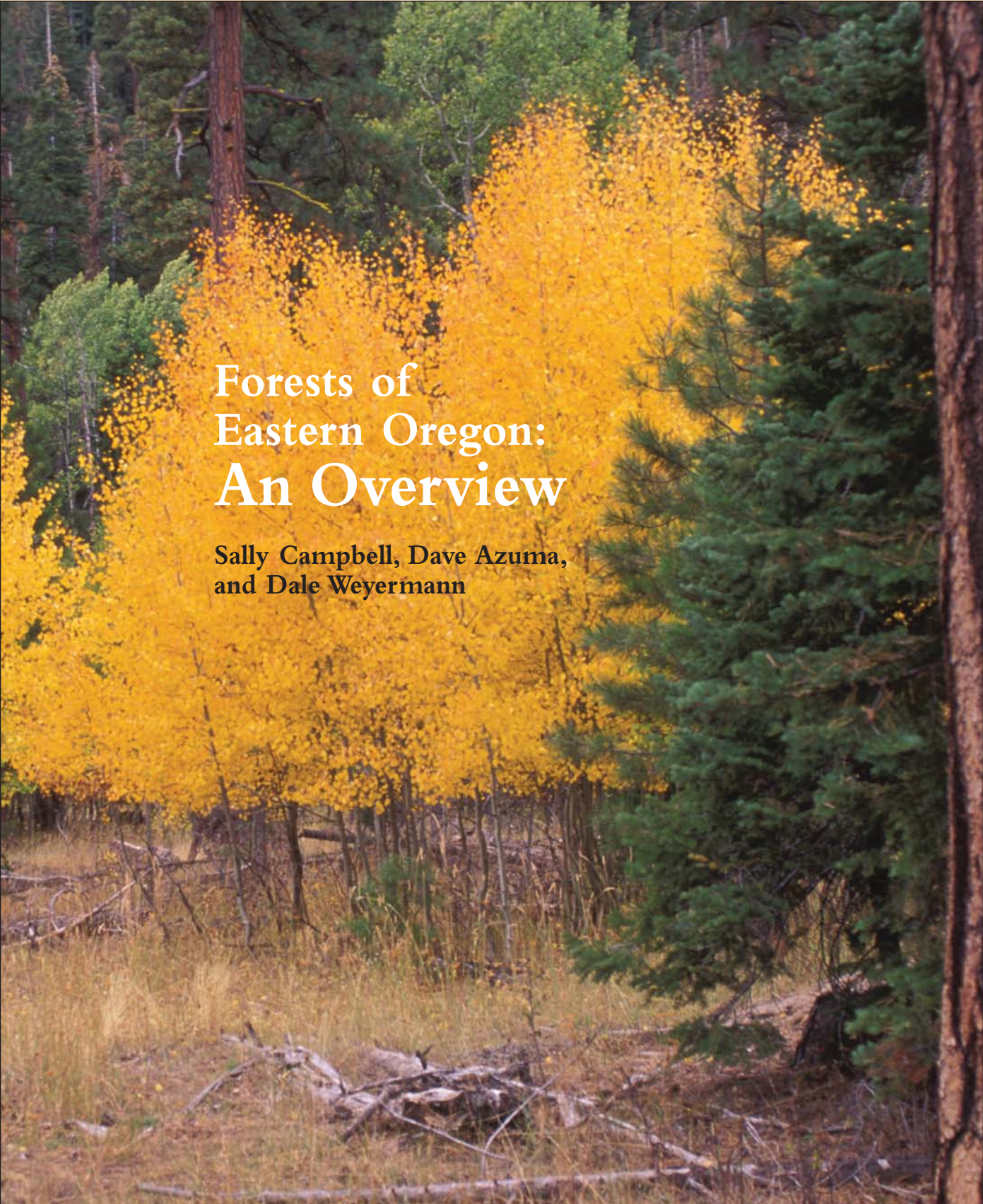




# Forests of Eastern Oregon: An Overview

Sally Campbell, Dave Azuma,  
and Dale Weyermann



United States  
Department of  
Agriculture



Forest  
Service



Pacific Northwest  
Research Station

General Technical Report  
PNW-GTR-578  
April 2003

**Revised 2004**







Joseph area, eastern Oregon. *Photo by Tom Iraci*

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Cover: Aspen, Umatilla National Forest. *Photo by Tom Iraci*



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Eastern Oregon:  
*An Overview*

Sally Campbell, Dave Azuma, and Dale Weyermann

U.S. Department of Agriculture Forest Service  
Pacific Northwest Research Station  
Portland, OR  
April 2003

## State Forester's Welcome

Dear Reader:

The Oregon Department of Forestry and the USDA Forest Service invite you to read this overview of eastern Oregon forests, which provides highlights from recent forest inventories. This publication has been made possible by the USDA Forest Service Forest Inventory and Analysis (FIA) Program, with support from the Oregon Department of Forestry.

This report was developed from data gathered by the FIA in eastern Oregon's forests in 1998 and 1999, and has been supplemented by inventories from Oregon's national forests between 1993 and 1996. This report and other analyses of FIA inventory data will be extremely useful as we evaluate fire management strategies, opportunities for improving rural economies, and other elements of forest management in eastern Oregon. We greatly appreciate FIA's willingness to work with the researchers, analysts, policymakers, and the general public to collect, analyze, and distribute information about Oregon's forests.

Developing current and historical information across all ownerships and forest types is critical to the Oregon Board of Forestry, which has embarked on an effort to define forest sustainability and assess the sustainability of Oregon's forests. Inventory data will be used to monitor changes in forest conditions, project future forest conditions, and develop benchmarks against which we can assess Oregon's progress in achieving forest sustainability.

As we reevaluate our forest management strategies in eastern Oregon with an eye to improving the social, economic, and environmental contributions from these forests, it is critical that we have available an up-to-date and consistent knowledge base. Current information using common measurements and standards by which to evaluate sustainable forest management locally, statewide, and nationally is indispensable. Recent and ongoing inventories and analyses help provide that knowledge base and will be extremely useful to policymakers and for educating Oregonians and others about Oregon's forest resources.

I encourage you to review the information in this report and keep it in mind as the Oregon Board of Forestry, the USDA Forest Service, and others craft and implement policies to assure a continuous and high level of goods and services from eastern Oregon's forests.

***James E. Brown***

James E. Brown  
State Forester



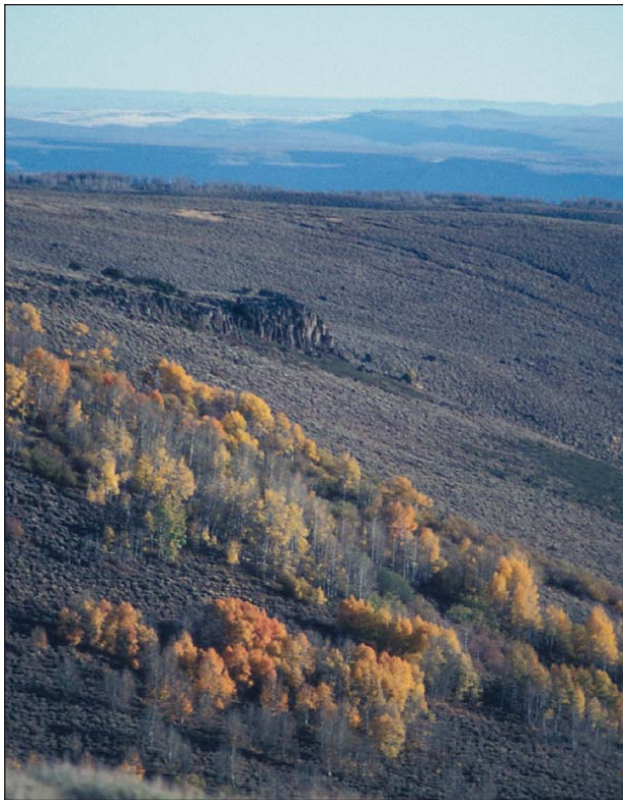
## Highlights

This publication provides highlights of forest inventories and surveys from 1993 to 2001.

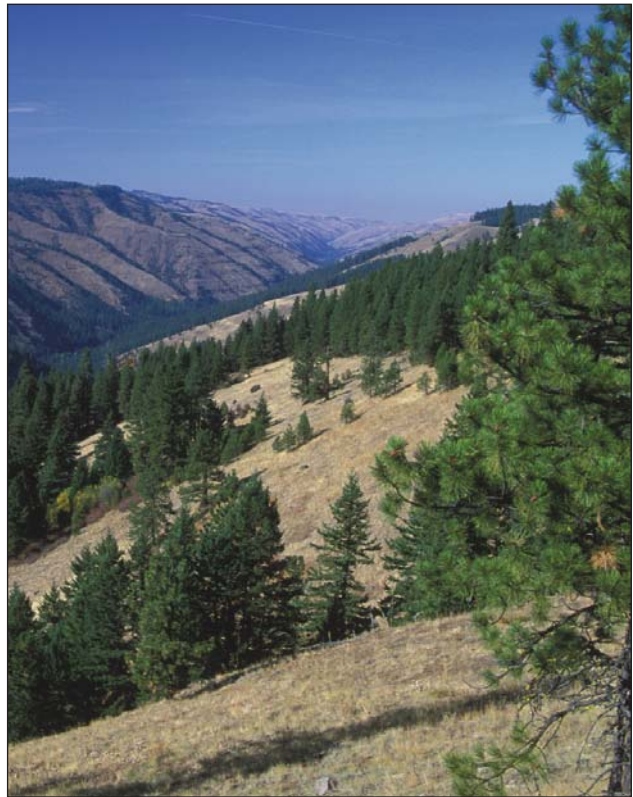
- About 35 percent of eastern Oregon is forested.
- The amount of forest land in eastern Oregon has increased overall by about 650,000 acres since the earliest inventory in the 1930s.
  - Timberland decreased by about 2.9 million acres
  - Western juniper forest land increased by about 1.8 million acres
  - Other forest land increased by 1.7 million acres
- Thirty-one tree species were tallied in forest inventories during the 1990s, with ponderosa pine the predominant species in all ecological provinces in eastern Oregon.
- Excluding juniper forest land, about 69 percent of eastern Oregon forest land is managed by the Forest Service, 2 percent by the Bureau of Land Management (BLM), 1 percent by the Oregon Department of Forestry, and 1 percent by other public agencies; the remaining 27 percent is privately owned.
- Forests are younger on private and other public lands, with only 17 percent over 100 years old, and older on national forests, with 55 percent over 100 years.
- Volume of wood in eastern Oregon forests is about 26.2 billion cubic feet, of which an average of about 312 million cubic feet (1.4 billion board feet) per year was harvested between 1987 and 1999.
- Between 1987 and 1999, the volume of mortality and removals exceeded the volume of growth for all ownerships.
- Down woody debris generally increases with forest age but shows no trend related to ownership across eastern Oregon.
- Native insects and diseases are present on the majority of forest land in eastern Oregon with higher levels of dwarf mistletoe, bark beetles, and root disease on national forests than on private and other public land.
- Over half of the inventory plots on nonfederal lands have at least one introduced plant species, and over 4 percent have at least one noxious weed.
- The greatest diversity of lichens (indicators of air pollution, climate, and forest age and structure) is found in the Blue Mountains Province and the lowest in the Intermountain Province.
- No ozone injury has been detected on sensitive forest species in eastern Oregon since ozone monitoring began in 1998.

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Steens Mountain area. Photo by Tom Iraci



Whitman Overlook. Photo by Paul Dunham

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## Abstract

**Campbell, Sally; Azuma, Dave; Weyermann, Dale. 2003.** Forests of eastern Oregon: an overview. Gen. Tech. Rep. PNW-GTR-578. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 31 p.

This publication provides highlights of forest inventories and surveys from 1993 to 2001. About 35 percent of eastern Oregon is forested. The amount of forest land in eastern Oregon has increased by about 650,000 acres from the 1930s, with increases in juniper forest land accounting for most of the change. Thirty-one tree species were tallied in forest inventories during the 1990s, with ponderosa pine the predominant species in all ecological provinces in eastern Oregon. The Forest Service, Bureau of Land Management, and other federal agencies manage about 71 percent of eastern Oregon forests; about 27 percent is privately owned; and the remaining 2 percent is managed by the Oregon Department of Forestry and other nonfederal public agencies. The volume of wood in eastern Oregon forests is about 26.2 billion cubic feet, of which about 312 million cubic feet per year were harvested between 1987 and 1999. In the same time period, annual mortality and removals exceeded annual growth for all ownerships. Down wood is an important forest component and shows increases with forest age. Insect defoliators, bark beetles, root diseases, and dwarf mistletoes are present on over 72 percent of forest land in eastern Oregon. Year-to-year defoliation or mortality trends can be detected with aerial surveys. Introduced plant species are present on over 50 percent of private and other public forest land. Diversity of lichens (indicators of air pollution, climate, and forest age and structure) is greatest in the Blue Mountains Province and lowest in the Intermountain Province. No ozone injury has been detected on sensitive forest trees and plant species in eastern Oregon.



Ponderosa pine,  
Newberry National  
Volcanic Monument.  
*Photo by Tom Iraci*

## Errata for PNW-GTR-578

The following changes have been made in this document.

**Publication:** *Forests of Eastern Oregon: An Overview*, PNW-GTR-578, April 2003

**Authors:** Sally Campbell, Dave Azuma, Dale Weyermann

Highlights (3<sup>rd</sup> page), 6<sup>th</sup> bullet: Change volume figure in sentence from 25.7 to 26.2 billion cubic feet.

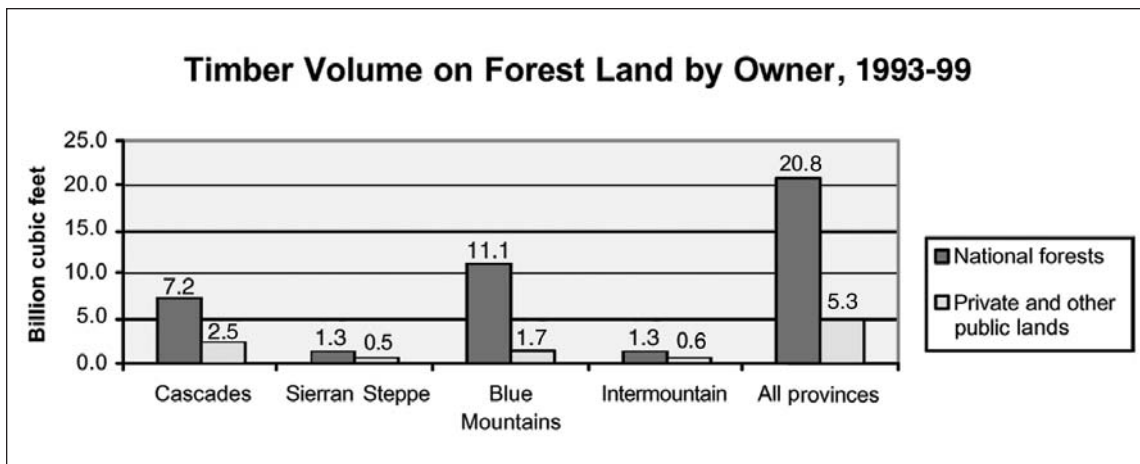
Abstract (5<sup>th</sup> page), 6<sup>th</sup> sentence: Change volume figure from 25.7 to 26.2 billion cubic feet.

Page 18: Change the following sentence from:

“The forests of eastern Oregon have about 25.7 billion cubic feet of timber...” to:

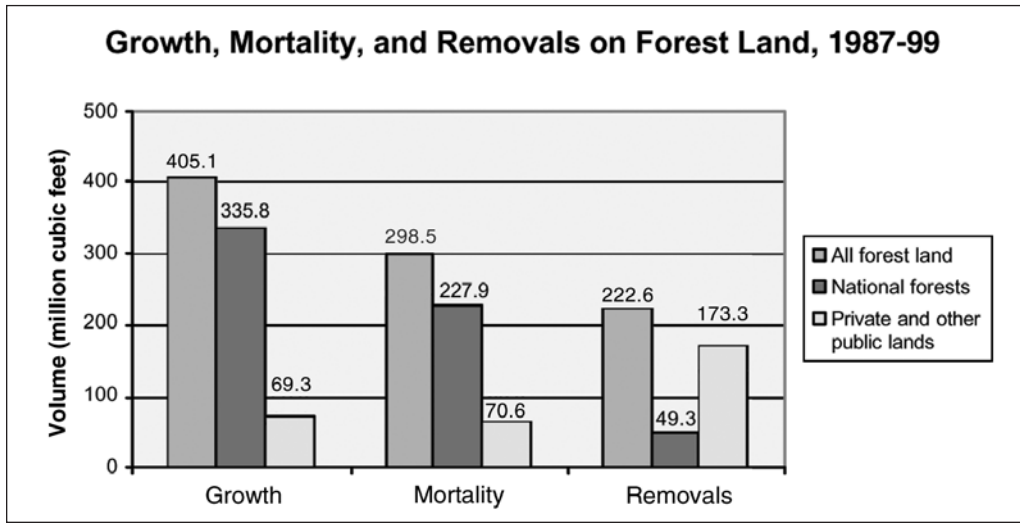
“The forests of eastern Oregon have about 26.2 billion cubic feet of timber...”

Page 19: Timber Volume on Forest Land by Owner graph:

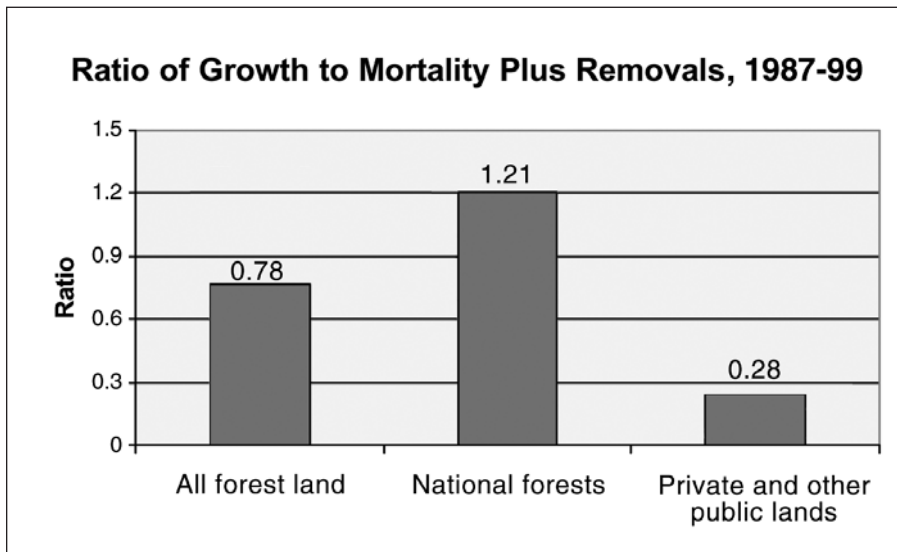




Page 21: Growth, Mortality, and Removals graph (top of page)



Page 21: Ratio of Growth to Mortality Plus Removals graph (bottom of page)



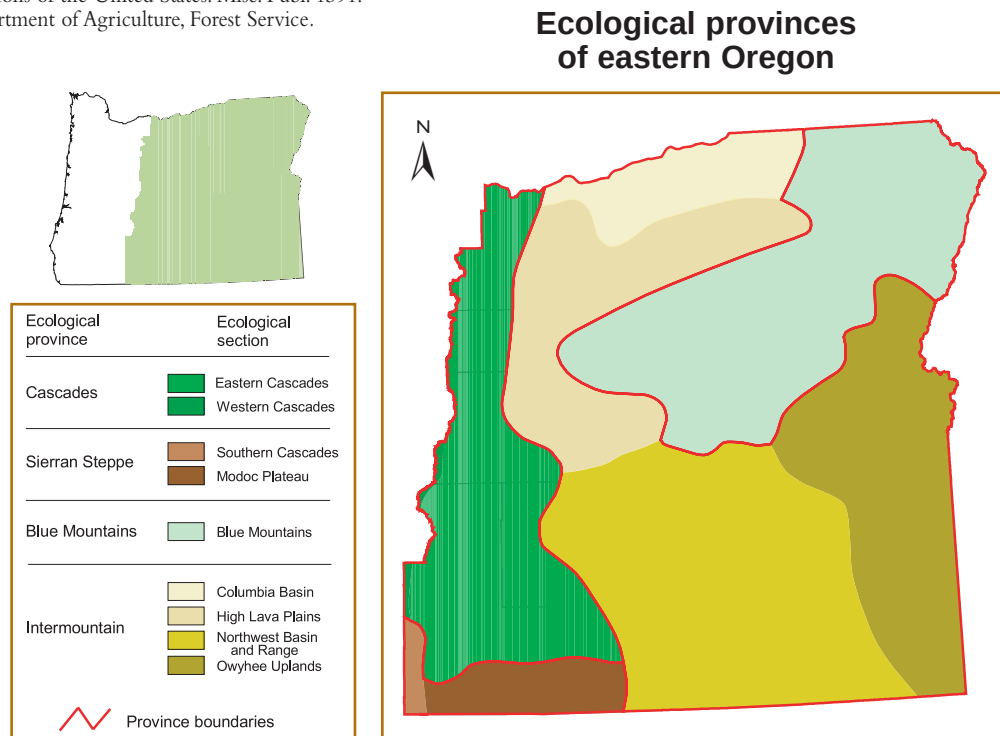
# Introduction

THIS REPORT DESCRIBES THE FORESTS OF EASTERN OREGON TODAY. We present several aspects of eastern Oregon forest land: Where it is, how old it is, who owns or manages it, how much wood volume is present, what tree species are present, and where it is being affected by insects, diseases, and air pollutants.

The information is organized by ecological provinces<sup>1</sup> that delineate relatively homogeneous landscapes by topography, hydrology, and climate. The four provinces in eastern Oregon, and the ecological sections that fall within them, are listed below.

- Cascades (Cascades mixed forest, coniferous forest, alpine meadow). This province includes portions of the Eastern Cascades and Western Cascades sections.
- Sierran Steppe (Sierran steppe, mixed forest, coniferous forest). This province includes portions of the Southern Cascades and Modoc Plateau sections.
- Blue Mountains (Middle Rocky Mountain steppe, coniferous forest, alpine meadow). This province includes the Blue Mountains section.
- Intermountain (Intermountain semidesert and desert). This province includes portions of the Columbia Basin, High Lava Plains, Northwest Basin and Range, and Owyhee Uplands sections.

<sup>1</sup> Bailey, R.G. 1980. Ecoregions of the United States. Misc. Publ. 1391. Washington, DC: U.S. Department of Agriculture, Forest Service.



Source: Bailey 1980. See footnote 1.



Collecting inventory data. Photo by Paul Dunham

Most of the information in this report is from the 1998–99 Forest Inventory and Analysis (FIA) inventory on state, private, and other public (such as National Park Service and Bureau of Land Management [BLM]) lands and the 1993–96 inventory on national forests. We also include information from the 1988 juniper aerial survey, 1998–2001 forest health monitoring plots (now a part of the FIA plot network), and Forest Insect and Disease aerial surveys between 1987 and 2001. With the exception of the aerial surveys where forest condition is observed and recorded from the air, all other data were collected by field crews visiting permanent ground plots and, unless otherwise noted, results reporting on tree or plot conditions are from the FIA and national forest ground inventories.

Two terms are commonly used to describe forested land: “forest land” and “timberland.”

- **Forest land** (14.9 million acres in 1999 in eastern Oregon<sup>2</sup>) is a more encompassing term that includes all land that is at least 10 percent covered by trees of any size, greater than 1 acre in area, and at least 120 feet wide.
- **Timberland** (10.4 million acres in 1999 in eastern Oregon; see footnote 2) is a portion of the forest land (described above) that produces (or is capable of producing) more than 20 cubic feet per acre of industrial wood products each year under natural conditions, is not withdrawn from timber use, and is not developed for nonforest uses.

Examples of areas included in forest land but excluded from timberland are national and state parks, nature preserves, wilderness areas, and urban forests (such as cemeteries and city parks). Also, because of agency policies such as those arising from the environmental assessments or for riparian reserves, all federal lands meeting the above definition of timberland may not be equally available for timber production.

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<sup>2</sup> The 14.9 million acres of forest land and 10.4 million acres of timberland include 2.2 million acres and 40,000 acres of juniper forest land and timberland, respectively, from the 1988 juniper aerial survey.



# What Is the History of Eastern Oregon Forests?

**F**OR CENTURIES BEFORE EUROPEAN SETTLEMENT of the Pacific Northwest, the primary agents of forest change in eastern Oregon were fire, wind, flooding, insects, and disease. Fire patterns ranged from frequent, mild, ground fires at low elevations to occasional intense, stand-replacing fires at high elevations. Native people also deliberately modified the vegetation of eastern Oregon, primarily through the use of fire. Fires were set to improve production of food and medicinal plants; to maintain open forests for traveling and hunting; to improve browsing conditions for deer, elk, and, by the early 1800s, horses; and to reduce fire risk around campsites.<sup>3 4</sup>

Thousands of emigrants passed through eastern Oregon on the numerous Oregon Trail routes to the Willamette Valley from the 1840s through the 1860s, with some settling in the river valleys of eastern Oregon. In the more forested areas of the Blue Mountains and eastern Cascades, grazing, ranching, and mining began, followed by extensive timber harvest enabled by railroads that could transport the milled lumber to more distant markets (see footnote 3). Beginning in the early 1900s, it was public policy that fires be vigorously suppressed owing to a perceived threat to forest management (see footnote 4). Fire suppression continued through much of the 20<sup>th</sup> century, taking away an important natural means for removing fuels and thinning stands, leaving sites dense with tree cover, particularly at lower elevations. Fire suppression

<sup>3</sup> Robbins, W.G.; Wolf, D.W. 1994. Landscape and the intermontane northwest: an environmental history. Gen. Tech. Rep. PNW-GTR-319. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p.

<sup>4</sup> Agee, J.K. 1993. Fire ecology of Pacific Northwest forests. Washington, DC: Island Press. 493 p.



Ponderosa pine forest in the early 1900s.

## Significant forestry events in eastern Oregon

**1860s:** First eastern Oregon sawmills mainly provided for local needs such as lumber for mining flumes and sluices.

**1887–1890:** One of the worst droughts in eastern Oregon hastened widespread pine mortality from bark beetles.

**1905:** The USDA Forest Service was created in order to conserve forest resources and stabilize markets.

**1907:** Northeastern forest insect control project started at the request of the forest supervisor of the Imnaha (Wallowa) National Forest to control bark beetle mortality on lodgepole and ponderosa pine near Joseph, Oregon.

**1911:** Oregon Department of Forestry was established, with F.A. Elliott appointed the first state forester.

**1934:** The first forest inventory in eastern Oregon was mandated by the McSweeney-McNary Act of 1928.

**1964:** The Wilderness Act originally designated 9.1 million acres of wilderness on national forest land across the United States. Now nearly 100 million acres of wilderness, countrywide, is managed by the Forest Service, BLM, and Fish and Wildlife Service. Oregon currently has 40 wilderness

*Continues on page 4.*

areas, 21 of these falling partially or wholly in eastern Oregon and covering nearly 1.34 million acres.

**1970:** The National Environmental Policy Act requires analysis of environmental and economic impacts of significant actions (such as timber harvest) on federal lands.

**1971:** Oregon State Forest Practices Act—the Nation's first Forest Practices Act set minimum standards for state and private forest lands for reforestation, road construction and maintenance, timber harvesting, chemical application, and slash disposal. Federal forest managers agreed to meet or exceed these standards.

**1973:** The Endangered Species Act requires federal departments and agencies to conserve endangered and threatened species and their habitat.

**1973:** Oregon Land Conservation and Development Act—a land use planning law to limit further loss of Oregon's most productive forest and farm land.

**1974:** Forest and Rangeland Renewable Resources Planning Act (RPA) requires the Forest Service to comprehensively assess the renewable resources on all forest and rangelands for purposes of sustained yield and multiple uses.

**1976:** The National Forest Management Act requires the Forest Service to prepare management plans for each national forest to provide for multiple use and sustained yield. Federal Lands Policy and Management Act in the same year authorized BLM to inventory and manage its public land for similar purposes.

**1978:** The Forest and Rangeland Renewable Resource Research Act further expanded the McSweeney-McNary Forest Research Act of 1928 and RPA of 1974 to include nontimber resources in forest and rangeland inventory and analysis.

**1993:** Interior Columbia Basin Ecosystem Management Project—an assessment by the Forest Service and Bureau of Land Management (BLM) of the resources, impacts, and potential forest management strategies for eastern Oregon and Washington with results to be applied to forest plans.

and the selective harvest of older, large pines, larch, and Douglas-fir transformed many open, parklike stands into dense, overcrowded stands. Grazing and loss of beaver dams and pool-stabilizing logs altered riparian areas. Grazing also affected fire intensity and frequency by removing fine grass fuels; as a result, understory species and density increased. High-elevation forests with longer natural fire frequencies were less affected by fire suppression than were those at low elevations (see footnote 4).<sup>5 6</sup>

Owing to these changes in disturbance patterns and resulting vegetation, many eastern Oregon forests, in the last 50 years, have experienced greater mortality from bark beetles, greater infection rates of root diseases, and more severe and frequent attacks by defoliating insects such as Douglas-fir tussock moth and western spruce budworm (see footnote 6).<sup>7</sup> And although the number of forest fires has decreased (owing to continued fire suppression), severity and size of those that occur have been much greater in the drier ponderosa pine and Douglas-fir forests (see footnote 4).

In the last few decades, natural resource managers have altered many forest management practices to reverse these changes in eastern Oregon forests. Thinning, prescribed fire, grazing restrictions, and control of insect defoliators are some of the tools they are using to restore forests to a more desirable condition.

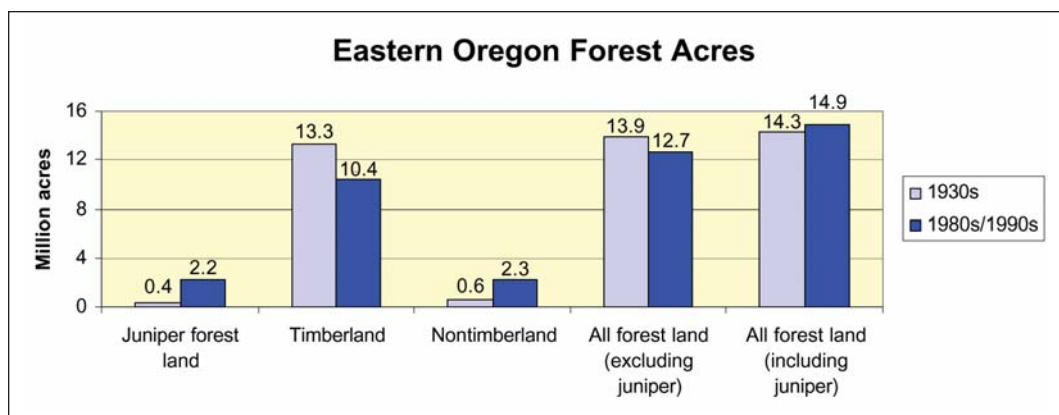
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<sup>5</sup> Campbell, S.; Liegel, L., tech. coords. 1996. Disturbance and forest health in Oregon and Washington. Gen. Tech. Rep. PNW-GTR-381. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station and Pacific Northwest Region; Oregon Department of Forestry; Washington Department of Natural Resources. 105 p.

<sup>6</sup> Lehmkuhl, J.F.; Hessburg, P.F.; Everett, R.L. [et al.]. 1994. Historical and current forest landscapes of eastern Oregon and Washington. Part I: Vegetation pattern and insect and disease hazards. Gen. Tech. Rep. PNW-GTR-328. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 88 p.

<sup>7</sup> Hessburg, P.F.; Mitchell, R.G.; Filip, G.M. 1994. Historical and current roles of insects and pathogens in eastern Oregon and Washington forested landscapes. Gen. Tech. Rep. PNW-GTR-327. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.

Forest inventories by the Forest Service were authorized in 1928 by the McSweeney-McNary Forest Research Act. The first inventory in eastern Oregon was undertaken between 1934 and 1937. Inventories from that first one to the present show an increase in juniper and nontimberland acres of 1.8 and 1.1 million acres, respectively, and a decrease in timberland acres of about 2.9 million acres.



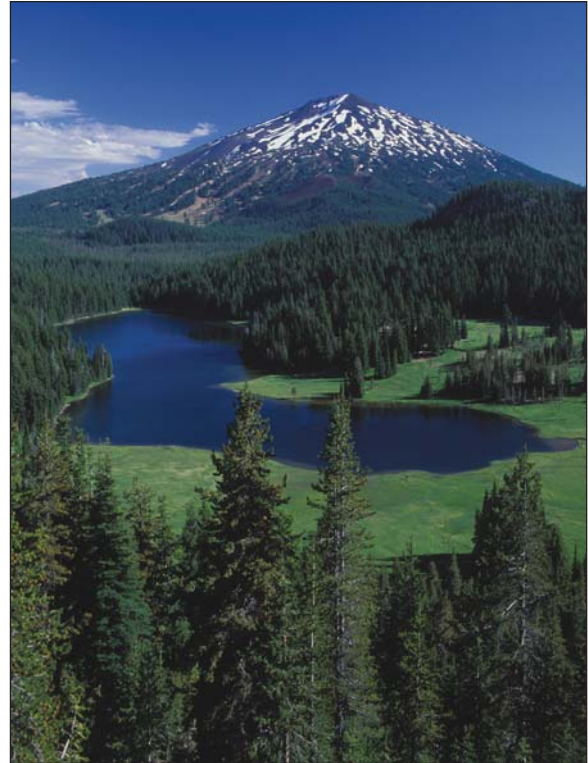


# How Much of Eastern Oregon Is Forest and Where Is It?

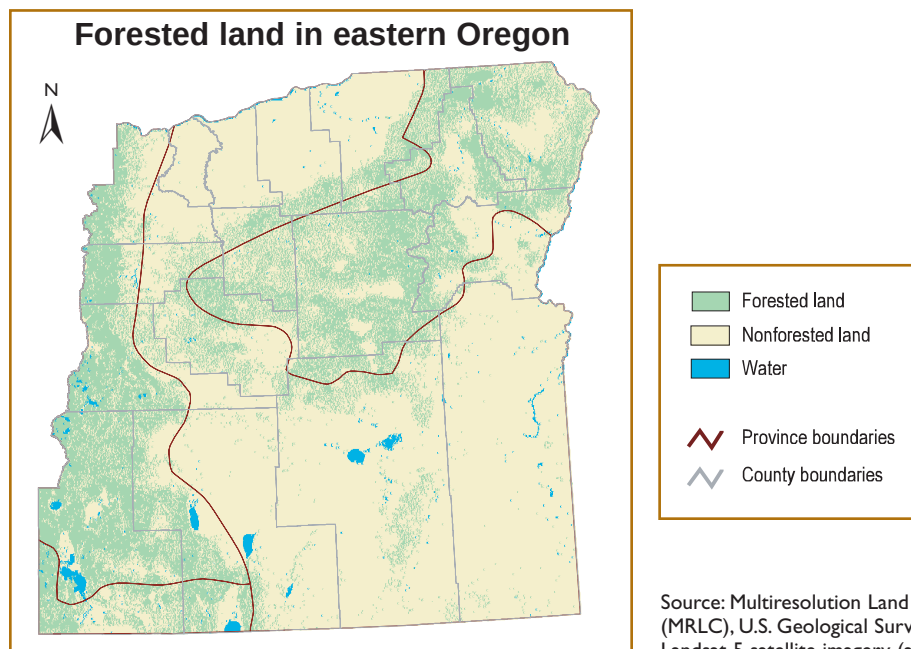
OF EASTERN OREGON'S 42.3 MILLION acres, 14.9 million (35 percent) are forested. The majority of the area is grassland and shrubland. The eastern slopes of the Cascade Range and the Blue Mountains are the two primary areas of forest. The larger cities and towns, such as Bend and La Grande, are found in these two areas as well.

The Cascades Province,<sup>8</sup> extending north to south on the eastern flank of the Cascade mountain range, makes up 16 percent of eastern Oregon. It has the highest percentage of forest land of the provinces in eastern Oregon (77 percent). Wide ranges in elevation (<100 to over 10,000 feet) and precipitation (20 to 120 inches) are typical of this province.

<sup>8</sup> The eastern Oregon 1990s inventory included a small piece (314,000 acres) of the western Cascades Province (see Campbell et al. 2002 for a description of this province). Data from this piece are included here.



Mount Bachelor, Cascades Province. Photo by Tom Iraci



Source: Multiresolution Land Characterization Consortium (MRLC), U.S. Geological Survey Map produced by classification of Landsat 5 satellite imagery (acquired 1992).

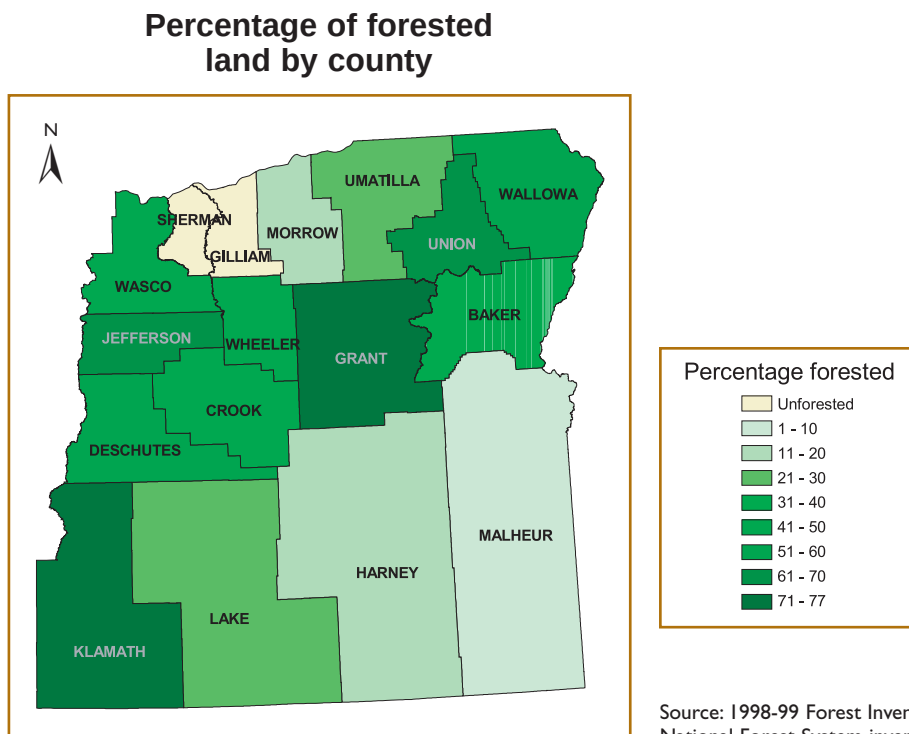
The northern portion of the province drains to the east into the Deschutes River and the southern portion into the Klamath River. The Newberry Volcanic National Monument and the town of Bend sit on the central eastern edge of the province, with smaller towns such as Dufur to the north and Chemult to the south. Portions of a number of wilderness areas, such as Badger Creek, Mount Jefferson, and Three Sisters, can be found in this province at the higher elevations along the Cascades Range.

The Sierran Steppe Province covers 5 percent of eastern Oregon (with the majority of the province in California); 51 percent of the province within eastern Oregon is forested. The northernmost portions of the Modoc Plateau and Southern Cascades sections are found within this province and include the towns of Klamath Falls and Lakeview.

| Ecological Province                           | Forest land <sup>a</sup> | Nonforest land <sup>b</sup> |
|-----------------------------------------------|--------------------------|-----------------------------|
| <i>Million acres (percentage of province)</i> |                          |                             |
| Cascades                                      | 5.2 (76.6)               | 1.6 (23.4)                  |
| Sierran Steppe                                | 1.0 (50.8)               | 1.0 (49.1)                  |
| Blue Mountains                                | 5.9 (64.8)               | 3.2 (35.2)                  |
| Intermountain                                 | 2.8 (11.3)               | 21.7 (88.7)                 |
| Total                                         | 14.9 (35.2)              | 27.5 (64.8)                 |

<sup>a</sup> Based on 1998-99 Forest Inventory and Analysis and 1993-96 National Forest System inventory plot data and the 1988 juniper aerial survey.

<sup>b</sup> Based on USDA Forest Service gap analysis program data.



Source: 1998-99 Forest Inventory and Analysis and 1993-96 National Forest System inventory data.

The Blue Mountains Province makes up about 21 percent of eastern Oregon. It is almost 65 percent forest land. This portion of northeastern Oregon is a plateau that includes the Ochoco Mountains in the southwest and the Wallowa Mountains to the east. The Hells Canyon National Recreation Area and Eagle Cap Wilderness are found in this province. Elevation ranges from 1,000 to 10,000 feet. Precipitation in the valleys (9 to 18 inches) is considerably less than in the mountains (17 to 100 inches). Towns in the Blue Mountains province include La Grande, Enterprise, Elgin, Baker, and John Day.



Whitman Overlook, Blue Mountains Province. Photo by Paul Dunham

The Intermountain Province covers about 58 percent of eastern Oregon but has the least amount of forest land (per our definition) in eastern Oregon—about 11 percent—because much of it is desert, shrub-grass land, or woodland. Elevation ranges from 200 feet near the Columbia River up to 10,000 feet for some mountain peaks. Precipitation is low through most of the province—4 to 20 inches. Ranching and farming (dryland and irrigated) are common. This province includes



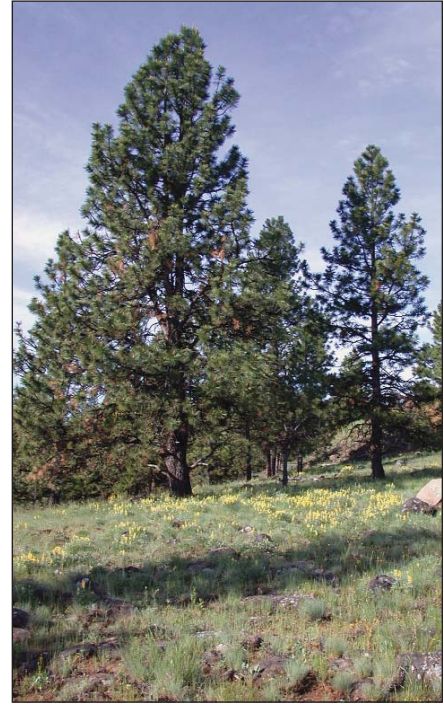
Steens Mountains, Intermountain Province. Photo by Tom Iraci

the Columbia Basin ecological section north of the Blue Mountains and the High Lava Plains, the Owyhee Uplands, and Northwest Basin and Range south of the Blue Mountains. The Columbia Basin area ranges from 200 feet near the Columbia River to over 4,500 feet in low mountains; communities include Hermiston, Pendleton, and Boardman. The High Lava Plains is a high desert area (2,000 to 5,000 feet elevation) with a history of volcanic activity (the most recent in Oregon) and the towns of Heppner, Fossil, Antelope, Madras, Prineville, and Redmond. The Northwest Basin and Range area consists of level valleys and basins, such as the Alvord Desert, and sharply rising plateaus and mountain ranges such as the Steens and Hart Mountains (over 9,700 and 7,600 feet, respectively). The Steens Mountain Wilderness Area, managed by the BLM, can be found in this area. Ranching communities here include Burns, Christmas Valley, and French Glen.

# What Trees Grow in Eastern Oregon?

**M**ANY SPECIES OF TREES GROW IN EASTERN OREGON. Forest inventories measure trees on each inventory plot and record detailed information on live trees including species, age, diameter, height, and damage by insects and disease. Thirty-one species of trees, 9 hardwood and 22 softwood (conifer), were tallied in eastern Oregon inventories (see tree list on page 29).<sup>9</sup> The Cascades Province is the most diverse, with 31 species tallied in the 1990s inventory; the Intermountain and Sierran Steppe were the least diverse with 17 and 19 species tallied, respectively (note: the number of species for the portion of a province—such as the Sierran Steppe—that is in eastern Oregon may not be representative of the entire province).

Several species are abundant in every ecological province in eastern Oregon: ponderosa pine, lodgepole pine, Douglas-fir, western juniper, white or grand fir, and quaking aspen. At the lowest elevations, western juniper grows along forest edges in a savannalike zone between ponderosa pine forests and dry sagebrush-grass areas. Ponderosa pine can be found either in pure stands where it has been maintained by fire or in mixes with other species such as true firs (*Abies* spp.) and Douglas-fir. Douglas-fir is generally found in mixed stands intermediate in elevation; common associates include western larch, western hemlock, true firs, western redcedar, and various pines. Lodgepole pine inhabits middle to high elevations; it grows across a broad range of environments from wet to droughty sites, developing after disturbances such as insect epidemics, fire, or logging; it is extensive on central Oregon pumice flats. Other species (besides lodgepole pine) found in higher elevation forests in the eastern Cascades and Blue Mountains include subalpine fir, mountain hemlock, Engelmann spruce, and whitebark pine. Several species have more specific growing requirements and may be found in only one or two areas (e.g., Oregon white oak in the northern Cascades and southwest of Klamath Falls in the Sierran Steppe Province) or in specific habitats (e.g., quaking aspen in riparian areas).



Ponderosa pine. Photo by Tom Iraci

<sup>9</sup> Because forest inventories sample only a portion of forest land, some species that are present may not be tallied.



Collections of species in an area make up a forest type, which, in eastern Oregon, is named after the predominant species. The most common types, across all ownerships, are ponderosa pine, true firs, lodgepole pine, and Douglas-fir. The following table lists the forest types for each ecological province in eastern Oregon.

| Forest type                   | Thousand acres | Percentage of forest land in province |
|-------------------------------|----------------|---------------------------------------|
| Cascades Province:            |                |                                       |
| Ponderosa pine                | 1,933.4        | 38.9                                  |
| Lodgepole pine                | 1,378.2        | 27.7                                  |
| <i>Abies</i> spp. (true firs) | 598.6          | 12.1                                  |
| Mountain hemlock              | 331.5          | 6.7                                   |
| Douglas-fir                   | 287.8          | 5.8                                   |
| Western juniper               | 106.6          | 2.1                                   |
| Oregon white oak              | 34.0           | 0.7                                   |
| Western hemlock               | 28.9           | 0.6                                   |
| Quaking aspen                 | 25.3           | 0.5                                   |
| Engelmann spruce              | 8.1            | 0.2                                   |
| Incense cedar                 | 8.1            | 0.2                                   |
| Other oaks                    | 7.5            | 0.2                                   |
| Western redcedar              | 5.0            | 0.1                                   |
| Whitebark pine                | 3.8            | 0.1                                   |
| Western white pine            | 3.5            | 0.1                                   |
| Western larch                 | 1.6            | 0.03                                  |
| Nonstocked <sup>a</sup>       | 102.1          | 2.1                                   |
| Access denied <sup>b</sup>    | 102.9          | 2.1                                   |
| Total                         | 4,966.9        |                                       |
| Sierran Steppe Province:      |                |                                       |
| Ponderosa pine                | 405.3          | 46.9                                  |
| <i>Abies</i> spp. (true firs) | 263.5          | 30.5                                  |
| Western juniper               | 68.4           | 7.9                                   |
| Mountain hemlock              | 30.6           | 3.5                                   |
| Lodgepole pine                | 25.5           | 2.9                                   |
| Douglas-fir                   | 24.0           | 2.8                                   |
| Incense cedar                 | 13.0           | 1.5                                   |
| Nonstocked <sup>a</sup>       | 19.7           | 2.3                                   |
| Access denied <sup>b</sup>    | 14.4           | 1.7                                   |
| Total                         | 864.4          |                                       |



Mixed-conifer stand. Photo by Tom Iraci



Western larch. Photo by Tom Iraci

| Forest type                   | Thousand acres | Percentage of forest land in province |
|-------------------------------|----------------|---------------------------------------|
| Blue Mountains Province:      |                |                                       |
| Ponderosa pine                | 1,939.1        | 35.2                                  |
| Douglas-fir                   | 1,215.3        | 22.1                                  |
| <i>Abies</i> spp. (true firs) | 1,118.4        | 20.3                                  |
| Lodgepole pine                | 454.7          | 8.3                                   |
| Mountain hemlock              | 231.1          | 4.2                                   |
| Western juniper               | 173.6          | 3.2                                   |
| Western larch                 | 102.4          | 1.9                                   |
| Whitebark pine                | 38.1           | 0.7                                   |
| Engelmann spruce              | 29.9           | 0.5                                   |
| Quaking aspen                 | 3.7            | 0.07                                  |
| Black cottonwood              | 2.1            | 0.04                                  |
| Nonstocked <sup>a</sup>       | 76.0           | 1.4                                   |
| Access denied <sup>b</sup>    | 123.1          | 2.2                                   |
| Total                         | 5,507.5        |                                       |
| Intermountain Province:       |                |                                       |
| Ponderosa pine                | 670.7          | 48.9                                  |
| Douglas-fir                   | 202.0          | 14.7                                  |
| Western juniper               | 167.4          | 12.2                                  |
| <i>Abies</i> spp. (true firs) | 106.0          | 7.7                                   |
| Lodgepole pine                | 59.9           | 4.4                                   |
| Western larch                 | 29.8           | 2.2                                   |
| Quaking aspen                 | 9.5            | 0.7                                   |
| Black cottonwood              | 4.5            | 0.3                                   |
| Western white pine            | 1.9            | 0.1                                   |
| Nonstocked <sup>a</sup>       | 85.1           | 6.2                                   |
| Access denied <sup>b</sup>    | 35.3           | 2.6                                   |
| Total                         | 1,372.1        |                                       |

<sup>a</sup> Nonstocked refers to a variety of conditions where the land is capable of supporting forest but currently has no trees, such as a recently harvested area.

<sup>b</sup> Access denied refers to those plots (and the area represented by them) to which owners have denied access to inventory crews.



True fir. Photo by Tom Iraci



Quaking aspen and ponderosa pine. Photo by Tom Iraci

# How Much Of Eastern Oregon Is Juniper Forest?

**W**ESTERN JUNIPER IS WELL ADAPTED TO GROW IN THE XERIC (DRY) ENVIRONMENT OF eastern Oregon. Juniper outcompetes much of the other vegetation because of its ability to grow extensive lateral roots that remove moisture from the space around the tree. This, in turn, prevents other plants from establishing and reduces available soil moisture for those already present, often resulting in a decrease in understory vegetation within juniper stands.

An inventory in 1936 estimated the area of juniper forest (areas having at least 10 percent crown cover) at 419,200 acres. An aerial survey in 1988 estimated the area of juniper forest at about 2,239,000 acres, with another 2,818,000 acres where cover was less than 10 percent. This increase in juniper area is reflected in the age class distribution, where most of the stands (68 percent) are under 100 years. A more recent inventory was conducted in 1999; data from that inventory are currently being compiled and will be reported later.

There are several hypotheses for the increase in juniper over the last century:

- Fire suppression since the settlement of eastern Oregon has reduced the amount of juniper killed by fire.
- Increases in grazing have reduced grasses that can carry fire through small juniper stands, again reducing juniper mortality.
- A minor climate shift has favored the establishment of juniper over the last 100 years.



Western juniper. Photo by Paul Dunham



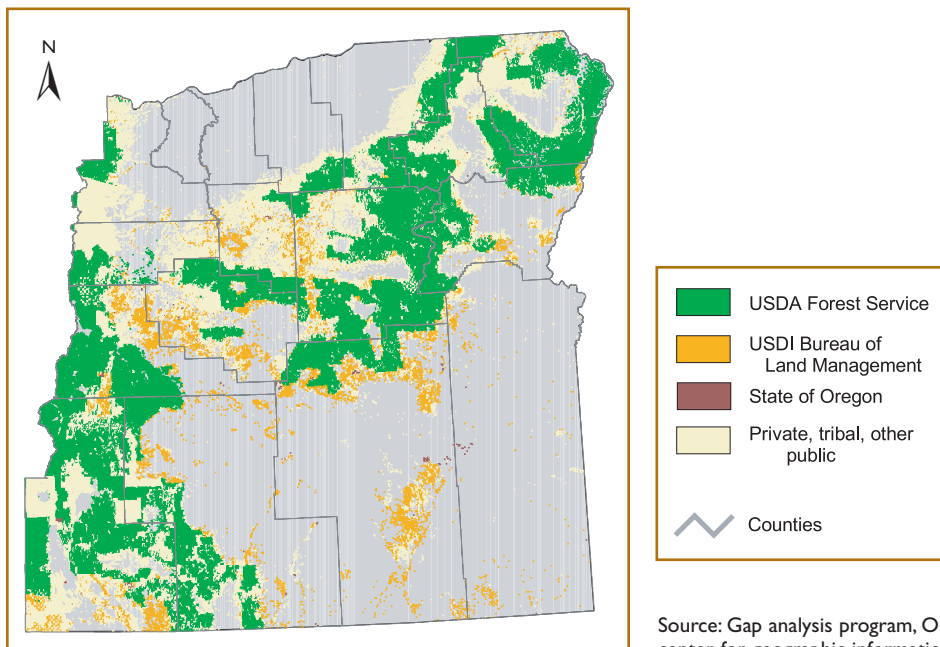
# Who Owns Eastern Oregon's Forests?

**P**UBLIC FOREST LAND IS MANAGED FOR THE public by agencies such as the USDA Forest Service, USDI Bureau of Land Management, Oregon Department of Forestry, counties, and municipalities. Most of the public forest land in eastern Oregon is national forest—over 8.7 million acres of forest land is in the Deschutes, Fremont, Mount Hood, Ochoco, Malheur, Umatilla, Wallowa-Whitman, and Winema National Forests. The BLM forest land includes 219,000 acres primarily in the Intermountain Province. About 97,000 forested acres are managed by the state and 170,000 acres by counties and cities. Management of public forests is guided by management plans, and each plan typically allows for many uses across the landscape, from providing recreation to harvesting timber to preserving wildlife to maintaining municipal watersheds. Plans are updated periodically and include public review.



Public agencies manage over 9.1 million acres of forest land in eastern Oregon. Photo by Paul Dunham

## Ownership of forested land in eastern Oregon

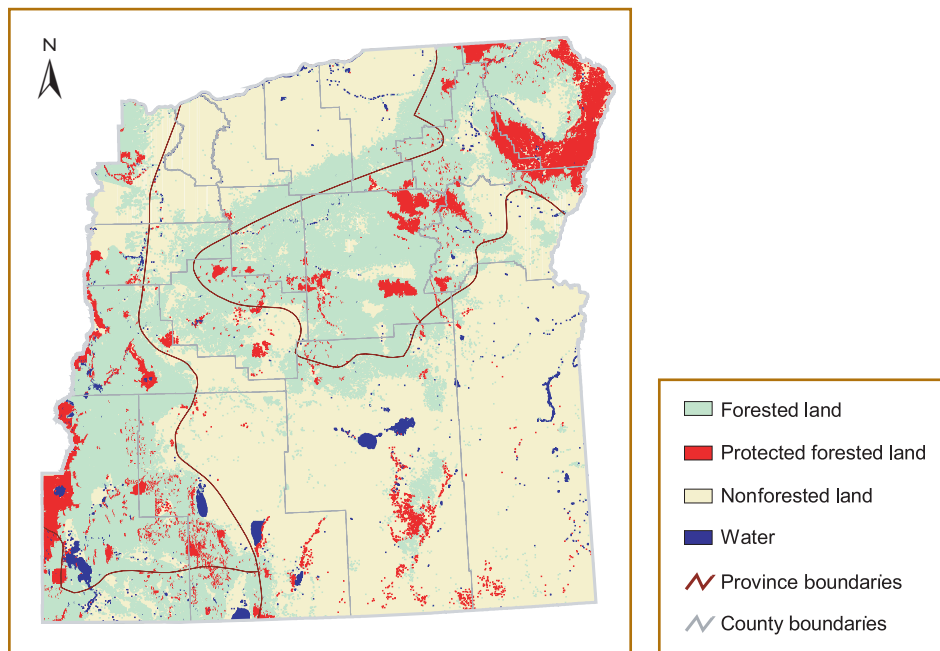


Source: Gap analysis program, Oregon State service center for geographic information systems.



There are a number of areas in eastern Oregon that are “reserved” or “protected” where forest land is withdrawn from timber harvest through statute, or administrative regulation or designation. These include Forest Service and BLM wildernesses, conservation areas, national recreation areas, and national monuments as well as areas reserved for protection of wildlife, municipal water supplies, or riparian habitat. Most of the protected lands are in the Blue Mountains and Cascades Provinces and are publicly owned (89 percent national forests, 11 percent other public). An explanation of the “protected” category used for the protected forested land map can be found on this page.

### Protected forested land



Source: Conservation Biology Institute protected areas database, 2001. Protected areas generally defined by codes 1 and 2 from the Gap Analysis Program (GAP), with a small number of updates from other sources. See below for definitions of GAP codes 1 and 2.

Code 1: Areas having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events are allowed to proceed without interference or are mimicked through management. Types of areas in code 1 include national parks, national monuments, wilderness areas, nature reserves and preserves, and research natural areas.

Code 2: Areas having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance. Types of areas in code 2 include state parks, state recreation areas, national wildlife refuges, national recreation areas, areas of critical environmental concern, wilderness study areas, conservation easements, and private conservation lands.



Over 3.4 million acres of forest land is privately owned. *Photo by Tom Iraci*

**Most important benefit expected by private forest landowners in the next 10 years in eastern Oregon**

| Benefit               | Owners | Estimated acres <sup>a</sup> | Average acres per owner |
|-----------------------|--------|------------------------------|-------------------------|
| Aesthetic enjoyment   | 27,000 | 391,000                      | 15                      |
| Income from timber    | 2,000  | 1,777,000                    | 8,885                   |
| Land value increase   | 2,000  | 561,000                      | 2,805                   |
| Farm and domestic use | 2,000  | 508,000                      | 254                     |
| Recreation            | 2,000  | 220,000                      | 110                     |
| Firewood              | <1,000 | 70,000                       | --                      |
| Other                 | 3,000  | 559,000                      | 186                     |
| Total                 | 39,000 | 4,086,000                    | approx. 105             |

-- = not available.

<sup>a</sup> Acres are based on the 1987 eastern Oregon forest inventory.

Sources: Birch 1997 (see footnote 11) and Butler 2002 (see footnote 10).

About 3.4 million acres are owned privately, either by individuals or companies. A 1994 survey of private forest landowners showed that over 38,000 individuals or companies own forest land in eastern Oregon.<sup>10</sup> According to the survey, the majority of owners cite visual enjoyment as the primary reason for owning forest land. However, if there is value in the standing timber on an owner's land, it often will be harvested at some time regardless of the cited primary use.<sup>11 12</sup> Many of the private forest landowners, especially industrial owners, have management plans for their forests.

<sup>10</sup> Data for eastern Oregon from the 1994 National woodland owner survey. On file with: Brett Butler, National woodland owner survey coordinator, USDA Forest Service, Northeastern Research Station, 11 Campus Blvd., Suite 200, Newtown Square, PA 19073.

<sup>11</sup> Birch, T.W. 1997. Private forest-land owners of the Western United States. 1994. Resour. Bull. NE-137. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 249 p.

<sup>12</sup> Lettman, G. 1995. Timber management practices and land use trends on private forest land in Oregon: a final report to the sixty-eighth Oregon legislative assembly. Salem, OR: Oregon Department of Forestry. 86 p.

# How Old Are Trees in Eastern Oregon?

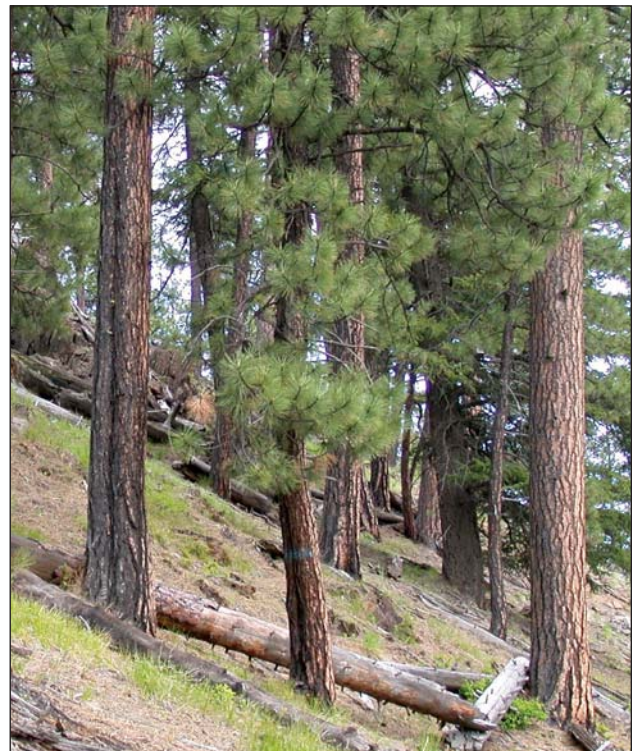
**F**OREST AGE DEPENDS ON THE TIME since the last harvest; the frequency, extent, and severity of disturbances such as forest fires or insect outbreaks; and, if left undisturbed, the lifespan of different species. Some tree species, such as aspen, with an average lifespan of less than 100 years, are relatively short-lived. Others, such as western juniper, can live for over 1,000 years.

Disturbances that cause mortality (fire, disease, insect attack, windstorms, flooding, etc.) result in mosaics of tree ages as regeneration fills in the gaps created by dead trees. The pattern of mortality, and thus ages, can vary from large continuous areas to small patches to single trees scattered throughout the forest.

Distribution of forest ages in eastern Oregon is very similar across all four ecological provinces with the majority of acres (39 percent) between 100 and 200 years old, 33 percent between 60 and 100, 24 percent less than 60, and 4 percent over 200. Age distribution is related primarily to past disturbances, ownership, and management activities. Forest age varies greatly



Ponderosa pine seedlings. *Photo by Tom Iraci*



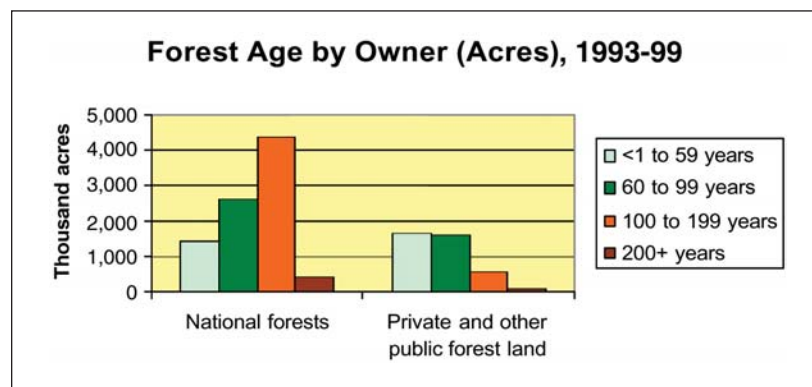
Mid-aged ponderosa pine stand. *Photo by Tom Iraci*





Old ponderosa pine. Photo by Tom Iraci

by owner in eastern Oregon. Fifty-four percent of national forest land is over 100 years old, contrasting sharply to 17 percent of private and other public forest land. Age distribution of forests in reserved areas, such as wilderness areas, mirrors that of national forests but with a higher percentage of acres over 200 years old (10.7 versus 4.8 percent, respectively).



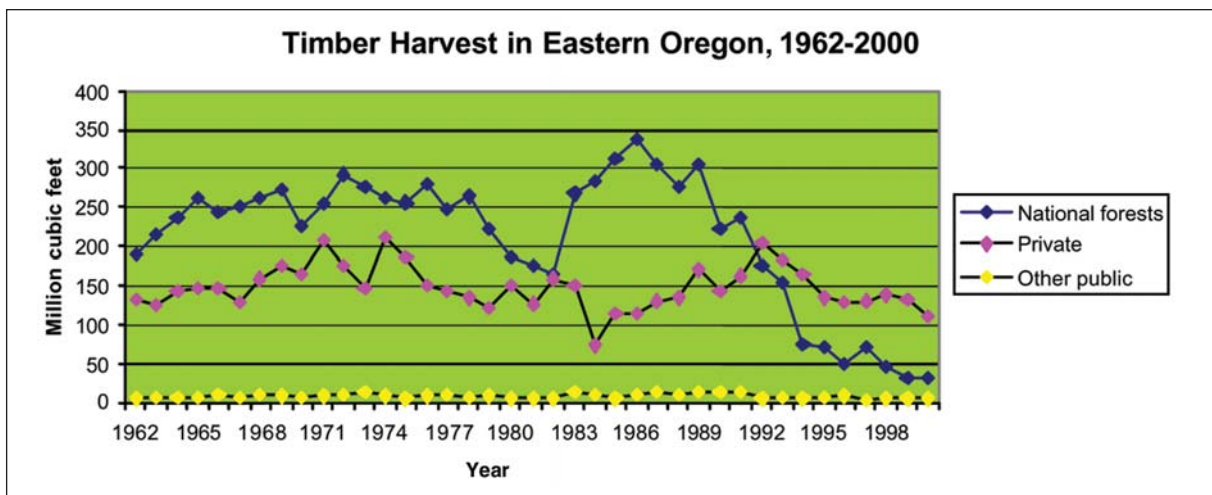


# What Is the Volume of Wood in Eastern Oregon?

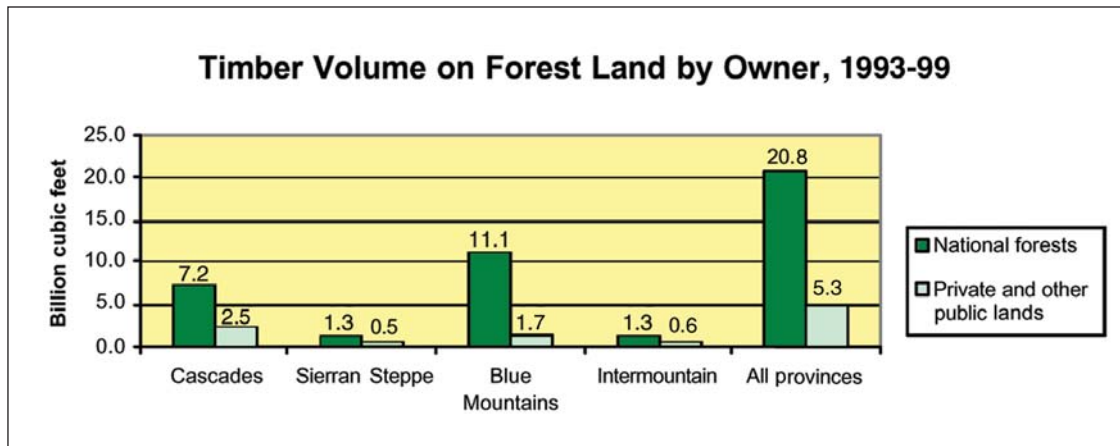


Transport of lumber from La Grande, Oregon. Photo by Paul Dunham

**T**IMBER REMAINS AN ESSENTIAL PART OF EASTERN OREGON'S ECONOMY. Many products such as paper, lumber, veneer and plywood, particleboard, firewood, and chips are produced from the timber in eastern Oregon's forests. The forests of eastern Oregon have about 26.2 billion cubic feet of timber (1 cubic foot = 1 foot high by 1 foot wide by 1 foot deep).



The ownership of this timber is a key factor in determining the availability of the timber for commercial use. Although national forests make up about 69 percent of the forest land area in eastern Oregon, they have about 81 percent of the timber volume. Private and other publicly managed forest land makes up 31 percent of the forest land and has about 19 percent of the volume. Federally owned timber is not necessarily available for production of forest products. The volume produced from federal timberlands has steadily decreased from a high of 339 million cubic feet in 1986 to 31 million cubic feet in 2000. The decline is due to a variety of reasons including establishment of riparian and wildlife reserves and withdrawal of limited access areas.



# How Fast Are Trees Growing, Dying, and Being Removed in Eastern Oregon?

“GROWTH” IS THE ANNUAL AVERAGE GROWTH of live trees greater than 5 inches diameter at breast height (for national forests, current annual growth was used because of lack of remeasurement data). “Removal” is the annual average volume removed by harvesting, silvicultural activities (such as thinning), and land clearing. “Mortality” is the annual average volume of trees that died of natural causes. Natural causes include competition, insect attack, disease, fire, drought, and other environmental factors.

Comparing tree growth to mortality plus removals illustrates one aspect of forest sustainability. For eastern Oregon forest land, excluding juniper forest land, the volume of annual removals plus annual mortality exceeded annual growth volume from 1987 to 1999 for all ownerships. Annual mortality plus removals on national forests was slightly greater than the amount of annual growth; on other public forest lands, it was about twice the amount of annual growth, and on private forest lands, it was over three times growth.

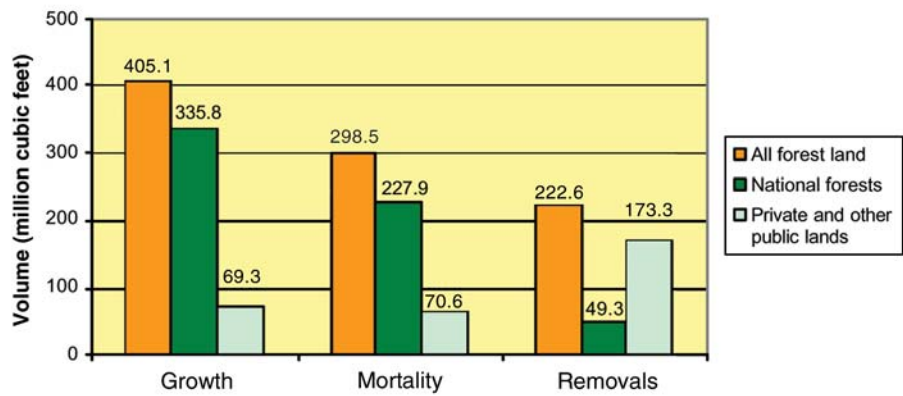


Harvest activities in eastern Oregon. *Photo by Paul Dunham*

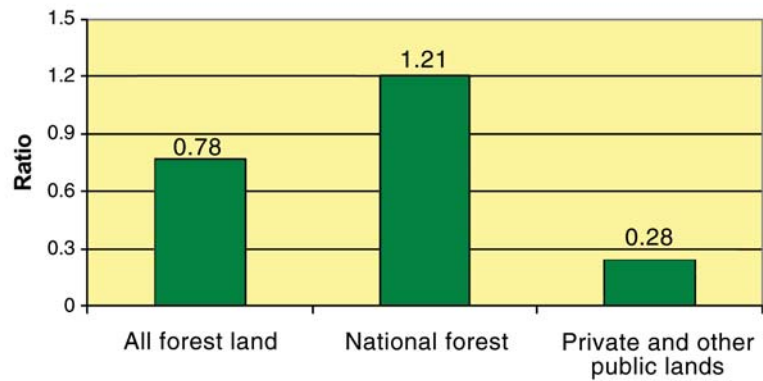


Mortality of true fir. *Photo by Paul Dunham*

**Growth, Mortality, and Removals on Forest Land, 1987-99**



**Ratio of Growth to Mortality Plus Removals, 1987-99**





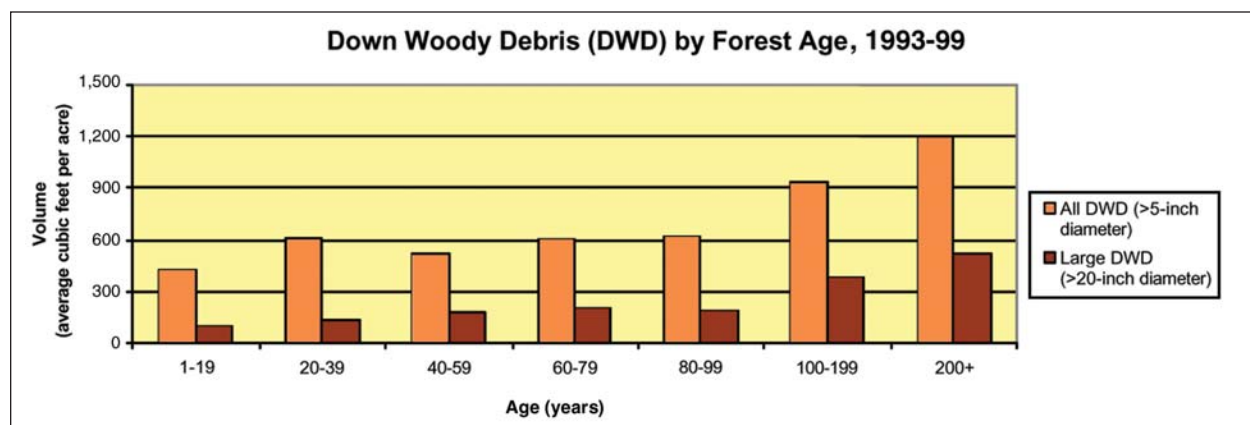
# How Much Dead Wood Is in Eastern Oregon Forests?

**D**EAD WOOD IS AN ESSENTIAL PART OF the forest and includes both “snags,” dead trees that remain standing for a period of time, and “down wood,” dead trees or portions of trees that have fallen to the ground naturally or branches or unusable sections of the trunk remaining after harvest. Dead wood, whether standing or down, plays key roles in forest ecosystems: it stores carbon; releases nutrients as it decays; provides substrate, habitat, and food for a wide array of other plants and animals; holds moisture; and serves as fuel for wildfire. The 1993–99 inventories sampled down wood >5 inches in diameter and >3.3 feet long.



Measuring down woody debris. Photo by Paul Dunham

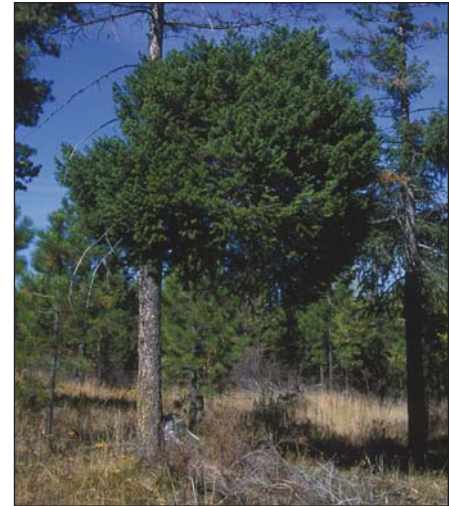
In eastern Oregon forests, the amount of dead wood varies tremendously across space and time. It is affected by forest age and type, site productivity, ownership (and therefore management activities), geographic and topographic location, and by the amount of insect, disease, and other mortality-causing events including fires and windstorms. Down woody debris generally increases with forest age but shows no trend related to ownership when summarized across all of eastern Oregon. On the other hand, snags are more abundant on national forests (average of 100 per acre) than on private and other public forest land (average of 52 per acre) but do not show a consistent increase with forest age.



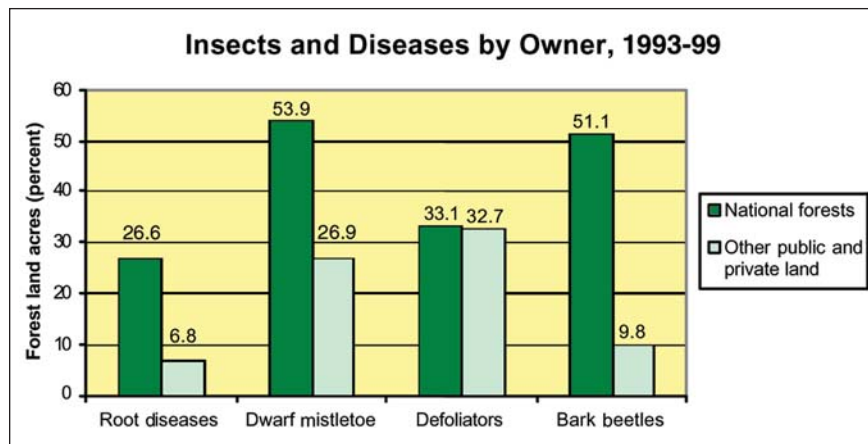
# What Insects and Diseases Are Affecting Eastern Oregon Forests?

**N**ATIVE INSECTS AND DISEASES PLAY AN IMPORTANT role in eastern Oregon forests—both beneficial and detrimental, depending on your point of view. They contribute to ecosystem functioning and diversity by creating dead material for nutrient recycling, create openings that result in mosaics of different species and ages, and provide habitat for wildlife. The mortality and growth loss they cause also can reduce productivity of forests being managed for wood production and can increase risk of wildfire.

Over 9 million acres (73 percent of the forested area) in eastern Oregon have trees with dwarf mistletoe, bark beetles, insect defoliators, or root disease. Other categories of insects and diseases also were tallied in the inventories but are not reported here. Compared to national forests, the incidence of insects and diseases is lower on private and other public forest lands, likely owing to host age, species, and stand structure as well as more intensive insect and disease management activities on these lands.



Broom on Douglas-fir caused by dwarf mistletoe.  
*Photo by Paul Dunham*

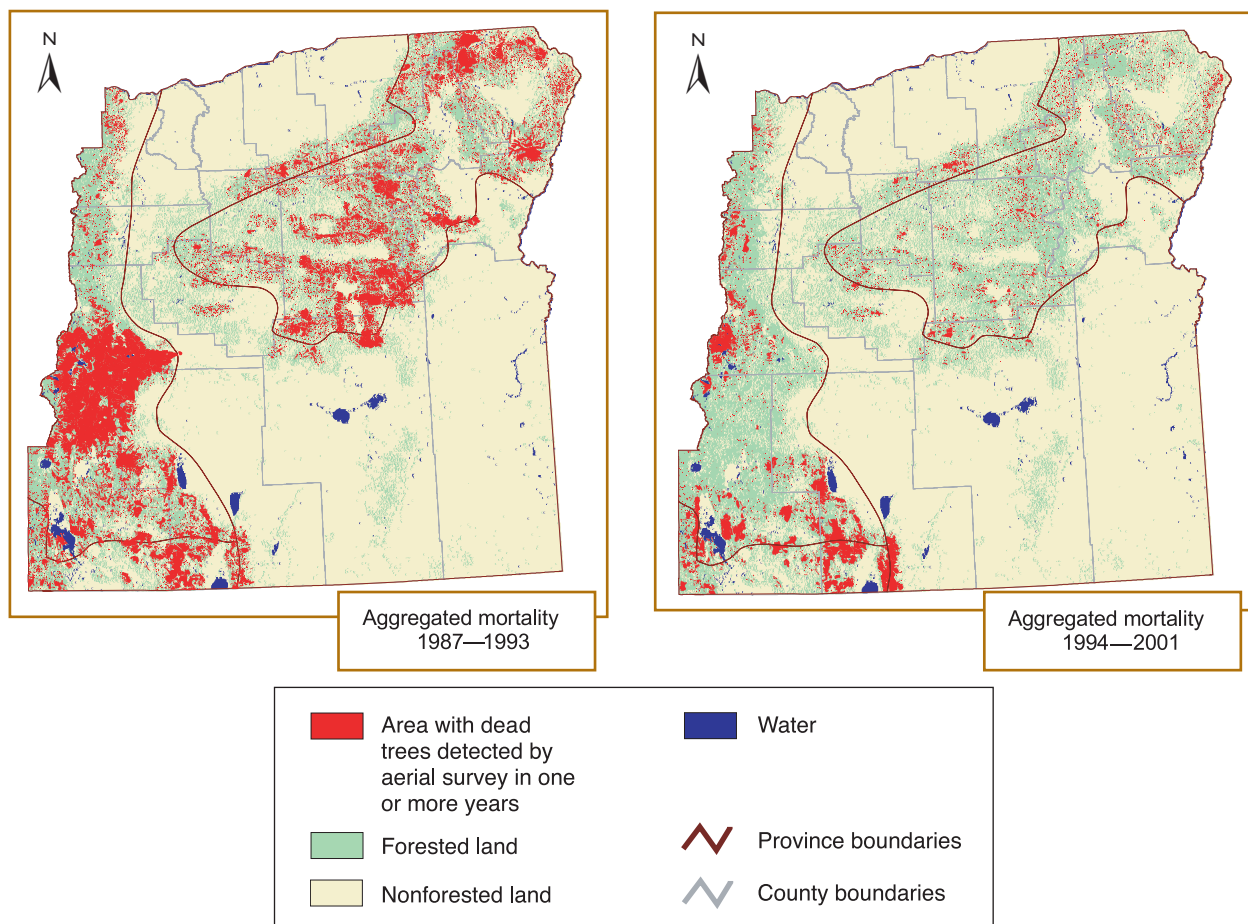


Dwarf mistletoe plant on Douglas-fir.  
*Photo by Paul Dunham*

continue

Annual aerial surveys by Forest Service and Oregon Department of Forestry insect and disease staff are conducted to detect and map forest defoliation and mortality that is often missed by plots owing to the localized nature of some diseases and insects, their spotty distribution, or the short period over which damage is visible. Any area with visible defoliation is mapped and, with a few exceptions, any area with more than five dead trees is mapped. Trends for the past 13 years in defoliation and mortality mapped from the air are shown on this and the next page.

### Forest mortality in eastern Oregon

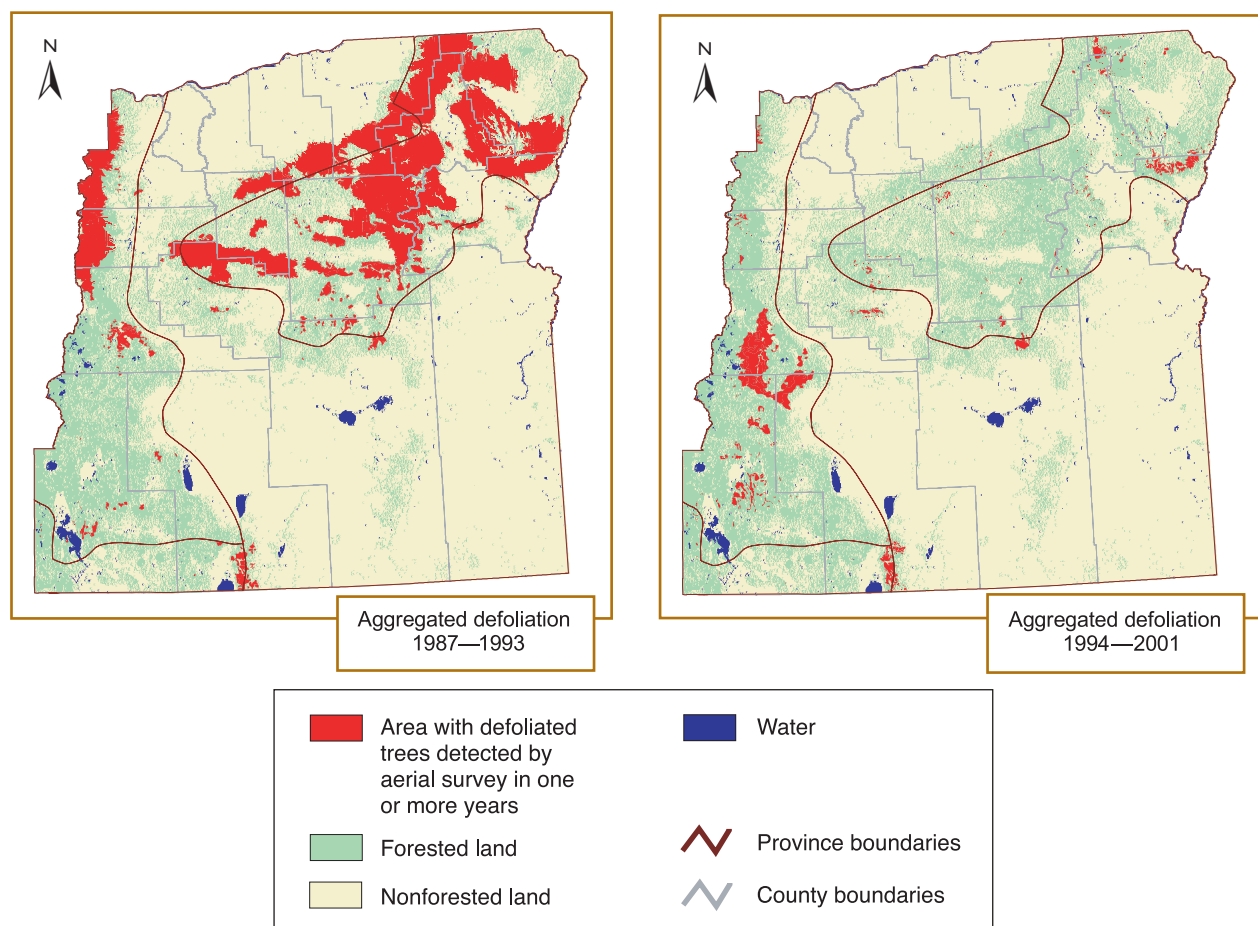


Source: Forest insect and disease aerial survey data. USDA Forest Service Pacific Northwest Region and Oregon Department of Forestry.

**Western spruce budworm** (*Choristoneura occidentalis* Freeman) defoliated Douglas-fir and true fir over huge areas of eastern Oregon in the late 1980s and early 1990s. In 2000, populations of **Douglas-fir tussock moth** (*Orgyia pseudotsugata* McDunnough) increased significantly and caused defoliation of about 174,000 acres in northeast Oregon. In 2001, acres of defoliation dropped to about 29,000. Drought in the late 1980s and early 1990s, coupled with overstocked stands, contributed to high levels of bark beetle mortality of pines, Douglas-fir, and true firs during those years. With the easing of the drought in recent years, mortality has decreased although factors such as wind-throw, snow breakage, root disease, defoliation, and fire damage contribute to localized bark beetle outbreaks.<sup>13</sup>

<sup>13</sup> USDA Forest Service, Oregon Department of Forestry, Washington Department of Natural Resources. 2001. Forest insects and disease highlights in Oregon and Washington, 2000. Portland, OR: Pacific Northwest Region. 17 p.

### Forest defoliation in eastern Oregon



Source: Forest insect and disease aerial survey data. USDA Forest Service Pacific Northwest Region and Oregon Department of Forestry.



# Are Introduced Plants Common in Eastern Oregon Forests?

ABOUT 57 PERCENT OF PRIVATE AND OTHER PUBLIC (nonnational forest) forest land has at least one introduced plant species (plants not native to a particular region, originating in other parts of the United States or other countries), and 4 percent has at least one noxious weed species (plants injurious to public health, agriculture, recreation, wildlife, or public or private property; some are native but most are introduced.<sup>14</sup>) Introduced plants in forests compete with native vegetation, reduce usable wildlife habitat, and can result in increased fire risk. Nonnative grasses account for about 82 percent of the introduced species. The most prevalent noxious weed is thistle (*Cirsium* spp. Mill.), occurring on 71 percent of the acres where at least one noxious weed was recorded. Other noxious weed species are St. Johnswort (*Hypericum perforatum* L.), knapweed (*Centaurea* spp.), Himalayan blackberry (*Rubus discolor* Weihe & Nees), and medusahead rye (*Taeniatherum caput-medusae* (L.) Nevski).



Himalayan blackberry, a common noxious weed in eastern Oregon forests. Photo by Paul Dunham

| Ecological province                                                   | Introduced plants | Noxious weeds |
|-----------------------------------------------------------------------|-------------------|---------------|
| <i>Percentage of private and other public forest land<sup>a</sup></i> |                   |               |
| Cascades                                                              | 41.9              | 1.9           |
| Sierran Steppe                                                        | 88.9              | 2.5           |
| Blue Mountains                                                        | 97.4              | 8.9           |
| Intermountain                                                         | 29.3              | 2.4           |

<sup>a</sup> Equivalent plant species data were not collected on the national forests during the 1993-96 National Forest System forest inventory.

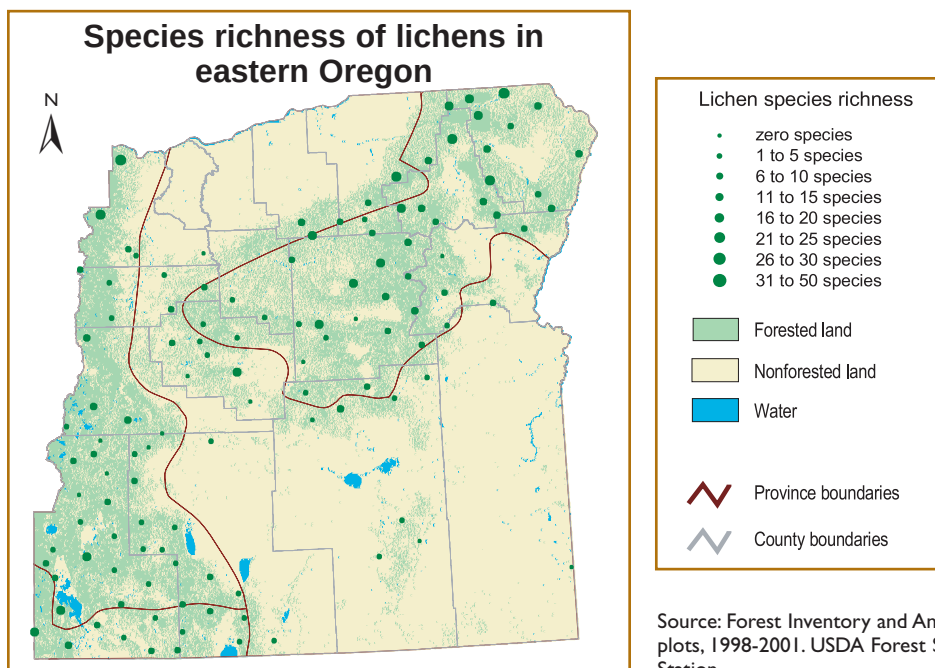
<sup>14</sup> Definition by Oregon Department of Agriculture 2002.

# What Are the Results of Lichen Monitoring in Eastern Oregon?

LICHENS HAVE BEEN SAMPLED ON INVENTORY PLOTS since 1998. Lichen abundance and species diversity (“richness”) are well correlated to air pollution, especially nitrogen- and sulfur-based pollutants, and are good indicators for potential pollution effects on other forest plant species. Lichen communities also are affected by climate (fewer species in dry climates) and forest age, structure, and density (fewer species in younger, denser, even-aged stands than in older, more open, multiage stands). Accurate interpretation of lichen species richness and abundance is dependent on developing gradient models for specific geographic areas that relate climate and pollution levels along gradients to corresponding lichen communities. A gradient model for Idaho, eastern Oregon, and eastern Washington is under development. However, initial summarization of the lichen data collected from 1998 through 2001 shows that species richness is greatest in the Blue Mountains Province and lowest in the Intermountain Province. Areas of low richness do not appear to be related to population centers as they are in western Oregon.



Lichens on western juniper. Photo by Paul Dunham



Source: Forest Inventory and Analysis data, forest health monitoring plots, 1998-2001. USDA Forest Service, Pacific Northwest Research Station.

# Is Ozone Damaging Forest Vegetation in Eastern Oregon?

AIR POLLUTANTS, SUCH AS OZONE AND SO<sub>2</sub>, affect forest health. The FIA program, in cooperation with state and federal partners, monitors for ozone injury on susceptible forest plant species. Ozone not only causes visible injury to foliage but also may cause long-term growth loss and contribute to plant mortality in concert with other agents such as insects or disease. Although ozone injury is common in California forests, no visible injury has been detected in eastern Oregon forests since ozone injury monitoring began in 1998.

Ozone-sensitive species used for monitoring ozone injury in eastern Oregon include the following:

- Ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.)
- Jeffrey pine (*Pinus jeffreyi* Grev. & Balf.)
- Scouler's willow (*Salix scouleriana* Barratt)
- Red alder (*Alnus rubra* Bong.)
- Pacific ninebark (*Physocarpus capitatus* (Pursh) Kuntze)
- Thinleaf huckleberry (*Vaccinium membranaceum* Dougl.)
- Blue elderberry (*Sambucus mexicana* C. Presl. ex DC.)
- Red elderberry (*Sambucus racemosa* L.)
- Snowberry species (*Symphoricarpos* spp.)



Ozone injury on ponderosa pine (in California). Photo by John Pronos

## Acknowledgments

First and foremost, we thank the Forest Inventory and Analysis (FIA) and national forest field crews who collected the data that made this report possible. We also want to acknowledge those people who supplied or compiled additional or special data for this report: Karen Waddell for down woody debris data, Andy Gray for noxious weed data, Peter Neitlich for lichen community data, Julie Johnson for Forest Health Protection aerial survey data, Don Hann for historical information, and Brett Butler for landowner survey data. And lastly, special thanks to our reviewers: Chuck Bolsinger, Gary Lettman, Susanna Melson, Tara Barrett, and Joe Donnegan.

## For More Information:

### EASTERN OREGON TIMBER STATISTICS

**Azuma, D.; Dunham, P.A.; Hiserote, B.A.; Veneklase, C.F. 2002.** Timber resource statistics for eastern Oregon, 1999. Resour. Bull. PNW-RB-238. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

### WESTERN OREGON TIMBER STATISTICS

**Azuma, D.; Bednar, L.F.; Hiserote, B.A.; Veneklaso, C.F. 2002.** Timber resource statistics for western Oregon, 1997. Resour. Bull. PNW-RB-237. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 120 p.

### WESTERN OREGON FOREST OVERVIEW

**Campbell, S.; Azuma, D.; Weyermann, D. 2002.** Forests of western Oregon: an overview. Gen. Tech. Rep. PNW-GTR-525. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.

### OREGON FOREST PRODUCTS

**Gebert, K.M.; Keegan, C.E., III; Willits, S.; Chase, A. 2002.** Utilization of Oregon's timber harvest and associated direct economic effects, 1998. Gen. Tech. Rep. PNW-GTR-532. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

### WEST COAST OZONE MONITORING

**Campbell, S.; Smith, G.; Temple, Pat [et al.]. 2000.** Monitoring for ozone injury in West Coast (Oregon, Washington, California) forests in 1998. Gen. Tech. Rep. PNW-GTR-495. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 19 p.



## **OREGON AND WASHINGTON FOREST HEALTH**

**Campbell, S.; Liegel, L., tech. coords. 1996.** Disturbance and forest health in Oregon and Washington. Gen. Tech. Rep. PNW-GTR-381. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station and Pacific Northwest Region; Oregon Department of Forestry; Washington Department of Natural Resources. 105 p.

**Pacific Northwest Research Station Forest Inventory and Analysis Web site for general information and inventory data** <http://www.fs.fed.us/pnw/fia/>

**Pacific Northwest Region (Oregon and Washington) Forest Insect and Disease Web site for general information and aerial survey data** <http://www.fs.fed.us/r6/nr/fid/>

**Forest Inventory and Analysis Down Woody Materials Web site** <http://www.ncrs.fs.fed.us/4801/DWM/>

**Forest Inventory and Analysis Lichen Monitoring Web site** <http://www.fia.fs.fed.us/lichen/>

**Forest Inventory and Analysis Ozone Monitoring Web site** <http://www.fiaozone.net/>

## Common and Scientific Names of Trees<sup>a</sup>

| Common name                | Scientific name                                           |
|----------------------------|-----------------------------------------------------------|
| Alaska-cedar               | <i>Chamaecyparis nootkatensis</i> (D. Don) Spach          |
| Bigleaf maple              | <i>Acer macrophyllum</i> Pursh                            |
| Black cottonwood           | <i>Populus trichocarpa</i> Torr. & Gray                   |
| Cherry                     | <i>Prunus</i> spp.                                        |
| California black oak       | <i>Quercus kelloggii</i> Newb.                            |
| Curlleaf mountain mahogany | <i>Cercocarpus ledifolius</i> Nutt.                       |
| Douglas-fir                | <i>Pseudotsuga menziesii</i> (Mirb.) Franco               |
| Engelmann spruce           | <i>Picea engelmannii</i> Parry ex Engelm.                 |
| Grand fir                  | <i>Abies grandis</i> (Dougl. ex D. Don) Lindl.            |
| Incense cedar              | <i>Calocedrus decurrens</i> (Torr.) Florin                |
| Jeffrey pine               | <i>Pinus jeffreyi</i> Grev. & Balf.                       |
| Lodgepole pine             | <i>Pinus contorta</i> Dougl. ex Loud.                     |
| Mountain hemlock           | <i>Tsuga mertensiana</i> (Bong.) Carr.                    |
| Noble fir                  | <i>Abies procera</i> Rehd.                                |
| Oregon white oak           | <i>Quercus garryana</i> Dougl. ex Hook.                   |
| Pacific silver fir         | <i>Abies amabilis</i> Dougl. ex Forbes                    |
| Pacific yew                | <i>Taxus brevifolia</i> Nutt.                             |
| Ponderosa pine             | <i>Pinus ponderosa</i> Dougl. ex Laws.                    |
| Quaking aspen              | <i>Populus tremuloides</i> Michx.                         |
| Red alder                  | <i>Alnus rubra</i> Bong.                                  |
| Shasta red fir             | <i>Abies magnifica</i> A. Murr.                           |
| Subalpine fir              | <i>Abies lasiocarpa</i> (Hook.) Nutt.                     |
| Sugar pine                 | <i>Pinus lambertiana</i> Dougl.                           |
| Western hemlock            | <i>Tsuga heterophylla</i> (Raf.) Sarg.                    |
| Western juniper            | <i>Juniperus occidentalis</i> Hook.                       |
| Western larch              | <i>Larix occidentalis</i> Nutt.                           |
| Western redcedar           | <i>Thuja plicata</i> Donn ex D. Don                       |
| Western white pine         | <i>Pinus monticola</i> Dougl. ex D. Don                   |
| White fir                  | <i>Abies concolor</i> (Gord. & Glend.) Lindl. ex Hildebr. |
| Whitebark pine             | <i>Pinus albicaulis</i> Engelm.                           |
| Willow                     | <i>Salix</i> spp.                                         |

<sup>a</sup> For tree species tallied in 1998-99 Forest Inventory and Analysis and 1993-96 National Forest System inventories.

The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

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