry, elderberry, and red huckleberry. Shrub cover averages 74 percent. The dense shrub layer generally inhibits herbaceous development. Oxalis, Mexican betony, Siberian montia, false lily-of-the-valley, sword fern, deer fern, maidenhair fern, fairybells, field woodrush, and sweet scented bedstraw are present in small amounts in most stands. Sword fern averages over 44 percent cover. Oxalis may be abundant. This association occurs on well-watered sites. It is most commonly found in moist riparian zones within the watershed. Soils are saturated much of the year, but are not as wet or poorly drained as in the devil's club association. It also occurs on middle and lower slopes on north or northeast aspects.

- **western hemlock/salmonberry/vine maple** - Douglas-fir dominates the canopy. Western hemlock occurs in the canopy of about one-third of the stands and occasionally occurs in the regeneration layer. Red alder is a major canopy species in about two-thirds of the plots. Big-leaf maple is relatively uncommon. Salmonberry and vine maple dominate the shrub layer. Red huckleberry is present in small amounts in most stands. Salal, California hazel, cascara, buckthorn, elderberry, and a few other shrubs may be present.This association represents the more inland end of the salmonberry spectrum. It occurs at higher elevations on warmer, slightly drier sites than the western hemlock/salmonberry association.

C **western hemlock/salmonberry-salal** - Douglas-fir and western hemlock dominate the canopy in most stands. Many stands have a substantial red alder component. Conifer regeneration is uncommon but may include western hemlock and western red cedar. The shrub layer is a dense mix of salmonberry and salal supplemented by minor amounts of red huckleberry, vine maple, Oregon grape, and evergreen huckleberry. Shrub cover averages 84 percent. Sword fern is the only abundant herb. Other common herb species are Siberian montia, field woodrush, and Pacific trillium. Total herb cover averages 32 percent. This association occurs in high rainfall areas where the western hemlock/salmonberry association extends nearly up to the ridge line. It is uncommon in the watershed but is more prevalent in the Lobster Valley and Harlan areas.

C **western hemlock/oxalis** - Douglas-fir usually dominates the canopy. Western hemlock is present in the canopy of most stands and in the regeneration layer of many stands. Western red cedar may be abundant. Red alder was present in 35 percent of the sample plots, occasionally as the major canopy species. The shrub layer is usually sparse. Red huckleberry and salmonberry are present in small amounts in many stands. Shrub cover averages 30 percent. Oxalis forms a dense carpet except in heavily shaded stands. Sword fern cover averages 44 percent. Fairybells, Siberian montia, ladyfern, deer fern, Pacific trillium, and sweet scented bedstraw commonly occur. Herb cover averages 71 percent. The western hemlock/oxalis association occurs on moist slopes, benches, and alluvial terraces generally above 500 feet.

C **western hemlock/sword fern** - Douglas-fir usually dominates the canopy, commonly associated with western hemlock. Western red cedar was present in half of the sample plots. Both western hemlock and western red cedar may be present in the regeneration layer, but western hemlock is more common and abundant. A few sample plots had substantial red alder canopies. Big-leaf maple may be present. Red huckleberry, salal, salmonberry, vine maple, and fool's huckleberry may be present, but the shrub layer is relatively sparse. Total shrub cover averages 22 percent. Sword fern is the major herb. Many other species may be present in small amounts including: Siberian montia, oxalis, deer fern, fairybells, Pacific trillium, evergreen violet, and sweet scented bedstraw. Herb cover averages 65 percent. This association occurs on middle to lower slopes and less often on benches and alluvial flats. Slopes are usually steep. Soils are well drained but receive continuous subsurface moisture from upslope.

C **western hemlock/vine maple/sword fern** - Douglas-fir usually dominates the canopy. Western hemlock and western red cedar are common. Western hemlock regeneration was present in 22 percent of the sample plots. Some sites have mixed alder/conifer canopies. Big-leaf maple frequently occurs. Vine maple is always present, averaging 52 percent cover. Red huckleberry, salal, and salmonberry are common in small amounts. Shrub cover averages 70 percent. Sword fern dominates the herb layer, averaging 61 percent cover. Oxalis, Siberian montia, sweet scented bedstraw, and Pacific trillium are present in most stands at less than 10 percent cover each. This association is similar in many respects to the western hemlock/sword fern association. It occurs on warm sites with all combinations of elevation, aspect, and slope. Soils are well drained but retain adequate soil moisture in summer. It is most common on steep middle-and-lower slopes between 500 and 1,000 feet elevation.

C **western hemlock/salal** - Douglas-fir dominates the canopy. Western hemlock is present in the regeneration and canopy layers on most sites. Small amounts of western red cedar may be present. Red alder occurred on about a third of the sample sites. Big-leaf maple and golden chinquapin are occasionally present. Salal is usually dense. Vine maple, Oregon grape, red huckleberry, and trailing blackberry occur in relatively low abundance. On more moist sites, salmonberry and thimbleberry may be present. Total shrub cover averages over 70 percent. The herb layer is dominated by sword fern. Bracken fern is often abundant in stands which have been thinned or recently disturbed. Trace amounts of a few other herbs occur, including sweet scented bedstraw, fairy bells, and Pacific trillium. Stands with particularly heavy salal cover have usually been disturbed and may lack an appreciable herb layer, except for sword fern. This association is most prominent on south- or west-facing upper slopes and ridges. It also occurs on upper slope slump faces and flats. Soils are well drained. Summer moisture stress is probably higher in the salal association than in lower slope associations. This association is fairly widespread in the watershed.

C **western hemlock/vine maple-salal** - Douglas-fir dominates the canopy in most stands. Western hemlock and western red cedar are occasionally present. The canopy is relatively open compared to other associations. Regeneration is sparse or absent. A few stands have a substantial red alder or big-leaf maple canopy. The dense shrub layer, consisting mainly of salal and vine maple, averages nearly 100 percent cover. A few other shrub species are common, including red huckleberry, trailing blackberry, and evergreen huckleberry. The herb layer ranges from nearly absent beneath the tangle of shrubs to 50 percent sword fern cover. Pacific trillium and sweet scented bedstraw are the only other common herbs. This association is very similar to the western hemlock/salal association. Both occur on well drained middle to upper slopes and ridges. It is also fairly common in the watershed.

C **western hemlock/Oregon grape-salal** - Douglas-fir dominates the canopy. Many sites have small amounts of wesern hemlock and western red cedar in the canopy and regeneration layers. Some stands have minor red alder, big-leaf maple or golden chinquapin canopy components. Salal and Oregon grape dominate the shrub layer. Vine maple or evergreen huckleberry may be abundant. Red huckleberry is common in most stands. Other shrubs, especially Pacific dogwood, baldhip rose, trailing blackberry, and ocean spray may be present. Sword fern is the major herb. Several other herbs occur in most stands: sweet scented bedstraw, western starflower, redwoods violet, Pacific trillium, fairybells, and California fescue. Herb cover averages 33 percent. This association is similar to the western hemlock/Oregon grape association. It is most common at upper elevations (average 1,385 feet in the Alsea Ranger District). Soils tend to be less stoney and sites more northerly facing than in the western hemlock/Oregon grape association.

- **western hemlock/Oregon grape -** Douglas-fir dominates the canopy. Western hemlock codominates in many stands and is the major regenerating species. Western red cedar occurs in some stands and is a minor climax species. Big-leaf maple is more common than red alder. Oregon grape is the major understory shrub, usually in association with salal. Vine maple may be abundant on some sites. Several other shrubs are common: trailing blackberry, red huckleberry, baldhip rose, California hazel, and ocean spray. Shrub cover averages 45 percent. Sword fern dominates the herb layer. Other common herbs include: Siberian montia, oxalis, fairybells, California fescue, sweet scented bedstraw, western starflower, Pacific trillium, and redwoods violet. Herb cover including sword fern averages 50 percent. This association occurs at upper elevations (average 1,285 feet) on east, south, and west-facing slopes. Sites are usually on middle-to-upper slope positions on well drained soils. At least one-third of the sites had exposed bedrock at the surface.

- **western hemlock/rhododendron/sword fern -** Douglas-fir dominates the canopy, often in association with western hemlock and western red cedar. Both western red cedar and western hemlock regenerate in many stands. Western hemlock is the major regenerating species. Big-leaf maple is present in nearly half the stands. Red alder is not as common. The diverse shrub layer averages 45 percent cover and usually includes red huckleberry, salal, vine maple, Oregon grape, evergreen huckleberry, and rhododendron. Species other than rhododendron and vine maple have relatively low covers. Sworfern cover averages 53 percent. Several other herbs, including sweet scented bedstraw, Pacific trillium, and fairybells may be present in small amounts. This association is the most moist of the rhododendron-dominated associations. It occurs on steep, well drained, northerly-facing slopes.

- **western hemlock/rhododendron-salal -** Douglas-fir dominates the canopy. A few sites have scattered western hemlock in both the overstory and regeneration layers. Red alder occurs on some plots, but big-leaf maple is the most common hardwood. The shrub layer is profuse. Rhododendron and salal usually dominate. Vine maple, Oregon grape, evergreen huckleberry, and red huckleberry commonly occur. Some sites and ridges have a dense rhododendron layer which excludes most other species. Total shrub cover averages 51 percent. Herbs other than sword fern are not abundant. Sword fern cover varies from nearly 0 to 70 percent. A few sites have traces of Pacific trillium, oxalis, and a few other herbs. Herb cover averages 27 percent. This association occurs on well drained slopes and ridges. Most sites are southerly-facing with steep, rocky soils. Nitrogen appears to be limiting on some sites and the canopy may be chlorotic.

- **western hemlock/rhododendon-Oregon grape -** Douglas-fir and western hemlock dominate the canopy. Western red cedar may be present. Conifer regeneration is usually sparse. Big-leaf maple is the major hardwood and occurred on one-third of the sample plots. The shrub layer is diverse and dense. Oregon grape and rhododendron are usually accompanied by salal, red huckleberry, vine maple, evergreen huckleberry, trailing blackberry, and ocean spray. Shrub cover averages 80 percent. Sword fern dominates the herb layer, averaging 32 percent cover. Other herb species occur in small amounts. This association occurs on ridge lines, mostly on southerly-facing, steep slopes. Plant moisture stress in summer is probably high enough to substantially slow conifer growth. Douglas-fir on nearby sites appear to be chlorotic from poor nitrogen status. Lower soil nitrogen may be the result of intense natural fire (which increases volatilization of nitrogen in the duff and surface soil) and a general absence of nitrogen fixing species during early succession.

Appendix #11 - Ecological and Physical Processes Affecting Riparian Ecosystems

Riparian ecosystems in the Upper Siletz watershed (and the Coast Range in general) have been greatly influenced by ecological and physical processes especially those associated with catastrophic events. These Anatural@ catostrophic events shaped the landscape and provided the mechanisms for watershed-wide changes to riparian and stream ecosystems. These changes varied spatially and temporally in response to the intensity and frequency of catostrophic events. Stand replacement fires, wind storms, and flood events have all contributed to Anatural variability of condition@ throughout the period. The following discussion focuses on the range, frequency and distribution of these particular events and their potential impacts on riparian ecosystems.

Vegetation

Riparian vegetation performs several important functions in aquatic ecosystems. It provides a primary source of energy and nutrients for small streams. It maintains channel and flood plain stability during floods and channel shifts by holding onto sediment with its root systems, and by trapping floating wood with branches and stems. Riparian vegetation also supplies the source of large wood that maintains an active flood plain, forms a variety of surfaces for riparian vegetation to develop, and creates high quality fish habitat. Finally, riparian vegetation shades streams and wetlands to keep water temperatures suitable for a wide variety of aquatic species.

Riparian vegetation contains some of the most complex vegetative patterns on the landscape. Fire, debris torrents, flooding, and blowdown all interact with flood plain and toeslope surfaces to develop a complex mosaic of vegetation containing all potential seral stages (for a discussion of riparian areas as special habitat, see Wildlife and Vegetation sections in this report). The processes which operate to form riparian vegetation patterns differ between small and large channels.

Following an intense fire, many small streams are scoured to bedrock by debris torrents, and streambanks are often colonized by alder and salmonberry. Conifers then become established upslope of the streambanks, and over time, they begin to shade out the alder due to their height and the narrowness of the valley bottoms. Upslope conifers periodically fall into the channel, providing nurse logs and openings for other conifers to become established nearer the channel. In this way, conifers slowly encroach on these streambamks. Debris torrent tracks in late-successional forests are colonized by conifers much faster than slopes where fire alone has removed the upslope vegetation.

In larger streams, flooding and blowdown, in addition to fire, are the dominant disturbance mechanisms. Following fire, debris torrents and burned riparian areas deliver large amounts of wood and sediment to these streams and adjacent banks. Large volumes of sediment are stored upstream of debris torrent deposits and wood accumulations. Eventually, as wood breaks and floats downstream, streams cut through these deposits and leave terraces upstream of the old deposits. Terraces are continually being formed and cut in stream systems with abundant wood.

The height of terraces, extent of soil development, and the availability of nurse logs strongly influence the riparian vegetation patterns found on the flood plains of larger streams. On low terraces, red alder is the dominant tree species, while on higher terraces and nurse logs, western hemlock and western red cedar are dominant. Big-leaf maple is more common in the upper half of the main stream channels, and Douglas-fir may dominate on drier sites. The oldest and largest trees (typically conifers) are found on the highest terraces; younger trees grow on the lower terraces closer to the stream channel. Alder, maple and salmonberry-dominated canopies are common in the upper reaches of mainstems due to frequent disturbance by floods in the narrow valley floors and the higher amount of beaver activity.

Western hemlock and western red cedar are the dominant coniferous species on flood plains due to their adaptations to flood plain conditions. Red cedar can tolerate high water tables because they develop adventitious roots when covered by water and sediment. Both species are shade-tolerant.

Mature riparian vegtation usually creates complex channel morphology with abundant large wood, because the vegetation provides a source of large wood for the stream channel. Although floods may transport wood downstream, adjacent vegetation is continually replacing it through bank-cutting and blowdown.

Large Woody Debris and Aquatic Processes

Large woody debris (LWD) is a basic structural component in Pacific Northwest aquatic ecosystems. It is delivered to stream channels by debris torrents, landslides and falling from the adjacent riparian area. In the channel and on the flood plain, large wood has many beneficial functions. One of its most important functions is helping maintain the connection between a channel and its flood plain. When large wood enters a stream, sediment accumulates upstream creating a low-gradient flat. The size of the flat is related to the amount and size of the wood, valley gradient, and channel constraint. These low-gradient flats are most common just upstream of tributary junctions, the usual deposit site for debris torrents. As these flats develop, the channel can shift positions on the flood plain, causing bank erosion and large wood recruitment. Channel shifts bring in large quantities of terrestrial biomass and nutrients for the aquatic ecosystem to process, and they are a major way in which side channels, high-flow channels and wetlands are formed. Large wood and the associated flats increase the stream's retention capacity by catching floating organics, such as leaves, sticks, and salmon carcasses. As these substrates decompose, the nutrients enter the aquatic ecosystem.

Large wood also functions to increase the frequency, depth, and types of pool habitats in mountainous streams. It creates the complex flow and cover patterns that provide habitat for many aquatic and terrestrial species. Log jams are areas of high fish production due to the large, deep, complex pools formed by the wood, and the abundant spawning gravels and side channels formed just upstream. Large wood on the upstream end of terraces can deflect flow around the terrace, allowing riparian vegetation to develop into later-successional stages. Functioning as nurse logs, large wood is often the major site of conifer establishment in the riparian area.

Large wood moves when stream flow rises; it may shift only slightly with a moderate rise in flow, or float downstream to a new site with a large rise in flow. Associated, upstream sediment plains become terraces when large wood moves and the channel downcuts through the sediment plain. Between large flows, wood in all channels may remain near to where it entered.

Most small streams do not have the capacity to float large wood, except in debris torrents. In larger streams, the wood can be floated and may accumulate in large jams, at channel constraints, bends in the river, or on large riparian conifers or other pieces of large wood in the channel. Large accumulations of wood also occur at gradient breaks and at the mouths of streams, deposited by the ocean during storms. The large wood in the estuaries, on the beaches, and in the ocean originated from streams.

Large wood, particularly in jams, can create temporary fish passage barriers, especially in small streams. However, these barriers may persist only for a few months or years before shifting and allowing passage again. These barriers may actually have positive impacts on species upstream, such as cutthroat trout and salamanders, by temporarily releasing them from competition with other species of fish. Such barriers may minimize competition and potentially increase survival by helping species segregate their use of the stream.

The type and abundance of wood in a channel vary with disturbance history. Large fires in mature forests leave stream channels filled with large wood from debris torrent deposits and riparian snags killed by the fire. This debris (particularly large diameter conifers) maintains structure in stream channels for the first 100 years until wood is recruited from the new forest. Wood from deciduous trees enters the stream about 50 years following the disturbance, while wood from conifers may take 100+ years. Unburned patches, which typically occur in larger riparian areas, may have abundant wood.

Fire

Throughout the Holocene Epoch, including the present time, large scale, severe fire has been a normal occurrence in the central Oregon Coast Range. Fires occurred at infrequent intervals when fuel and weather conditions coincided with an ignition source (refer also to Appendix #5 on natural fire processes). The size of high intensity events (referred to as Astand replacement fires@) has generally been on the order of 10,000 to 500,000 acres or more. The return interval for such events is believed to range from 100 to 350 or more years.

During a stand replacement fire, typically 80% or more of the vegetation is killed in upland areas. Riparian ecosystems would not be affected to this degree because of the higher moisture levels. If severe storm (rain or rain-on-snow) events occur in the decades following a severe fire, significant increases in surface erosion and in the number and extent of shallow landslides would occur. Severe fires will usually destroy all the vegetation in headwall areas due to the compounding effects of topography and radiant heating. These headwall areas could be expected to fail and advance upslope significantly for several decades following a fire. This would occur as root strength from the mature vegetation is lost through decay and as dry ravel delivers new material to load the headwall again. In very large events, re-establishment of timber may be delayed for periods up to fifty years or more due to loss of nearby seed sources. This could result in prolonging the period of high erosion and slope failure.

Much of the coarse sediment and large wood delivered to a stream system would occur during the period following a severe fire. During the intervening centuries between fires, much of the material delivered during the early years following the fire would be washed, sorted, and routed through the system, and eventually removed. This wood and the benefits it provides would have persisted over intervals longer than the return periods of floods or fire.

Wind

In all likelihood, windstorms occurred during this period due to the same climatic patterns that we see today. During periods of mature forest conditions with fully developed canopies, windthrow in riparian zones and wetlands probably resulted in a minor but steady introduction of new wood into the aquatic system. Catastrophic windthrow events which accounted for major changes in riparian degradation (as well as stream temperature and sedimentation effects C refer to Appendix #13 on water quality processes) were most likely associated with stand replacement fires and assumed to have approximately the same return period (see fire section). During periods of Aedge@ exposure such as after a wildfire or landslide, riparian areas and wetlands with trees still standing would have experienced higher levels of windthrow. (Damaging winds are intensified when a wide expanse of open area is windward of the remaining forested strip.) Old-growth Douglas-fir is particularly susceptible to windthrow due to its form and height (Stienblums, 1977). The confined riparian reaches of the Upper Siletz watershed were predominately Douglas-fir mixed with western red cedar and hemlock (see vegetation section).

Some of the riparian vegetation in the watershed especially at higher elevations was consumed by wildfire. Remaining snags would have become stream material within the 15 to 100 years following the fire, as their roots rotted and wind and/or gravity delivered them into the streams. Mid-elevation (1,000 ft to 1,800 ft) riparian zones probably remained somewhat intact as the fire effects fingered through this zone. The remaining riparian trees were likely susceptible to windthrow, with steady recruitment into the streams until a catastrophic wind event (similar to the Columbus Day storm of 1962) occurred. At that point, most standing old-growth riparian trees might have been wind-thrown due to the exposure of their massive boles and canopies. Pockets of trees would remain in reaches that were protected by valley confinement. Western red cedar may have remained standing in much of this zone due to its natural stability (fluted bole at base).

Loading of the channel with windthrown trees after wildfire functioned in the retention and release of sediment Apulses@ moving through the system after exposure of soil. Old-growth windthrow has a high probability of breaking up, but the root wad section usually stays in the location in which it falls. These pieces would have persisted in place despite flooding; large pieces would have remained in place in the smaller tributaries. The large wood within the channel would persist over time due to the cool, moist conditions and low rates of decay. Almost all old debris in channels associated with Coast Range wildfire sites consisted of conifer and most was from the size class associated with the burn (Heimann 1988).

Riparian vegetation in the lower elevations, which may have occurred along openings created by Native American burning, was also subjected to blowdown on a continuing basis. If the Native American burning resulted in a large opening adjacent to the riparian zone, windthrow potential would be high. Deeper soils, higher productivity, and available moisture would have allowed conifers to reach mature size before windthrow occurred. These lower elevation stands were probably more diverse in age class and species, due largely to the dynamic nature of the flood plain. As single trees became larger, potential for windthrow became higher, and as the channel shifted, it undercut roots and recruited material. It can be inferred that introduction of wood to the system was steady over time and less windstorm related.

Floods

Throughout the Holocene Epoch, including the present time, the central Oregon Coast Range has experienced severe storms which included intense rainfall and flooding. These floods are a dominant force in riparian and channel change, and a key routing mechanism for sediment and large wood. Such flooding resulted in dynamic changes to riparian ecosystems (and channels) such as those in the Upper Siletz watershed, particularly in the lower gradient reaches with flood plains. The routing of flood waters (and sediment) throughout the lower watershed was largely controlled by a properly functioning riparian system consisting of a forested flood plain which slowed flows, protected stream banks, and retained sediment. Riparian ecosystems (including vegetation and large wood) as well as channel form and roughness, dissipated flood energy and contributed to the resiliency of the system. In the lower reaches, flood plains remained saturated throughout most of the year and would have supported a rich growth of riparian species (e.g., big-leaf maple, western red cedar, scattered red alder, and willow with a dense shrub understory).

Large wood has played an important role in the Upper Siletz watershed as a channel roughness factor. In higher gradient streams such as Warnick Creek and Boulder Creek, large wood increased the capability of riparian zones to absorb stream energy and to capture sediment. Downstream, in the lower gradient reaches (<3%), log jams provided connections between flood plains, riparian ecosystems, and adjacent stream channels as well as creating pools. This wood and the benefits it provides persisted over long periods (350+ years, depending on the decay rate). Much of this wood was retained in place as many individual pieces were too large for the smaller tributaries to move even during flood flows.

Appendix 11a. Hydrology Analysis: Objectives, Techniques, Assumptions, and Confidence Levels

1) Stream Segments "At Risk" For Increases in Temperature During Summer Low Flow

A. Objective

The primary objective of this analysis was to identify subwatersheds and stream segments within subwatersheds which appear to be at risk for temperature increases during summer low flow. Since very little stream temperature data is currently available for the Upper Siletz watershed, this analysis will help us to focus limited monitoring resources on streams and subwatersheds which appear to have the highest risk.

B. Analysis Technique

Landsat TM (thematic mapper) data classified by OSU researchers as part of the CLAMS project was converted to ARC/INFO coverages and clipped by 10-meter wide buffers along perennial streams. The resultant coverage was manipulated in ARCVIEW to identify stream segments with "open" stand characteristics. "Open" vegetation (either bare ground, recent clearcut, grass and forb, burned, or water surface) was assigned a high risk; everything else was rated as a low risk. Stream miles in each category (high risk or low risk) were derived by assigning stream segments the risk rating of the adjacent riparian vegetation. Stream segments by risk category were mapped in ARCVIEW.

C. Assumptions

- Shading of surface waters by riparian vegetation adjacent to small streams provides significant protection from temperature increases due to solar radiation during summer low flows.

- "Open" riparian stands adjacent to small streams may put the stream "at risk" for temperature increases during summer low flow.

- Landsat vegetation coverage provides an adequate representation of riparian vegetation to make meaningful predictions at this scale of analysis.

- Stream temperature monitoring is necessary to verify assumptions.

D. Confidence Level

As a broad level technique for identifying stream segments which appear to be at risk for temperature increases, this approach appears adequate. Having identified stream segments potentially at risk we can select appropriate candidates for temperature monitoring (our basic objective in this analysis).

Weaknesses in this analysis include: 1) The landsat data is from 1988 and significant increases in shading from new streamside vegetation in formerly Abare@ sites may have occurred, 2) factors other than stream side vegetation probably have a significant effect on stream temperature (i.e., low flows, channel characteristics such as gradient and width/depth ratio, ground water influxes, and elevation). This analysis does not consider these factors. This analysis does not quantify the errors resulting from these inaccuracies.

2) Potential of Stream Segments to Provide Adequate Levels of Large Woody Debris (LWD) Recruitment

A. Objective

The primary objective of this analysis was to identify subwatersheds and stream segments within subwatersheds which currently have low potential for LWD recruitment. Since very little riparian and channel data is currently available for the Upper Siletz watershed, this analysis will help us to focus limited monitoring resources on streams and subwatersheds which appear to have the least potential for LWD recruitment. In addition, it will be useful for identifying streams which may be in need of management intervention to restore optimum conditions.

B. Analysis Technique

Landsat TM (thematic mapper) data classified by OSU researchers as a part of the CLAMS project was converted to ARC/INFO coverages and clipped by 30-meter-wide buffers along streams. Potential for LWD recruitment (Low, Moderate, High) was assigned for each pixel of data (0.0625 hectare/pixel) within this buffer based on a matrix of stand age and type. "Open" vegetation and stands 0-40 years in age were assigned a low potential; conifer stands between 40 and 80 years in age or conifer-hardwood stands greater than 40 years were assigned a moderate potential, and conifers over 80 years in age a high potential for recruitment.

Acres of riparian vegetation in the three categories, by subwatershed, were mapped and derived in ARCVIEW.

C. Assumptions

- LWD is a critical factor in the maintenance of riparian and stream processes in forest ecosystems of western Oregon.

- LWD recruitment potential for stream channels is highest in forest stands immediately adjacent to the stream (in this case, within 30 meters).

- LWD recruitment potential is poor in open areas, stands of less than 40 years of age, and young hardwood stands adjacent to streams. Conifer stands greater than 80 years in age have average diameter at breast height (DBH) >21 inches or greater and provide a high level of woody debris (Salem RMP, p. 3-35). Remaining conifer stands (40-80 years-old) have only a moderate LWD recruitment potential.

- Landsat vegetation coverage provides an adequate representation of riparian vegetation to make meaningful predictions at this scale of analysis.

D. Confidence Level

Primary weaknesses in this analysis are: 1) Landsat data is from 1988 and riparian vegetation adjacent to channels has likely been altered during this time; 2) Landsat data has been interpreted and has inherent limitations (for a description of these limitations contact the Marys Peak GIS staff). We did not quantify the errors resulting from these inaccuracies.

This analysis did not include a number of additional factors (such as streamflow, water quality, geomorphic processes, other biological indicators, etc.), which, in tandem with LWD, are critical to the functioning of riparian-and-stream systems. Nevertheless, streamside vegetation and channel LWD are among the best understood, most easily measured, and manipulated factors which are known to affect stream-and-riparian ecosystem processes. Therefore, these factors have taken priority in our analysis. Sparse in-channel data, especially on private lands, reduces the credibility of this analysis. This inadequacy will only be overcome as stream inventories are conducted and data becomes available. Meanwhile, this highlights a critical data gap to be filled for future iterations of this analysis.

As a broad level technique for identifying stream segments which appear to be at risk this approach is adequate.

Appendix #12 - Stream Channel Processes

Stream morphology is influenced by eight factors which change over time: channel width, channel depth, water velocity, discharge, slope of the stream channel, roughness of the stream bed, amount of sediment, and size of sediment (Leopold et al. 1964). In addition, streambank vegetation influences streambank stability. All of these factors interact with each other; a change in one can result in an adjustment by any or all of the other factors. For example, an increase in the amount of sediment may cause the stream channel to fill with sediment (aggrade), which in turn may cause channel widening. Alternatively, an increase in discharge may cause more sediment to be transported. The streambed is scoured, and the channel may downcut. To further understand stream channel processes, it is helpful to categorize channels into response types based on the expected responses of streams to ecological and physical changes; and into Rosgen stream classifications based on geomorphological characteristics.

Stream Channel Response Types

The distribution of stream types throughout the watershed is a description of how the stream network functions and how it is expected to respond to proposed projects. Different streams within the same stream type will respond similarly to changes in inputs of sediment, water, or wood. Certain stream types are more sensitive to physical changes than others. The sensitivity to disturbance for each stream type has been described by Montgomery and Buffington (1993) and Rosgen (1994).

In general terms, the routing of stream flow and sediment can be described by dividing the stream network into Asource,@ A transport@, and Aresponse@ reaches. Source reaches have gradients that are greater than 20%, and are found primarily in headwalls and along steep side slopes. These reaches are the primary source for much of the streams= flow and for inputs of organic material, nutrients, and sediment. They have no flood plain development, and typically the riparian area is dominated by conifer.

The sensitivity of source reaches to disturbance varies widely with local surface geology and soil types (see Table below). These reaches are subject to periodic scour by debris torrents (see Soils section of this report). Periodic, catastrophic disturbances in these reaches are typically a normal part of the watershed ecology in the Coast Range and critical processes in the maintenance of the aquatic ecosystem (see Benda 1990). Many source reaches are intermittent or ephemeral channels (they have surface flow primarily in response to storm events).

Table: Stream Types and Sensitivity to Disturbance

Stream Type	Sediment Supply	Riparian Vegetation	Peak Flows
Source	Low-High	Low-High	Low-High
Transport	Low	Moderate	Low
Transport/Response	High	High	High
Response	Extremely High	Extremely High	Extremely High

Transport reaches have a relatively high gradient (4-20%), are fairly resistant to changes in stream morphology, and tend to act as conduits for material from high-gradient reaches to depositional, response reaches. These reaches typically have a step-pool morphology, a large cobble-or-boulder substrate, and resistant banks with little or no flood plain development. Riparian vegetation is variable but tends to be dominated by conifer.

Response reaches have low gradients (less than 4%) and are areas of sediment deposition, stream meander, and high diversity and abundance of aquatic habitat (see Biological Processes in this report). These reaches can experience significant changes in stream morphology if sediment supplies increase, riparian soils and vegetation are disturbed, flow regime is altered, or channel elements (substrate, large woody debris, meander geometry, width-to-depth ratio, etc.) are disturbed.

Identifying response reaches that are sensitive to disturbance is important because these reaches may be the most critical for anadromous fish habitat. In addition, high water tables, large inputs of nutrient-rich organic material, and the protected valley settings of these reaches combine to produce diverse and productive riparian habitat on the flood plain (see Riparian Vegetation in this report). Finally, these reaches are critical for the buffering of stream flows (they reduce floods and support summer base flow) and the maintenance of water quality.

In general, reaches that are sensitive to changes are low-gradient, unconfined channels, in uncohesive alluvium (gravelly, sandy or sandy-loam soils) especially at confluences with transport reaches. Transport reaches often enter response reaches at nearly right angles. This, in combination with low gradients, rapidly reduces the stream=s ability to transport sediment and flows. Channel meander and flood plain development are the stream=s natural response to these conditions, and therefore, it is critical for the functioning of response reaches that proper channel geometry be maintained. The same elements that maintain stable channel geometry (substrate, large woody debris, meander geometry, width-to-depth ratio, etc), are also critical for the maintenance of biological processes.

Rosgen Stream Classifications

The stream network can be further stratified, on a site-specific basis, based on geomorphological characteristics using the Rosgen stream classification system (Rosgen 1994). This classification system groups streams into channel types based on entrenchment, geometry, sinuosity, gradient, and streambed and bank material. This classification allows stream channel geometry to be measured and monitored to describe channel conditions and functions quantitatively. Channel response and sensitivity to disturbance can be quantified and monitored. This has implications for the management of stream channels themselves as well as adjacent riparian and upland vegetation.
Rosgen stream classification requires extensive field work with precise measurements of channel variables. To date, channel classification has only been estimated for streams in the Upper Siletz watershed. Therefore, classification is an on-going process which, in the future, will focus on measurements of Arepresentative@ reaches and project reaches for monitoring purposes. Below is a generic description of channel types in the Rosgen system.

Stream Type: AA+

Description And Processes:

These streams are in steep, first-order headwater areas, and second-order mainstem tributaries in the middle of the channel network. These streams are confined by deep, V-shaped, valley walls and are transport reaches for sediment and wood. Gradients are between 10 and 20+ percent with a cascade or vertical-step, bed morphology. These channels are sources of sediment where they flow through unstable or erosive soils. Runoff is funneled by the narrow, confined banks and scours the channel and banks. The channel is typically large boulder or bedrock with little deposition of sand or gravel. In headwater reaches, stream flow is mainly intermittent and is not sufficient to transport large wood downstream; downed trees accumulate in the channel. Episodic debris flows and mass wasting from steep hillslopes above may scour these channels and transport accumulated wood to lower gradient reaches downstream (see Soils section of this report and Benda, 1990).

This stream type is divided into two general subcategories based on stream particle size; Ala+ and A2&+ streams have bedrock-and-boulder channel material, while A3a+ and A4a+ have cobble-and-sand channel material.

Sensitivity And Response Potential:

<u>Coarse and Fine Sediment</u>

These are high energy streams which transport sediments downstream with very little storage in the channel. There is no formation of bars or flood plains on which to dissipate high flows and deposit sediment. A potential increase in sediment would be flushed down the channel with very little effect on channel stability.

<u>Riparian Vegetation</u>

In channels with streambanks armored by boulders and bedrock (type Al&+ and A2a+), riparian vegetation has little effect on protection of banks and has a low sensitivity to disturbance. In channels with smaller sized bank material (A3a+ and A4a+), tree root systems can be important in stabilizing the steep slopes adjacent to the stream, preventing surface erosion, and filtering sediment eroded from surfaces upslope. These areas have a high sensitivity to disturbance in the riparian zone.

The riparian zone in some of these streams serves as a source of large wood delivered by floods and debris flows to lower gradient, B-type reaches downstream where they create pools, fish habitat, and help to stabilize the channel. Riparian vegetation can regulate stream temperature by shading the stream from direct sunlight. Opening the canopy can result in increased stream temperatures along the affected reaches.

<u>Peak Flows</u>

Sensitivity to peak flows is low in stream types Ala+ and A2a+. Streambanks and beds are armored with boulders or bedrock and are resistant to erosion and adjustment during high runoff stages.

There is a very high sensitivity to peak flows in stream type A3a+ and A4a+ where the stream flows through unstable or erosive soils. High stream flows can erode bank-and-bed material triggering debris flows, stream bank failures, and deep-seated landslides. Many of the debris flows observed in these channels coincide with large rain on snow events (see Soils section of this report). Increased input of water to the soil could cause an increase in the frequency of debris flow events.

Stream Type: A

Description And Processes:

These channels occur mostly in the middle and lower reaches of the stream network. They are mostly in second order mainstems below the junction of steep As+ channels, and on benches between steeper As+ reaches. They are confined by steep, V-shaped, valley walls. Gradients are between 4 to 10+ percent with a step-pool, channel-bed morphology. Stream flow is perennial. Generally, these are transport reaches for sediment and wood but depositional sections occur on short, flat reaches where large wood and rock outcrops are the main grade control features. Log jams occur on lesser gradient benches where steep, debris flow channels meet. There may be short sections of type-B channels in some reaches. The channel may be subject to scouring by debris flows and avalanches.
Streambank material is mostly boulder or bedrock (type Al and A2 channels), but many reaches have cobble-and-gravel, bank material (type-A3-and-A4 channels). Type-A3-and-A4 channels occur in segments where tributary streams flow across alluvial fans, mass wasting deposits, or alluvial terraces. These reaches are not confined by valley walls, but instead are confined by V-shaped banks where the streams have incised into gravelly alluvium.

Sensitivity And Response Potential:

Coarse and Fine Sediment

A-type channels have a high sediment, transport capacity due to high gradient and tight valley confinement. Localized storage of sediment occurs in pools, bars, and behind log jams. Potential increases in sediment supply would be transported downstream with only moderate sediment deposition on bars and in pools along lower gradient. Debris flows have the potential to block these channels and trigger dam-break floods.

Riparian Vegetation

A3-and-A4 stream types have a high sensitivity to disturbance of riparian vegetation. These streams generally flow through unstable or erosive soils (see Soils section) where riparian vegetation acts to bind the soil together, filter sediment, and prevent surface erosion. In lower gradient, less confined segments, large woody debris in the channel helps to form pools, trap gravel, and prevent bank erosion by dissipating the energy of flood flows.

In Al-and-A2 channel types, riparian vegetation has little influence on bank stability because large bank-and-bed material is resistant to scouring. Large wood has little effect on pool formation or bank protection.

Riparian vegetation can influence stream temperature by shading the stream from direct sunlight. Impacts to the temperature regime and increases in maximum and incremental temperatures beyond State standards may occur with removal of riparian vegetation shading the stream.

Peak Flows

A3-and-A4-type channels have a very high sensitivity to channel scour and surface erosion from slopes adjacent to streams.

Al-and-A2-type streams have a very low sensitivity to high stream flows. The streambanks are very resistant to erosion and channel widening because the rocky banks are well armored against high stream flows.

Stream Type: B

Description And Processes:

These segments flow across alluvial fans, mass wasting deposits, and alluvial terraces. They occur mostly at the mouth of steep, tributary valleys as they enter broad valley flats. Streambed form is riffle/pool with gravel-and-cobble banks and bed. Some streams flow subsurface before they resurface downhill. Gradient is 2-to-4 percent with low, moderately confined banks and moderate sinuosity. These are depositional/transport reaches for sediment and wood moved from upstream by floods and debris flows. Sediment is stored on bars and behind debris jams. This stream type has potentially good fish habitat.

Sensitivity And Response Potential

Coarse and Fine Sediment

These channels have a moderate sensitivity to sediment inputs depending upon substrate-and-bank materials. Boulder, cobble, and gravel channels are well armored; sand-and-silt channels may be subject to erosion. High gradients in these reaches, in combination with high stream flows, quickly route sediments to lower gradient, depositional reaches on valley flats.

Riparian Vegetation

Streambank stability is sensitive to disturbance of riparian vegetation on silt-and-sand-dominated bank materials. The vegetative root mass holds the alluvial soil together and resists erosion. Downed large wood in the channel is important in forming pools and preventing bank erosion by dissipating stream energy. The main source of large wood in channels includes trees recruited from the riparian zone or delivered by debris flows from steeper slopes upstream. On erosive reaches, removal of riparian vegetation can cause streambanks to erode and trigger major channel changes.

Impacts to the temperature regime and increases in maximum and incremental temperatures beyond State standards are likely to occur with removal of riparian vegetation shading the stream from direct sunlight.

Peak Flows

The moderately confined, banks and gradients of these reaches have a moderate channel capacity. High flows can cause overbank flooding, erosion of streambanks, and channel changes. The gravel bank material is easily eroded by increased flood flows, especially in segments which have decreased channel roughness due to removal of large, instream wood and riparian vegetation. Well armored reaches dominated by boulders, cobble, or gravel are stable and insensitive to increases in peak flows.

Stream Type: C

Description And Processes

This channel type is in wide, alluvial valley bottoms of tributary streams. They are unconfined and have high sinuosity. They generally have well developed flood plains and terraces with gravel-and-sand bank material. They have a pool/riffle bed form with 2-to-4 percent gradient. These are depositional areas for sediment and wood transported from upstream areas by floods and debris flows. Sediment is stored on point bars and behind debris jams. These reaches are potentially productive areas for fisheries.

Sensitivity And Response Potential:

Coarse and Fine Sediment

These channels have a high sensitivity to sediment inputs. The unconfined, low-gradient stream bed has low stream energy and will deposit excess sediment. Increased sediment supply from the watershed is deposited behind log jams, and on point bars at meander bends which forces streamflow into streambanks. This can cause streambank erosion, channel widening, channel aggradation, and channel changes. This stream type has potentially good fish habitat which can be degraded by infilling pools and embedding spawning gravels.

Riparian Vegetation

Streambank stability is very sensitive to disturbance of riparian vegetation. The vegetative root mass holds the alluvial soil together and resists erosion. Downed large wood in the channel is important in forming pools and preventing bank erosion by dissipating stream energy. Removal of riparian vegetation can cause stream banks to erode and trigger major channel adjustments. The main source of large wood in the channel are trees recruited from the riparian zone or delivered by debris flows from steeper slopes upstream.

Tree canopy closure influences stream temperatures by shading the stream from direct sunlight and providing insulation over the stream. Impacts to the temperature regime and increases in incremental temperatures beyond State standards may occur with removal of riparian vegetation shading the stream.

Peak Flows

These channels are very sensitive to increases in peak flood flow. The unconfined banks and low gradients of theses reaches have a low channel capacity, and high flows can cause overbank flooding, erosion of the streambanks, and channel changes. The gravel material along streambanks and terraces is easily eroded by increased flood flows, especially in segments which have decreased channel roughness due to removal of large, instream wood and riparian vegetation. These streams are very sensitive to channel constrictions which further lower channel capacity and can cause major channel changes.

Stream Type: D

Description And Processes:

These are reaches which flow through broad alluvial valleys up to 1,000-feet wide and are common at river mouths and in estuary settings. Gradient averages between 1-and-2 percent. Streambanks and bed consist mostly of gravel and cobble. Frequent, coarse sediment deposition causes the stream channel to be highly variable and lateral migration is common within the active flood plain. The width of the active flood plain, or flood-prone area, is five-to-eight times the channel width. The pattern of the stream channel is almost continuously braided with large transverse bars and numerous cut-off side channels. The pattern of the flood-prone area within the wide, alluvial, valley bottom has a stable form as it meanders through terraces dominated by large conifers. Young hardwoods are the dominant vegetation on the bars within the flood-prone area. Type-D channels may form in aggraded C channels that have reduced sediment transport capacity.

Sensitivity And Response Potential

Coarse and Fine Sediment

These segments have low sensitivity to increases in sediment inputs, because the background sediment regime has naturally large variations in sediment load. These channels have a wide active flood plain and extensive bars which have a large capacity to store excess sediment. The channel is naturally aggrading and shifting so any additional aggradation due to increased coarse sediment inputs would have little effect on the already unstable stream.

Type-D channels in aggraded C-channel settings are highly unstable and may produce tremendous quantities of sediment through bank erosion. Untransportable sediment in these channels is deposited and further exasperates channel widening and deposition. Aquatic habitat is degraded or destroyed. Stream temperatures increase.

<u>Riparian Vegetation</u>

Riparian vegetation has a high sensitivity to disturbance because it plays a key role in stabilizing the streambanks. Although the banks immediately adjacent to the channel are frequently formed and reformed as the channel aggrades and shifts around, the banks and vegetation on terraces along the margin of the flood-prone area form a stable, meandering pattern. These banks are armored by a deep, dense root mass which provides resistance to erosion during high flows. When vegetation is removed on these terraces, accelerated bank erosion, channel migration, channel widening, and major channel shifts may occur.
Large wood is usually flushed downstream by high flows and does not significantly contribute to channel stability in the the main channel. Large wood recruited from riparian zones does provide channel stability and complexity in side channels, along streambanks at the edge of terraces, and in more confined reaches downstream.

Stream Type: E

Description And Processes

This channel type is in wetland or meadow settings in alluvial, valley bottoms of tributary streams or within entrenched streambanks of F channels. They are unconfined and have very high sinuosity. Channels are deep and narrow. They generally have well-developed flood plains and terraces with gravel-and-sand bank material that are well vegetated by grasses, herbs, and shrubs. They have a pool/riffle bed form with < 2 percent gradient (higher gradient E channels are not uncommon). These are depositional areas for sediment and wood transported from upstream areas by floods and debris flows. Sediment is stored behind debris jams. Beaver dams are commonly associated with E channels. These reaches are potentially highly productive for fisheries.

Sensitivity And Response Potential:

<u>Coarse and Fine Sediment</u>

These channels have a high capacity for sediment transport due to their efficient channel geometry. Channel migration may result from beaver damming and from large trees falling across the channel from adjacent riparian stands. This can cause streambank erosion, channel widening, channel aggradation, and channel changes. This stream type has potentially good fish habitat which can be degraded by infilling pools and embedding spawning gravels.

Riparian Vegetation

Streambank stability is very sensitive to disturbance of riparian vegetation. The vegetative root mass holds the alluvial soil together and resists erosion. Removal of riparian vegetation can cause stream banks to erode and trigger major channel adjustments.

Vegetation influences stream temperatures by shading the stream from direct sunlight and providing insulation over the stream. Impacts to the temperature regime and increases in incremental temperatures beyond State standards may occur with removal of riparian vegetation shading the stream.

Peak Flows

These channels are insensitive to increases in peak flood flow. The unconfined banks and low gradient of these reaches have a high channel capacity, and high flows are quickly dissipated by overbank flooding. Nevertheless, the gravel material along streambanks and terraces is easily eroded by increased flood flows in segments which have decreased roughness due to removal of riparian vegetation.

Stream Type: F

Description And Processes:

These are constricted, highly entrenched reaches on low gradients (< 2 percent) with high width/depth ratios. They are meandering, have little or no flood plain development, and are laterally unstable with high bank erosion rates. These reaches have a riffle-pool morphology. Degrading C-and-E channels may entrench to form F channels in alluvial settings. These are highly unstable and may produce enormous quantities of sediment through lateral migration and bank cutting.

Sensitivity And Response Potential

Coarse and Fine Sediment

These segments have a low-to-high sensitivity to increases in sediment inputs, varying with streambank and bed materials. Well armored channels in bedrock-constricted settings quickly route sediment to depositional reaches. Entrenched-F channels on silts and sands may lose transport capacity and further widen with increased sediment loads.

Riparian Vegetation

Riparian vegetation has a high sensitivity to disturbance because it plays a key role in stabilizing the streambanks on F channels in fine-sized materials in alluvial settings. Banks are armored by a deep, dense root mass which provides resistance to erosion during high flows and lateral scour.

When riparian vegetation is removed, accelerated bank erosion, channel migration, channel widening, and major channel shifts may occur.

Downed large wood in the channel is important in forming pools and preventing bank erosion by dissipating stream energy. The main source of large wood in the channel includes trees recruited from the adjacent riparian zone or delivered by debris flows from steeper slopes upstream.

Tree canopy closure influences stream temperatures by shading the stream from direct sunlight and providing insulation over the stream. Impacts to the temperature regime and increases in incremental temperatures beyond State standards may occur with removal of riparian vegetation shading the stream.

Peak Flows

These channels have a moderate sensitivity to increases in peak flows. If streambank material is highly erodible, sand and gravel, increases in peak flows may cause channel widening and bank erosion.

Stream Type: G

Description And Processes:

These are deeply entrenched, V-shaped channels on 2-4% gradients. They exhibit Agully@ step-pool morphology with low width/depth ratios. They are located in narrow, constricted valleys or deeply incised in alluvial-or-colluvial materials. These are unstable reaches, often with grade-control problems (i.e., head cutting) and high, bank erosion rates.

Sensitivity And Response Potential

Coarse and Fine Sediment

These segments have a high sensitivity to increases in sediment inputs, are highly unstable, and may produce tremendous quantities of sediment through bank erosion and downcutting.

Riparian Vegetation

Riparian vegetation has a high sensitivity to disturbance because it plays a key role in stabilizing the streambanks. If stream banks are armored by a deep, dense root mass, they have resistance to erosion during high flows. When riparian vegetation is removed on these stream types, accelerated bank erosion, channel downcutting, channel widening, and major channel shifts may occur.

Large wood in these channels may exacerbate lateral scour and bank erosion. Log jams store sediment until the stream cuts laterally around the constriction and destabilizes it.

Tree canopy closure influences stream temperatures by shading the stream from direct sunlight and providing insulation over the stream. Impacts to the temperature regime and increases in incremental temperatures beyond State standards may occur with removal of riparian vegetation shading the stream.

Peak Flows

These channels have a high sensitivity to increases in peak flows. If streambank material is highly erodible, sand-and-gravel increases in peak flows may cause channel downcutting and bank erosion.

Appendix #13 - Water Quality Processes

Turbidity - Turbidity is an indicator of the amount of suspended sediment in the water, but the exact relationship must be determined for any given stream over a range of discharge in order to make quantitative estimates. Natural variation in turbidity for any given flow is almost always greater than 10%, and the variation tends to increase with higher discharges (Brown 1983). Turbidity is a concern for drinking water, recreation, and freshwater fisheries. For example, the ability of salmonids to find and capture food is impaired above 25 NTU. Five-to-ten days of exposure to water with turbidity above 25 NTU reduces salmonid growth and damages gill tissue.

In Oregon, turbidity is an important indicator of quality for drinking water, and by federal law, municipal drinking water must be maintained below 1 NTU. The State of Oregon also has "relative" standards which are applied to freshwater streams: "no more than a 10 per cent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity." In practice, this is nearly unenforceable for forested watersheds because, as noted, natural stream turbidity usually varies by more than 10%.

Microbiology - Concern over the potential for introduction of pathogenic microorganisms has risen in recent years, due in part to the increased human use associated with unmanaged, dispersed camping, and recreation occurring in riparian areas, as well as to livestock grazing in the lower river valley reaches. The extent and effects of microbial contamination in most Oregon streams is unknown.

High levels of bacteria in forested areas will usually be associated with inadequate waste disposal by recreational users, presence of animals in the riparian zone, and septic systems (EPA 1991). Dispersed camping and recreation occurs along streambanks throughout the watershed, and may result in unsanitary disposal of human fecal matter in the riparian zone (see Recreation section in this report). Bacterial contamination of streams may result from elk and other wild animals. In addition, incidences of giardia, cryptosporidium, and *E. coli* contamination of surface-and-spring water in the coast range have been reported (O=Shea 1995).

Appendix #14. Ecological and Physical Processes Affecting Fisheries Habitat

Fish habitat is created by the interaction of water, sediment, rocks, boulders, and wood routing through the stream system. Water provides the energy to move and sort materials, scour deep pools, undercut banks, create meandering channels, and erode stream banks. Wood and rock form the obstructions and/or structure necessary to dissipate stream energy, trap spawning gravels, scour deep pools, and create complex habitats.

The importance of large woody debris (LWD) in creating fish habitat in streams has been recognized since the early 1980's (Bisson et al. 1987; Sedell et al. 1988). Perhaps the most important function of downed logs is to dissipate stream energy by creating obstructions which slow water velocity and cause the steam to meander. Steep streams develop a Astair-step@ profile of productive pools separated by small falls or rapids, rather than a single long and relatively unproductive riffle. Maintaining adequate amounts of large wood is important to slow water velocities, dissipate stream energy, and maintain minimum flows in the summer.

Downed logs and debris jams often dam a stream to form deep, slow moving pools which trap spawning gravels and other substrate materials, while currents deflected off downed logs scour additional pools. Large amounts of woody debris create complex habitats and provide the cover necessary to support a variety of fish species and age classes. Numerous researchers have documented the relationship between increasing amounts of large woody debris in streams and increasing fish populations (Sedell et al. 1985). The primary sources of large woody debris inputs into streams are from trees within the riparian areas and from debris torrents and landslides from upland sites.

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

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

Appendix #15. Natural Ecological Processes Affecting Wildlife Species and Their Habitat

The vegetation that defines a watershed is also most responsible for defining the wildlife species that can be found in that watershed. Each plant community and its stand characteristics create distinct environmental conditions that fulfill the habitat requirements of certain wildlife species. Based on our understanding of the reference conditions for vegetation, assumptions can be made about the existence and prominence of various wildlife species and their populations.

Historical accounts of the earliest explorers and settlers shed some light on the more notable species. For instance, the journals of David Douglas (1976) reveal that grizzly bears, Columbian white-tailed deer, and California condors were occasionally encountered in the Willamette Valley and central Oregon Coast Range. These species have since become extinct or extirpated from this area. There is also evidence that the Willamette Valley and smaller valleys in the Coast Range supported stable herds of elk and deer which attracted Indians and early settlers. But mostly, what species were historically present and how their populations may have fluctuated, must be inferred based on the spatial and temporal scales of vegetation patterns.

At the scale of the Coast Range Province, it is likely that when major disturbances occurred, such as the Yaquina fire, the remaining patches of late-seral vegetation would function as refugia for closely associated species. In contrast, species associated with early-successional stages would have flourished for a time immediately following such a disturbance. With the fire return interval approaching 400 years or more, the vegetation between the unburned patches would have ample time to recover, and those species associated with late-seral conditions would then be able to disperse out of the refugia and repopulate the recovered forest. The populations of wildlife species associated with late-seral forest and species associated with early-seral conditions would alternately have ebbed and flowed as the seral stages naturally shifted in response to succession and disturbance.

Even when late-seral forests dominated a watershed, it is likely that other seral stages would still be present at some level within the watershed or in adjacent watersheds due to ecological processes described above. Therefore, a variety of wildlife species associated with other seral stages and special habitats would also likely be present in the watershed. At the province scale, the most prominent and longest lasting habitat available to wildlife species through time was likely late-seral forest due to the long duration of this stage and the long fire return interval. Thus, it is logical to expect that the Coast Range would support a stable and diverse assemblage of late-seral associated species.

Large-scale disturbance processes would have minimized the ratio of high contrast, edge lengths to late-seral patch areas, and would have left large amounts of down wood and standing snags across the landscape. The more frequent small-scale disturbances (localized blowdown, landslides, insect kills, and disease pockets) would leave canopy gaps within the recovering forest patches. These processes, along with individual site conditions (microclimate, elevation, slope aspect), would contribute to the development of several important structural features for wildlife such as down wood, standing snags, and multiple canopy layers which include a highly diverse herbaceous layer in canopy gaps. The presence of these structural features is important to many animals by providing resting and nesting sites, protection from predators, food, and thermal protection; it is essential for some animal species that specific plants be present in a stand. Down wood is also critical for many species of vascular plants, fungi, liverworts, mosses, and lichens which provide food for certain wildlife species.

Special habitats such as caves, cliffs, talus, exposed rock, and grass meadows are important to wildlife. (See discussion above on the processes which creates special habitats.) Indeed the presence of some wildlife species is dependent upon the existence and extent of such habitats. Natural processes continually reduce these habitats through time, moving them ecologically in the direction of the adjacent plant communities. Yet, as noted above, other natural processes such as fire, disease, and wind produce and help maintain these habitats.

While the diversity of wildlife species and their populations has likely fluctuated over the past several thousand years, there existed certain patterns which favored some species more than others. The response of wildlife species to these processes and resultant patterns would be quite variable. The larger vertebrates and most bird species are usually excellent dispersers enabling them to repopulate distant forest patches following disturbances, or conversely, allowing then to use widely separated early-seral patches as natural succession moves the landscape toward late-seral conditions. For smaller vertebrates and some invertebrates (e. g., flightless insects and mollusks), adequate corridors of suitable habitat are necessary to allow for dispersal from one suitable patch to another. As noted above, species adapted to late-seral forest conditions would have likely utilized the most often abundant and longest lasting of the available habitats. The populations of early-seral and edge contrast species (e. g., early seral stands adjacent to late-seral habitat) would have gone from "boom to bust" relatively quickly as early-seral habitats usually developed into subsequent seral stages within a couple of decades following a major disturbance. Species adapted to unique habitats, especially the higher elevation habitats, have likely been steadily declining through time due to natural successional processes. Some invertebrates in these areas have long since been separated from the populations of the Cascades and Rocky Mountains, and have become relict populations, even evolving into distinct species from their now distant relatives.

Appendix #16. Road Types

Road Types: There are three road designations used by the BLM; i.e., **primary, secondary** and **local. Primary** roads are major, through-access routes designed and maintained for high use by all types of vehicles (logging, hauling, administrative, recreational). These roads have crushed rock surfaces and receive frequent maintenance. **Secondary** roads are routes frequently used for transportation of forest products or dispersed recreation (hunting, fishing, sightseeing, etc.) that have a definite terminus. These roads are generally surfaced with crushed rock, and are maintained annually or during periods of sustained timber hauling. **Local** roads are usually short (one mile or less) and access specific resource management units where use is limited to short-term transportation of forest resources and some dispersed recreation. Road surfaces may consist of some form of rock or natural soil; typically, these roads are maintained only when used for transporting forest products.

Appendix #17. Transportation Management Plan (TMP) Process

The following is an outline of the TMP process:

A. Field inventory and data collection by Resource Area personnel

1. determine present location and condition of roads and drainage structures
2. collect information on streams and landscape condition adjacent to roads

B. Watershed Team identifies management/legal constraints and uses for each road

1. guidance from RMP, access documents, and Federal Code of Regulations;
2. determine preferred road use (forestry, recreation, commuter).

C. Watershed Team analysis of each road

1. establish desired future condition of roads (open vs. closed);
2. based on weighing constraints against the value of access for the various potential users;
3. identify which constraints and uses are of primary importance for each road system.

D. Watershed Team develops Transportation Management Objectives (TMO's) for each road

1. transportation engineering has lead;
2. evaluate potential management actions for cost/benefit to resources.

E. Team identifies and prioritizes potential projects (restoration opportunities)

1. identify access needs and closure opportunities and methods;
2. mitigation measures to implement on roads remaining open;
3. establish a prioritized list of projects.

F. Present proposed road management actions to Area Manager for approval

1. includes prioritized list of projects;
2. proposed implementation costs and potential funding sources.

G. Establish a monitoring system to evaluate continued management actions on the transportation system

1. periodic inventory of all drainage structures;
2. field reviews of Transportation System to monitor condition and types of use;
3. install traffic counters to monitor vehicle use patterns and average daily traffic (ADTs);
4. track maintenance costs on roads to assist in project planning.

Appendix #18 - Regional Ecosystem Office Draft Exemption Criteria for Silvicultural Treatments in LSRs and MLSAs

The following draft criteria are for thinning treatments or intermediate harvests in LSRs and MLSAs. These treatments are commonly referred to as commercial thinning, stocking control, or thinning-from-below.

1) The objective or purpose of the treatment is to develop and maintain late-successional conditions or to reduce the risk of large-scale disturbance, consistent with standards and guidelines (ROD, pp. C-12, 13, and 26). Further, the specific treatment will result in the long-term development of vertical and horizontal diversity, snags, large woody debris, and other stand components benefitting late-successional forest related species. The treatment will also, to the extent practicable, create components that will benefit late-successional forest related species in the short term. Volume production is only incidental to these objectives and is not, in itself, one of the objectives of the treatment. Creation or retention of habitat for early-successional forest related species is not a treatment objective.

2) The treatment is primarily an Aintermediate treatment@ designed to increase tree size, crown development, or other desirable characteristics, to maintain sufficient vigor for optimum late-successional development, to increase diversity of stocking levels and size classes within the stand or landscape, and to provide various stand components beneficial to late-successional forest related species.

3) The average stand age is less than 80 years. Large, predominant overstory trees or other trees over 80 years old, if present at all, shall be no more than a minor component of the stand and shall not be harvested.

4) The stand is primarily even-aged and overstocked. Overstocked means that reaching and maintaining the management objective of late-successional conditions will be significantly delayed, or desirable components of the stand may be eliminated, because of stocking levels. The prescription should be supported by empirical information or modeling (for similar, but not necessarily these specific sites) indicating the development of late-successional conditions will be accelerated or enhanced. The stand is not a complex, diverse older stand that will soon meet and retain good late-successional conditions without treatment.

5) Harvest (trees to be removed and sold) shall not exceed 18" dbh, and except for the purpose of creating openings or meeting other habitat objectives, harvested trees will be smaller than leave trees.

6) The treatment will increase diversity within otherwise relatively uniform stands. Spacing within the overall Astand@ will vary substantially within areas a few acres in size. In addition to areas of regular spacing, the treatment includes:

C Ten percent or more of the area in unthinned patches to retain thermal and visual cover as well as retaining areas of natural suppression and mortality, small trees, and natural size differentiation, undisturbed debris, and so forth.

C Five to 15 percent of the area in openings, roughly 1/4-to-1/2 acre in size, depending on the forest type.

C Five to 15 percent of the area in heavily thinned patches, often as low as 25 to 50 trees per acre, to maximize individual tree development and encourage some understory vegetation development. The treatment avoids Asimplifying@ stands by removing layers or components, creating uniform stocking levels, or making the stand unnaturally healthy over large areas, thereby eliminating endemic levels of insects and diseases important to late-successional development and processes.

C To the extent practicable for the diameter and age of the stand being treated, the treatment includes falling green trees or leaving snags and existing debris to meet or make substantial progress toward meeting an overall coarse woody debris objective. Within the limits dictated by acceptable fire risk, coarse woody debris objectives should be based on research that shows optimum levels of habitat for late-successional forest-related species, and not be based simply on measurements within Anatural stands@. Recent research indicates owl prey base increases fourfold as coarse woody debris within Douglas-fir forests increases. If tree size, stocking, or other considerations preclude achievement of this objective at this time, the prescription includes a description of how and when it will be achieved in the future.

C Treatments, including the creation of snags at this time, optimize short and long-term snag levels at an objective of meeting 100 percent of potential populations for all expected snag-dependent species.

C There will be no net increase in roads within the LSR.

C The likelihood of negative short-term effects to late-successional forest related species already using the stand has been considered.

C The treatment favors retention of a mix of tree species representative of the natural variation and composition for the site.

C The leave-tree criteria identify individual characteristics consistent with LSR objectives, such as culturing individual trees specifically for large crowns and limbs, and the retention of certain disease, damage, and other mortality or habitat inducing characteristics. AHealthiest, best tree@ criteria typical of matrix prescriptions are modified to reflect LSR objectives.

Appendix #19 - Density Management Prescriptions

Northwest forest ecosystems have evolved with a great diversity of disturbance intensities; from large-scale catastrophic fires to fine-scale beetle or root-rot kills. Foresters can imitate those intensities and scales of disturbance by application of the known spectrum of silviculture systems from large clearcuts to single tree selection, creating coarse or fine-scale diversity on the landscape.

Managing the Legacies of Plantation Forestry for Spotted Owls

Sensible treatments designed to promote diversity and multi-storied canopy depend on the stage of stand development:

YOUNG STANDS (age 10-20) can be precommercially thinned to low densities (100-150 tpa) encouraging ingrowth and prolonged retention of seral species.

POLE STANDS (age 20-40) are just closing so they have long-crowned dominants. They can be commercially thinned to wide spacing (30-120 tpa) and underplanted to encourage multi-storied canopies.

SMALL SAWTIMBER (age 40-60) can be lightly commercially thinned and subsequently more heavily thinned to promote diversity and multi-storied canopies. A two-stage thinning process will probably be necessary, because these stands are highly differentiated in crown class, and height-diameter ratios of over 80 for dominant trees indicate susceptibility to windthrow.

MATURE STANDS, especially those previously thinned, have strong dominants and can be shelterwooded in several stages to promote diverse understories. If they have undergone periods of mortality, they often have abundant snags and coarse woody debris for retention.

OLD-GROWTH stands are difficult to manage, even with uneven-aged methods because of the large tree size. Large group cuts, or clearcuts with patchy green tree and snag retention will foster creation of young stands with considerable horizontal and vertical diversity.

RIPARIAN ZONE PROBLEMS occur where pure stands occupy long stream reaches. Where ideal stream habitat is desired, it can be created by thinning and underplanting desired species.

SNAGS AND COARSE WOODY DEBRIS are important elements in all management regimes, and minor species should be used to avoid monocultures. Management of young stands created by past clearcutting practices can shorten the time it takes to grow good spotted owl habitat.

Silvicultural Systems and Harvest Methods

Late-Successional and Adaptive Management Reserves:

Forest stands less than 80 years of age within most Late-Successional Reserves would be considered for silvicultural treatments where stocking, structure, or composition are expected to prevent or significantly retard development of late-successional conditions. In Late-Successional Reserves within the Northern Coast Range Adaptive Management Area (AMR), forest stands up to and including 110 years of age could be considered for silvicultural treatments. Such stands would generally be composed of trees less than 10-to-10 inches diameter at breast height, and would show no significant development of a multiple-canopy forest structure. Stands that have desired late-successional structure or that will soon develop it would not be treated unless such treatment is necessary to accomplish risk-reduction objectives (as described below).

Silvicultural treatments:

Density management prescriptions would be designed to produce stand structure and components associated with late-successional conditions, including large trees, snags, logs, and variable-density, multistoried, multispecies stands. By removing a portion of the stand, the remaining trees would be provided room to maintain or increase diameter growth rates. In addition, openings in the canopy would permit development of an understory of seedlings and saplings and other vegetation. Some of the overstory trees may be converted to snags over time, to help meet snag habitat targets, or felled to provide large woody debris. Trees cut, but surplus to habitat needs, would be removed for commercial use.

A wide variety of silvicultural practices would be employed, rather than relying on a limited variety of techniques. Silvicultural activities would be conducted in suitable stands, whether the action would generate a commercial return or not.

In general, manipulated acreage would be limited to five percent of the total area in any Late-Successional Reserve in the initial five-year period of implementation unless the need for larger-scale actions is explicitly justified.

In some areas, stands would be made less susceptible to natural disturbances by focusing salvage activities on reduction of catastrophic insect, disease, and wildfire threats, and by designing treatments to provide effective fuel breaks wherever possible. These treatments would be designed so that they would not result in degeneration of currently suitable, spotted owl habitat or other late-successional conditions.

Treatments would be implemented to reduce risk in older stands if the proposed management activity would clearly result in greater assurance of long-term maintenance of habitat; is clearly needed to reduce risks; and would not prevent Late-Successional Reserves from playing an effective role in attaining the objectives for which they were established.
Unless exempted from review, proposed risk reduction projects would be submitted to the Regional Ecosystem Office.

Riparian Reserves

Some stands within Riparian Reserves would be considered for silvicultural treatments if they do not prevent or retard attainment of Aquatic Conservation Strategy objectives. Watershed analysis would be completed prior to any treatments.

Where portions of young, even-aged conifer plantations are located within the Riparian reserves, these stands would be considered for density management treatments. The objectives of such treatment would be to promote development of large conifers and to improve diversity of species composition and stand density. Merchantable logs would be removed only where such action would not be detrimental to the purposes for which the Riparian Reserves were established.

Conifer underplanting: Where hardwood stands dominate streamside areas and there is a lack of large conifers to provide inputs of large wood for instream structure, efforts would be made to reestablish scattered conifers within the Riparian Reserve. This would involve cutting or girdling some hardwoods to create openings in the canopy, followed by cutting of brush and planting of a variety of conifer seedlings in the openings created. In most cases, followup stand maintenance treatments would be necessary to ensure successful establishment of an adequate number of conifers in the riparian area.

The iterative process by which nonpoint controls including best management practices are to be selected and implemented to achieve water quality standards include: (1) design of best management practices based upon site-specific conditions, technical, economic and institutional feasibility, and the water quality of those waters potentially impacted; (2) monitoring to ensure that practices are properly designed and applied; (3) monitoring to determine: a) the effectiveness of practices in meeting water quality standards, and b) the appropriateness of water quality criteria in reasonably assuring protection of beneficial uses; and (4) adjustment of best management practices when it is found that water quality standards are not being protected to a desired level and/or possible adjustment of water quality standards based upon considerations in 40 Code of Federal Regulations 131.

Riparian Enhancement

Plant conifer and woody riparian species in riparian areas where previous management activities have removed them. Placement of woody debris, creation of snag, or planting of conifers and riparian species would be used where appropriate to restore riparian conditions. Convert suitable alder and brush riparian areas to conifers where water quality is limited. This will reduce nitrates and organic material, and provide new sources for future stream structure (woody debris).

Management for diversity has become a high priority. Forests with high diversity are thought to hold the best hope for preserving species and sustainable systems. Management actions, such as thinning, shelterwooding, or gap creation can greatly increase diversity.

DEFINING DIVERSITY: Diversity comes in many forms. Landscape diversity increases as the number of different plant community types increases across a landscape. Genetic diversity is maintained by promoting a large number of species and by preserving genetic variation within species. Stand structural diversity increases with vertical canopy layers and with variation in structure horizontally.

PATTERNS IN STAND DEVELOPMENT: Structural diversity of even-aged plantations typically decreases for many decades as stands develop closed canopies. Generally, coastal Douglas-fir/western hemlock forests go through a "black forest" stage from about age 20 to 50 or 80 years. During this period, the forest floor is nearly bare, because the overstory conifer canopy remains nearly continuous and dense. Mortality of small crowned, suppressed trees does not create enough "gap" to markedly increase understory development, and large snags are lacking.

As stands develop, individual trees develop special characteristics that affect their ability to grow and respond to change. Trees that "express dominance" are structurally sound, have large crowns, and grow well either before or after thinning. Intermediate or suppressed trees are weak structurally, have small crowns and grow slowly before and after thinning. As stands age, these individual tree characteristics become more pronounced.

MANAGEMENT FOR STAND STRUCTURAL DIVERSITY: Management to maintain or increase structural diversity requires special attention to the above mentioned factors, in order to be most cost effective. What makes sense silviculturally and operationally changes with stage of stand development. Special features of diversity such as snags, large crowned green trees, or other character trees maybe added to all of these general treatments.

Table 1. Relationship of Stand Development, Management Action and Efficacy of Treatment. Stands Are Assumed to Be Unmanaged.

Stage of Stand Development	Management Action	Efficacy Rate
Stand Closure (5-15 yrs) - up to 8-10" diameter	Precommercial thinning	Low
	Gap creation	Low
Small Pole Stand (15-25 years) - 10-15" diameter	Early commercial thinning	Moderate
	Gap creation	Low
	Shelterwood	Low
Medium Pole Stand (25-35 years) - 15-20" diameter	Commercial thinning	Low
	Gap creation	Low
	Shelterwood	Moderate
	Green tree retention	High
Large Pole Stand (35-50 years) - 20-30" diameter	Commercial thinning	Low
	Gap creation	High
	Shelterwood	High
	Green tree retention	High
Mature Stands (50-100 years) - 25" plus	Commercial thinning	Low
	Gap creation	High
	Shelterwood	High
	Green tree retention	High
Super mature or old growth (greater than 100 years old) - 30" plus	Commercial thinning	Very low
	Gap creation	High

Stage of Stand Development	Management Action	Efficacy Rate
	Shelterwood	Moderate
	Green tree retention	High

Appendix #20. Proposed Road Improvements.

The following is a list of significant needs in regards to road maintenance and the prevention of soil displacement:

A.Road No 8-8-1: Remove five decaying log drainage structures needing replacement with new culverts. Replace two worn 18" culverts with larger pipes on perennial streams. Add two culverts on perennial streams. Add one cross drain and construct occasional draindips.

B. Road No 8-7-23: Install or replace thirteen cross-drain culverts. Install or increase culvert size on nine perennial streams, two of which will replace aging of structures. Install or replace twelve culverts on intermittent streams.

C. Road No 8-8-3: Install culverts and or draindips.

D. Road No 8-8-12: Install or replace thirteen culverts on intermittent streams and four on perennial streams. Install or replace five ditch relief culverts. Improve one hazardous location by restoring the embankment, which includes the installation of two culverts intended to contain the scouring creek within its channel.

E. Road 7-8-15.1: Install or replace four aging culverts at stream crossing with larger pipes.

F. Road 8-7-6.2: Replace four undersized culverts at stream crossing with larger pipes.

G. Road 7-8-24.1: Install six ditch relief culverts and replace a 36" deteriorating culvert at an intermittent stream crossing. Restore access through two washout areas.

H. Road 7-8-27: Remove log fill and replace with culvert and construct frequent draindrops where needed. Repair and stabilize Boulder Creek slide area.

I. Road 8-8-18: Replace two deficient culverts with one large pipe at a perennial creek crossing. Place a maintainable depth of surface aggregate.

J. Install or replace up to 14 culverts at creek crossings and four ditch relief pipes (a number of those pipes are separating within the fill). In order to access the drainage structures on the west side of Warnick Creek, a crossing structure or low water ford will be necessary.

Appendix #21. List of Roads for Potential Closure in the Upper Siletz.

Road No.	Miles	Method	Remarks
7-8-18.3	0.16	Earthberm	Road unnecessary for future use. Rip and seed.
7-8-18.5	0.19	Earthberm	Road unnecessary for future management. Rip and seed.
7-8-18.6	0.30	Earthberm	Road necessary for future management. Restore natural stream channels.
7-8-27.2	0.23	None	Road is currently impassable due to vegetation. Road unnecessary for future management.The 8-8-3 closure will block this road. No need to rip since vegetation has covered road subgrade and ripping would cause additional surface disturbance.
7-8-28	0.18	None	Similar condition and recommendation as 7-8-27.2. The 8-8-3 closure will block this road also.
7-8-28.1	0.23	None	Similar condition and recommendation as 7-8-27.2.
7-8-30	0.66	Earthberm	Road necessary for future management and significant culverts and rock surface to protect. Ridge top road with low potential for sediment without road maintenance.
7-8-29.1	0.61	Earthberm	Rock surface. Potential rip and grass seed. Low potential for future management needs.
7-8-30.2	0.27	Earthberm	Natural surface. Road is currently impassable due to vegetation. No need to rip since subgrade is revegetated. Low potential for future management.
7-8-30.3	0.17	None	The 7-8-29.1 closure will block this road. Similar condition and recommendation as 7-8-30.2
7-8-30.4	0.21	None	The 7-8-29.1 closure will block this road. Similar condition and recommendation as 7-8-30.3
7-8-31.1	0.23	None	Road will be blocked by 7-8-30 berm. Rocked road needed for future management.

Road No.	Miles	Method	Remarks
7-8-31.2	0.74	Earthberm	Block, rip and seed the natural surfaced portion of 7-8-31.2 from jct of 7-8-31.4 and 7-8-31.2. The rocked segment of Road 7-8-31.2 and the 7-8-31.4 will remain open for future management.
7-8-31.3	0.32	Earthberm	Install waterbars on natural surface on midslope road.
7-8-32.1	5.10	Gate	The Watershed Analysis team will meet on the ground to determine future needs and potential corrective measures. The road is currently in fair to poor condition on midslope ridge with some mass wasting occurring into Warnick Creek. Gate to be installed @ Jct of 7-8-29 & 7-8-32.1.
8-8-3	0.40	Earthberm	Block at section line common to Sections 27 and 34 T. 7 S., R. 8 W. Potential ripping and seeding from Section line to Jct of 7-8-28.
8-7-31.3	0.20	Earthberm	Future access needed of surfaced ridge-top road.
7-8-18.1	0.50	Earthberm	Future access not needed of surfaced ridge-top road. Potential rip and grass seed.
8-7-31.4	0.10	Earthberm	Future access needed of surfaced ridge-top road.
8-7-31.5	0.09	Earthberm	Future access needed of natural surface ridge-top road.
8-7-31.6	0.11	Earthberm	Future access needed for natural surface ridge-top road.

Note: The above comments are general and additional measures may be necessary to meet the Aquatic Conservation Strategies of the RMP (ie., water barring, planting of tree species upon ripping).

Appendix #22 . Data Gaps and Monitoring Needs for Resource Issues.

Erosional Processes:

#1 - Mass Wasting

Data Gaps:

- Lack of sediment yield estimates for debris avalanches and slumps.

Monitoring Needs:

- Measure quantity of slide material.
- Study existing deposits in riparian areas to determine causes.
- Monitor headwall areas with high mass failure and/or debris flow potential to provide an understanding of the processes linking the high-gradient, eroding reaches with low-gradient, depositional reaches.
- Determine sediment yields from roads.
- Place sediment traps below known or predicted erosion areas and measure accumulated materials after a season.
- During peak flow periods, trace stream turbidity to determine its source.

#2 - Soil Surface Erosion

Data Gaps:

- Lack of hillslope erosion studies.

Monitoring Needs:

- Placement of catchments to assess hillslope soil movement and to compare with controls and other areas of varying cover condition.

#3 - Soil Productivity

Data Gaps:

- Determine area of soil compaction on older harvest units.
- Lack of current research on relationship of soil compaction to runoff and sedimentation in

streams.

CNeed research on long-term impacts to growth of vegetation.

Monitoring Needs:

CMonitor subsoiling impacts to soil structure and runoff.

CConstruct catchments in compacted, disturbed, and in control areas to measure the amount of sedimentation in runoff.

Vegetation:

#1 - Vegetation Management:80 year and older stands/<80 years/5-15 year-old stands/recent harvest units:

Data Gaps:

CLack of long-term research on the effects of density management on development of old-growth forest characteristics.

Monitoring Needs:

CConduct stand exams in a selected sample of 80-year-and-older stands

CConduct stand exams in < 80 year-old stands to determine feasibility for density management.

CMonitor tree growth and survival following plantings of seedlings in recent harvest units.

CIn 5-15 year-old stands thinned down to 100-200 trees per acre, monitor tree growth and development of older forest characteristics over time.

2 - Special Status Plants

Data Gaps:

CLack of basic natural history and distribution information for special status plants.

Monitoring Needs:

CDevelop long-term monitoring projects to determine natural history and distributional information on these species.

#3 - Special Plant Communities

Data Gaps:

CLack of data on extent and locations of special plant communities.

Monitoring Needs:

CConsider a prescribed fire research plan to learn about control of brushy and/or competing non-native species.

Riparian Reserves:

Data Gaps:

CImprove LANDSAT characterization of riparian vegetation.

CImprove accuracy of hydrography and topographic themes.

Monitoring Needs:

CEstablish monitoring program to determine long-term trends in LWD and other stream channel parameters.

CDetermine appropriateness of interim Riparian Reserve widths.

Hydrology:

Data Gaps:

CFlow data (i.e., base flow and peak flow) is unavailable.

CThe influence of road surfaces on the routing of water and fine sediment.

CIdentification of Hydrologic Response Units (HRU) for cumulative effects analysis.

Monitoring Needs:

C Modeling of flow should be initiated.

CField surveys of roads during storm events to estimate surface water and fine sediment routing.

Stream Channel:

Data Gaps:

CStream channel condition (i.e., large woody debris, pool/riffle ratio, gradient, etc.).

CLocation and condition of wetlands.

CSource area by HRU for initiation of stream channels.

Monitoring Needs:

- Long-term monitoring of channel response by installing permanent transects on selected reaches.

Water Quality:

Data Gaps:

- Water quality data is generally unavailable (i.e., temperature, chemistry; sediment; and biotic community).

Monitoring Needs:

- Monitor stream temperatures on Callahan or Sand Creek during summer base flow.
- Monitor macroinvertebrate populations, dissolved oxygen, conductance and flow throughout the watershed in order to establish baselines for these parameters.

Fish Species and Habitat:

Data Gaps:

- Limited current fish habitat data on public lands.

- Limited fish habitat data on private lands.

- Limited fish species distribution data.

- Limited trend data for fish abundance throughout the watershed.

Monitoring Needs:

- Continue and/or initiate monitoring for stream temperatures, turbidities, and instream flows.

- Monitor summer steelhead on BLM reaches in SF Siletz subwatershed to determine if stream temperatures are limiting their populations.

- Expand fish habitat monitoring to entire watershed.

Wildlife Species and Habitat:

Data Gaps:

- Lack of information on quality and quantity of special habitats within the watershed.

- Lack of basic inventory data for coarse woody debris on managed and unmanaged stands. Knowledge of long-term effects of thinnings on riparian habitat and ROD species.

CInformation on population size, distribution, and life history requirements.

CLack of information on special habitats.

CLack of large-scale and small-scale analyses of wildlife distributions and habitat.

Monitoring Needs:

CMonitor treatments for effectiveness

CEstablish long-term monitoring sites to determine health of riparian ecosystem subject to management actions.

CConduct monitoring in accordance with guidance presented in the 1994 Salem District RMP.

CSurvey and Manage requirements of the NFP and RMP will involve surveys for listed, candidate, and SEIS special attention species.

CMonitor elk habitat conditions in the SF Siletz subwatershed to determine the relative contribution of private and BLM-administered lands.

Human Uses:

#1) Timber

See Vegetation section.

#2) Special Forest Products

Data Needs:

CLack of research on responses of SFP species to harvesting.

Monitoring Needs:

CMonitor all SFP species to evaluate effects of harvesting.

#3) Roads

Data Gaps:

CLack of road/culvert data and condition on private controlled roads.

Monitoring Needs:

CMonitor road closures to determine effectiveness.

CExamine roads during and following major storm events to identify erosion problems associated with drainage structures, surface condition, and roadside slopes.

CDevelop culvert risk rating/evaluation procedure to prioritize management opportunities.

<u>#4) Recreation</u>

Data Gaps:

CNeed additional information on needs of the physically disadvantaged community.

CNeed information on user needs, frequency of use, number of riders, etc.

CNeed data on road conditions.

Monitoring Needs:

CMonitoring standards to ensure the suitability of recreational projects to meet the needs of the physically disadvantaged community.

CDevelop monitoring standards to assure the adequacy of recreational developments for public use.

<u>#5) Land Tenure</u>

Data Gaps:

CNeed additional information on land resource values for specific parcels of public and private lands.

Monitoring Needs:

CAssess desirability of land tenure adjustments and efficiency of the adjustment process at periodic intervals.

Map Packet - Upper Siletz Watershed

Map #	*Title*
1	Digital Elevation Model
2	Stream Orders and Subwatersheds
3	Federal Land Use Allocations
4	Slope Hazard
4a	Landslides
5	Soil Productivity
6	Vegetation
7	Special Plant Communities
7a	Stream Channel Response Types
8	Temperature Risk
9	Large Woody Debris Recruitment Potential
9a	Streamflow (Perennial and Intermittent)
10	Hydrologic Cumulative Effects
11	Fish Distribution
12	Marbled Murrelet Habitat
13	Spotted Owl Habitat
14	Existing Density Management Opportunities
15	Riparian Reserves
16	Stands with a Hemlock Component
17	Transportation/Potential Road Closures