II. Oregon's Forest Resources

A. Forest plant diversity

Ecologically, Oregon is the most diverse state aside from California [1]. Oregon has coastal rainforests dominated by Californian and Alaskan species; barren deserts receiving less than eight inches of rainfall a year; and mountain ranges associated with the Rocky Mountains, the Cascades, the Klamath Mountains and the Great Basin Ranges.

Trees from many regions converge in Oregon, where numerous species are at or near the edge of their range. Many plants typically found in the Arctic dominate the high Cascades. Alaskan species such as Sitka spruce dominate northern coastal lowlands, while the southern coast has a redwood belt that spills over from California. The Wallowa Mountains form the western edge of the Rocky Mountains and are home to many forest species common to central Colorado. Southeastern Oregon is on the edge of the Great Basin and harbors plants found in the cool deserts of Nevada and Utah such as narrow-leaf cottonwood.

In the Klamath Mountains, the flora of the Sierra Nevadas, the Cascades, and the Great Basin comes together to form unique combinations. A two-mile stretch of the Siskiyou Crest in southwestern Oregon provides a range of niches for a rich reservoir of genetic material, supporting plant communities as varied as old-growth Douglas-fir forest, alpine meadows, western juniper steppe, Jeffrey pine savannas, California red fir forests, and rigid sagebrush steppe. The Klamath Mountains are home to the greatest diversity of conifer species in the world, with over 14 species found within a few square miles of the Kalmiopsis Wilderness Area. The forest diversity of this area has made it an internationally known study site for forest ecologists.

B. Recreational, cultural, and scenic resources

Oregon has gained a reputation for its extensive forests of tall trees, timber resources, biodiversity, and overall scenic splendor. Currently, the rugged beauty of Oregon's mountains, seacoast, and forest lands attracts millions of tourists every year. A variety of recreational opportunities await in any of Oregon's parks, forests, and other scenic areas. Crater Lake National Park, the nation's fifth oldest national park, draws visitors from around the world to its six mile-wide caldera lake and hiking trails that wind through old-growth forest. In 1999 Crater Lake drew 417,992 visitors during its brief snow-free summer season. Oregon also has 48 designated Wild and Scenic Rivers, 177 state parks, and hundreds of miles of public beaches.

Thirteen national forests throughout the state offer abundant opportunities for outdoor recreation and escape from urban life, including hiking, camping, fishing, hunting, picnicking, and sightseeing. For example, the varied landscape of wooded slopes, high mountains, and narrow canyons of the Willamette National Forest, which stretches for 110 miles along the western slopes of the Cascade Range in western Oregon, makes it a valuable scenic and recreational resource. In Oregon's northern Cascade Mountains lies the Mount Hood National Forest, which encompasses 1.2 million acres, has four designated wilderness areas, and over 1200 miles of hiking trails. Within this national forest lies Oregon's tallest

[1] Based on the number of plant associations described in the National Vegetation Classification System by the Association for Biodiversity Information

peak, Mt. Hood, which rises 11,245 feet above sea level and is the second most climbed mountain in the world (second only to Japan's holy Mt. Fuji). Nestled midway to the summit of Mt. Hood is Timberline Lodge, a National Historic Landmark and popular tourist destination, which boasts a ski area with the only year-round ski season in North America.

Further south, the Deschutes National Forest in central Oregon covers nearly 1,600,000 acres of public lands and is home to Mt. Bachelor, the largest downhill ski area in the Pacific Northwest, which receives over 700,000 visitors annually. Fishing is also an important attraction in the Deschutes National Forest, where each year anglers spend almost $8 million on fishing and net over 300,000 fish. The 2,392,508 acre Wallowa-Whitman National Forest in the northeast corner of the state, with its 2,653 miles of trails, accounted for an estimated 4,110,500 visitor days in 1999. Oregon's national forests also manage and protect cultural resources ? the Deschutes National Forest has identified over 8,000 known cultural resource sites which range from 9,500-year-old American Indian lodges to small trapper cabins and traces of early pioneer trails and wagon roads. Eastern Oregon's Malheur National Forest manages over 3,000 archaeological and historical sites, including American Indian encampments, obsidian quarries and workshops, 19th century mining camps and homesteads, logging railroads and camps, and Forest Service lookout towers and guard stations.

The state of Oregon also manages some large forests: including the Elliot State Forest near Coos Bay; Sun Pass in the east Cascades by Klamath Falls; the Santiam State Forest in the west Cascades of Clackamas, Marion, and Linn counties; and the Tillamook and Clatsop State Forests in the northern Coast Range. The Tillamook State Forest is significant because it is over 360,000 acres, and was acquired by the state between 1930 and 1950, after a series of large wildfires had burned most of the forests. State bonds and community effort have resulted in complete reforestation of this area, creating a major forest resource for the state.

Private forest lands border many of these public recreational, cultural, and scenic areas. These private lands contribute to the state's recreational opportunities by providing vital access points, maintaining scenic corridors, adding access for hunting and fishing and offering an outlet for intense recreation pressures on public lands and resources. As cities continue to grow, more and more people will seek the aesthetic enjoyment of outdoor activities, making the continued health and conservation of forest land an important component in the quality of life Oregon has to offer.

C. Fish and wildlife habitat, and threatened and endangered species

Oregon's diversity of climate, topography, and vegetation types creates a complex system of forest habitats for fish and wildlife species. An estimated 300 species of native terrestrial vertebrates use some form of forest cover to breed; overall, forest management practices can affect habitat quality for over 400 terrestrial forest vertebrates, including the northern spotted owl, bald eagle, wolverine, and several other sensitive and threatened species. Western and montane conifer-hardwood forests and oak woodlands are some of the more species-rich areas in the state (Olson *et al.* 2001).

Some forest species have declined in Oregon. These include old-growth obligate species, species requiring deciduous cover or riparian habitat, cavity-nesting birds and mammals, amphibians, species using snags or fallen, decaying trees, large game animals, and other mammals, including forest carnivores. More than 60 wildlife species are associated with downed wood alone. Of the 114 species of wildlife listed within the Oregon Natural Heritage Program database as being either state or federally endangered, threatened, or sensitive, 65 species have some association with forests, whether for nesting, roosting, hibernating, or foraging.

In addition, forest lands of all elevations often encompass riverine wetlands and riparian habitats which support a range of wildlife species. In fact, riparian areas are sometimes richer in vertebrate diversity than upland areas. Some vertebrates are strictly associated with riparian hardwoods, mainly due to the opportunities for cavity nesting or foraging. Amphibian diversity is also high in these areas. Seven amphibian species spend large portions of their lives in smaller streams, making them sensitive to forestry practices. Riparian habitats and streamside wetlands are also crucial for providing cover, food, and water to wide-ranging species. Without these forest corridors, peripheral species and species from other habitats may suffer decreased population numbers as well.

Oregon's fish populations are also particularly reliant on healthy riparian areas since overhanging trees lower water temperatures and increase the amount of dissolved oxygen in the water. Healthy forests improve the overall living conditions for cold-water dependent fish by stabilizing steep slopes and thus reducing erosion and silt-loading in the streams. Over 60 species of fish are native to Oregon’s streams and rivers, with a majority of these occurring within forested habitats. For example, steelhead trout, chum, coho and Chinook salmon, and cold water-dependent cutthroat and bull trout are found throughout the state’s forested lakes and streams. Yet many of Oregon’s fish species continue to experience population declines and range contractions. A majority of the stocks of anadromous salmonids (13 of 20 ESUs, or Evolutionary Significant Units) are now listed as either threatened or endangered under federal and/or state endangered species acts and have severely declined from their historical range. Some of the leading causes of this habitat decline are the conversion of many riparian forests to agricultural, urban and residential uses; and water pollution and the diversion of water for development and agriculture.

A total of 261 different species of rare, sensitive and endangered plants occur in Oregon’s forests (Oregon Natural Heritage Program 2001). Some of these such as howellia and wayside aster are local endemics. Others, like the clustered lady slipper are of concern throughout the west. Recent work by the USDA Forest Service and the US Department of the Interior Bureau of Land Management (USDI BLM) has identified a number of invertebrates, fungi, and lichens which are completely dependent on the forests of the Pacific Northwest. Figure 1, below, shows the distribution of the all of the sensitive, threatened and endangered species in Oregon, from the Oregon Natural Heritage Program’s at-risk species database. While these include all species, most are fish, wildlife and plants.

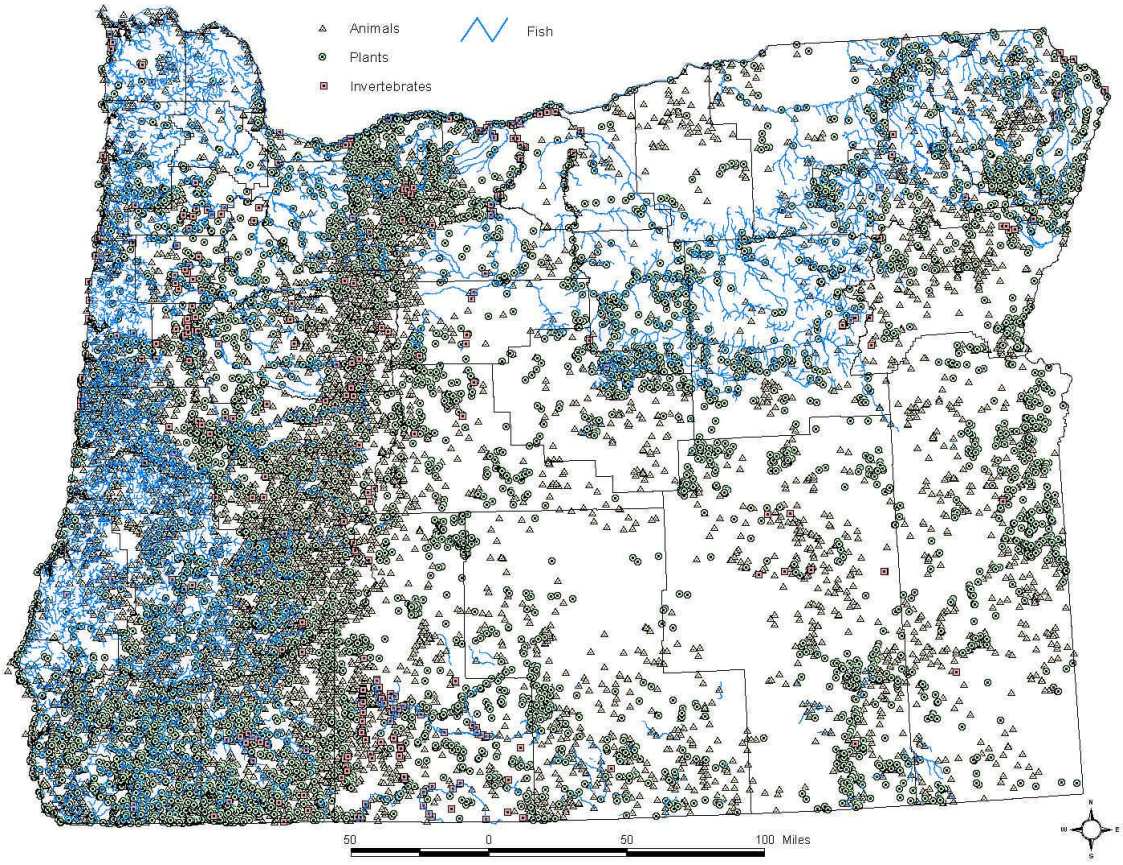

Figure 1. Distribution of Rare, Threatened and Endangered Species in Oregon as of 6/2001.

D. Geological features and mineral resources

Plate tectonics and millions of years of volcanic activity have shaped the Oregon landscape (Figure 2). Steep cliffs rise along much of Oregon's coast, where scenic headlands ? remnants of an ancient volcanic island chain that collided with North America ? are interspersed with sandy beaches and protected harbors. The eye-catching Cascade Mountains combine two volcanic regions: the older, broader, and deeply eroded western Cascades; and the snow-capped peaks of the younger, more easterly volcanoes of the high Cascades such as Mount Hood, Mount Jefferson, and the Three Sisters. Another high Cascade peak, Mount Mazama, was destroyed about 6,800 years ago by a catastrophic eruption, leaving a deep caldera that eventually filled with water and became Crater Lake. The Klamath Mountains in the southwestern corner of the state, which are covered with thick and highly diverse forests, consist of north-south trending belts of metamorphic and igneous rocks. This area also has the state's richest mineral deposits. Gold mining made its mark on the history of this area ? one mine near Ashland recovered $1,300,000 in gold between 1886 and 1933, and the historic gold-rush town of Jacksonville has become a modern tourist attraction.

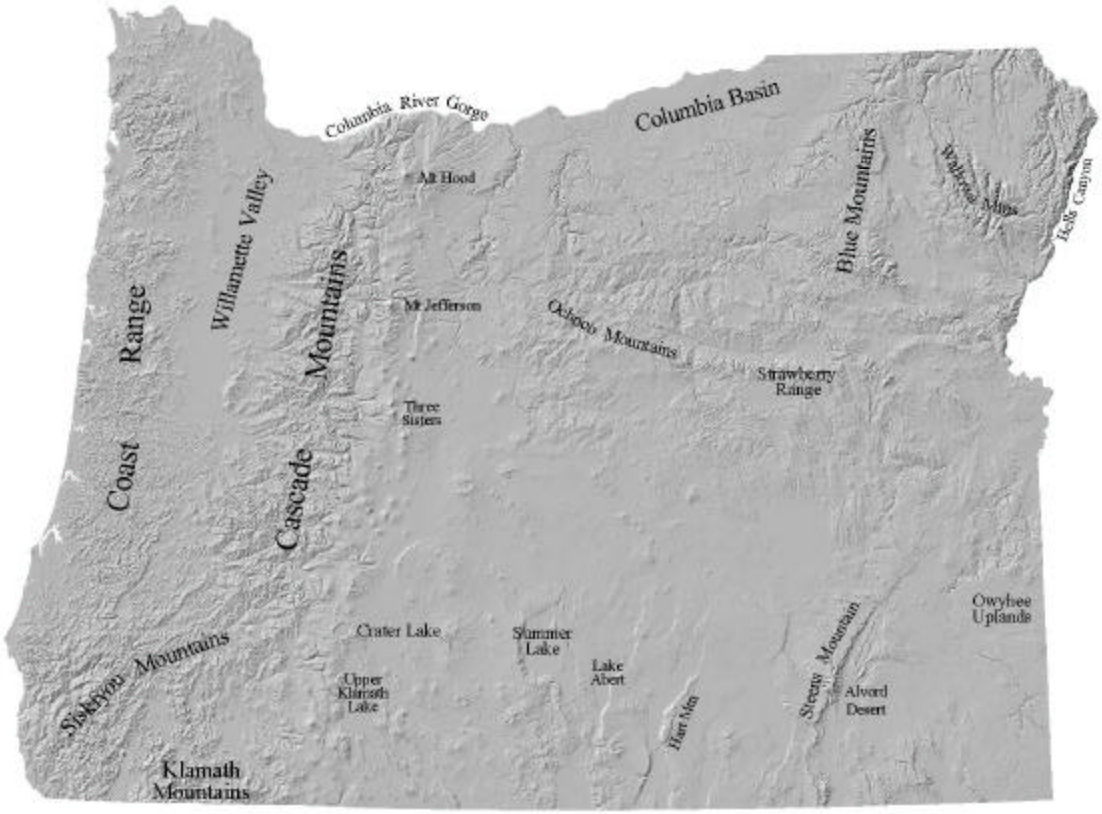

Figure 2. Shaded relief map of Oregon

Most of Oregon east of the Cascades is covered by basalt lava flows, which can be seen as columnar cliffs or rimrocks standing out above the plains throughout much of the region. A particularly spectacular sequence of these rocks has been exposed by the Columbia River, creating the Columbia River Gorge. The expanse of high desert in southeastern Oregon, which envelops the northern extremity of the Great Basin, is broken up by massive fault-block mountains such as Steens and Hart mountains. Separating these ranges are numerous flat basins containing features such as the Alvord Desert and Lake Abert. The intense volcanic and hot-spring activity in the area has produced fine-grained gold deposits and jasperoids that are prized by rock hounds.

Northeastern Oregon's most notable geological features are the rugged Blue and Wallowa mountains. This area is made up of separate exotic terraces, areas that were prefabricated elsewhere and pushed outward by the North American continent as it moved west. In addition to their timberlands, the Blue Mountains also have a gold-mining heritage, with a history of active placer and lode mines. On Oregon's eastern border with Idaho, the Snake River has carved the famous Hells Canyon, a gorge with an average depth of 5,500 feet between the Wallowa Mountains and Idaho's Seven Devils Mountains.

Widespread deposits of limestone, sand, and gravel are Oregon's most important mined resources. Sand and gravel are found almost everywhere in the state. The most valuable limestone deposits are in northwestern and extreme eastern Oregon. A small natural gas field lies beneath the surface in the northwestern part of the state. Other mineral deposits in the state include clays, diatomite, coal, gemstones, gold, nickel, silver, and talc.

E. Soil productivity

Soils are considered a basic resource since both the abundance and distribution of all renewable resources, such as forests, depend on soil characteristics. In general, the soils of Oregon's forests can be grouped into two main units: soils at moderate to high elevations, which were formed under tree-dominated vegetation; and soils at lower elevations which were formed under grassland or shrub-grassland vegetation.

The soils of western Oregon ? from the Coast Range, through the Willamette Valley, and up the west slope of the Cascades ? are quite productive. All the forest soils in these areas meet the definition of prime timber land, which requires that they be capable of producing at least 85 cubic feet of wood fiber per acre per year. The acid soils of the western Cascades, which are characterized by an accumulation of humus, and aluminum and iron oxides beneath the surface, produce between 147 and 220 cubic feet of wood fiber per acre per year, as do the soils of the Coast Range. Western Cascade soils typically have a light-colored horizon overlying a reddish-brown horizon. Gray-brown soils cover the Coast Range and Klamath Mountain regions. The deep soils of the Willamette Valley are capable of producing between 107 and 207 cubic feet of wood fiber per acre per year. Shallow soils cover most of the eastern Cascade slopes, and the basin and range region. The wheat belt of the Columbia Basin has rich soils good for growing crops.

The best forest-producing soil, volcanic ash, is found in many areas of the state. In the Blue Mountains of central Oregon, volcanic ash-based soil covers over 30 percent of forest lands. Approximately 60 percent of the Blue Mountain forests consist of steep slopes that are subject to surface soil erosion. These ash soils are also the most sensitive to compaction. In the east Cascades, soils are primarily derived from the weathering of volcanic bedrock and/or volcanic ash and pumice and are relatively young in age. Residual, loess, glacial till, glacial outwash and colluvial soils are all present within forest boundaries. The majority of these soils have unique thermal and chemical properties associated with their young age and the volcanic material from which they are derived, including poor heat transfer, moderate water holding capacities and coarse textures. Despite their relatively young age they are still productive, as indicated by the forests that they support. The primary nutrients for plant growth such as nitrogen, phosphorous and potassium are available in these soils, although nitrogen may be limiting. Water is the primary limiting factor to vegetative growth in this area, as seen by the changes in vegetation with elevation and distance from the Cascade crest.

F. Watershed values

Forests are key to healthy watersheds, keeping the streams cool and the soils stable, cleaning the air and water, and providing critical fish and wildlife habitat. Conversion of riparian forests for agriculture, range, and urban uses as well as intensive timber management of some streamside forests have contributed to the current declines in both water quality and fish habitat throughout the state. As a result of these declines, the state has developed the Oregon Plan for Salmon and Watersheds. This plan represents an unprecedented undertaking on the part of the State of Oregon to restore its salmon and aquatic resources. Its goal is to restore populations of fisheries to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits – as well as to assist in the improvement of water quality throughout the state.

The people of Oregon have provided over seven percent of the revenue from the state lottery to the Oregon Watershed Enhancement Board (OWEB) to implement the plan. OWEB is a new state agency created by the people of Oregon to promote and implement programs to enhance and maintain watersheds throughout the state. In Oregon, watershed protection has been organized by local groups called watershed councils. Watershed councils are locally organized, voluntary, non-regulatory groups established to improve the condition of watersheds in their local area. The 1995 Legislature unanimously passed House Bill 3441 providing guidance in establishing watershed councils but making it clear that formation of a council is a local government decision, with no state approval required. Watershed councils offer local residents the opportunity to independently evaluate watershed conditions and identify opportunities to restore or enhance the conditions. Through the councils, partnerships between residents, local, state and federal agency staff and other groups can be developed. Through these partnerships and the resulting integration of local efforts, the state's watersheds can be protected and enhanced.

Across the state, established watershed councils are systematically assessing watershed conditions to identify problems and set priorities for restoration. The information gained from assessments provides a necessary starting place for planning ways to restore watershed functions. As watershed councils complete assessments, they collaborate with landowners, soil and water conservation districts, businesses, government, and others on projects and actions designed to resolve problems and improve watershed health. When aggregated, watershed assessments will play a critical role in developing a statewide strategy that points toward key restoration opportunities in each region of the state.

G. Timber management opportunities

Most of the state's timberlands are now being managed for multiple uses such as recreation, scenic values, and protection of wildlife habitat. The environmental concerns of Oregonians have led to some of the strictest reforestation and other forest practice requirements in the nation. Virtually all land in the state that is clearcut must be reforested according to the Oregon Forest Practices Act, which protects forest resources like water, soil, and fish and wildlife habitat. Landowners are responsible for replanting within two seasons after harvest. On federal forest lands, the policy in recent years has been directed toward creating more late-successional forests by limiting harvests. Timber sustainability needs a balance between growth and harvest over time, though harvests from federal lands have fallen far below current growth rates due to this de-emphasis on timber production.

According to a 1989 Oregon State University study, the long-term sustainable timber harvest on federal lands is 1.3 billion board feet per year. For comparison, the harvest volume on federal lands in 1997 was 0.67 billion board feet. On private land, according to the study, the long-term sustainable baseline harvest is 3.7 billion board feet a year, and in 1997 approximately 3.4 billion board feet were harvested on these lands. In other words, harvests from private lands remain fairly constant at levels close to current growth and long-term sustainability. The wood products industry still accounts for about 27 percent of the jobs and income in Oregon's manufacturing sector, and is considered a "basic industry" since most forest products are sold outside of the state. Over the past ten years, timber supply has shifted toward private lands with the non-industrial owner group taking a more significant role due to declining timber availability on federal lands.