# Chapter Two

# Understanding the Forest: Planning and Resources

This chapter describes the process used to develop the *Elliott State Forest Management Plan* and presents information about the resources within the Elliott State Forest.

The planning process involved the participation of many people, including individuals from local communities and the regional community, as well as agency specialists and scientists. This inclusive process was based on the conviction that public awareness and public involvement leads to the most effective FMP.

Forest management begins with an understanding of the various resources that exist within the forest. The resource descriptions in this chapter briefly describe what is currently known about the Elliott State Forest. The resource descriptions are updated and supplemented over time through continuing research, monitoring, and on-site experience.

The main headings in this chapter are:

# Elliott State Forest Planning Process

During the late 1980s, biologists expressed growing concern about the status of several wildlife species. The northern spotted owl was listed as a federal threatened species in 1990. In response, the ODF began to survey for the presence of northern spotted owls in and near existing and planned timber harvest units. Many northern spotted owl sites were located, thus affecting sold timber sale contracts. Following federal guidelines for take avoidance (since rescinded), the ODF established circles with a 1.5-mile radius around each owl site, and severely limited management activities within the circles (USDI Fish and Wildlife Service 1990). This resulted in a net reduction in the acres available for sustainable timber production, and a corresponding reduction in the harvest objectives for each district with northern spotted owl sites.

The marbled murrelet was listed as a federal threatened species in 1992. This new listing resulted in a similar process of surveying, establishing habitat areas around occupied sites, and reducing the acres available for timber production and district harvest objectives.

In December 1991, the State Land Board initiated a new long-range FMP for the Elliott State Forest. The ODF was directed to work with the Oregon Department of Fish and Wildlife (ODFW), the Oregon Department of State Lands (DSL), and other state agencies to develop the FMP.

A new FMP was approved for the Elliott State Forest in 1994 (Oregon Department of Forestry 1994a). In 1995, an HCP for the northern spotted owl and the marbled murrelet was approved by the USFWS (Oregon Department of Forestry 1995a). The USFWS issued the ODF a 60-year ITP for the northern spotted owl, and a 6-year ITP for the marbled murrelet. The marbled murrelet permit was limited to six years because little was known about the murrelet at that time. This permit expired on October 3, 2001.

Part of the HCP strategy called for the ODF to fund research for more information on the murrelet so the strategies could be revised if needed, and so they could be used to seek a longer-term ITP for the murrelet. The ODF used information from this research, as well as research conducted by other scientists and additional information on northern spotted owls from ODF sponsored studies, to develop revised management strategies for both the marbled murrelet and the northern spotted owl.

In addition, ODF chose a multi-species approach to the planning process that would include both fish and wildlife. Since the signing of the original Elliott State Forest HCP in 1995, coastal coho salmon were listed as “threatened” under the federal ESA. In 2004, coastal coho were delisted under the federal ESA, but are again proposed for listing, with a final determination expected in December 2005.

At a minimum, the ODF intended to include the northern spotted owl, marbled murrelet, and coastal coho salmon in a revised HCP. The ODF also considered other species at risk for federal listing that may be found within the Elliott State Forest, and for which there was suitable scientific knowledge for inclusion in the HCP.

The ODF concentrated initial efforts in the planning process on revising the long-range FMP for the Elliott State Forest. The concurrent development of a revised HCP facilitated compliance with the federal ESA and helped to fully implement the Elliott State Forest's revised FMP.

## Planning Team, Resource Specialists, and Consultants

The core planning team consisted of both field and program staff of the ODF, along with representatives from the ODFW, USFWS, and NOAA Fisheries. This core team was directly responsible for managing all technical aspects of the planning process.

The core team included foresters, fish and wildlife biologists, and other specialists. These professionals have expertise in wildlife biology, fish biology, forestry, silviculture, threatened and endangered species, monitoring and adaptive management, public involvement, and technical writing.

The core team consulted many additional specialists in fields such as geotechnical studies, soils science, geology, hydrology, air quality, geographic information systems (GIS), forest technical analysis, forest pathology, forest inventory, forest economics, special forest products, botany, cultural resources, and recreation resources.

A steering committee was formed to provide overall direction to the core planning team and provide a key link to the district level and program managers, the counties, and the State Land Board. From the ODF, the committee included the Southern Oregon Area director (chair), the assistant state forester, the state forests program director, the state forests policy and planning manager, and the Coos district forester. Other committee members included the assistant director of the DSL, the southwest regional supervisor of the ODFW, an attorney from the State Attorney General's office, a county commissioner from Coos County, and the superintendent of the South Coast Education Service District.

## Technical Planning Elements

The technical planning process included the development of an integrated set of goals and strategies for managing forest resources, and the development of specific processes and procedures for district-level implementation of the strategies.

### Guiding Principles

The guiding principles listed in Chapter 3 directed the planning process for the Elliott State Forest. These guiding principles were derived from the following sources:

- **State Constitution, Oregon Admissions Act, and State and Federal Laws and Administrative Rules—**Statutes and mandates governing state forest management include those in the Oregon Constitution involving maximization of revenue from CSFLs to the CSF over the long term, consistent with sound techniques of land management (Article VIII, Section 5). Other laws recognize the special interests of counties and local governments, and address the importance of salmon and other native species.

- **Board and State Agency Policies—**These include policies of the State Land Board, BOF, and State Forester.
- **Other Sources—**These include recommendations from steering and planning team members, resource specialists, peer and formal reviewers, and the public, consistent with good stewardship of the forests.

The core planning team developed the guiding principles using those listed in the 1994 FMP as a basis, and including those developed during the northwest Oregon state forests management planning process.

## Resource Descriptions

Technical specialists developed descriptions of each resource, including information about current status and future trends. Resource descriptions are found in the subsequent sections of this chapter, with more detailed information available in the appendices and supporting documents of this FMP.

## Development of Goals

The resource goals listed in Chapter 3 describe the broad objectives of the management of each resource, and are intended to be qualitative rather than quantitative in nature. Goal statements were developed initially from several different sources, including:

- **State and Federal Laws and Administrative Rules—**Some goal statements identify the relevant legal standards pertaining to the resource, and state that the specific law will be followed in managing that resource.
- **Board and State Agency Policies—**These include policies of the State Land Board, BOF, State Forester, and other natural resource agencies participating in the planning process.
- **Other Sources—**These include recommendations from steering and planning team members, resource specialists, and the public. These goals are not mandated in law or policy, but are consistent with good stewardship of the forests.

The core planning team again referenced the 1994 FMP in developing these goals, along with those developed during the northwest Oregon state forests management planning process.

## Development of Strategies

Utilizing the guiding principles, along with input from resource specialists and the public, the planning team prepared strategies for achieving each goal.

## Balancing the Goals

Individual resource goals compete to some degree with the goals for one or more of the other resources. Any such potential conflicts were resolved in the strategy development phase of the planning process, consistent with the CSFL mandate. The strategies have attempted to achieve an appropriate balance among various resource goals, with the understanding that not all goals carry equal weight (e.g., the Oregon Constitution and Attorney General's 1992 opinion required the State Land Board to use the lands for schools and the production of income for the CSF). It was also important that the strategies be designed so the forest could be managed to meet the federal ESA through a multi-species HCP.

The planning team placed the highest priority on designing strategies to meet goals related to the constitutional mandate for CSFLs, specific laws or administrative rules, the DSL Asset Management Plan, and other specific policies, while meeting the federal ESA. Thus, the planning team focused on goals that were based on the following policies and agreements:

- CSFLs agreement between the State Land Board, ODF, and DSL
- State Land Board and BOF policies
- State Forester's policies
- Other state agency policies

The planning team focused next on meeting goals not mandated by law or policy. In the case of conflicts at this level, the core team resolved issues by developing strategies that provided the best balance among the goals.

## Modeling and Analysis of Alternative Approaches

The core planning team examined a broad array of conceptual management scenarios for the Elliott State Forest, with the help of spatial forest modeling completed in the fall of 2001 by Dr. John Sessions at Oregon State University (OSU). Eight scenarios were developed, representing a wide range of possible management approaches. These scenarios ranged from an emphasis on conservation to an emphasis on timber production. The core team analyzed the outputs from the spatial models to narrow the focus of the planning effort, and to identify strategies that would best accomplish the resource goals for the forest. From this analysis, the steering committee identified three concepts for the core team to include in the planning effort: 1) conservation areas for protection of important habitat; 2) revised aquatic/riparian strategies; and 3) use of stand structure concepts in defining habitat.

After public input on the three concepts, the core team developed a draft landscape strategy based on those concepts. The draft strategy was modeled for comparison against the eight conceptual management scenarios to determine how well the draft landscape strategy would accomplish the goals for the forest. The core team adapted the strategies to achieve the best alignment with forest resource goals.

## Adaptive Forest Management

Monitoring and adaptive management are key elements of the FMP. A properly constructed monitoring program, combined with effective adaptive management, provides the necessary information to assess the effectiveness of the strategies in achieving the goals, and the flexibility to modify the strategies and management techniques as new information becomes available. The ODF views the integrated strategies and their associated standards as a reasonable starting point. The strategies will continue to change as more information is acquired. Over the long term, the strategies may result in a variety of possible outcomes as adaptive management occurs on the forest.

# Public Involvement

Public involvement provided the planning team with a wider range of information and ideas, and was critical in gaining public understanding, acceptance, and support for planned actions. The planning team developed a comprehensive public involvement process at the beginning of the revision process in 2000, and adapted the process to meet changing needs for public involvement as planning proceeded.

The public involvement process had three important objectives:

- Seek appropriate insight, opinion, and data on planned management actions for the Elliott State Forest.
- Foster understanding, acceptance, and support for the management planning process and the management plan.
- Capitalize on important opportunities to inform the public about forest systems, forest stewardship, and management of state forests.

The public involvement process included public meetings, newsletters, field tours and contacts with local groups and individuals. The public involvement process is summarized in Appendix G.

## Public Meetings and Tours

The ODF held public meetings at key points to obtain public input on the planning process. The initial meetings explored the issues of importance to the public in managing the Elliott State Forest. The ODF publicized the meetings—held at Coos Bay, Salem, and Roseburg—in newsletters, through press releases and media coverage, and by letters sent to those on the mailing list of the *Expectations* newsletter. Written comments were accepted after the meetings.

The planning team also sponsored tours that focused on the planning process and management of the state forest lands. These included tours for the BOF and the general public.

## Expectations Newsletter

The ODF originally developed *Expectations* during the development of the 1994 FMP, to communicate information to interested parties about the planning process and related topics. *Expectations* was published at intervals throughout the current planning process.

# Plan Approval

The provisions of this plan are intended to satisfy the legal and policy framework for managing CSFLs and BOFLs. Accordingly, this plan requires the approval of both the State Land Board and the BOF.

# Introduction to Resources

The following sections describe in detail the following Elliott State Forest resources:

- Agriculture and grazing
- Air quality
- Aquatic and riparian systems
- Climate
- Cultural resources
- Ecology and disturbance history
- Energy and minerals
- Fish and wildlife
- Forest health
- Geology, topography, soils, and geotechnical issues
- Land base and access
- Plants
- Recreation
- Scenic resources
- Social and economic resources
- Special forest products
- Timber

# Agriculture and Grazing

## Current Status

The steep, broken terrain of the Elliott State Forest precludes the growing of agricultural crops. The Elliott State Forest has not been used for agriculture in the past. The forest's potential for special forest products is discussed later in this chapter. Possible future agricultural use of the Elliott State Forest could include Christmas tree farming or livestock grazing.

Growing high-quality Christmas trees in the Elliott State Forest does not seem to be economically feasible. The management of Christmas tree cultivation is intensive, and involves machine planting, weeding, spraying, and mechanical and cultural practices. Slopes must be less than 20 percent for these activities. Although the Elliott State Forest has approximately 5,000 acres of slopes that are less than 20 percent, they are not readily available for Christmas tree growing. The slopes are located in narrow corridors along rivers or are small, mid-slope benches and ridge tops. Of this acreage, three larger, grassy areas are managed under a cooperative agreement by the ODFW as winter habitat for elk; the remainder is located mainly in forested areas.

ODFW subleases approximately 90 acres of Big Creek bottom lands to a local rancher for grazing. In cooperation with ODFW and the Tenmile Lakes Basin Partnership (a watershed council), a number of stream enhancement activities have taken place along Big Creek, including fencing, a temporary habitat dam, and riparian plantings.

Domestic livestock grazing is of little importance in the Elliott State Forest. One acre of grassy area is being leased to an adjoining landowner near Palouse Creek. The site includes a small stream that is fenced off from the livestock, and abundant riparian vegetation grows on both sides of the creek. Because agriculture and domestic grazing are incidental uses of the Elliott State Forest, there are no goals or strategies for these resources in the FMP.

# Air Quality

The State of Oregon is required to meet ambient air quality standards specified in the federal regulations adopted under the federal Clean Air Act. Failure to do so could result in the loss of funding for federal transportation programs in the state. State air quality standards must also be met.

Two types of events in the Elliott State Forest contribute to particulate air pollution: prescribed burning and wildfires. Currently, air quality in and near the Elliott State Forest meets state and federal standards. It is expected that this will continue because there is a trend toward less prescribed burning in the Elliott State Forest and on surrounding forest land. Because of the climate and location of the Elliott State Forest, lighter fuels and smaller materials decay naturally and break down within a short time.

**Key Terms**

**Clean Air Act—**Federal law passed in 1970, and amended several times since. The law's goal is "to protect and enhance the quality of the Nation's air resources"; it is implemented, in part, through a permit system.

**Particulate—**Particles are in the smoke produced by prescribed burning. State and/or federal air quality standards exist for particles in two size classes: $PM_{10}$ (particles smaller than 10 microns in diameter) and $PM_{2.5}$ (particles smaller than 2.5 microns in diameter).

**Prescribed Burning—**Controlled fire burning under specified conditions to accomplish planned objectives; also called slash burning, as a frequent objective is to reduce the amount of slash left after logging.

## Current Programs

The Oregon Smoke Management Plan regulates prescribed burning on all forest lands in Oregon, including federal, state, and privately owned lands. Some of its objectives are to protect public health, minimize smoke intrusions into designated population areas, reduce emissions from prescribed burning in western Oregon, and protect visibility in Class I areas during high-use periods. The Smoke Management Plan regulates forestry prescribed burning activities and ensures that they comply with the Clean Air Act. The regulations are set by the ODF and the Environmental Quality Commission, with assistance from the Oregon Department of Environmental Quality (DEQ).

The ODF regulates prescribed burning in the Elliott State Forest. District employees collect data on each site (or unit) proposed for burning, including the tons of fuels, location, elevation, tree species, and fuel moistures. They register the unit with the Coos Forest Protective Association and pay a per-acre registration and burn fee required by state law. The Association regulates the burning activities and issues burning permits.

ODF meteorologists in Salem evaluate weather and smoke dispersion conditions. The meteorologists then issue daily burning forecasts and instructions, which are designed to protect air quality. The instructions control the amount and location of prescribed burning on any particular day. Burning conducted in the Elliott State Forest must comply with these burning instructions or any exceptions allowed by the meteorologists. The district must also comply with any additional restrictions imposed by the Coos Forest Protective Association caused by local conditions. For prescribed burning on the Elliott State Forest, the goal is to protect the air quality of Coos Bay/North Bend, Roseburg, the Willamette Valley, Grants Pass, and the Rogue Valley.

The Coos Forest Protective Association is a private, nonprofit corporation that provides protection from fires to its corporate members and to other private, state, and federal lands. Its objectives are to minimize the cost of fire suppression and the damage caused by wildfire to forests and watersheds, and to respond to all fires with an effective, well-trained, equipped, and supervised fire control organization. As a result of aggressive efforts to suppress wildfires, effects on air quality are minimized and less particulate matter is released into the airshed.

# Aquatic and Riparian Systems

Water affects virtually every other resource in Elliot State Forest—trees, plants, fish, wildlife, soils, and recreation. Aquatic and riparian resources include surface water (streams, lakes, and wetlands), groundwater and aquifers, riparian areas, water supply (for instream and out-of-stream uses), and water quality.

Other resource descriptions within this chapter also contain information related to aquatic and riparian resources. (In particular, see "Geology and Soils" for a discussion of slope stability, and "Fish and Wildlife" for a discussion of streams as fish habitat and a summary of stream survey information.)

## History

Aquatic and riparian resources in the Elliott State Forest have been affected by a number of natural events and human caused activities. These include: forest fires, landslides, the Columbus Day storm of 1962, stream cleaning, and past harvest practices. Several fires have occurred in the Elliott State Forest. The largest known fire was the Coos Bay Fire of 1868, which burned 90 percent of the area now known as the Elliott State Forest. It has been difficult for large riparian conifers to become established after fire because of rapid establishment of alder and salmonberry. These fires often left riparian areas and uplands with little vegetation to hold soil in place and shade streams.

The Columbus Day storm blew down approximately 100 MMBF of timber in 1962. An additional 200 MMBF was cut to access the blowdown. In the past, fisheries biologists assumed that large wood in streams interfered with fish passage, and recommended that this large debris be removed. As a result of these recommendations, logging practices of the time routinely removed large woody debris (LWD) from streams. However, more recent research has revealed that this LWD contributes to essential fish habitat.

Riparian protection standards prior to the 1970s provided less protection than is currently implemented in Elliott State Forest. Riparian trees were usually harvested along with upland forests, and large logs providing valuable fish habitat were frequently removed from streams. As a result of historical logging and fires, many streams today have limited amounts of mature conifer forest in their riparian areas and few large logs. Streams often have riparian forests of alders and other hardwoods, or young conifers.

In 1909, the Oregon Legislature declared that all water in the state belonged to the public. In the years since then, many state agencies have been given the job of helping manage Oregon's public waters. Currently, the Water Resources Commission has the primary responsibility for the development of an integrated, coordinated state program for managing Oregon's public waters. Other state agencies and public corporations are directed to conform to statements of water resources policy.

Aquatic and riparian resources received greater attention in the 1970s, when new laws set water quality standards to be met in all bodies of water, including forest streams and rivers. The Forest Practices Act (FPA) was passed in 1971 to regulate forest operations.

The federal government passed the Clean Water Act (CWA) in 1972. This federal law set national water quality standards, and gave states the responsibility for carrying out the law.

The ODF addressed the effects of forestry activities on water quality through additional FPA rules, enacted at various times over the last 25 years. The new rules were designed to meet the water quality needs of fish and wildlife, and also to meet the requirements of the federal CWA. Water quality rules focus on retaining riparian vegetation and reducing the amount of sediment entering streams from forestry operations such as road building and logging. Wetlands are also protected by FPA rules and various state and federal laws.

## Surface Water: Streams, Lakes, and Wetlands

Water bodies in Elliott State Forest drain into three major basins. The eastern and northern portions of the forest drain into the Umpqua River. The west side of the forest drains into the Tenmile Lake system. The West Fork Millicoma runs through the center of the forest towards the south and is part of the Coos River system. The Elliott State Forest contains parts of two lakes. Loon Lake, a popular recreation site has approximately 1 mile of shoreline in the Elliott State Forest. Elk Lake, also known as Gould's Lake is a small pond located within the Elliott State Forest on Elk Creek. Outside the Elliott State Forest, Tenmile Lake is influenced by waters draining from the forest.

Water moves continuously through a watershed, crossing property lines and other boundaries. Each landowner in a watershed affects water as it flows across or underneath that piece of land, and water resources downstream are influenced by the actions of upstream owners. Because the Elliott State Forest is mostly a contiguous block of land, restoration and protection measures can affect entire watersheds as well as downstream areas outside the forest.

The basic character of streams is shaped by hydrology, the steepness of the slope, channel morphology, and geology. An important factor is the nature of the stream's substrate, which can be silt, sand, gravel, or bedrock. Riparian areas and streams influence and shape each other in many ways. In particular, riparian forests are the source of fallen trees, which are important structural components of streams. Large, fallen trees in streams create pools, modify the stream gradient, and retain organic material and sediments.

Healthy streams are naturally dynamic ecosystems. Occasional major disturbances (such as fires, wind, floods, and landslides) are normal processes that can add logs, boulders, and gravel, which are important building blocks of stream structure and aquatic habitats. In healthy streams, floodplains, wetlands, off-channel habitats, complex stream structures, beaver dams, and deep pools provide the resilience that enable streams to absorb these disturbances.

**Key Terms**

**Riparian Area—**Three-dimensional zone of direct influence and/or interaction between terrestrial and aquatic ecosystems. The boundaries of the riparian area extend outward from the stream bed or lakeshore.

**Riparian Management Area (RMA)—**A protected area with site-specific boundaries established by the ODF. The width varies according to the stream classification or special protection needs. The RMA protects the stream, aquatic resources, and riparian area. Aquatic resources include water quality, water temperature, fish, stream structure, and other resources.

**Stream—**To qualify as a stream, a water course must have a distinct channel that normally carries flowing surface water.

**Perennial Stream—**Year-round surface flow. In the FPA, it is defined as a stream that normally has summer surface flow after July 15.

**Intermittent Stream—**Surface flow only part of the year. In the FPA, it is defined as a stream that normally does not have summer surface flow after July 15. Ephemeral streams may run only during or shortly after periods of heavy rainfall or rapid snowmelt.

**Stream-Associated Wetland—**A wetland that is immediately adjacent to a stream. This includes wetlands adjacent to beaver ponds, side channels, or oxbows that are hydrologically connected to the stream channel by surface flow at any time of the year.

**Wetland—**As defined in the FPA Rules, wetlands are "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

## Stream Classification

Streams are grouped into the following categories based on their beneficial use (Oregon Department of Forestry 1994b):

- Type F—Fish-bearing streams
- Type N—Not a fish-bearing stream
  - Perennial streams
  - Intermittent streams
- Type D— Domestic use

## Wetlands

Wetlands are often near streams or have trees, but they are ecologically distinct from streams and forests. The FPA identifies three major types of wetlands: significant wetlands, stream-associated wetlands, and other wetlands. Significant wetlands are

defined as bogs, estuaries, and both forested and non-forested wetlands larger than eight acres. Stream-associated wetlands are those less than eight acres and classified according to the stream to which they are connected. Other wetlands include seeps and springs. Wetlands can be especially valuable in providing refuge for juvenile salmonids during high water events. Wetlands also provide habitat for wildlife, improve water quality, and contribute surface and groundwater. Although important, wetlands do not occupy a significant portion of the Elliott State Forest.

## Groundwater, Riparian Areas, and Uplands

Groundwater is subsurface water that accumulates in tiny open spaces in soil or loose rock, or in the crevices of hard rock formations. Groundwater and surface water are interconnected. Surface water percolates down through the tiny open spaces in soil and eventually reaches the groundwater. Groundwater moves from zones of high pressure to zones with lower pressure, and discharges into springs and streams. Streams often exchange water with the groundwater repeatedly along their course, with groundwater upwelling into the stream at various points, and surface water from the stream downwelling into the groundwater at other places.

Uplands are part of the hydrologic cycle. Rain or snow can evaporate, infiltrate into the soil, or flow overland until it reaches a stream or area where it can soak into the ground. The condition of the uplands can influence the retention of water, the rate of water runoff from rain or snow, and the frequency of landslides. These processes are influenced by the geology and soils, type of vegetative cover (whether forest or grass, for example), and the age of forest stands. The hydrologic processes on uplands affect the amount of stream flows and the timing of peak flows after rainstorms.

## Riparian Habitat

The condition of the trees, other vegetation, and soils in the riparian area affects the morphology of streams, and the condition of fish habitat. Ecological functions of riparian areas include shade, bank stability, nutrients (as leaves and wood drop into the water), large wood, and complex margins to the stream. These functions are important for healthy fish habitat, and also for the many wildlife species that rely partially or completely on riparian habitats. Floods may occur rarely (only one or two days a year), but a healthy riparian area is especially important at these times and may influence whether the flood renews or degrades conditions within the stream.

## Water Supply

Water that flows through state forest lands sustains ecosystems and also provides for out-of-stream uses such as irrigation, domestic use, and municipal use. The Coos District keeps records of all registered water users that use water from state forestlands. The Oregon Water Resources Department monitors stream flows, issues permits for water withdrawals from streams, and regulates water rights.

Holders of water right certificates are authorized to withdraw a specific amount of water from waterways in the State of Oregon. The point of diversion, amount of water allotted, place of use, and purpose of water diverted are indicated on each water right. Several adjacent landowners draw surface water from sources that are on or close to the Elliott State Forest. No municipal water systems are located within the plan area.

The ODFW operates the Millicoma Interpretive Center located on the West Fork Millicoma within the Elliott State Forest boundary. This educational facility produces coho, chinook, and steelhead with the assistance of many students and volunteers. The water source for this facility is a nearby spring.

The ODF occasionally draws water from the Elliott State Forest streams for firefighting, pesticide applications, road construction, and dust abatement. The ODF generally draws water from small pools behind culverts and artificial ponds.

Statewide water supply policy involves two issues. First, the demands on Oregon's water resources are increasing while the supply of freshwater stays the same. Future water needs may be met through alternatives such as conservation, storage, and water right transfers.

Second, instream flows provide substantial public benefits, including support of fish and other aquatic life, recreational opportunities, and maintenance of water quality. The Oregon Water Resources Department is working to restore and enhance stream flow and lake levels by the establishment of instream water rights through new allocations, the transfer of existing out-of-stream rights to instream uses, and support for environmentally sound multi-purpose storage. These activities are designed to be consistent with the preservation of existing water rights. ODFW established instream water rights for many streams in the Elliott State Forest in the early 1990s. If newer water rights are granted, water from these streams may be used only to the extent that stream flows do not fall below that protected by the older instream water right.

Forest management activities influence water supply by affecting the age, species, and density of tree cover and other vegetation; the location and condition of roads; and the condition of the soil.

## Water Quality

Water quality is measured by chemical, physical, and biological properties of water. Aquatic species such as salmon need high-quality water as well as suitable habitat. In forests, the water quality parameters of most concern are usually sediment and temperature. A biological parameter, bacterial contamination, can be of concern near recreational areas. Chemicals are not usually a water quality concern in forests, but could be if any chemical contamination occurred, such as a fuel spill or improper use of herbicides.

Both natural events and forest management activities can put sediment in streams. Sediment, soil, and debris are often delivered to streams in pulses, during major storms or floods. Road systems and poor timber harvest methods can generate and deliver considerable amounts of sediment to streams during storms. The episodic nature of these

events can make it difficult to evaluate their effects on water quality. Water quality monitoring is further complicated by the natural variability within stream systems. Forest management activities can also influence water temperature. This effect can occur through the loss of streamside shade, or when stream channels become wider and shallower.

Road-related landslides tend to be larger than other types of landslides, causing more off-site impacts. In recent years, most road-related landslides in the Elliott State Forest have started from forest roads built before excavated material was hauled to a stable location.

# Climate

The Elliott State Forest has a strong maritime influence from the nearby Pacific Ocean. As a result, temperature fluctuations are relatively moderate and rainfall amounts are high. The mean minimum January temperature in the Elliott State Forest is approximately 32° F and the mean maximum July temperature is 76° F.

Recorded rainfall varies across the Elliott State Forest, averaging 65 inches per year at lower elevations on the western edge of the forest, and 115 inches per year on the high, interior ridges. Rainfall declines slightly on the eastern side of the Elliott State Forest, to 90 inches per year. Snowfall in the forest is normally light to moderate, both in amount and duration of the snow. There is no residual snowpack.

The west side of the Elliott State Forest is most strongly influenced by the proximity of the ocean. This influence is seen in the moderate temperatures and the frequency summertime fog on the west side. During the dry summer period, the fog contributes a significant amount of moisture to vegetation through condensation, and it reduces moisture stress on vegetation. Although much of the Elliott State Forest has steep slopes, sometimes with shallow soils, the south Oregon coast climate makes the forest a superior location for conifer tree growth.

# Cultural Resources

Cultural resources are archaeological and historical resources. They may include objects, structures, or sites used by people in the past. Archaeological sites provide information about past cultures. Many sites also have religious, historic, or associational values for Native American communities. Historic sites have important interpretive, recreational, and heritage values, which are lost when artifacts and information are removed or destroyed. These resources are fragile and irreplaceable, especially objects still in their original locations. These undisturbed objects provide the most information about the culture that created them, the time frame in which they were created, and the character of the landscape at the time. Cultural resources provide a meaningful record of past cultures, events, and ecological conditions in Oregon.

## Current Condition

The Elliott State Forest has not been fully surveyed for cultural resources. However, a cultural resource literature search for potential sites was completed in 1998. This report (Stepp Consulting 1998), identified 4 potential prehistoric sites and 50 historic site locations. Currently, only two of these sites have been field verified: two pioneer cemeteries that are currently protected as heritage sites.

The Elliott State Forest may contain some prehistoric cultural resources, but more information is needed before this can be verified. The Umpqua, Hunus, and Miluk Indian tribes were not awarded Indian reservations by the government; instead they received land allotments for their individual families, though some tribal members simply lived on the land. Native American legends, stories, hearsay, and other documented claims indicate that some of these land allotments may have been in the Elliott State Forest (Phillips 1996). It is possible that a burial ground was located along the Umpqua River within the Elliott State Forest boundary. A prehistoric foot trail may have been located along the ridge tops from Allegany northeast to Ash Valley, with some of the trail extending through the Elliott State Forest.

A few historic cultural resources from early Euro-American settlements remain in the Elliott State Forest. An historic wagon trail stretched from Allegany north along the East Fork Millicoma River, by Glenn Creek, east of Loon Lake, and continuing east to Scottsburg. Most of this old trail has been covered by modern roads. The Elliott State Forest also contains two homestead areas totaling 480 acres, two pioneer cemeteries (the heritage sites mentioned in the first paragraph of this section), and four fire lookout towers. In addition, the Cougar Pass lookout remains standing, and an old pioneer foot trail may still exist by the former Trail Butte lookout.

## Key Terms

**Archaeological and Historical Resources—**Districts, sites, buildings, structures, and artifacts that possess material evidence of human life and culture of the prehistoric and historic past.

**Archaeological Object—**An object that is at least 75 years old; is part of the physical record of an indigenous or other culture found in the state or state waters; and is material remains of past human life or activity that are of archaeological significance, including, but not limited to, monuments, symbols, tools, facilities, technological by-products, and dietary by-products.

**Archaeological Site—**A geographic locality in Oregon, including but not limited to submerged and submersible lands and the bed of the sea within the state's jurisdiction that contains archaeological objects, and the contextual associations of the archaeological objects with each other or with biotic or geological remains or deposits.

**Burial—**Any natural or prepared physical location, whether originally below, on, or above the surface of the earth, into which, as a part of a death rite or death ceremony of a culture, human remains were deposited.

**Historic Artifacts—**Three-dimensional objects, including furnishings, art objects, and items of personal property that have historic significance. "Historic artifacts" does not include paper, electronic media, or other media that are classified as public records.

# Ecology and Disturbance History

## Environmental Setting

The interaction of geology, geomorphology, climate, and soils produced a varied and complex vegetation pattern across the Elliott State Forest. Various combinations of these factors provide habitat for diverse groups of plant species. Although there is seldom a discrete boundary along environmental gradients, categorizing discrete forest plant communities is a useful management tool. Vegetative zones are broad areas where a uniform macroclimate results in a plant association that is climax. The western hemlock zone is the most extensive vegetation zone in western Oregon, and includes most of the Elliott State Forest (Franklin and Dyrness 1973).

The western hemlock zone spans a wide range in precipitation and temperature, but the plant associations likely to occur in Elliott State Forest cluster at the warmer end of the temperature gradient and toward the midrange of precipitation (80 to 100 inches annually). Nearer to the coast, western hemlock plant associations are found mainly on ridges above the fog influence. Because of the disturbance history, much of this zone is dominated by Douglas-fir. Douglas-fir, western hemlock, and western redcedar are the predominant conifers in the western hemlock association. Bigleaf maple and red alder are the predominant hardwoods, providing up to 28 percent canopy cover (McCain and Diaz 2002).

Even though the Elliott State Forest is within the western hemlock zone, the forest is currently dominated by Douglas-fir. Douglas-fir represents the early stage in plant succession, having become established as the result of wildfires and timber harvesting. The Elliott State Forest's natural and planted stands of Douglas-fir include a range of age classes, stand densities, and species composition. Western hemlock is the second most common conifer in the forest, followed by Western red cedar. No other conifers are found in significant amounts. Pacific yew (*Taxus brevifolia*) is rare, but does occur. Although Port-Orford-cedar grows in areas adjacent to Elliott State Forest, and occurs on some of the scattered tracts to the south, only a small plantation is found in the main block of the forest.

Several hardwoods of significance occur in Elliott State Forest. Red alder is the most abundant, and quickly inhabits any site with exposed soil. Bigleaf maple is common throughout the area, and Oregon myrtle (*Umbellularia californica*) is found in the western portion of the forest. Other tree species include willow, golden chinquapin (*Chrysolepis chrysophylla*), Pacific madrone (*Arbutus menziesii*), cascara (*Rhamnus purshiana*), and Pacific dogwood (*Cornus nuttalii*).

The scattered tracts encompass a wide range of vegetation types. Portions of these lands adjacent to the California border have some coast redwood (*Sequoia sempervirens*) and Douglas-fir mixtures. Much of one scattered tract near Brookings at Bosley Butte is predominantly knobcone pine (*Pinus attenuata*). A small tract on Crafton Creek near Port Orford includes a small acreage of native prairie and scattered oaks (*Quercus spp*.). ODF

tracts adjacent to the South Slough Estuary of Coos Bay are composed of a mixture of Port-Orford-cedar, Douglas-fir, western hemlock, and Sitka spruce. Another tract adjacent to Winchester Bay is a stand of Sitka spruce with some western hemlock. Other scattered tracts, such as the one on Tom Folley Creek near Elkton, are very similar to the vegetation in the Elliott State Forest.

# Disturbance History

## Scale

Disturbance regimes vary at different scales and are relative to specific locations and time intervals. Some locales may be more subject to wind, landslides, and flooding, while others are affected more by fire, insects, and disease. However, both small- and large-scale disturbances by different causal agents can operate simultaneously in the same community or on the same landscape as a function of local climate, topography, and biota (Pickett and Thompson 1978).

Within a stand, small-scale disturbances primarily involve tree death or treefall and subsequent canopy gap formation. Such gaps occur when one to several large trees in the upper canopy die and/or fall over. The size and intensity of the local disturbance resulting from tree death or treefall are a function of the number and biomass of the tree(s) that fall.

Wildfire, wind, landslides, flooding, and certain other weather phenomena can be of great magnitude and act over large areas. Such catastrophic disturbances affect both healthy and weakened trees, and usually result in significant or complete mortality over wide areas. Large-scale disturbances such as wildfires generally return a stand to an earlier developmental state by killing many plants, thereby favoring the establishment of early seral species. On the other hand, windthrown forests may be accelerated toward a later developmental state if shade-tolerant advance regeneration forms the bulk of the next stand (Spies and Franklin 1988).

Wildfires range from approximating the size of a canopy gap to covering hundreds of thousands of acres. Wind damage covers a spatial range similar to that of wildfires, from small gaps to landscape scales. Variations in effects are caused by meteorological conditions, topographic characteristics, stand and tree characteristics, and soil characteristics.

Potential consequences of landslides and flooding include major changes to the structure of surface materials and drainage channel systems. In nearly all cases, a similar ecosystem eventually develops on the site. Interactions between the abiotic disturbances of wind and wildfire, and the biotic disturbances of disease and insects, occur on a large scale as well.

Distinctions between small- and large-scale disturbances are somewhat artificial considering that the development and cyclic renewal of terrestrial ecosystems are intimately linked to disturbances of both kinds at all temporal and spatial scales. The

more difficult question is how to define what is normal in a particular system (Pickett and White 1985).

## Disturbance in Oregon Coast Range Forests

Forests along the Oregon Coast, including the Elliott State Forest, result from a typical progression of stand structures following large, relatively infrequent disturbance events and subsequent smaller, more frequent disturbances. Relatively recent, large-scale events—such as the Coos Bay Fire (1868) and the Columbus Day Storm (1962)—influenced the distribution, composition, and structure of vegetation across the forest. Small-scale disturbances caused by subsequent small fires, windstorms, disease, insects, and harvesting also significantly affect the characteristics of the forest across the landscape.

### Fire

Fire is the primary coarse-scale disturbance agent in the western hemlock zone of the Oregon Coast (Wimberly 2000). The frequency of fire occurrence is variable, and is determined by long-term climate changes (Long 1998). The average regional fire-return interval for the coastal zone is estimated at 230 years, but stands much older than this indicate the variability of a fire return interval (Long 1998; Agee 1993). The randomness of natural disturbances results in some stands burning repeatedly on short cycles while other stands escape for much longer periods (Hunter 1999). The lack of long-term fire records, variability, and climate changes do not allow inference of cyclic patterns of fire return (Agee 1993).

Large fires have been important historically to the development of forests in the hemlock zone. The historic Coos Bay fire of 1868 burned 90 percent of the area that is now the Elliott State Forest (Oregon Department of Forestry 1994a).

Fire size and severity increase as the fire return interval lengthens. However, large fires do not generally burn uniformly, and fire severity varies over the area. Topographic features had a greater influence on the probability of reburns after a major fire than on the occurrence of high-severity crown fires. Dry sites have a higher probability for reburning than moist sites (Wimberley and Spies 2001). The severity of a fire is a factor in determining the successional pathway of an area. The effect of fire size and severity on seed sources is a factor in determining the structure and composition of post-fire vegetation. Forests experiencing high severity fires may require 200 years before stands develop old-growth characteristics. Areas of moderate severity fire can develop many characteristics of old growth in a much shorter time (Wimberley et al. 2000).

The Biscuit fire of 2002, located at the southeast end of the hemlock zone, occurred in an area that historically has more frequent, less severe fires. It is an example of the variability of fire severity resulting from a large fire. The fire's perimeter encompassed 499,900 acres, with 15 percent burned at high severity, 24 percent burned at moderate severity, 44 percent burned at low severity, and 17 percent burned at very low severity or unburned (Siskiyou National Forest BAER Team 2002).

## Wind

The continuum of disturbance by wind is difficult to characterize. Wind can cause coarse-scale disturbances, such as the Columbus Day Storm of 1962, or fine-scale disturbances that are more chronic in nature. Major wind events occur along the coast approximately every 20 years (Wilson 1998). Depending on the intensity, large-scale wind disturbances can create even-aged stands or increase the complexity of stand structures. The impact of wind on a forest depends on stand composition, canopy structure, size, age, and vigor. Wind direction and severity, soil and site properties, and the influence of mountains on wind flow and rainfall are also factors that affect the landscape (Nowacki and Kramer 1998). In a study conducted on the Oregon coast, approximately 25 percent of the sites showed evidence of wind disturbance, characterized by one or more uprooted trees, or trees with portions of their main stem snapped (Wimberley and Spies 2001).

## Insects and Disease

(For a more detailed description, see the "Forest Health" section in Chapter 2.)

Most insect damage on the Oregon Coast is caused by the Douglas-fir bark beetle (*Dendroctonus pseudotsugae*), which tends to affect low vigor trees weakened by other factors. Beetle population buildup after significant disturbance events can cause damage to healthy trees. Increases in beetle populations tend to be short lived unless continued disturbance provides new habitat.

Laminated root rot (*Phellinus weirii*), is the most common and damaging disease in this area. In many forests with long intervals between stand-replacing disturbances, it is the most important disturbance agent affecting stand structure and composition (Hansen et al. 1998). This fungus is an efficient parasite that kills host trees of all ages and sizes. It is a relatively slow moving disease that can persist for up to 50 years in stumps of cut trees and roots of dead trees. It kills susceptible host trees, usually leaving younger, smaller trees standing, but increases the susceptibility of larger trees to windthrow. Laminated root rot results in scattered, various-sized patches of dead trees across the landscape. Because Douglas-fir is particularly susceptible to this disease, fire suppression and domination by Douglas-fir in planted or natural stands have contributed to its spread.

Heart rot fungi are present in older forests and are important as disturbance agents by initiating and sustaining canopy gaps (Hennon 1995).

Douglas-fir along much of the Oregon Coast is experiencing severe damage from Swiss needle cast. Though Swiss needle cast affects some stands in the Elliott State Forest, it has not become severe enough to cause serious decline in tree growth.

## Landslides and Floods

Landslides are a dominant erosion factor on steep, forested slopes in western Oregon. Many factors affect landslide susceptibility. A landslide is the movement of a mass of soil, rock, and organic debris down slope. The typical landslide on steep forest lands begins as a relatively small failure, which may initiate debris flows. It is not possible to

predict when any specific location will experience a landslide, but it is possible to recognize where landslides are more likely. The debris flow can scour soils along its path (Landslide and Public Safety Team 2001).

Floods are generally restricted to more predictable areas than fires or windstorms, and their magnitude and frequency of occurrence can be estimated for a given river (Oliver and Larson 1996). The effects of flooding are dependent on local weather and drainage basin conditions.

# Energy and Minerals

## Current Status

The DSL leases oil, gas, and minerals on state-owned lands. It leases by auction for 40 acres or more of land, and through negotiation on less than 40 acres of land. DSL administers the leases on both CSFLs and BOFLs, but must obtain approval from the ODF for leases on BOFLs. DSL also issues prospecting permits and permits for surface disturbance, such as seismic lines.

The Oregon Department of Geology and Mineral Industries (DOGAMI) regulates gas, oil, and mineral exploration, development, and reclamation/abandonment throughout Oregon. DOGAMI routes applications for drilling permits to all state natural resource agencies, which have 21 days to respond. Additional statutes and regulations apply to exploration and development, and various permits and licenses are required. The various laws, regulations, and permits address issues such as air quality, water, threatened and endangered species, fish, explosives, and mines, and they are enforced by various state and county agencies.

Any mine plans prepared for DOGAMI will encourage mining and drilling by state-of-the-art, environmentally sound methods, to ensure that the CSF receives maximum revenues, and that other forest resources are protected. Exploration operations and leases can provide significant revenue. The actual mining operations, however, typically provide the highest per acre values of any natural resource.

The Elliott State Forest currently produces no oil, gas, or minerals. In the past, oil and gas drilling have occurred nearby, and leases were awarded on the forest. Currently, there are no leases on the Elliott State Forest. Likewise, several sandstone quarries in the Elliott State Forest have provided building stone and road rock in the past, but no extraction operations are currently active. Nearby mineral exploration and development have included coal prospects and quarries for volcanic road rock. The Elliott State Forest has a large quantity of poor-quality sandstone. Geologic conditions on the forest are thought to be more favorable for natural gas than for oil.

The southern Oregon Coast Range, which includes the Elliott State Forest, is believed to have some potential for oil, gas, and mineral resources. The Elliott State Forest is not considered a reliable area to prospect, however. This situation could quickly change as new geological models are developed for currently valuable commodities, or if prices rise dramatically for resources with a low value.

# Fish and Wildlife

The Elliott State Forest provides habitats for most native species found in forests in the Oregon Coast Range (Johnson and O'Neil 2001). Appendix E contains lists of native fish and wildlife species, with scientific names, that are currently known, or are likely, to exist on or adjacent to the Elliott State Forest. These lists include approximately 221 species: 51 mammals, 116 birds, 24 amphibians and reptiles, and 30 fish.

## Summary of All Species of Concern

Table 2-1 lists all fish and wildlife species of concern for the Elliott State Forest. Species of concern include species listed under the federal or state threatened and endangered species lists; species proposed for or candidates for listing as threatened or endangered; and state sensitive species.

**Table 2-1. Listed Fish and Wildlife Species and Species of Concern on or near the Elliott State Forest[1,2,3]**

| Category | Species |
|---|---|
| Federal threatened species | Bald eagle, marbled murrelet, northern spotted owl |
| State endangered species | Peregrine falcon |
| State threatened species | Bald eagle, marbled murrelet, northern spotted owl |
| Federal candidate for listing | Steelhead (Oregon Coast ESU), coho salmon (Oregon Coast ESU), fisher |
| State sensitive species | Chum salmon, **coastal cutthroat trout (Oregon Coast)**, **steelhead (Oregon Coast)**, **coho salmon**, **Millicoma longnose dace**, **Pacific lamprey**, **Umpqua chub**, clouded salamander, foothill yellow-legged frog, red-legged frog, southern torrent salamander, tailed frog, western toad, sharptail snake, western pond turtle, bufflehead, Lewis' woodpecker, northern goshawk, olive-sided flycatcher, pileated woodpecker, purple martin, western bluebird, willow flycatcher, American marten, **fisher**, fringed myotis, long-eared myotis, long-legged myotis, ringtail, silver-haired bat, Townsend's big-eared bat, western gray squirrel, white-footed vole |

[1] Species names in bold represent species listed under more than one classification.
[2] ESU = evolutionarily significant unit (a federal designation).
[3] As of 2004.

# Threatened or Endangered Wildlife Species

Of the many wildlife species potentially found in the Elliott State Forest, four species are listed as threatened or endangered under either the federal or state ESA (or both). Fish are discussed separately later in this section. Some species are classified in various special designations such as candidate or sensitive categories.

## Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened by the USFWS and the state of Oregon. Guidance for species recovery is currently provided under the Pacific Bald Eagle Recovery Plan (USDI Fish and Wildlife Service 1986) and a cooperative IP developed by the Oregon and Washington Bald Eagle Working Team (Washington Department of Wildlife 1990). Most recovery goals have been met or exceeded, and the species has been proposed for delisting by USFWS. Even after delisting, the bald eagle will continue to be protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Bald eagles are found on or near the Elliott State Forest year-round, and use the state forests and waters for nesting, foraging, and roosting. Because a pair of eagles often uses alternate nest sites, each nesting territory can include multiple nesting sites. In 2003, there were three occupied bald eagle nesting territories in the Elliott State Forest.

## Peregrine Falcon

The American peregrine falcon was removed from the federal threatened and endangered species list in 1999, but is still on the state list of endangered species. It is proposed to be downlisted to a state threatened species. A recovery plan for the Pacific states region was approved in 1982 by the USFWS. Extensive monitoring, research, and reintroduction programs have occurred in Oregon and the West over the past 15 years, and populations have slowly recovered. There currently are no known active nest sites in the Elliott State Forest.

## Marbled Murrelet

The marbled murrelet was listed as threatened in 1992 by the USFWS within Washington, Oregon, and California, because of loss of nesting habitat, potential threats from gill net fishing in Washington, and oil spills (USDI Fish and Wildlife Service 1992). A recovery plan was developed for the marbled murrelet in 1997 (USDI Fish and Wildlife Service 1997).

## Key Terms

Federal and state agencies make formal classifications of wildlife, fish, and plant species, according to standards set by federal and state ESAs. The various classifications are defined below. Federal designations are made by the USFWS or NOAA Fisheries. State of Oregon designations are made by the Oregon Fish and Wildlife Commission (part of the ODFW).

### Federal Classifications

**Endangered Species**—Any species (including subspecies or qualifying population) that is in danger of extinction throughout all or a significant portion of its range.

**Threatened Species**—Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**Federally Listed Species**—Species, including subspecies and distinct vertebrate populations, of fish, wildlife, or plants, listed as either endangered or threatened.

**Proposed Threatened or Endangered Species**—Species proposed by the USFWS or NOAA Fisheries for listing as threatened or endangered; not a final designation.

**Candidate Species**—Species for which the USFWS or NOAA Fisheries has sufficient information on hand to support proposals to list as threatened or endangered.

**Federal Species of Concern**—An informal term that refers to those species which the USFWS or NOAA Fisheries believes might be in need of concentrated conservation actions. "Species of concern" receive no legal protection, and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species.

### State Classifications

**Endangered species**—Any native wildlife, fish, or plant species determined by the Oregon Fish and Wildlife Commission to be in danger of extinction throughout any significant portion of its range within Oregon, or any native species listed as endangered under the federal ESA.

**Threatened Species**—Any native wildlife, fish, or plant species that the Oregon Fish and Wildlife Commission determines is likely to become endangered within the foreseeable future throughout any significant portion of its range within Oregon.

**Sensitive Species**—Wildlife, fish or plant species that are likely to become threatened or endangered throughout all or a significant portion of their range in Oregon. A watchlist of these species has been developed by the ODFW and is periodically updated. It is sub-divided into four categories: critical, vulnerable, peripheral, and undetermined status. The list is advisory only.

The marbled murrelet is a seabird that nests on natural platforms in trees in mature and old-growth coniferous forests within 50 miles of the ocean. Surveys for marbled murrelets have been conducted in the Elliott State Forest since 1992. In addition, research on the habitat characteristics of marbled murrelet nesting habitat on state forest lands, including the Elliott State Forest, was conducted between 1993 and 1998 (Hamer and Meekins 1996; Nelson and Wilson 2002). Through surveys and research, 11 nests were located and subcanopy behaviors were observed in many survey areas in the Elliott State Forest. Additional acres of potential habitat in the Elliott State Forest have not been surveyed for marbled murrelets.

## Northern Spotted Owl

The northern spotted owl was listed as threatened by the USFWS in 1990. Surveys for spotted owls occurred in the Elliott State Forest and adjacent suitable habitat between 1990 and 1993. In addition, research on the demographics, habitat use, and habitat characteristics of spotted owls on state forest lands, including the Elliott State Forest, took place between 1993 and 1998 (Anthony et al. 2000a, 2000b; Tappeiner et al. 2000). Although there was an apparent loss of territories over the five years of the study, the rate of population change remained relatively steady, largely because of greater survival and fecundity. A density survey of all suitable spotted owl habitat in the Elliott State Forest in 2003 located an equivalent number of owl sites as the last similar survey in 1996.

**Key Terms**

**Activity Center—**For northern spotted owls, the nest tree, or the location best describing the focal point of the activity of a northern spotted owl or pair of owls when the nest location is not known.

**Demographic Study—**A study of population dynamics: the quantitative analysis of population structure and trends in size, growth rate, and distribution.

**Subcanopy Behavior—**Marbled murrelet behaviors that occur at or below the forest canopy, and that strongly indicate that the site has some importance for breeding (Mack et al. 2003).

**Marbled Murrelet Management Area (MMMA)**—Area designated for the protection of marbled murrelets, according to ODF policy.

**Potential Habitat—**For the purposes of surveys for marbled murrelets, any forested area with a residual tree component, small patches of residual trees, or one or more platforms (Mack et al. 2003).

**Territory—**The area that an animal defends, usually during breeding season, against intruders of its own species.

## State Sensitive Species

The ODFW maintains a sensitive species list. The list is a "watch list" of species that could qualify for listing as threatened or endangered in the future, and serves as an early warning system for land managers and the public. These species have been highlighted for a number of reasons, most of which are related to decline in the quantity, quality, or isolation of their habitat, and/or vulnerability to competition with other species. ODFW recommends that these species receive additional management attention and support, as they are likely to be the next candidate species for formal threatened or endangered species listing. Fish and wildlife species listed as sensitive by ODFW as of 2004 are found in Table 2-1.

## Fish

The streams, rivers, lakes, and other water bodies in the Elliott State Forest provide habitats for a variety of fish species. At least 30 species of fish use habitats in the plan area for part or all of their life history, or use habitats downstream from the state forest that may be influenced by state forest management.

Native salmonid species in the Elliott State Forest include fall Chinook salmon, coho salmon, chum salmon (*Oncorhynchus keta*), winter steelhead, resident populations of rainbow trout (*Oncorhynchus mykiss*), and both anadromous and resident races of cutthroat trout (*Oncorhynchus clarkii*). Native non-salmonid fishes include various species of lamprey, sculpin, dace, sucker, and others. Appendix E contains a complete list of native freshwater fish species currently known or likely to exist in the planning area. The ODFW collects information on fish habitat, distribution, and populations.

**Salmonid Species (salmon and trout) —** Anadromous salmonid populations have been generally depressed throughout western Oregon for a variety of reasons, including reduced survival in the ocean, reduced productivity of freshwater habitats due to logging, farming, and conversion of farm and forestland to other uses such as for dwellings and industrial use, and fishing levels. In recent years, numbers in the Elliott State Forest have improved. Listed fish species are discussed further below.

For resident salmonid populations, resident cutthroat trout are widely distributed and appear stable, although special consideration is warranted for populations isolated above natural barriers.

**Non-salmonid Species —** There is much less information about the status of non-salmonid species. Two species, the Pacific lamprey and Millicoma longnose dace, are of concern due to limited distribution, reduced abundance, and/or special habitat needs.

**Key Terms**

**Anadromous Fish—**Species of fish that mature in the ocean and migrate into freshwater rivers and streams to spawn (e.g., salmon and lamprey).

**Resident Fish—**Fish species that complete their entire life cycle in freshwater, or non-anadromous fish (e.g., a resident population of cutthroat trout).

**Salmonid—**Fish species belonging to the family *Salmonidae*, which includes trout, salmon, and whitefish species.

## Listed Fish Species

One fish species listed under the federal ESA, coho salmon, inhabits the Elliott State Forest. Coho salmon species within the Oregon Coast evolutionarily significant unit (ESU) were listed as threatened in 1998. In addition, the federal government has identified other populations of these species as candidate species or species of concern. In 2004, coastal coho salmon were delisted, but are again proposed for listing, with a final determination expected in 2005. See Table 2-1 for a summary of these listings.

The State of Oregon has not listed any fish species that occur in the Elliott State Forest as threatened or endangered. However, several species are included on the list of sensitive species. A "sensitive" species classification was created to identify and prevent species from qualifying for listing as threatened or endangered. See Table 2-1 for a summary of these listings.

**Key Terms**

**Species—**Any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife that interbreeds when mature [Section 3(15) of the ESA].

**Population—**A group of fish spawning in a particular area at a particular time that do not interbreed to any substantial degree with any other group spawning in a different area, or in the same area at a different time [OAR, Division 7, 635-07-501(38)]. For example, "Millicoma River fall Chinook salmon" are a population.

**Evolutionary Significant Unit—**A group of populations that: 1) are substantially reproductively isolated from other population units of the same species, and 2) represent an important component in the evolutionary legacy of the species (National Marine Fisheries Service 1991). This term is used by NOAA Fisheries as guidance for determining what constitutes a distinct population segment for the purposes of listing Pacific salmon species under the ESA. For example, the "Oregon Coast coho ESU" is a delineation that encompasses all naturally spawned populations of coho salmon south of the Columbia River and north of Cape Blanco.

## Habitat Status

The following is a summary of the in-depth habitat status discussed in the 2003 Elliott State Forest Watershed Analysis (Oregon Department of Forestry 2003). In 1993, the ODFW, in collaboration with the ODF, began inventorying stream habitats in the Elliott State Forest (Oregon Department of Forestry 2003). Since the start of the program, habitat inventories have been completed for much of the extent of anadromous salmon distribution within the forest. These surveys measure instream habitat characteristics (pool size and depth, active channel width, amount of wood in the channel, and other attributes), streamside vegetation, and valley attributes (valley width and other factors) for a desired reach of stream. Habitat benchmark values developed by ODFW can be useful in evaluating current conditions, but should be used with caution. The ecological potential for a specific stream can vary depending on the ecoregion, geology, natural disturbance history, size, and other individual features.

Pool habitat is a useful indicator of aquatic habitat quality. A pool area of at least 35 percent of the total stream area is considered desirable by ODFW. In addition to percent pool area, pool depth and complexity factor into habitat quality. Within the Elliott State Forest, the Tenmile Basin has the highest quality pool habitats and is the only region that meets ODFW habitat benchmark. Limited amounts of large wood in stream channels contributed to the low pool area and complexity outside the Tenmile Basin.

Gravel substrate in stream channels is important for providing spawning habitat and creating scour pools. The ODFW benchmark for desirable amount of gravel in riffle areas is 35 percent. Most of the surveyed low gradient stream reaches in the Elliott State Forest are near this habitat benchmark. The wide channels of the West Fork Millicoma, where limited large wood exists to capture material, have minimal gravel retention. Many streams with an active channel width of less than 40 feet also lack in-channel large wood and have limited riffle gravels.

Large wood within the stream channel is important in creating zones of lower velocity water, gravel deposits, and pool habitat. These features benefit both fish and aquatic amphibians. Wood jams help trap gravel and cobbles that would otherwise move downstream unimpeded during high flows. These deposits are a preferred substrate for fish spawning and for the production of aquatic insects on which fish feed. Wood in streams can create zones of slower water that provide refuge for young fish during high flows. Deep pools created by woody debris jams are also important for summer survival, when low flows reduce the cover available to fish.

Hardwood dominated stands are common along fish-bearing streams in the forest and are likely more widespread now than in the past. Hardwood trees provide shade and leaf litter to the aquatic environment, but their ability to create the volume of large wood desired in forest streams is very limited. The lack of large riparian conifers reduces the ability of natural recruitment of instream LWD and the associated beneficial habitat features.

# Forest Health

Fire, windstorms, people, insects, and diseases constantly disrupt forests, injuring and killing trees and other living things. These disturbances are natural and necessary processes of the forest ecosystem, and in fact provide many important components of wildlife habitat. (More detail on these disturbances is provided above under the section "Ecology and Disturbance History.") However, when disturbances are more severe, frequent, or widespread than considered normal or acceptable, the forest is often described as unhealthy (Campbell and Liegel 1996).

Most definitions of a healthy forest are based on the premise that management objectives can be achieved only within the limits of an ecologically viable and sustainable ecosystem. The following concepts are common to most current definitions of forest health: 1) a healthy forest can vigorously renew itself across the landscape and recover from a wide range of disturbances; 2) a healthy forest provides for the human needs of values, uses, products, and services; and 3) a healthy forest provides a diversity of stand structures that provide habitat for many native species and all essential ecosystem processes (Campbell and Liegel 1996; Kolb et al. 1994; Stolte 1997).

Although comprehensive assessment of ecosystem health is beyond the scope of this FMP, several key indicators of ecosystem health and vitality can be evaluated. Key indicators of forest health include damage from biotic agents such as insects, diseases, and animals, as well as damage from abiotic stressors such as fire, weather extremes, and air pollutants. These disturbance agents kill trees or parts of trees, reduce tree growth, and may predispose trees to damage by other agents. The effects of these various disturbance agents are usually described in terms of number of acres affected, number of trees killed, degree of damage, or reduction in tree growth rates, all of which can be measured through various survey techniques. Evaluations must determine what level of change indicates a significant forest health trend within the context of normal and historical variability.

Restoring or maintaining forest health usually is accomplished through silvicultural manipulation of the forest at the stand or landscape level. Such manipulations can help sustain healthy productive forests and keep damage from native pests to acceptable levels. Non-native or "invasive" species often require special measures such as eradication, quarantine, or direct suppression.

## Current Condition

The current condition of the Elliott State Forest can be ascertained partially by examining long-term trends in damage from major disturbance agents. For example, the Elliott State Forest has not experienced the type of widespread deterioration that has occurred in eastern Oregon forests as a result of fire suppression and high-grade logging. However, substantial blowdown has occurred during periodic major winter storms.

Several diseases have reached noticeable levels of damage in recent decades. Swiss needle cast, the highly visible foliage disease of Douglas-fir, is causing serious growth

decline over a large area along the west slope of the Coast Range. In northwest Oregon, growth reduction is severe enough on some sites that the future of those stands is uncertain. In the Elliott State Forest, though Swiss needle cast affects some stands, it has not become severe enough to modify silvicultural activities. Laminated root rot, a native disease of conifers, has damaged Douglas-fir on some sites, but current management practices will stabilize or reduce unwanted effects of this disease. Black stain root disease has reached epidemic proportions in some locations in southwest Oregon, but is found infrequently in Douglas-fir in the Elliott State Forest.

Aerial and ground surveys conducted during the past 50 years show little evidence of major pest outbreaks in the Elliott State Forest. Currently, few insect problems occur in the mid- to late-successional Douglas-fir stands. The most significant pest is the Douglas-fir beetle, whose outbreaks follow major windthrow events. The Sitka spruce weevil (*Pissodes strobi*) continues to limit Sitka spruce management. Continued monitoring through aerial and ground surveys will provide early warnings of new problems, and gradually improve our ability to maintain a healthy forest.

## Sudden Oak Death

Sudden oak death, caused by the non-native pathogen *Phytophthora ramorum,* was found in late July 2001 near Brookings, Curry County, Oregon, killing tanoak (*Lithocarpus densiflorus*) and infecting Pacific rhododendron (*Rhododendron macrophyllum*) and evergreen huckleberry (*Vaccinium ovatum*). Sudden oak death is a new disease caused by a pathogen that was unknown prior to its discovery in California in 2000.

Sudden oak death infects many plant species. As of November 2005, 38 plant species have been confirmed as hosts of *P. ramorum,* and at least 46 additional plant species have been found naturally infected by the pathogen (but have not yet been confirmed as hosts by rigorous experiments). Plant species vary widely in their susceptibility to the disease. Tanoak is readily killed by the pathogen, while Douglas-fir and redwood suffer only dieback of small shoots. Many plants are considered foliar hosts because only the leaves appear susceptible to infection and damage. These foliar hosts, however, can produce spores and contribute to disease intensification. In Oregon forests, tanoak appears to be the most susceptible species and the most important in terms of disease intensification.

Sudden oak death spreads by means of microscopic spores that are produced on infected plants and released into the air under wet conditions. Spores of the pathogen can also be transported in infected plants or plant products, or in infested water or soil.

Since the discovery of sudden oak death in Oregon, state and federal agencies have been attempting to eradicate the pathogen. In 2001, nine disease patches totaling 40 acres were treated by cutting and burning all host plants within the disease patch and within at least 50 feet of its edge. As of December 2005, 50 sites totaling approximately 85 acres are undergoing eradication treatments. Although the pathogen has not been eradicated from Oregon forests, the treatments appear to have contained the pathogen to a relatively small area (12 square-miles) near Brookings. Extensive surveys throughout the tanoak forests of SW Oregon and elsewhere in coastal forests have failed to recover the pathogen.

Sudden oak death poses a significant but uncertain threat to Oregon's forest ecosystems. Continued research, monitoring, eradication, and regulation to prevent artificial spread on plant and wood products are essential to limiting disease impact. Currently a 12-square-mile quarantine area near Brookings is subject to state and federal regulations that restrict transport of plants and plant products.

## Swiss Needle Cast

Swiss needle cast (*Phaeocryptopus gaeumanni*) is a native fungal disease of Douglas-fir that occurs throughout the Coast Range and western Cascades. Until recently, the disease was of little consequence, causing premature shedding of three- and four-year-old needles. However, since the mid-1980s, several hundred thousand acres of Douglas-fir in the Coast Range have shown increasingly severe damage from this disease (Kanaskie et al. 2002). As of 2004, Swiss needle cast affects some stands in the Elliott State Forest, but it has not become severe enough to modify silvicultural activities.

Several hypotheses have been suggested to explain why this normally benign pathogen is causing severe damage to Douglas-fir. The most likely explanation is that management practices, in combination with a climate conducive to the disease, have shifted the ecological balance in favor of the pathogen. Much of the Sitka spruce and western hemlock zones have been planted to dense stands of Douglas-fir. Often, these plantations were established from seed collected farther inland and at higher elevations than native coastal stands. The combination of a favorable climate, an increase in the amount and density of Douglas-fir in coastal areas, and slightly off-site seed sources may have set the stage for rapid and efficient spread of the fungus. As a result, the pathogen population may have increased to levels that can overwhelm naturally occurring mechanisms of disease tolerance. Apparently, a delicate balance exists between the tree, the pathogen, and the environment.

Current management efforts to reduce the impact of Swiss needle cast are guided by a strategic plan developed by the ODF. Disease distribution and severity is monitored annually through aerial and ground surveys. ODF applies a range of silvicultural treatments, including planting species mixtures, thinning to encourage non-host tree species, pre-commercial thinning to maintain deep crowns, deploying genetically tolerant Douglas-fir, and converting severely infected stands and replanting with non-host species. Cooperative research efforts with OSU are underway to evaluate the effectiveness of a variety of silvicultural and chemical approaches to reducing impacts from the disease.

## Laminated Root Rot

Laminated root rot (*Phellinus weirii*), a native fungal disease that affects many conifer species, is the most widespread and destructive disease of Douglas-fir in the Coast Range of Oregon. On average, it affects approximately five percent of the Douglas-fir forest land, but the disease is distributed unevenly. Results from several surveys show that, in Southwest Oregon, including the Elliott State Forest, less than two percent of the

Douglas-fir, or mixed conifer types, are affected by this disease (Kanaskie and Baer 1994).

Laminated root rot causes tree mortality and growth loss, and predisposes trees to windthrow. Because the disease spreads from root to root and affects groups of trees, it commonly creates canopy openings of various shapes and sizes. These openings allow light to reach the understory, stimulating growth of herbs, shrubs, and tree species resistant to the disease (Holah et al. 1993). Trees killed by the disease provide snags and downed logs that benefit certain wildlife species. The increased diversity and benefits to wildlife partially offset the huge volumes of timber lost to this disease annually. Because the disease destroys major structural roots, laminated root rot can contribute to extremely hazardous situations in developed recreation sites.

Laminated root rot intensifies on a site when Douglas-fir or other highly susceptible species are planted into an infested area, and the fungus (which survives for decades in buried roots) grows from infected roots onto the roots of the newly established tree. The most susceptible host species are Douglas-fir, grand fir (*Abies grandis*), and mountain hemlock (*Tsuga mertensiana*). Western hemlock and noble fir (*Abies procera*) have intermediate susceptibility, pines and cedars are resistant, and hardwoods are immune to the fungus (Thies and Sturrock 1995).

Current management emphasizes planting or retaining resistant or immune species, and carefully designing silvicultural systems to prevent blowdown after thinning. The ODF Insect and Disease Section in Salem conducts root disease surveys on specific areas when requested by the district.

## Black Stain Root Disease

Black stain root disease, caused by the fungus *Leptographium wageneri*, was largely unrecognized in the Pacific Northwest before 1969. Since then, the disease has become widespread in Douglas-fir plantations in southwest Oregon. In this area, 25 to 50 percent of 10- to 30-year-old Douglas-fir plantations contain diseased trees, with mortality as high as 50 percent in some stands (Hansen et al. 1988). The ODF Insect and Disease Section surveyed the Elliott State Forest for black stain root disease in 1986 and 1993, and found that it occurred with very low frequency (Kanaskie and Irwin 1993).

Black stain root disease is transmitted over long distances by spore-carrying bark beetles and weevils. The disease typically appears in small patches. These disease patches are encountered most frequently in areas with severe soil disturbance, in dense stands that have been pre-commercially thinned, along roads, and in stands with a history of tractor logging (Hansen 1978, Goheen and Hansen 1978). The high frequency of black stain root disease centers in disturbed areas likely reflects insect preference for stressed or injured host trees. Thinning in mid-summer, avoiding site and tree damage, and favoring species other than Douglas-fir reduces the impact of this disease.

## Port-Orford-Cedar Root Disease

The Port-Orford-cedar root disease, caused by *Phytophthora lateralis*, threatens Port-Orford-cedar and, to some extent, Pacific yew in Southwest Oregon and northern California. Port-Orford-cedar occurs in some of the scattered tracts south of the Elliott State Forest's main block, but it has not been documented on the main block of the Elliott State Forest. The 1993 survey for black stain root disease did not reveal any Port-Orford-cedar in the areas surveyed. Pacific yew does occur as scattered individuals in the Elliott State Forest. As a result of the root disease, Port-Orford-cedar was once considered for candidate status under the state and federal ESAs, but was never listed.

Port-Orford-cedar root disease is caused by a non-native soil- and water-borne pathogen that can be transmitted in moving water and by logging machinery, vehicle traffic, and human and animal traffic. Its presence or absence in a drainage can significantly affect forest management. Because its natural range reaches the southern boundary of the Elliott State Forest, it can potentially be replanted in the Elliott State Forest in low risk areas away from infected drainages. Genetically resistant seedlings are available for deployment. Special management guidelines will be necessary if the district plans Port-Orford-cedar regeneration.

## Armillaria Root Disease

Armillaria root disease is far less abundant and damaging than laminated root rot, but occasionally causes significant damage in young Douglas-fir plantations. Root disease surveys show that, in the Oregon state forests, armillaria is widely scattered and occurs in very small patches, usually affecting only a few trees. Scattered dead trees from armillaria have a positive value for wildlife habitat.

Damage appears most severe in even-aged plantations and on severely disturbed sites. Tree stress, which can result from poor planting, inappropriate seed source, soil compaction, or nutrient imbalance, generally predisposes trees to damage by armillaria (Shaw and Kile 1991, Hadfield et al. 1986), but vigorous, rapidly growing trees can also be attacked and killed (Rosso and Hansen 1998).

## Hemlock Dwarf Mistletoe

Hemlock dwarf mistletoe (*Arceuthobium tsugense*) is the only dwarf mistletoe that occurs in the Elliott State Forest. The principal host is western hemlock, but several true firs can also be damaged. Dwarf mistletoes are flowering seed plants that parasitize conifer trees by growing root-like structures directly into tree branches. They extract nutrients and water from host trees and cause mortality, growth loss, deformation of tree form and crown structure, and reduced seed production. Although birds and mammals can carry the sticky mistletoe seeds a long distance, most spread occurs when seeds are cast from infected overstory trees onto susceptible understory trees (Hawksworth and Wiens 1996).

In heavily infested stands, hemlock dwarf mistletoe can reduce wood volume to as little as sixty percent of normal. Infected trees are predisposed to damage from other stressors such as drought and bark beetles (Weir 1977). Hemlock dwarf mistletoe also provides

food and habitat for certain wildlife species. For example, marbled murrelets are known to nest on hemlock branches deformed by dwarf mistletoe.

Because dwarf mistletoes are parasitic plants that require a living host to survive, clearcutting has been an effective control measure. Clearcutting, large fires, and short rotations have reduced occurrence of hemlock dwarf mistletoe on much of the Elliott State Forest. Long rotations and partial cutting may increase the abundance of hemlock dwarf mistletoe (Parmeter 1978).

## Other Diseases and Insect Pests

The following diseases and insect pests are also present in the Elliott State Forest.

- **Annosum Root Disease—**Western hemlock and grand fir are the principal hosts, with the most significant damage occurring on western hemlock. Most annosum decay is associated with tree wounds. Commercial thinning or partial cutting increases the potential for annosum. The disease may increase as thinning intensifies and stand ages increase.
- **Stem Decay—**In old-growth stands, decay organisms cause tree death or breakage, creating gaps in the canopy and providing rotten wood and hollow logs for wildlife. In areas with extensive young stands, the main concern may be the lack of decay and defect and its likely effect on wildlife and ecosystem processes.
- **Douglas-fir Bark Beetle—**In western Oregon, the Douglas-fir bark beetle usually infests windthrown or diseased Douglas-fir trees. When a major windstorm occurs, the large supply of high-quality Douglas-fir breeding logs allows beetle populations to increase tremendously. Unless the large (more than 12 inches in diameter) windthrown Douglas-firs are salvaged rapidly or treated with the beetle-repellent methylcyclohexanone, a bark beetle outbreak can occur when the emerging brood attacks nearby standing green trees.
- **Spruce Weevil—**The Sitka spruce weevil is an important pest of Sitka spruce regeneration in coastal Oregon. It causes significant damage to young, open-grown Sitka spruce. Research now suggests that a combination of stocking control, genetic resistance, and site selection may reduce the impact of weevil infestations.
- **Spruce Aphid—**Spruce aphid infestations cause premature loss of older needles in Sitka spruce, and eventually kill branches or the entire tree. Much of the spruce decline visible along the Oregon coast is attributable to the spruce aphid.
- **Noxious Weeds—**Noxious weeds are an emerging problem on forest lands. Invading non-native plants compete with native vegetation, and can significantly alter ecosystems. Spotted knapweed, gorse, and many other species are present in western Oregon forests (Campbell et al. 1997).
- **Black Bears—**Black bears (*Ursus americanus*) peel and eat the bark of young conifers, especially Douglas-fir, in spring when bark is succulent and sugar

content is high. They damage some trees and kill others. Bear damage typically occurs in Douglas-fir stands that are 16 to 25 years old, often soon after stands have been thinned (Kanaskie et al. 1990, 2001).

- **Animal Damage—**In addition to bears, other animals that are known to damage forest trees include mountain beavers, deer, elk, porcupines, gophers, and river beavers. Damage from these animals can be locally severe.

## Drought, Freezes, Windthrow, and Other Non-Biological Factors

Severe windstorms, droughts, and freezes can kill many trees. The ODF expects at least several of these events over the life of a stand. Isolated fragments of conifer stands, set aside for threatened and endangered species, will be particularly susceptible to windthrow. Windfall is minimized when sound trees, free of root disease, are left along cutting lines.

The historical record for the Elliott State Forest from the 1950s to the 1960s shows substantial amounts of blowdown following major winter storms. Because of the soil types and steep slopes in the Elliott State Forest, blowdown is likely to recur.

Periodic cold snaps have caused extensive browning of many conifers in the Coast Range, but the long-term effects have been generally minor. Low temperatures can also cause top-kill of conifers. Damage from abiotic stresses tends to be greatest when tree genotypes or species are poorly suited to their local environment.

# Geology, Topography, Soils, and Geotechnical Issues

## Geology

The Elliott State Forest is located in the southern portion of the Oregon Coast Range physiographic province. The formation of the underlying rocks of the Coast Range province began during the early Eocene period, approximately 50 million years ago. The deep marine basin present at that time received massive quantities of sediment from the ancient Klamath Mountains located at the basin's southern end. The Tyee formation, which underlies most of the Elliott State Forest, is believed to have been formed from massive underwater landslides. When this material settled, the heavier sand was deposited first, and then covered by the finer silt and clays. This process created the layered siltstone over sandstone rock that is visible in many of the deeper road cuts in the Elliott State Forest. Subsequent periods of marine deposition, tectonic uplift, sea-level changes, and erosion have created the landforms visible in the Elliott State Forest today.

The sandstone beds may be more than 50 feet thick, alternating with siltstones and mudstones that vary from lenses (thin layers) to several feet in thickness. The sedimentary rocks tend to weather and decompose when exposed to air and water, and therefore have extremely limited potential for aggregate. Sedimentary beds are normally gently dipping with less than 10 degrees slope. Igneous rocks, which originate from lava flows or other molten rock, are uncommon in the Elliott State Forest, although some marine igneous rocks occur on private lands just south of the forest. Igneous rocks that provide good aggregate are not found in the Elliott State Forest. Rock formations in the Elliott State Forest are moderately jointed and fractured. Groundwater flow through these formations is highly variable, and aquifers generally are unreliable for significant well water production.

## Topography

The topography in the Elliott State Forest is generally rugged and highly dissected with steep, narrow canyons, although the southeast part of the forest is less steep. The dissected landforms contain many ridges and swales. Across the forest, slopes face in all directions, with no dominant exposure. Elevations range from near sea level to 2,100 feet above sea level.

The major rivers and streams are in narrow valleys, bordered by steep side slopes. The gradients on the side slopes commonly exceed 65 percent. The valley bottoms were formed by alluvial deposits, and are gently sloping. Steep colluvial basins, sometimes called headwalls, are fairly common across the Elliott State Forest. The colluvial materials include soil and debris that have been moved downslope by gravity and biological activity. The many small stream channels in the forest generally begin some distance downslope from the headwalls.

The forest lies between six and twenty miles from the Pacific Ocean. The Umpqua River borders the northeast part, and the West Fork Millicoma River flows through the south and southeastern parts of the Elliott State Forest. Loon Lake is on the eastern border and Tenmile Lake is to the west of the Elliott State Forest.

**Key Terms**

**Aggregate—**Small rocks used in building forest roads.

**Alluvial—Soil** and similar materials that were transported and deposited by running water.

**Colluvial—Soil**, debris, and other materials that have been moved downslope by gravity and biological activity.

**Debris Flow—**A rapidly moving mass of rock fragments, soil, and mud; more than half of the particles are larger than grains of sand.

**Debris Torrent—**Rapid movement of a large quantity of materials, including wood and sediment, down a stream channel. This generally occurs in smaller streams during storms or floods, scouring the stream bed.

**Dissected—A** landscape that has been cut into hills and valleys by the process of erosion.

**Geotechnical—**The study of soil stability in relation to engineering.

**Leave Area—**An area of standing timber retained among areas of logging activity to satisfy management objectives, such as seed source, wildlife habitat, or landscape management constraints.

**Morphology—**Form and structure.

**Site Class—**A measure of an area's relative capacity for producing timber or other vegetation. (See the discussion under "Timber" later in this chapter for details on site classes.)

**Site Index—**A measure of forest productivity, expressed as the height of the tallest trees in a stand at an index age. In this document, an age of 50 years is used. (See the discussion under "Timber" later in this chapter for details.)

**Tectonic—**Resulting from changes in the earth's crust.

## Soils

Soil is a complex material made of decomposed and fragmented mineral rock, water, chemicals such as plant nutrients, organic material, and air and other gases in the spaces between mineral grains. The organic material consists of living, dead, and decomposed plants and animals. The soil is formed by the combined influences of bedrock geology, time, climate, topography, and especially biologic activity. Forest site productivity is controlled by the soil depth, soil porosity, soil biology, and availability of water and nutrients in the soil.

The soils in the Elliott State Forest are composed of several different soil series. Approximately 83 percent of the forest soils are residual soils. Alluvial soils compose a small percentage of the land, and are found in river terrace areas. Agricultural land, rock outcroppings, lakes, ponds, and rivers constitute approximately one percent of the land. Most of the Elliott State Forest is Site Class II or III, indicating that trees reach heights of 95 to 134 feet at the age of 50 years (King 1966).

On the steeper slopes, away from channels and colluvial basins, soil depth typically varies from one to three feet. These soils tend to be gravel and sand dominated, contain more silt and clay-sized particles, and are usually well drained. In colluvial pockets, soil depth typically varies from three to eight feet. These soils are poorly sorted, contain more silt and clay than other steep slope soils, and are often relatively poorly drained.

Benches have been created in several ways. They occur at old geomorphic weathering surfaces, called valley stages, or as a result of large-scale slope movement, or in areas where harder rocks resist erosion. Soils in benches may be deep with well-developed soil profiles, especially when the soils are well drained. Other benches have poorly drained soils with the water table near the surface.

Along streams, alluvial deposits are fairly common. These materials are typically well-sorted sands, gravels, or coarse silts, though drainage characteristics are highly varied. Clays are uncommon.

Three different organizations have produced soil maps that include the Elliott State Forest: the Soil Conservation Service, the Bureau of Land Management (BLM), and the Weyerhaeuser Company. The maps each use different soil names, which create difficulty in coordinating between the maps. A soil key of Coos County has been created, which helps in this coordination.

The ODF inventory and planning departments use the Soil Conservation Service Survey of the Elliott State Forest. The soil series and slope steepness were mapped into polygons to show the soil components, depth, and productivity. The Soil Conservation Service Survey Book is on file at ODF offices in Salem and Coos Bay.

## Geotechnical Issues

Slope movements or landslides are the predominant landform-altering agent in the Oregon Coast Range. They "...constitute a major natural process of erosion and a source of downstream sedimentation from sloping terrain in the Pacific Northwest" (Swanson 1978). Generally, slope movements in the Elliott State Forest's steep terrain are classified as debris flows. Often these flows start in or enter the steep V-shaped channels characteristic of the forest, and become debris torrents. For the remainder of this discussion, the term landslides will be used to include all types of slope movements.

Forest management activities such as road building and timber harvest potentially can trigger slope movements, although this potential can be minimized with good management practices. Slope movements can have negative effects on forest resources such as soil productivity, water quality, and fish habitat. The prevention of slope movements is a major geotechnical consideration in planning management activities.

The winters of 1995-1996 and1996-97 were the last winters with extremely heavy rains in the Coast Range. As a result of those storm events, the ODF published "Storm Impacts and Landslides of 1996" (Robison et al. 1999). Among other findings, the study revealed an increase in the rate of landsliding on very steep slopes in three of the four study areas in recently clearcut harvested units (interestingly, recently harvested stands in the Elk Creek area showed a lower landslide rate relative to the 100+ year age class). The study also revealed that forested areas in the 10 to 100-year age class experienced a lower landslide rate than that found in mature forest stands. Also, according to the study, the incidence of road-associated landslides was lower than in previous studies; this led to the conclusion that current road management practices are reducing the size as well as the number of landslides.

Research and monitoring, including the ODF landslide study, "Storm Impacts and Landslides of 1996" (Robison et al., 1999)~~,~~ has documented that small Type N streams in steep terrain contribute significant amounts of large-diameter wood (greater than 24 inches) to fish-use streams. It has also been established that the lack of large wood in stream systems can be a contributing factor to the degradation of fish habitat

Reeves et al. (2003) studied the sources of large wood in Cummins Creek, a fourth-order watershed in the Oregon Coast Range. They found that 65 percent of the number of pieces and 46 percent of the estimated volume of wood originated from upstream sources delivered by landslides or debris flows more than 300 feet from the channel. The remainder of the wood originated in streamside sources immediately adjacent to the channel. Wood from upstream areas constituted the majority of wood found between the bank-full channel width and below the surface level of water at bank-full flow. Reeves et al. (2003) also state that 25 percent of the wood was in aggregates (log-jams), which were formed mostly from wood originating in the upstream areas.

Landslide effects may be either on site or off site (downslope). On-site effects generally are limited to the landslide initiation site. Often, the soil has been completely removed at the initiation site, causing a loss of soil productivity. Off-site effects include changes to stream channel morphology, and riparian vegetation, and redistribution of stream bed materials. Water quality may be temporarily degraded, as suspended sediments and bedloads increase. Landslides generally have short-term negative effects on fish habitat. Over the long term, inputs of LWD and gravel are an important mechanism to sustain and improve fish habitat (Everest and Meehan 1981).

The goal of the geotechnical program in the Elliott State Forest is to minimize landslides induced by forest management practices. These can be divided into two categories: road-related landslides and management-related landslides.

## Road-Related Landslides

Many road design practices can substantially reduce the incidence of road-related landslides. These practices are used routinely in the Elliott State Forest. Roads are designed to fit the topography as much as possible, using ridge top locations, steep grades, and minimum widths. On extremely steep slopes, all material excavated from the

road is hauled to a stable location. Road cross-drains are located judiciously. Sites unsuitable for road location are avoided.

Currently, most road-related landslides start from forest roads built before truck hauling of excavated material became a standard practice. One goal of the Elliott State Forest's aggressive road maintenance program is the prevention of sidecast failures from roads built with outdated construction practices.

Generally, road-related landslides tend to be larger than other types of landslides, and therefore produce the most off-site effects. Reducing the number of landslides caused by roads is an important goal in the Elliott State Forest. The district's program of road design, construction, and maintenance practices has proved successful in achieving this goal (Sessions et al. 1987).

## Management-Related Landslides

Management practices that reduce soil disturbance are prescribed for harvest units with high landslide hazard locations. High landslide hazard locations are identified in the annual operations planning process, and the risk to downslope resources from a landslide is evaluated.

Foresters in the Elliott are trained in high landslide hazard location identification. The geotechnical specialists participate in the annual operations planning process, and are available to review operations where slope stability is a concern. Harvest practices in the Elliott are conducted with the intent of minimizing site disturbance, and providing a source of large wood in potential debris torrent tracks for aquatic habitat.

Various hypotheses explain the relationship between timber harvest and in-unit landslides. Root strength, site disturbance, and loss of tree canopy are mentioned as possible causes of landslides. On the nearby Mapleton District of the Siuslaw National Forest, "headwall leave areas" have been prescribed as a way of preventing in-unit landslides. A study by the Coastal Oregon Productivity Enhancement program (Skaugsett et al., 1992) inventoried 276 headwalls in the central Oregon Coast Range, including forested, clearcut, and leave areas. The study actually showed a higher rate of landslides from the leave areas. The authors speculate that headwall leave areas may be more susceptible to windthrow, or that the headwalls selected as leave areas may be inherently more unstable than headwalls where logging is allowed.

# Land Base and Access

In this section, the Elliott State Forest lands are described in terms of land ownership, administrative organization, and access.

## Land Ownership

State forest lands include CSFLs and BOFLs. The State of Oregon acquired the two types of land in different ways, and the two types are owned by different entities within state government. The CSFLs are owned by the State Land Board, and the BOFLs are owned by the BOF. Figure 2-1 shows the breakdown of land ownership in the Elliott State Forest. Each land ownership has its own set of legal and policy mandates. These mandates are discussed in Appendix D, "Legal and Policy Mandates."

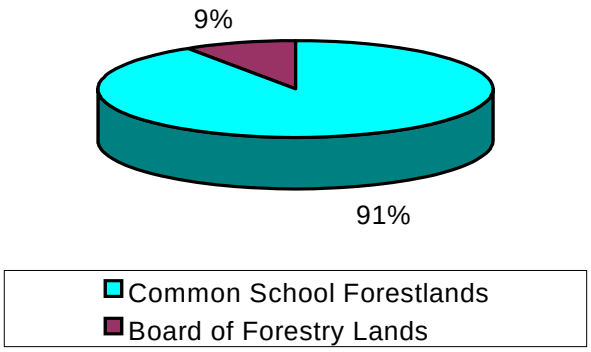



**Figure 2-1. Elliott State Forest Land Ownership**

The planning area includes 97,022 acres of state forest land. Of this total, 87,934 acres (90.6 percent) are owned by the State Land Board, and 9,088 acres (9.4 percent) are owned by the BOF.

## Administration

For administrative purposes, the ODF divides Oregon into districts. District foresters and their staffs carry out all field activities of the ODF in their respective section of the state. This FMP covers all state forest lands managed by the Coos District.

ODF districts are organized into regional areas. As shown in Figure 2-2, the Southern Oregon Area staff provides management oversight, long-range planning coordination, and professional resource specialist support to four districts and the Phipps Forest Nursery. Professional and technical support includes geotechnical engineering services,

forest planning coordination, wildlife biology consultation, and radio system maintenance and repair.

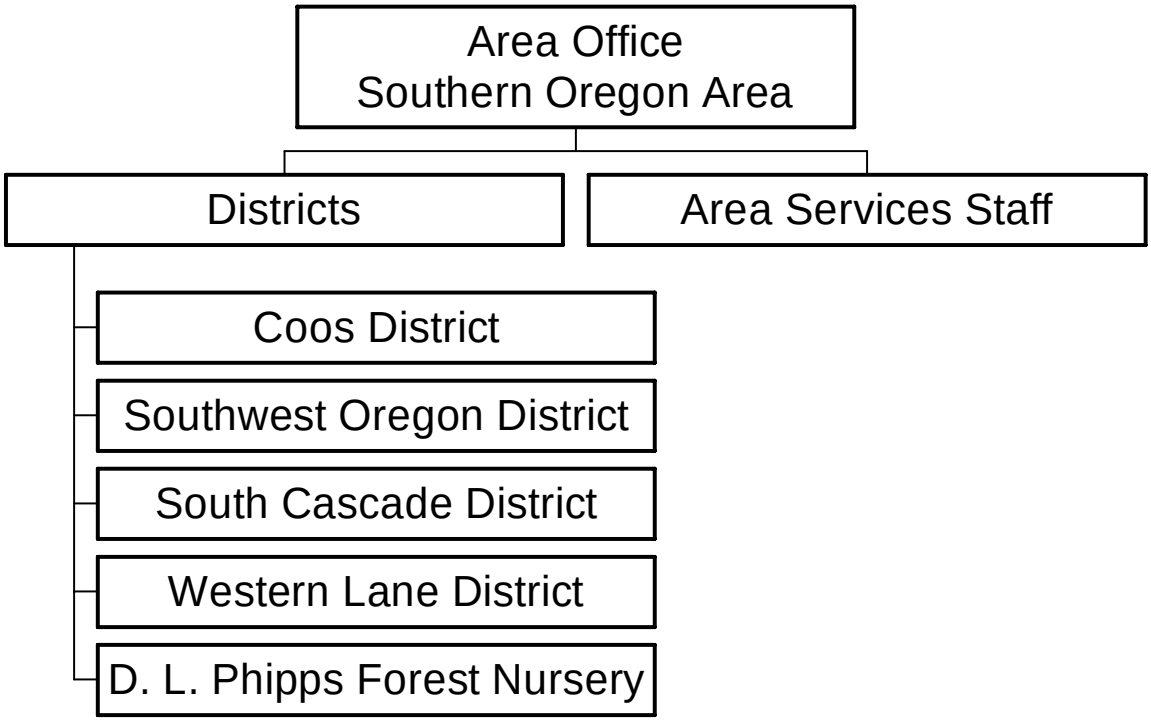



**Figure 2-2. Management Organization**

## Management

In addition to the management provided by the district and area staff, state forest management is supported by the state forests program staff in Salem. Under the leadership of the state forests program director, the program staff provides overall program policy direction; liaison with other agencies and organizations; department-wide planning and program support; specialized expertise in biological, technical, and legal areas; business management; and fiscal accounting. The program staff carries out the forest management and business management functions that provide benefits through economies of scale and a consistent approach across all state forests.

The state forests program operates almost entirely on program-generated revenue, with minor amounts from cost-share grants, mostly in the recreation management program. The primary source of revenue is the sale of forest products, mainly timber. Because the program is almost wholly self-supporting, careful financial management is imperative. On BOFLs, 63.75 percent of the gross revenues is returned to the specific county in which the revenue was generated. The remainder goes to an account that is legally dedicated for the management of the forestlands.

On CSFLs, the net revenue (gross revenue minus management costs) is dedicated to the CSF. Historically, costs have averaged approximately one-third of the gross revenue. Thus, all of the management activities for both BOFLs and CSFLs are accomplished on approximately one-third of the gross revenue produced.

Financial management of the program is accomplished in two primary ways:

- Revenue and expenditure planning, accomplished through revenue forecasting, and biennial and fiscal budgeting
- Revenue accounting and expenditure monitoring, accomplished on both a fiscal and biennial basis

The FMP and district IP are the primary mechanisms for financial management planning, because they identify the appropriate types and levels of management activities that accomplish the legal mandates for managing the lands. Through the biennial budgeting process, these specific activities are translated into resources required to implement the plan. Detailed annual operations are then reflected in the fiscal budgets. Biennial and fiscal budgets are prepared for the program staff in Salem, the Southern Oregon Area staff, and for the four districts and the Phipps Forest Nursery.

Revenue forecasting is conducted at the district and program staff levels on a periodic basis, to ensure that revenue flow is adequate to support planned activities. Expenditure and accomplishment monitoring is performed at the district, area, and program levels on a monthly and quarterly basis to ensure that actual expenditure levels are consistent with projected levels from fiscal and biennial budgets.

As part of the current planning process, all resources have been assessed for their revenue potential. For the foreseeable future, timber will remain the largest source of direct revenue generation. Alternative revenue sources will continue to be examined and analyzed. The state forests' high-quality water resources, fish and wildlife habitats, and diverse recreational opportunities will continue to produce important community and regionally based revenues and income.

## Land Base Designation

By administrative rule (OAR 629-035-0040), all state forestland is designated either as silviculturally capable of growing forest tree species or not capable of such growth. A computer-generated map depicts the capability of the lands to grow trees. This map is merely descriptive, and does not propose a land use strategy.

## Land Management Classification

A 1998 administrative rule (OAR 629-035-055) requires the State Forester to classify all forestlands according to the types of management that will be applied, the appropriate range of management activities, and the forest resources addressed. Land management classification describes the management emphasis for parcels of state forestlands, as determined by FMPs and any applicable HCP. The system identifies when a particular forest resource may need a more focused approach, or possibly an exclusive priority, in

management. State forestlands will be classified into one of three classifications: General Stewardship, Focused Stewardship, or Special Stewardship.

**General Stewardship—**Lands where forest resources are managed using integrated management practices, and for which resource management goals are compatible over time and across the landscape. All resources addressed in the FMP will be managed. All resources may not be treated equally on every acre, but across the landscape, management will meet the goals identified in the plan.

**Focused Stewardship—**Lands are managed using integrated management practices, for a specific resource or resources, an FMP, HCP, or legal requirement that identifies the need for supplemental planning, modified management practices, or compliance with specific requirements. Management of specific forest resources may have minor effects on the management of other resources, but will not preclude integrated management. Focused Stewardship lands will be further classified into one or more of the following subclasses: Agriculture, Grazing, or Wildlife Forage; Aquatic and Riparian Habitat; Cultural Resources; Deeds; Domestic Water Use; Easements; Energy and Minerals; Plants; Recreation; Research/Monitoring; Transmission; Visual Resources; and Wildlife Habitat. An example of Focused Stewardship might be an area with scenic values, where visual activities are protected during and after forest management activities. This consideration could affect harvesting systems, the size and location of harvest units, or road locations.

S**pecial Stewardship—**Lands in which one or more forest resources require a level of protection that precludes integrated management of all resources; where a legal or contractual constraint dominates the management of the lands; or where lands are committed to a specific use, and management activities are limited to those compatible with that use. Special Stewardship lands are classified as one or more of the following subclasses: Administrative Sites; Agriculture, Grazing, or Wildlife Forage; Aquatic and Riparian Habitat; County or Local Comprehensive Plans; Cultural Resources; Deeds; Domestic Water Use; Easements; Energy and Minerals; Operationally Limited; Plants; Recreation; Research/Monitoring; Transmission; Visual Resources; and Wildlife Habitat. An example of Special Stewardship land might be the area surrounding a nest tree of a threatened or endangered species.

Land management classifications will be displayed on maps. For the purpose of protecting threatened and endangered species, as well as some cultural resource sites, some specific locations will not be displayed on classification maps. Instead, broader geographic areas within which the sites exist will be displayed. Exact locations of boundary lines will be determined on site and will depend on site conditions. More than one classification or subclass may be assigned to a parcel of land.

The goals and strategies in the FMP and HCP determine the management of key resources. The identification and mapping of land management classifications will be based on criteria in the plans. Information will be updated through watershed analysis and site-specific monitoring and field visits.

Public involvement is an important component of the land management classification process (described under the “Public Involvement” section of Chapter 6, in the

subsection, “Public Involvement in District Implementation Plans and Annual Operations Plans”).

## Management Basins

The Elliott State Forest consists of 14 management basins that vary in size from 3,740 acres to 11,314 acres. The 13 management basins in the main block of the Elliott State Forest include the non-contiguous Sock Creek, Ash Valley, and School Land Bay tracts. Streams from these tracts drain into the watershed of the management basin to which they have been assigned. Approximately 3,740 acres of forest lands are scattered throughout Coos, Curry, and Douglas counties. These scattered tracts are collectively identified as the 14$^{th}$ basin. Table 2-2 lists the management basins and total acres in each. These management basins have varying resource considerations. The management basin boundaries were determined based on the following criteria:

**Size Similarity—**This criterion helps to ensure that habitat is well distributed throughout a basin and the forest.

**Compatibility with Watershed Analysis—**This criterion ensures that the basin organization, size, and boundaries are well-suited to conducting watershed analysis.

**Consistency with HUC Boundaries—**This allows the aggregation of basins as needed into sixth and fifth field Hydrologic Unit Codes (HUCs), which may be important for compatibility of monitoring, analysis, and research with other agencies or organizations.

The sixth field is the smallest watershed division of the recognized federal system for delineation of hydrologic unit boundaries. This system, originated in the 1970s by the USGS, is designed to result in a nationally consistent database of hydrologic units. Consistency with HUC boundaries allows the exchange and analysis of information with other organizations. For example, ODFW used sixth field HUCs to delineate priority watersheds for salmonids.

**Table 2-2. Elliott State Forest Management Basins**

| Basin Number | Basin Name | Basin Acres |
|---|---|---|
| 1 | Mill | 5,356 |
| 2 | Charlotte-Luder | 6,422 |
| 3 | Dean Johanneson | 7,296 |
| 4 | Scholfield | 4,990 |
| 5 | Big Creek | 7,823 |
| 6 | Benson-Roberts | 7,417 |
| 7 | Johnson Creek | 6,322 |
| 8 | Palouse Larson | 6,541 |
| 9 | Henry's Bend | 8,284 |
| 10 | Marlow-Glenn | 6,512 |
| 11 | Millicoma Elk | 10,873 |
| 12 | Trout Deer | 11,314 |
| 13 | Ash Valley | 4,132 |
| 14 | Scattered Tracts | 3,740 |
| | TOTAL | 97,022 |

The seventh field HUCs were delineated by the Coastal Landscape Analysis and Modeling Study to model the economic, social, and environmental effects of forest management on coastal Oregon. This level of division is not described in the national system at this time, but it may be the next logical subdivision of the sixth field HUCs.

For the most part, the basins meet the HUC criteria. However, some very small tracts along the outer boundary of the Elliott State Forest are included in an adjacent management basin, although they are in a separate sixth or even fifth field HUC.

**Alignment with Guiding Principles—**The FMP is aligned with the guiding principles found in Chapter 3. For example, one guiding principles states that this is a goal-driven plan rather than an issue-driven plan. The management basins were selected on physical boundaries based on watersheds rather than organized for a particular issue. Watershed analysis uses the management basins to evaluate natural processes and human influences on those processes. This helps managers focus on ways to achieve the goals in the plan rather than on separate issues and concerns.

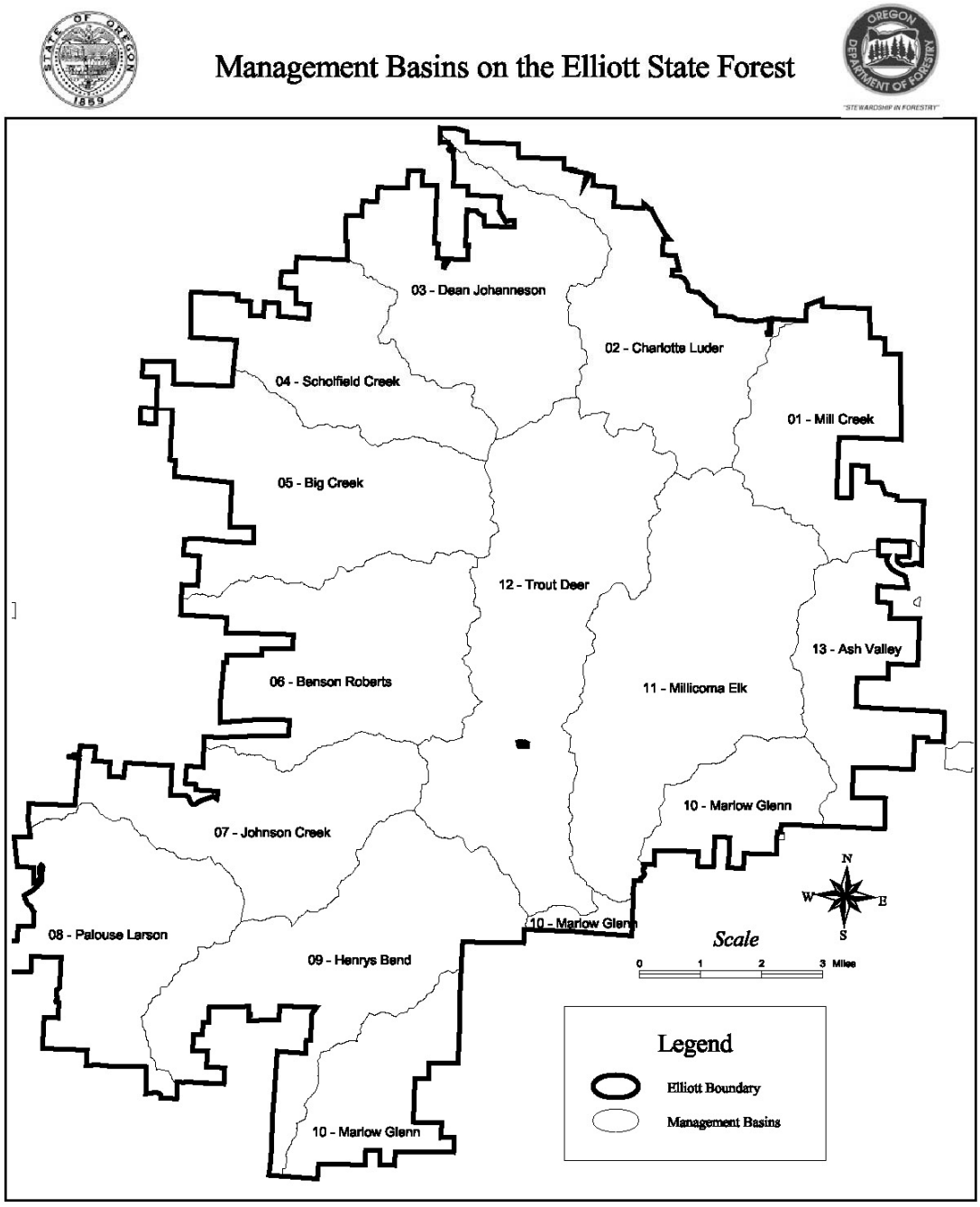



**Figure 2-3. Management Basins in Elliott State Forest**

## Current Programs for Land Acquisitions and Exchanges

Oregon law gives the BOF the authority and means (through the ODF) to acquire forest land by "purchase, donation, devise or exchange." Any acquisition of forest land must be approved by the board of county commissioners in the county in which the lands are located. The BOF recently reaffirmed its policy that the ODF will actively pursue acquisitions and exchanges as a means of consolidating state forest lands for management efficiencies, economic values, or enhanced stewardship practices.

The purpose of acquiring and exchanging land is to increase the amount of state forestland and/or to consolidate state forestlands in contiguous blocks, rather than in scattered parcels. The consolidation of state forest lands will increase management efficiencies and long-term economic values, and will enhance stewardship practices and other forest resource values.

## Access

The access system for state forestlands is composed of state highways, county roads, private and state forest roads, and navigable waterways. The state forestland access system is necessary to achieve forest protection and management goals, as well as to provide public access. State forest roads are a resource, and represent large, long-term capital investments. They must be maintained in usable condition, with minimum impacts on other resources such as water quality, soil, and wildlife.

### State Highways and County Roads

The public road system of state highways and county roads provides the initial access to state forestlands. When state highways cross significant stretches of state forestlands, the scenic qualities of views from the highways are protected in accordance with the FPA, appropriate land management classifications, and integrated resource management. County roads that cross large blocks of state forest land are considered an integral part of the forest road system in that area.

### Roads on State Forestlands

Roads on state forestlands are used to access timber sales, special forest products, and forest management activity sites. They also provide access for fire suppression and recreation. For most Elliott State Forest lands, the main road system is essentially complete. However, additional spurs will still be needed to access future timber sale units.

Most roads identified as being suitable for decommissioning have been decommissioned. Most drainage structures identified as being impediments to fish passage have been removed or replaced.

Roads are built or improved as projects on timber sales. They are designed and constructed to standards that provide for good road maintenance and safe log

transportation. Main access roads are surfaced with rock to provide for all-weather use and to minimize effects from rainfall and runoff. Secondary spur roads are built to the same maintenance standards, but may have lesser specifications for width and surfacing. In many instances, secondary spurs are blocked off after a timber sale or other forest management activity is completed, to minimize disturbance for elk and deer and for other management reasons. These roads are still subject to road maintenance requirements, unless they are legally closed or decommissioned by removing culverts and providing necessary long-term drainage.

There are approximately 550 miles of roads on state lands in the planning area.

## Easements for Legal Access

A significant portion of state forestland is accessed by roads that extend through privately owned forest land. Legal easements are necessary to use these roads for the hauling of logs from timber sales or for other forest management activities. The ODF has acquired easements for many roads, and in some cases requires further acquisition of easements. Depending on the district's needs and the private owner's desires, easements can be temporary or permanent, and allow either public use or use only by the agency's employees and contractors.

## Current Access Management Programs

The ODF's policy on forest roads states that roads will be developed and maintained to provide access for the sale of timber and other forest products, timber management activities, protection from fire, and public access. It also states that forest roads will be designed, constructed, and maintained to meet or exceed rules of the FPA. These rules set construction and maintenance standards intended to protect water quality, forest productivity, and fish and wildlife habitat. In addition to establishing the policy, the ODF's *Forest Roads Manual* sets road standards, gives design guidelines, sets an excavation and appraisal policy, and provides a wide variety of specifications and costs (Oregon Department of Forestry 2000).

The Elliott State Forest roads and private roads with easements are maintained under a road maintenance contract or by contractors as a requirement of a timber sale contract. District personnel monitor road use, determine maintenance needs, and develop maintenance plans. These plans include road surface maintenance (grading and rock application); ditch, waterbar, and culvert maintenance; roadside vegetation control; storm monitoring; and damage repair.

# Plants

## Elliott State Forest, Main Block

The main block of the Elliott State Forest is located within the Oregon Coast Range Ecoregion. The precipitation levels and geology of the Coast Range render it unique among its neighbors, the Klamath Mountain and Willamette Valley ecoregions. These unique qualities result in an unusual combination of plants within the forest ecosystem. These plants provide habitat and forage, add organic matter to forest soils, and influence the microclimate. In addition to their ecological functions, some plant species such as salal and sword fern are harvested commercially. Commercial uses of understory plants are discussed in this chapter's section entitled "Special Forest Products," below.

The resource description focuses on threatened or endangered plants, as listed under the state ESA. Also included are plants on the state candidate list and special concern plants designated by the ODF. All four of these categories are combined into the heading of "rare plants."

No comprehensive assessments or basic systematic surveys for rare plants have been conducted in the Elliott State Forest. In the late 1990s, individual harvest units were surveyed for rare plants. The ODF has developed a base list of state-listed plants, using the Oregon Natural Heritage Program (ONHP) list of May 2004, with the assistance of the botanist from the local BLM.

Of the 25 species found in Coos and Douglas counties, only three plant species have habitat and ranges that coincide with the forest. Most of the potential species were eliminated because they occur only on serpentine soils (a soil type not found in the main block of the Elliott State Forest), high elevations, coastal dunes, or boggy areas in the dunes. Other potential species appeared to have similar habitat requirements to that found in the Elliott State Forest, but there have been no discoveries within this range (i.e., north coast to south coast). None of the three listed species are confirmed to be present in the forest, although they have been discovered within reasonable proximity on other ownerships.

The three species that are likely present on the main block are Bensonia (Bensoniella oregona), tall bugbane (Cimicifuga elata), and Howell's montia (Montia howellii). Bensonia has been found above 2,500 feet at Signal Tree, above Camas Valley. Tall bugbane is found in lowland Douglas-fir forests with maple and sword fern. There are known populations on adjacent BLM lands. Howell's montia is found on moist lowland areas in vernally wet sites.

These three species are on the state candidate list. The remaining plants have a low likelihood of occurrence on the main block of the Elliott State Forest, although the ONHP plant list is reviewed annually for updated information regarding changes in ranges and habitats.

The ODF is not aware of any other federally listed threatened or endangered plant species that are likely to occur on the main block of the Elliott State Forest.

### Rare Plants

*Bensoniella oregona* (Bensonia) Status: State Candidate

Found in wet meadows and moist streamside sites in Pre-Cretaceous meta-sedimentary rock at elevations above 2,500 feet. Known at Signal Tree above Camas Valley, the northern-most location with lowest elevation confirmed.

*Cimicifuga elata* (tall bugbane) Status: State Candidate

Found in lowland Douglas-fir forests with maple and sword ferns.

*Montia howelia* (Howell's montia) Status: State Candidate

Found in moist lowland areas, vernally wet sites, often on compacted soil less than 400 meters in elevation.

## Scattered Tracts

The scattered tracts of the Elliott State Forest are spread across Coos, Douglas, and Curry counties. The serpentine geology of Southern Oregon has a tremendous influence on the botanical biodiversity of the area. Thus, the number of potential listed species is greater on the scattered tracts than on the main block of the Elliott State Forest. There have been no comprehensive assessments or basic systematic surveys for rare plants on the scattered tracts. The following 29 plant species are on the state list of threatened, endangered, or candidate plants (Oregon Natural Heritage Information Center 2004), and have the potential to occur on the scattered tracts.

### Rare Plants

*Arabis koehleri* var. *koehleri* (Koehler's rockcress) Status: State Candidate

*Aster vialis* (Wayside aster) Status: Listed Threatened

*Bensoniella oregona* (Bensonia) Status: State Candidate

*Calochortus coxii* (Cox's mariposa-lily) Status: Listed Endangered

*Calochortus howellii* (Howell's mariposa-lily) Status: Listed Threatened

*Calochortus umpquaensis* (Umpqua mariposa-lily) Status: Listed Endangered

*Lathraea clandestina* (purple toothwort) Status: State Candidate

*Cimicifuga elata* (tall bugbane) Status: State Candidate

| | |
|---|---|
| *Cordylanthus maritimus* ssp. *palustris* (Pt. Reyes bird's beak) | Status: Listed Endangered |
| *Cypripedium fasciculatum* (Clustered lady's slipper | Status: State Candidate |
| *Draba howellii* (Howell's whitlow-grass) | Status: State Candidate |
| *Frasera umpquaensis* (Umpqua swertia) | Status: State Candidate |
| *Gentiana setigera* (Waldo gentian) | Status: State Candidate |
| *Horkelia congesta* ssp. *congesta* (Shaggy horkelia) | Status: State Candidate |
| *Lasthenia macrantha* ssp. *prisca* (Large-flowered goldfields) | Status: State Candidate |
| *Lilium occidentale* (Western lily) | Status: Listed Endangered |
| *Limnanthes gracilis* var. *gracilis* (slender meadow-foam) | Status: State Candidate |
| *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine) | Status: Listed Threatened |
| *Meconella oregana* (White meconella) | Status: State Candidate |
| *Microseris howellii* (Howell's microseris) | Status: Listed Threatened |
| *Montia howellii* (Howell's montia) | Status: State Candidate |
| *Oenothera wolfii* (Wolf's evening-primrose) | Status: Listed Threatened |
| *Peridérida erythrorhiza* (Red-root yampah) | Status: State Candidate |
| *Phacelia argentea* (Silvery phacelia) | Status: Listed Threatened |
| *Plagiobothrys hirtus* (Rough popcorn flower) | Status: Listed Endangered |
| *Sidalcea malviflora* ssp. p*atula* (Coast checker bloom) | Status: State Candidate |
| *Strepthanthus howellii* (Howells streptanthus) | Status: State Candidate |
| *Triteleia hendersonii* (Leach's Brodiaea) | Status: State Candidate |
| *Viola primulifolia* (Western bog violet) | Status: State Candidate |

## Current Management

The ODF protects listed plant species in accordance with the state and federal ESAs. Known sites are mapped, and listed species that occur or are suspected to occur on state forests are identified. The lists are continually updated in consultation with the Oregon Department of Agriculture (ODA) (Oregon Natural Heritage Information Center 2004).

During plan implementation, the ODF will determine if listed species occur or are likely to occur on lands where management activity is planned. If so, the district will determine if the proposed action is consistent with the conservation program for the listed species established by the ODA.

# Recreation

## General Patterns of Recreation Use

Recreation use within the Elliott State Forest is concentrated in several small areas of the forest; the remainder of the forest has little recreation use. The heaviest use occurs on long holiday weekends in the summer, and during deer and elk hunting seasons in the fall. Most forest visitors are local residents who enjoy undeveloped and relatively unregulated nature of the forest, with little competition for favorite sites. Future demand will be moderate for the recreation activities currently popular in the Elliott State Forest.

### Camping

The Elliott State Forest provides numerous areas for dispersed camping along roads and streams. Popular areas include Elk Creek and the West Fork of the Millicoma River. Other sites are scattered throughout the forest, with widely varying use levels. The BLM operates and maintains the Loon Lake Recreation Area in the northeast corner of the Elliott State Forest on an 80 acre tract they own.. This recreation area is one of the more popular destination sites in the Reedsport vicinity, with an average of 70,000 to 80,000 visitors each year.

### Motorized Use (Off-Highway)

Some visitors to the Elliott State Forest use old skid roads and trails for preseason scouting and hunting in off-highway and four-wheel drive vehicles. Most people use existing roads, many of which have been blocked off to regular vehicle activity. Summer use of motorcycles and all-terrain vehicles also occurs.

### Non-Motorized Use

Horse riding, hiking, picnicking, and mountain biking activities occur across the forest, but in lower to moderate levels. Hiking and mountain biking trails have not been developed, as use is fairly infrequent.

### Fishing

Winter steelhead fishing is popular in the Elliott State Forest in the West Fork Millicoma River. The ODFW, through its Salmon Trout Enhancement Program, created an increase in steelhead fishing opportunities at the Millicoma Interpretive Center and below.

### Hunting and Shooting

Most recreational hunting in the Elliott State Forest occurs during the big game hunting season, which begins in late August and continues through January.

## Other Uses

A small number of people use the forest for other specialized activities. Kayakers use the West Fork Millicoma River, and sightseers use the Elliott State Forest's backcountry roads. School groups, universities, and forestry organizations also use the forest for various educational tours.

# Current Condition

Outdoor recreation opportunities are among the major reasons people visit Oregon (Oregon Tourism Commission 1998). Between 1994 and 1997, an average of 1.85 million outdoor recreation trips was taken in Oregon each year.

Nationally, outdoor recreation has increased at a fast pace. The greatest increase has occurred in the number of bird watching participants. The National Survey on Recreation and the Environment also noted significant increases in the number of participants in hiking, dispersed camping, off-road driving, and sightseeing; these activities have increased at rates of 40 to 94 percent. The survey highlighted declines in two activities during the same period: fishing and hunting. The number of fishing participants declined almost 4 percent, while hunting participants declined by 12.3 percent. There is common speculation that cultural shifts and a lack of access to hunting areas are the reasons for the decline in hunting participants.

Table 2-3 presents trends in statewide recreation use, including the yearly increases in specific recreational activities.

**Table 2-3. Statewide Recreation Use Trends**

| Activity | Percent Yearly Increase |
|---|---|
| Nature study/bird watching/food gathering | 8.5 percent |
| Hiking/walking/climbing | 8.9 percent |
| Camping | 5.5 percent |
| Off-road driving | 2.9 percent |
| Sightseeing/picnicking | 12.2 percent |
| Fishing | 4.9 percent |
| Hunting/shooting | 2.1 percent |

Source: Oregon Statewide Comprehensive Outdoor Recreation Plan, 2003.

SCORP reports that fishing, water activities, sightseeing, picnicking, and camping are the major outdoor recreation activities in the south coast region (Curry, Coos, and coastal Douglas counties). Six percent of all tourist trips in Oregon occurred in the south coast region (Oregon Tourism Commission 1998).

Other data from Oregon State Parks shows that camping is growing in popularity in the south coast region. Day use, however, has declined steadily since 1997. Recreation use,

as reported by BLM's Coos District for Loon Lake and Dean Creek, has remained fairly consistent, with gradual increases in the number of visitors at the Dean Creek elk viewing area.

## Implications

Regionally, the National Survey on Recreation and the Environment predicts that, with expected population growth (a 20.7 percent increase by 2010), increases will be seen in the number of participants in bird watching, hiking, dispersed camping, off-road driving, sightseeing, and fishing. Only hunting is expected to decrease, by 14 percent by 2010.

A narrower, statewide view of recreation use is presented in the Oregon Statewide Comprehensive Recreation Plan (SCORP) (Oregon Parks and Recreation Department 2003). SCORP notes bird watching, hiking, dispersed camping, off-road driving, sightseeing, fishing, and hunting as the top activities in the state. Similar to regional and national numbers, SCORP predicts significant growth in the demand for sightseeing, hiking, and nature study by 2010. SCORP further predicts that these activities will increase at a faster rate in Oregon than in the Pacific Coast region as a whole.

The national and regional trends indicate an overall decline in hunting activities. The trend toward less hunting must be considered in light of overall demographic changes. Because of increasing urbanization and general population growth, at both the national and regional levels, trends may be dominated by the activities of urban residents. The area surrounding the Elliott State Forest is largely rural, and it is likely that hunting will continue to be an important recreation use in the Elliott State Forest. However, hunting participation rates are not expected to grow at the same rate as other recreation activities.

Continued growth is expected in activities such as hiking, nature viewing, sightseeing, and dispersed camping. The Elliott State Forest could also support off-road driving, with careful management of other forest uses in potential conflict with that activity. Recreational use of the Elliott State Forest is expected to remain moderate because of the steep terrain, distance from major metropolitan areas, and relative lack of access.

# Scenic Resources

In 1988, a SCORP survey revealed that sightseeing (i.e., driving for pleasure) was the most popular outdoor activity in Oregon; 69.3 percent of the households surveyed indicated participation in that activity (Oregon Parks and Recreation Department 1988). The SCORP survey also showed that sightseeing was the fastest growing recreational activity, increasing at a rate of 12.2 percent each year.

The Elliott State Forest is on the remote southern Oregon coast. The nearest major city to the Elliott State Forest is Eugene/Springfield, approximately 76 miles to the northeast. The Elliott State Forest is a major part of the view along the Tidewater portion of the Umpqua River on Highway 38 in the Coast Range from milepost 6 to milepost 13.

## Current Condition

State Highway 38, adjacent to Elliott State Forest lands, is designated as scenic for the purpose of visual corridor management. The visually sensitive corridor is defined as the area within 150 feet of the outermost right-of-way boundary along both sides of the highway. Special rules apply to timber harvest in this corridor.

Two state forest land management classifications are used to designate areas for visual sensitivity. Where legal requirements or the management of visual resources dominates over the management of other resources, the lands are classified as Special Stewardship–Visual. Where management of visual resources allows for integrated management of other resources, but is subject to legal restrictions, supplemental planning, and/or modified management practices, the lands are classified as Focused Stewardship–Visual.

On private lands between the river and the Elliott State Forest, the lower Umpqua River along Highway 38 and its immediate visual foreground is protected either by Department of Transportation-owned scenic buffers or by scenic statutes and FPA rules. Some areas farther back from the highway, but still visible from the road, are considered mid-ground scenic areas and are designated as Special Stewardship–Visual. This means that harvesting is only allowed to enhance the visual characteristics of the forested landscape and/or viewshed. The background areas adjacent to these lands are classified as Focused Stewardship–Visual. Management activities for these areas are adjusted for visual considerations.

# Social and Economic Resources

The economic analysis of forest management became much more complex after 1990. Historically, timber harvest levels alone drove the economic analysis; however, currently, other resources, costs, and issues that focus on forest health, aesthetics, recreation, biodiversity, livability and other values play a more important role in the analysis. In Coos County, wood products still account for approximately 10 percent of personal income, as well as 17 percent of the employment in Douglas County. A change of 1 MMBF in timber harvest from the Elliott State Forest is projected to affect 11 to 13 jobs in southwest Oregon, with an average annual wage of $32,000. The Elliott State Forest Management Plan Revision: Connection to State and Local Economies (Lettman et al. 2001) provides a detailed description of current local and state economic conditions and information for analyzing the short-term economic consequences of forest plan strategies on local and state economies.

The analysis of that information is key to meeting the planning goals for the Elliott State Forest, and to presenting a comprehensive, integrated management approach that addresses the broad range of forest values. Management strategies for each commodity and amenity resource represented in the Elliott State Forest may have an economic effect on local and statewide communities. The following discussion presents highlights from the Lettman report.

## Oregon's Changing Economy

The state of Oregon has experienced significant population growth over the past 10 years. The economic boom of the 1990s is strongly correlated to population growth. During that time, high-tech industries led the state's strong economy, helping to attract a record number of 579,000 people to Oregon. This is a distinct departure from the upswing in population in the 1970s, which was caused in large part to the thriving lumber and wood products industry. The prosperous Oregon economy, along with the perception of Oregon's unsurpassed livability continues to attract people from out of state. Oregon's total population increased to 3,421,399 over the past decade.

Although the Oregon economy grew rapidly from 1987 through 1997, the state experienced an economic slowdown in overall population, employment, and personal income. After 1997, Oregon faced slow growth and likely recession, but forecasters predict that the average performance over the next few years will be better than the national average.

The lumber and wood products industry, although a declining force in the state's overall economy, is still a major provider of jobs and income, and will continue to have a considerable effect on state and local economies. Low product prices, mill mechanization, and decreased log availability all contribute to decreased employment and income in the manufacturing of primary wood products. Employment in the lumber and wood products industry fell from 69,000 jobs in 1988 to 46,000 jobs in 1996. In 2000, employment declined by an additional 3 percent, with the loss of another 1,300 jobs. By

2007, less than 3 percent of Oregon workers are projected to remain in the wood products industry.

Timber harvesting has declined to less than half of historical levels. Most of this decline has resulted from the smaller amount of public land available for timber management and decreased timber sale volumes from federal forests. Harvests from private timberlands have also declined.

Fishing has always been an important part of Oregon's economy. However, because of unfavorable ocean conditions, deteriorating spawning habitat in streams and the effects of hatcheries and overharvesting, salmon populations declined steadily along the Oregon coast in the 1990s. In recent years, the numbers of fish present along the coast have increased, along with income derived from commercial salmon fishing.

Tourism remains one of the state's top generators of jobs and revenue. Transfer payments and investment income also continue to account for substantial portions of personal income among residents. Both of these economic forces will experience reductions in contributions as Oregon enters a likely recession.

## The Elliott State Forest and Local Economies

Timber has been the primary commodity sold from the Elliott State Forest. Changes in timber harvests have the largest effect on employment in the lumber and wood products industry, but also on schools and other local and state governments. Construction, retail and wholesale trade, health, and other services are among the sectors likely to experience changes in economic output as a result of a ripple effect.

Coos County has not experienced the same population growth as the other counties in southwest Oregon, and has experienced weak economic growth. Because of fewer residents and because it contains most of the Elliott State Forest (66 percent, or approximately two-thirds of the Elliott State Forest), Coos County will be more affected by changes in state forest management than the other counties.

Over the past two decades, the economies and population growth rates in southwest Oregon and Coos County lagged behind those for the state as a whole. Coos County has a large percentage of older residents and a smaller percentage of young adults than most Oregon counties. Older adults are attracted to the area because of its striking beauty and the relatively low cost of retirement living, while young adults choose to leave the area because of lack of entry-level employment and higher educational opportunities. Despite the decline in younger residents, populations in southwest Oregon and Coos County will continue to grow, although at a slower rate than the rest of the state. The main source for the population growth will be retired in-migrants.

Local economies in southwest Oregon (Coos, Curry, Jackson, Josephine, Douglas, and Lane counties) will be affected differently by changes in state forest management strategies. The economies of Jackson and Josephine counties would be less affected by any changes in the management of state forestlands. Although natural resource-based industries have experienced declines, non-manufacturing jobs have increased, fueled by people moving into these two counties for quality of life and retirement reasons. And,

although Douglas and Lane counties have experienced changes in their natural resource-based economies, they are becoming regional centers for wood processing and high-tech industries, respectively. Curry County has experienced similar trends in slowing employment and shifts in personal income.

Tourism, in terms of visitors to the Elliott State Forest, has little economic effect on Coos County. However, the effects of visitors are only a part of the total economic contribution of recreational activity. Other economic changes created by recreation include the indirect and induced economic activity generated by visitor expenditures. The industries most affected by tourist spending are lodging, amusement and recreation services, eating establishments, retail stores, and automobile services.

The availability of recreation resources is important to the local economy, but is difficult to measure quantitatively. Perceptions of quality of life and environmental quality considerations are credited for driving local economies (Power et al. 1995). Again, the inherent beauty of southwest Oregon provides a strong attraction to the area and, in turn, benefits the economy.

## Impact: Schools, Counties and Local Governments

The majority of the Elliott State Forest (90.6 percent) is composed of CSFLs. Revenues from CSFLs are distributed to the CSF, with the ODF reimbursed for management expenses. Revenues from BOFLs (9.4 percent of the Elliott State Forest) are distributed according to a formula, with approximately one-third distributed to the ODF for management and fire protection expenses. The remainder goes to the local taxing districts.

Almost all revenues generated from the Elliott State Forest come from timber harvesting. Over the past four years, 98 percent of the timber harvest and stumpage receipts came from CSFLs. Changes in timber harvest levels will cause varying effects on revenues for schools and other governments. For CSFLs, most revenue effects occur over the long term, with less noticeable effects in the short term.

Changing timber harvest levels on BOFLs will cause immediate effects on revenues to schools and other governments. However, because BOFLs constitute a small percentage of the total Elliott State Forest land base, the effect is relatively small.

Since 1982, the economy in Coos County has become less dependent on manufacturing and more dependent on the service industry and retirement-associated income (transfer payments and investments). All of the job growth has come from non-manufacturing industries, primarily trade, services, and government. Non-manufacturing employment expanded by 19 percent over the past decade, adding a total of 3,060 jobs.

Manufacturing employment fell by more than 30 percent, with a loss of nearly 1,200 jobs (960 in the lumber and wood products industry). Because of the declines in timber harvests and other natural resource-based industries, the county's economy is experiencing considerable stress. No increase is expected in either the salmon or timber industries.

Unemployment rates in Coos County in 2002 were 8.6 percent, higher than the state's average of 7.5 percent in that year (USDA Economic Research Service 2004). The declines in timber harvesting indicate that timber industry employment is unlikely to rebound in southwest Oregon, in spite of low interest rates that continue to encourage increased housing starts and the demand for lumber, plywood, and other wood products. The unemployment outlook remains bleak for the future; projections indicate a loss of an additional 300 jobs (14 percent) in natural resource-based industries such as wood products and fishing (Lettman et al. 2001).

With transfer payments and investment income becoming a far more important economic consideration, growth will continue in retail trades, tourism-related activities, recreation, health care, and social services. The future of the Coos County economy depends on this growth, as the large majority of job growth in this area (4,150 new jobs by 2008) will occur in the retail and wholesale trade and service industries as a result of the increasing population of retirees.

The Lettman report projects that the Oregon economy will continue to grow with any of the management strategies considered for the Elliott State Forest. The economic activity generated by Elliott State Forest management activities is a small part of Oregon's economy. Growth is expected to be somewhat slower under management strategies that decrease the timber harvest, or somewhat faster under management alternatives that increase the timber harvest from the current level.

# Special Forest Products

## Current Management

Special forest products include a variety of plant products, other than timber, that are collected or harvested for personal or commercial purposes. In the Elliott State Forest, the following special forest products have been sold, or permits issued for their collection: brush leases for sword fern (*Polystichum munitum*), salal (*Gaultheria shallon*), and huckleberry, and cedar sales for shakes. To date, these products have had little value to forest managers or landowners, so development and management has been minimal. For Elliott State Forest, the current program for special forest products involves responding to public inquiries and demands for these products.

The brush leases are the main special forest product in the Elliott State Forest. In general, approximately 25 leases are active at all times during the year. Forest managers charge $20 for a 1-year use of 320 acres, generating an annual total of approximately $500.

Forest managers have also issued contracts and special sales for cedar shakes. These sales are based on the amount of logs available, and have generally occurred as salvage of windthrown cedar trees. Very few cedar sales have occurred in recent years because of a lack of suitable logs and restrictions on harvest in riparian areas.

Most firewood is generated from timber harvest activities. Approximately 500 free use woodcutting permits are given to the public each year, which allows the cutting of firewood for personal use. However, because of the current practice of leaving downed wood across the harvest unit after logging, little wood is available for firewood use.

# Timber

Trees define the character of the forest, and they serve many ecological functions. Live trees produce energy through photosynthesis, are the structural foundation of the forest, and provide habitat for wildlife. Standing dead trees, known as snags, are used by cavity-nesting birds and animals, and are food sources for many kinds of insects, which in turn, are food for woodpeckers and other birds. On the forest floor, the decay process for fallen trees occurs over centuries; during that time, the decaying trees provide a source of organic material and nutrients for young trees and plants, as well as habitat for insects, salamanders, and small rodents, which in turn are prey for larger wildlife.

This section discusses the timber resource in the Elliott State Forest. Other information relevant to trees and timber can be found in the sections entitled “Ecology and Disturbance History” and “Forest Health.”

## Timber Management

The timber program is based on general policies for managing state forests, which are based on the Oregon Constitution, the Oregon Admissions Act, and statutory direction. These legal and policy mandates are discussed in detail in Appendix D.

**Common School Forest Lands** are managed to provide the greatest benefit for the people of Oregon. The primary objective is the generation of the greatest amount of revenue for the CSF, consistent with sound techniques of land and timber management. Consideration is given to the need to protect soils, streams, wildlife habitat, recreational opportunities, and other forest values, as long as this need does not significantly detract from the generation of revenue over the long term (Oregon Admissions Act 1859; Oregon Constitution, Article VIII, Section 5; Crookham 1992; State Land Board’s Asset Management Plan).

**Board of Forestry Lands** are managed to provide “the greatest permanent value of such lands to the state” (ORS 530.050), which the BOF has defined to include “sustainable and predictable production of forest products that generate revenues for the benefit of the state, counties, and local taxing districts; properly functioning aquatic habitats for salmonids, and other native fish and aquatic life; habitats for native wildlife; productive soil, clean air and water; protection against floods and erosion; and recreation” (OAR 629-035-0020).

**Key Terms**

**Board foot—**An amount of wood one foot square by one inch thick.

**Stand Level Inventory—**The ODF's Stand Level Inventory acquires and updates state forest vegetation information at the forest stand level. This information is used for tactical and operational decision-making. The Stand Level Inventory includes vegetation sampling protocols, forest stand data arranged in a database, computer programs for managing and using the information, and documentation of inventory elements.

**Stocking—**A measure of the adequacy of tree cover on an area. Unless otherwise specified, stocking includes trees of all ages.

As an asset to the counties, local taxing districts, and the CSF, prudent and careful management of the timber resource is an important theme in all planning and management of the forest. Administrative rules require that these lands be managed in an environmentally sound manner to provide sustainable timber harvest and revenues to these government entities.

The principle of sustained yield guides the timber program, and ensures that the CSF, counties, and local taxing districts will benefit from a perpetual source of revenue from a managed forest.

Past FMPs defined timber production as the predominant land use, with 95 percent of the Elliott State Forest in this classification. The remaining acres were allocated to uses such as roads, stream buffers, inoperable terrain, watershed use, recreation, service and transmission lines, scenic and protective conservancy, and non-commercial lands. Timber harvest was generally targeted to a sawlog market. Anticipated harvest ages for well-stocked stands ranged 30 to 45 years old for young commercial thinning, with most clearcutting being performed in stands from 90 to 130 years old.

During the six-year period from 1991 through 1996, the volume harvested in the Elliott State Forest was heavily influenced by the presence of the northern spotted owl, which was federally listed as threatened in 1990, and the marbled murrelet, also listed as threatened in 1992. The average annual volume harvested during this period was 17.74 MMBF. Because of the listing of the spotted owl, the State Land Board directed the ODF to prepare a new management plan for the Elliott State Forest not based on "moving owl circles," but providing more certainty to the management of the Elliott State Forest and the production of income. In addition, the ODF decided to pursue an ITP for spotted owls and marbled murrelets through an HCP with the USFWS.

The HCP was approved in October 1995, and the new FMP was approved in 1994. The first annual plan implemented under the new FMP was for fiscal year 1995. The average annual harvest under this FMP was approximately 28 MMBF.

Management of the timber asset includes investment of time, dollars, and resources to realize the forest's ability to generate sustainable timber harvest and revenue over the

long term. Investments include direct expenses for stand establishment; management activities such as site preparation, seeding and planting, and precommercial thinning; and forest infrastructure, such as roads and bridges. Long-term management includes indirect expenses, such as forest inventory and GIS systems, research projects, and monitoring projects.

## Current Condition

Conifer forest covers most of the land in the Elliott State Forest. Before these lands became state forests, large fires killed or removed most of the older conifer forests. Approximately half of the conifer stands in the forest are more than 85 years old, as shown in Figure 2-4 and Table 2-4.

Other types of vegetation dominate the remaining acres, including grass, brush, and various species of hardwood trees such as alder and bigleaf maple. All resource information in this section is based on the Stand Level Inventory Program inventories as of December 2004.

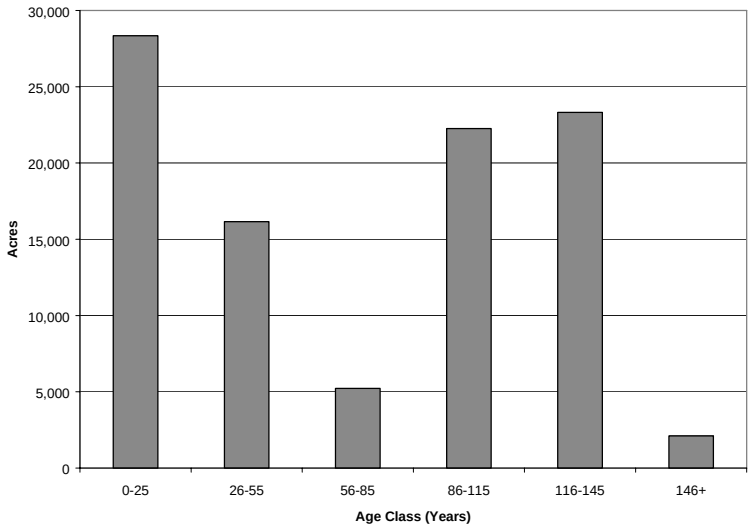
Forests are naturally divided into stands—areas of five to several hundred acres occupied by trees or other vegetation similar in age, stocking, size, and species. Each stand is identified, mapped, and described in the ODF inventory. The inventory recognizes three main types of stands:

- **Conifer Stands—**These stands occupy most of the Elliott State Forest. The ODF classifies conifer stands as those in which conifer species compose 30 percent or more of the tree canopy. Although conifers are the principal species with economic value in these stands, the stands may also include substantial amounts of other vegetation types such as hardwoods, brush, grass, and ferns, which contribute to a diverse forest ecosystem. These types are either intermixed with the conifers or are in clumps too small to map and inventory separately.
- **Hardwood Stands—**These stands are found on a minority of Elliott State Forest lands. The ODF classifies hardwood stands as those in which hardwood species compose more than 70 percent of the tree canopy.
- **Unclassified Stands—**These stands are currently under contract for harvesting, or have already been harvested and will be planted soon.

In the 1950s, when forest management activities began in the Elliott State Forest, the forest predominantly consisted of Douglas-fir, with a minor component of other conifers (mainly hemlock and very small amounts of western redcedar and Sitka spruce). In most Elliott State Forest timber sales, these other conifers have usually constituted less than 5 percent of the volume. When forest management began in the Elliott State Forest, hardwoods constituted less than 10 percent of the acreage, much of this located in riparian areas. Most of the riparian hardwoods are red alder, with lesser amounts of bigleaf maple and myrtle. A greater amount of red alder is located in the Marlow Creek drainage, which was railroad logged in the 1920s to 1930s. Significant amounts of myrtle exist on south slopes in the western half of the Elliott State Forest. Other native

hardwoods in the Elliott State Forest include very small amounts of bitter cherry (*Prunus emarginata*), cascara, madrone, chinquapin, and dogwood.

## Figure 2-4. Conifer Age Classes in the Elliott State Forest




### Table 2-4. Summary of Conifer Age Classes

| Summary of Conifer Age Classes | | | | | | | |
|---|---|---|---|---|---|---|---|
| Age Class (Years) | 0–25 | 26–55 | 56–85 | 86–115 | 116–145 | 146+ | Total |
| Acres | 24,643 | 19,882 | 5,094 | 18,501 | 26,891 | 2,011 | 97,022 |