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Warner Mountains, Fremont National Forest.

## Chapter 6: Products

Oregon's forests are an essential source of raw material for timber and nontimber forest products, and they provide many other amenities and services to the people of Oregon. The forest products industry has historically been a mainstay of Oregon's economy and culture. Its contributions continue today in the form of wood products, employment and income, tax revenue, and maintenance of forest lands across the landscape. This chapter examines the productive capacity of Oregon's forests and its contribution to the state's economy and environment.



Data in this chapter address Montréal Process criterion 2 and indicators pertaining to maintenance of productive capacity of forest ecosystems and criterion 6 and indicators pertaining to maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies.



Data in this chapter also address Oregon indicator B pertaining to social and economic outputs and benefits and indicator C pertaining to maintenance and enhancement of productive capacity of Oregon's forests.

### Oregon's Primary Forest Products Industry<sup>1</sup>

#### Background

Oregon's forest products industry uses timber harvested from Oregon as well as other states in the Western United States and Canada. The industry provides ecological, social, and economic benefits by supplying society with wood products such as lumber and plywood (fig. 85) and by providing employment and income associated with forest management, timber harvesting, and wood products manufacturing. Future availability of forests for harvesting and remaining capacity and capability of the primary forest products industry to use timber are important issues facing Oregon's forest products industry.

In cooperation with Pacific Northwest Forest Inventory and Analysis (PNW-FIA) Program, the Bureau of Business and Economic Research at the University of Montana conducts a periodic census of Oregon's primary forest

<sup>1</sup> Authors: Jason Brandt and Todd Morgan.



Gary Lettman

Figure 85—Plywood is one of the many timber products that Oregon mills produce.

products industry (that is, timber processors and users of mill residue). The latest census is the source of information presented below and provides detail on timber harvest and flow and comprehensive information about the state's timber processing sectors, product volumes, sales values, and mill residue (Brandt et al. 2006).

## Findings

During 2003, a total of 249 primary forest products facilities operated in 32 of Oregon's 36 counties (fig. 86). Oregon remains the leading softwood lumber-producing state in the United States. Total Oregon lumber production during 2003 was 6,574 million board feet (MMBF) lumber tally with a sales value of just under \$2.3 billion. Production capacity for Oregon sawmills was 7,764 MMBF lumber tally, with 79 percent of lumber-producing capacity aggregated among 33 sawmills with annual production capacity greater than 100 MMBF. These largest sawmills also accounted for 79 percent (5,196 MMBF) of lumber production. Sawmills received approximately 3,211 MMBF Scribner, or 75 percent, of the timber delivered to Oregon processors in 2003. The volume-weighted statewide average recovery in 2003 was 2.07 board feet of lumber per board foot Scribner of timber input.

Shown below are 2003 sales from Oregon's primary forest products sectors:

Sector	2003 product sales value
	<i>Thousands of U.S. dollars</i>
Sawmills	2,284,985
Pulp and board facilities	2,271,143
Plywood and veneer plants	1,773,487
Other sectors <sup>a</sup>	345,688
Chipping facilities	23,627
Log homes plants	13,153
Posts, pole, pilings, and utility pole plants	11,403

<sup>a</sup> Other sectors include manufacturers of bark products, cedar products, biomass energy, engineered wood products, log exports, log furniture, fuel pellets, and firelogs.

Oregon's primary forest products sectors had product sales of more than \$6.7 billion in 2003. The largest share of sales from the pulp and board sector and sawmills were to Washington and California, whereas the largest portion of plywood, veneer, and other primary products sales were within Oregon. During 2003, Oregon's plywood and veneer sector produced 4,106 million square feet (MMSF) (3/8-inch basis) of plywood<sup>2</sup> and 2,094 MMSF (3/8-inch basis) of veneer, making Oregon the leading producer of plywood in the United States.

The pulp and board sector is the major consumer of mill residue in the state, processing over 70 percent of the residue generated from sawmills and plywood and veneer facilities in the state. Oregon's pulp and paper sector produced more than 4.4 million dry tons of pulp and paper, and board facilities produced a total of 1,676 MMSF of products, including particleboard, medium-density fiberboard, and hardboard. Mill residue-utilizing facilities other than pulp and board, consisted of one biomass energy-generating operation, three firelog and wood pellet manufacturers, and five bark product facilities. Sawmills produced 78 percent (5.9 million dry tons) of all mill residue generated in Oregon during 2003. Other facilities produced about 1.7 million dry tons of residue for a total of about 7.6 million dry tons, nearly all of which (99.8 percent) was used.

Almost 65,700 workers, earning a total of \$3.3 billion annually, were directly employed in the primary and secondary wood and paper products industry in Oregon during 2003. About 70 percent of these workers were employed in the harvesting and processing of timber or in private-sector land management, earning nearly \$2.3 billion in labor income. The secondary industry employed 22,400 workers, with earnings of approximately \$1 billion. The secondary industry includes firms (e.g., window frame and door manufacturers, truss and remanufacturing facilities, as well as furniture and packaging makers) that further process output from the primary industry.

<sup>2</sup> Plywood volume reported here is substantially higher than that published by the Engineered Wood Association because we include softwood and hardwood plywood production as well as specialty veneer panel products, whereas the Engineered Wood Association's estimate includes just softwood plywood.

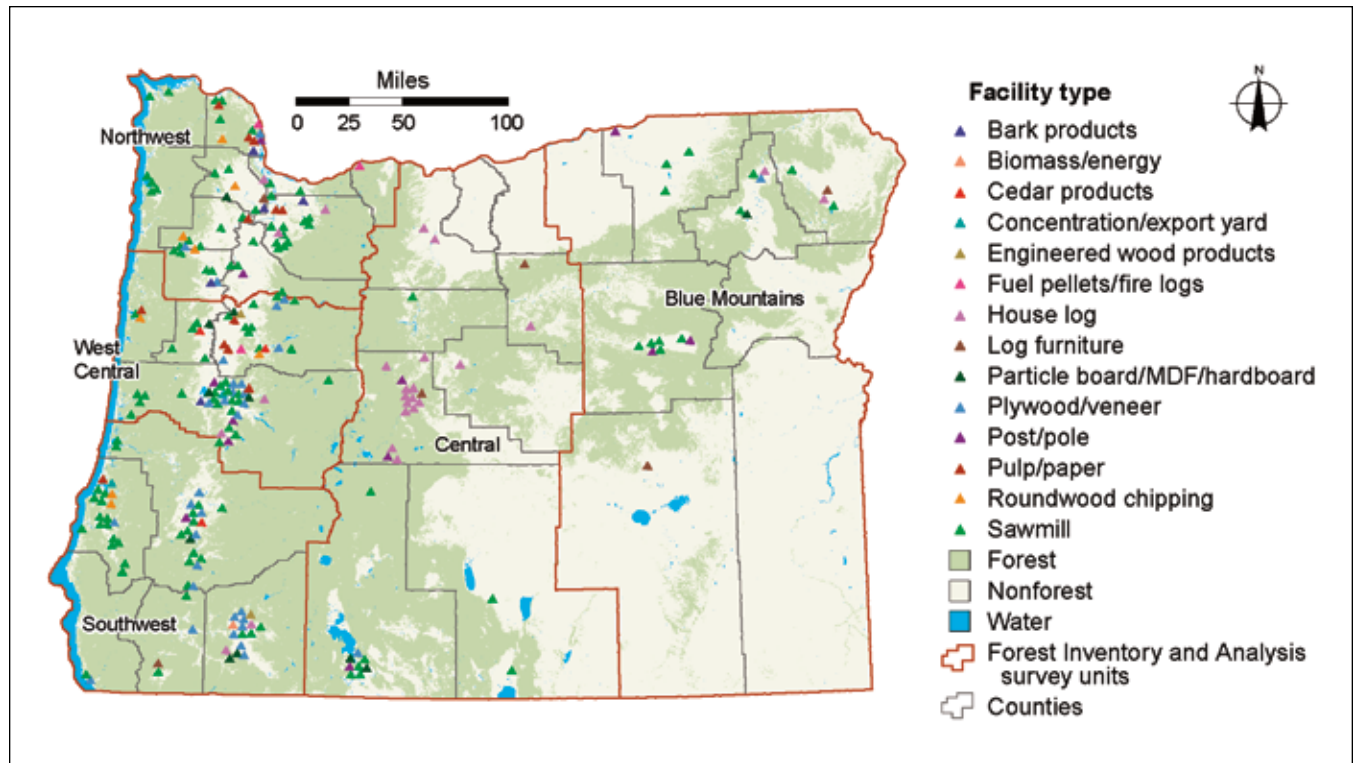


Figure 86—Active Oregon primary forest products facilities by county and resource area, 2003 (forest/nonforest geographic information system (GIS) layer: Blackard et al. 2008; urban/water GIS layer: Homer et al. 2004).

Oregon's forest products industry has consistently been responsible for a higher portion of labor income than employment, indicating the industry provides above-average wages and benefits. During 2003, Oregon's average worker, across all industries earned \$32,400, while for the forest products industry the figure was almost 55 percent higher, at nearly \$50,200. In addition to primary and secondary employment, the forest products industry also provides indirect employment such as log hauling and machinery sales and service.

### Interpretation

After declining in response to reductions in federal timber harvest levels during the 1990s, Oregon's forest products industry is experiencing a resurgence. Oregon's total timber harvest has increased about 8 percent since 2003. Lumber production has also increased, with 2005 lumber production almost 14 percent higher than 2003 and 2006 production about 8 percent higher than 2003. Improved milling technology has increased product recovery (e.g., overrun) while allowing increased use of smaller-diameter trees. Oregon is expected to remain the leader in U.S. softwood lumber and plywood production.

## Growth, Removals, and Mortality<sup>3</sup>

### Background

Increases or decreases in timber volume can be explained by examining growth, removals, and mortality of trees. Comparing removals and mortality to growth addresses one aspect of forest sustainability; when removals and mortality exceed growth, total tree volume will decline. In localized areas, removing trees to reduce risk from fire or insect outbreaks can cause removals to exceed growth, but may benefit the health of the stand. Alternatively, widespread mortality from some agent of disturbance such as bark beetles may also offset growth gains and thus slow stand development (fig. 87).

Because the current FIA inventory differed from past inventories in how the different parts of the forest land base were measured (i.e., forest land, timberland, and inclusion or exclusion of reserved land), and because the inventories used different definitions of forest attributes (e.g., growing

stock), it is not possible to simply compare prior published results with current results to estimate change in the net volume of trees. To minimize the definition-based effects, we estimated net change based on revisited plots and assessed them under our current algorithms and definitions.<sup>4</sup> We estimated current annual gross growth from increment cores taken from a subset of softwood trees on the revisited plots. The difference between net change and current annual gross growth is our estimate for removal and mortality.

### Findings

Growth of softwood trees on Oregon's timberland significantly exceeds removals and mortality. The ratio of growth to removals and mortality is similar in eastern (2.02) and western Oregon (1.95). Across the state, the net change was positive for all owner groups (national forest, state and local government, corporate, and noncorporate private owners).

<sup>3</sup> Author: Olaf Kuegler.

<sup>4</sup> In western Oregon we established new plots on BLM land and previous plots were not revisited. As a result, we did not estimate growth, removals, and mortality on BLM land.



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Figure 87—Growth of trees is offset by harvesting and mortality. Mortality in the Santiam Pass area of Oregon, shown here, was caused by western spruce budworm (*Choristoneura occidentalis* Freeman).

The tabulation below shows the net growth of softwood trees on timberland in Oregon:

	Annualized net change					
	Oregon		Western Oregon		Eastern Oregon	
	Total	SE	Total	SE	Total	SE
	<i>Thousand cubic feet</i>					
National forest	712,758	147,497	494,111	140,241	218,647	47,450
State and local	140,236	96,084	132,904	95,568	7,332	9,943
Corporate private	117,540	102,852	127,420	97,904	-9,880	31,515
Noncorporate private	110,941	79,701	73,107	73,198	37,834	31,533
All owners	1,081,475	218,663	827,542	208,901	253,933	65,862

In eastern Oregon, between 1987 and 1999, the ratio of growth to removals and mortality was less than 1 for national forest, other public, and private forest land (Campbell et al. 2004). Currently, growth significantly exceeds removal and mortality on east-side national forest land. Standard errors for our limited sample were too high for us to definitively estimate trends on land owned by state and local government, corporate, and noncorporate private owners.

In western Oregon, growth significantly exceeded removals and mortality on national forest timberland. The positive trends for state and local, corporate, and noncorporate private timberland were not statistically significant.

Across Oregon, state and local timberlands produce the largest amount of softwood timber (211 cubic feet per acre per year), followed by corporate lands (150 cubic feet), noncorporate private lands (122 cubic feet), and national forest timberlands (86 cubic feet). Softwood timberlands are far more productive in western Oregon (178 cubic feet per acre per year) than in eastern Oregon (50 cubic feet).

Western white pine (see “Scientific and Common Plant Names”) is the only species group with a significant estimated decline in volume. Potential volume declines in other species groups were not statistically significant.

### Caveats

The design and definitions used in past inventories are significantly different from those used in our current inventory (see app. 2). The design has changed from a variable-radius plot to a fixed-radius design and from five to four

subplots with only the center of one subplot being the same. As a result, only a small fraction of trees were remeasured in the current annual inventory. Although it is still valid to estimate overall net change based on these different designs, there are some inherent problems. For this chapter we have tried to minimize procedural differences between inventories by comparing only subplots from the two inventories that have the same center location and by applying the same definitions and algorithms to both data sets (i.e., for growing stock, timberland, reserved land, forest type, tree volume). However, a small bias introduced by measurement or model error that may exist in one inventory and not in the other will exaggerate the estimate of net change.<sup>5</sup>

We estimated gross growth by taking tree cores from a subset of trees in our current inventory. Although the field crew was instructed to core one live tree for each condition, representing each species and crown class, that was not always possible. This introduces a small bias with an unknown direction into our gross growth estimate.<sup>6</sup> Furthermore, increment cores were not cross-dated, and standardized ring-width indices were not developed.

Removals and mortality are estimated as the difference between gross growth and net change. Even if these estimates are unbiased, they are still subject to sampling

<sup>5</sup> Since overall softwood trees on timberland grow about 3 percent per year, a total volume bias of only 1 percent per year amounts to about 30 percent of gross growth.

<sup>6</sup> The estimated bias for total volume for Oregon, based on trees selected for gross growth estimate, is 5.1 percent with a standard error of 1.5 percent. In contrast, the estimated bias for total volume based on the first tree per species, crown class, and condition is 1.2 percent with a standard error of 1.5 percent.

error. Thus, the estimate for removals and mortality can be negative. Although such an estimate is still unbiased, it is of course logically untenable. Furthermore, any bias in the gross growth or the net change estimates is also present in removals and mortality estimates.

Past inventories were conducted between 1993 and 1999, while the current inventory covers 2001 through 2005. As a result, the remeasurement period ranges between 2 and 12 years, with an average of 8.6 years.

Finally, the sampling errors for most of our estimates are very large compared to the estimates. Sampling error should be taken into account when basing conclusions on the estimates.

In 2005, PNW-FIA began collecting information that can be used for growth, mortality, and harvest. The data include remeasurement of previous trees in two of the five periodic subplots and recording natural mortality and harvest on all five prior subplots. These new data will allow better estimates of change for the next report.

## Growth, Removals, and Mortality Tables in Appendix 2

Table 53—Estimated gross growth of softwood growing stock volume on timberland, by location and owner, Oregon, 2001–2005

Table 54—Estimated ratio of growth to removal and mortality of softwood growing stock species on timberland, by owner group and location, Oregon, 2001–2005

Table 55—Estimated gross growth, net change, removals, and mortality of softwood growing stock on timberland, by owner and location, Oregon, 2001–2005

Table 56—Estimated gross growth, net change, removals and mortality of softwood growing stock on timberland, by species group and owner, Oregon, 2001–2005

## Removals for Timber Products<sup>7</sup>

### Background

Volume removed from forest inventory during the harvesting of timber is known as removals (fig. 88). Removals are an important indicator of the sustainability of timber harvest. Removals that exceed growth could indicate overharvesting and decreasing forest inventory, whereas growth greatly exceeding removals could signal a need for increased vegetation management to decrease risks of insect outbreaks or wildfire.

Removals can come from two sources: the growing stock portion of live trees (live trees of commercial species meeting specified standards of quality or vigor), or dead trees and other nongrowing stock sources. The two general types of removals are (1) timber products harvested for processing by mills and (2) logging residue (i.e., wood cut or killed but not used). Removals, as reported here, are based on a 2003 census of Oregon's primary forest products industry (Brandt et al. 2006).

### Findings

Oregon's 2003 timber harvest for wood products was 4.055 billion board feet Scribner, and dead trees accounted for 25.7 MMBF (less than 1 percent). The 2003 harvest was roughly 99 percent of the average annual harvest for the previous 10 years, but only 57 percent of the 40-year average (fig. 89).

Removals for timber products totaled 1,055.1 million cubic feet (MMCF) during 2003. Growing stock accounted for 979.0 MMCF (93 percent) of removals for products, with the remainder coming from other sources including dead trees. Saw logs were the leading product harvested, accounting for 67 percent of removals for products. Veneer logs accounted for 19 percent, and pulpwood and fuelwood, including industrial fuel and residential firewood, accounted for 7 and 6 percent, respectively. Poles, posts, and other miscellaneous products accounted for the remaining 1 percent of removals for products. Softwoods accounted for approximately 94 percent of removals for timber products.

<sup>7</sup> Authors: Todd Morgan and Jason Brandt.



Don Gedney

Figure 88—Harvest of red alder, Redland, Oregon.

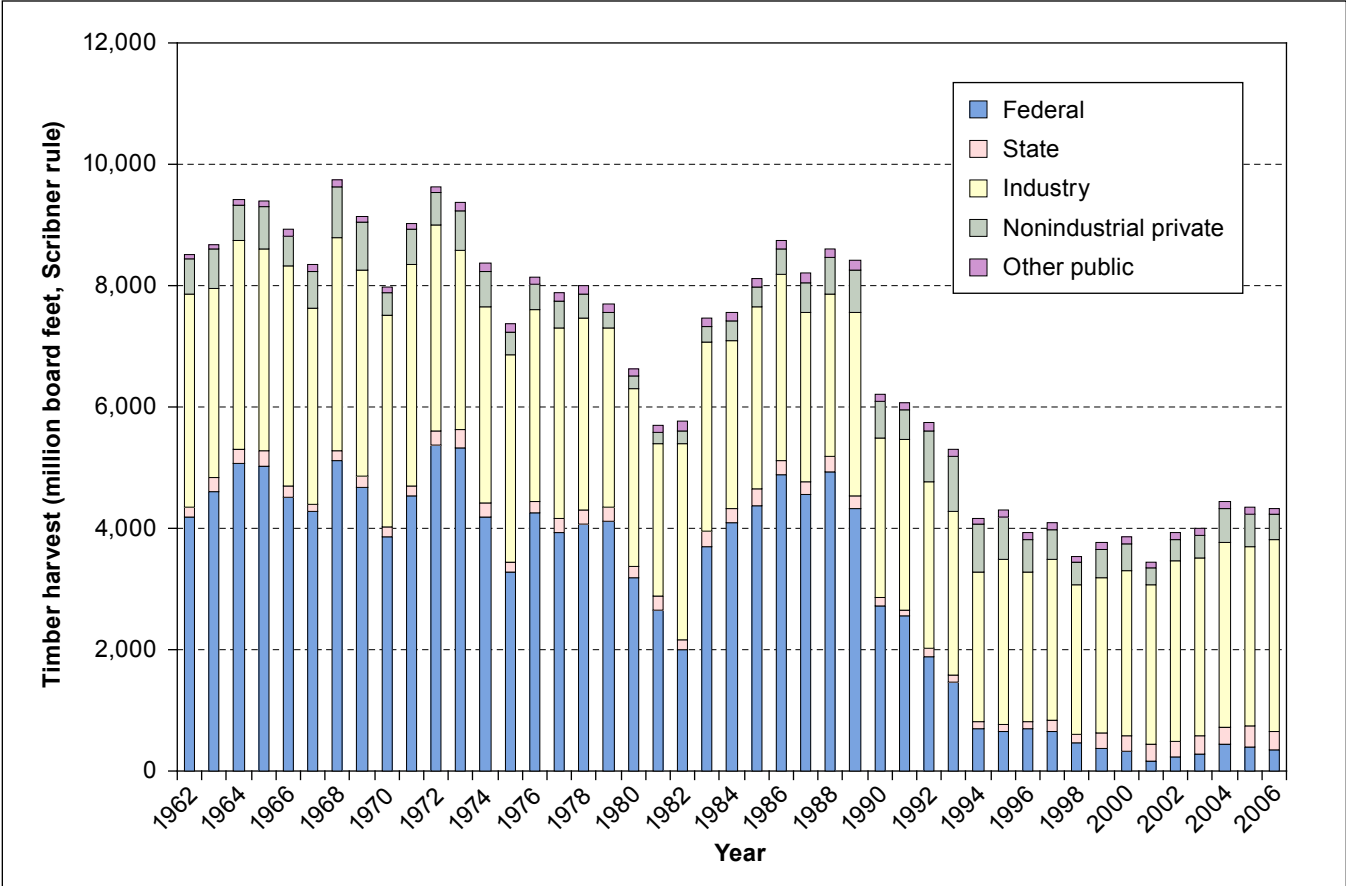


Figure 89—Timber harvest by ownership in Oregon, 1962–2004 (harvest data: Andrews and Kutara 2005).



The largest volumes of hardwoods were used for saw logs and pulpwood.

Total removals from Oregon’s timberlands during 2003 were 1,356.8 MMCF. This included 1,055.1 MMCF used for timber products and 301.7 MMCF of logging residue left in the forest as slash. Growing-stock removals were 1,039.9 MMCF. Slightly over 94 percent (979.0 MMCF) of growing-stock removals was used to produce wood products, and just under 6 percent (60.8 MMCF) was not used. Saw logs were the largest component (67 percent) of growing-stock removals, followed by veneer logs (19 percent), and pulpwood (7 percent).

Corporate timberlands provided almost 74 percent (764.5 MMCF) of growing-stock removals, whereas other private and tribal lands supplied 11 percent (118.1 MMCF). National forests supplied slightly less than 5 percent of the

volume removed from growing stock. Other public land-owners, including the Bureau of Land Management and the state of Oregon, provided slightly more than 10 percent.

Douglas-fir was the leading species harvested, accounting for 65 percent (679.8 MMCF) of growing-stock removals (fig. 90). True firs and hemlock each represented about 9 percent. Ponderosa pine, cedars, spruces, lodgepole pine, larch, sugar pine, and other softwoods together accounted for 11 percent. Hardwoods including red alder accounted for 6 percent of growing-stock removals. Douglas-fir was the leading species harvested for most products; 69 percent of saw logs and 63 percent of veneer logs were of Douglas-fir. Red alder was the leading species harvested for fuelwood; most of the cedar and larch harvested were used for other products.

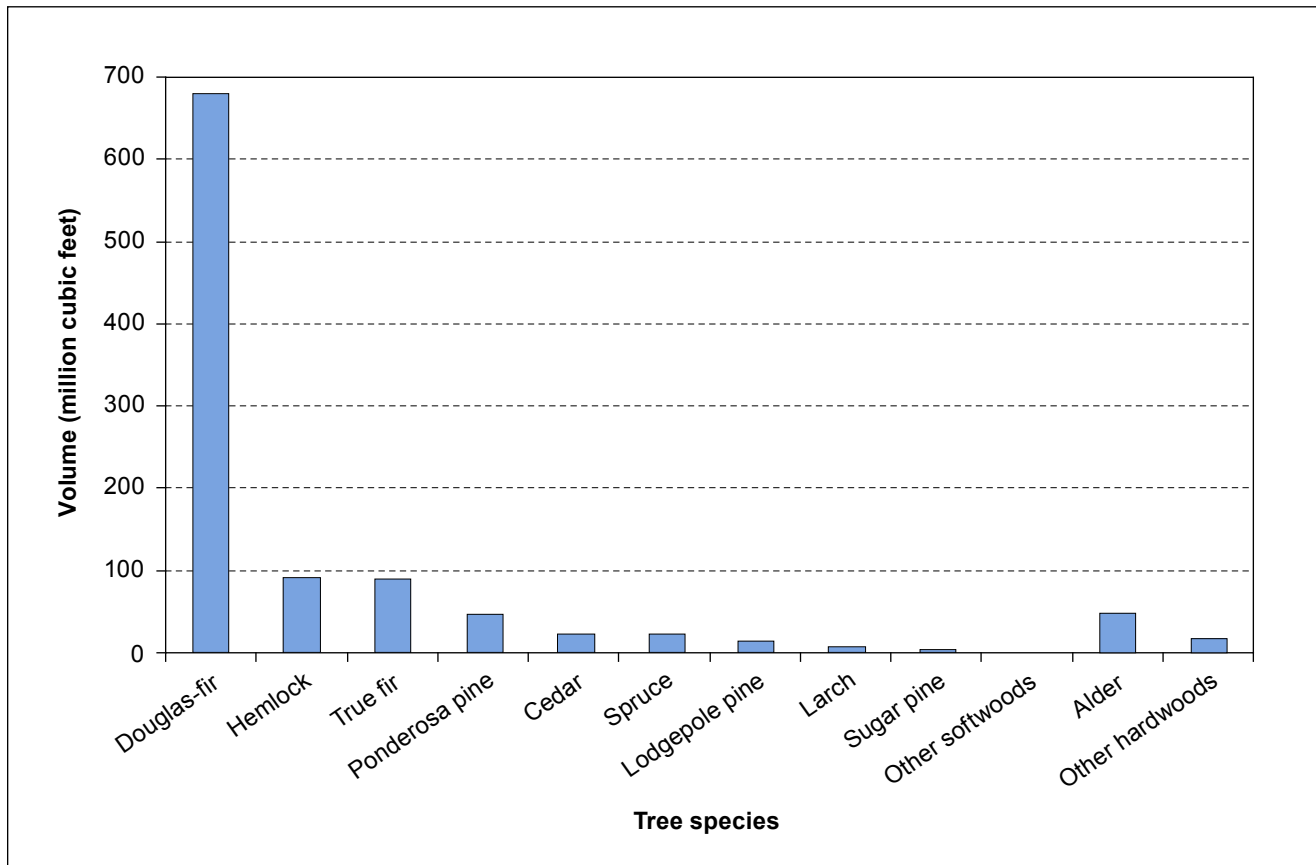


Figure 90—Volume of growing stock removals by tree species in Oregon, 2003 (removals data: Brandt et al. 2006).

## Interpretation

Sustainability of Oregon's forests depends on sustainable harvest levels and a forest products industry capable of using material removed from inventory. Statewide, growth exceeded removals, but reductions in national forest harvests since the late 1980s led to a decline in Oregon's overall timber harvest and caused a distinct shift in the proportion of timber harvested from public versus private lands. From 1993 to 2005, timber harvests from national forests in Oregon averaged less than 10 percent of the state's total annual harvest, whereas between 1962 and 1992, national forest timber harvests averaged 38 percent of the state's total annual harvest. Recently there has been a slight increase in Oregon's timber harvest volume, and Oregon's forest products industry has begun a resurgence. Throughout this upswing, careful consideration to growth and removals among the different ownership classes is needed to ensure that sustainable harvest levels are achieved and maintained.

## Removals for Timber Products Tables in Appendix 2

Table 57—Total roundwood output by product, species group, and source of material, Oregon, 2003

Table 58—Volume of timber removals by type of removal, source of material, and species group, Oregon, 2003

## Nontimber Forest Products<sup>8</sup>

### Background

Nontimber forest products (NTFP) are species harvested from forests for reasons other than production of timber commodities. Vascular plants, lichens, and fungi are the primary organisms included in NTFPs (Jones 1999) and are collected for subsistence, recreational, educational, or commercial purposes (Vance et al. 2001). The NTFPs are fundamental to many botanical, floral, and woodcraft industries and are important to medicinal and natural food industries as well.

Although harvest of NTFPs is prevalent in Pacific coast forests, relatively little is known about their overall abundance or how they are affected by different land management practices. It is also not clear whether current levels of harvesting are sustainable or whether they are negatively affecting the resources (Everett 1997). Because PNW-FIA crews record the cover of the most abundant and readily identifiable vascular plant species found on each phase 2 plot, the inventory can provide useful baseline information on the status and trends of many NTFP species (Vance et al. 2002). Crews also collect samples of epiphytic lichens found on phase 3 plots, allowing assessment of selected lichen NTFPs.

Lists of vascular plant NTFPs were compiled from the literature (Everett 1997, Jones 1999, Vance et al. 2001) and compared with species recorded on FIA plots. Species that were readily identifiable by most crews (i.e., common shrubs or common and distinctive herbs) were included in the analyses, as well as seedlings and saplings of selected tree species (under the assumption that most boughs are harvested from small trees). Mean cover of each species across all sampled subplots was calculated, and the area covered on each plot extrapolated to all forest land with standard inventory statistics.

<sup>8</sup> Authors: Andrew Gray and Sarah Jovan.

## Findings

The NTFP plant species with the greatest cover was swordfern (fig. 91), which covered 1.5 million acres. Brackenfern was the next most widespread herb, covering 260,000 acres. The shrubs covering the most acreage were vine maple (935,000 acres), salal (890,000 acres), and dwarf Oregon grape (546,000 acres). In comparison, the cover of

NTFP tree seedlings and saplings was quite low except for Douglas-fir, which covered 200,000 acres. Plant NTFPs were most prevalent in moist ecoregions; the Coast Range had the most cover (fig. 92). Lichen NTFPs were common, with wolf lichen and beard lichens recorded on 57 percent of the forested plots.



Figure 91—Swordfern is the nontimber forest product that covers the greatest area of Oregon forest lands.

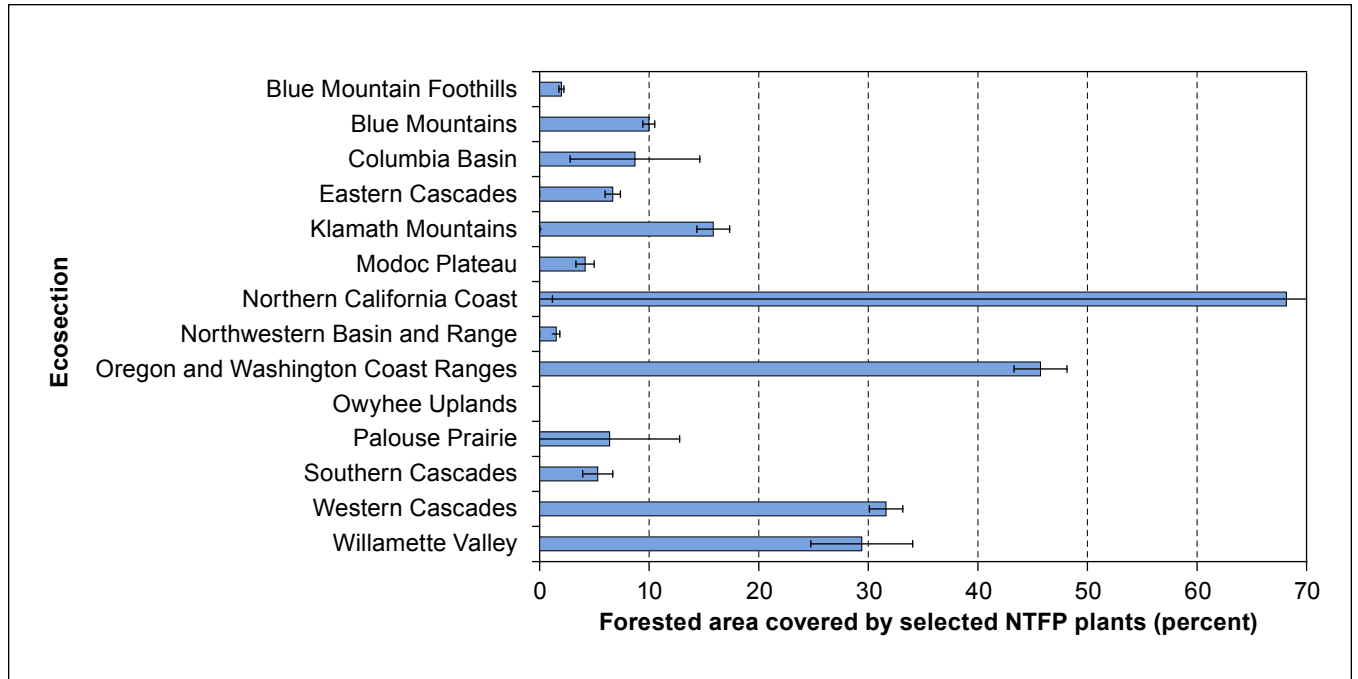


Figure 92—Forested area covered by selected vascular plant nontimber forest products (NTFPs) by ecoregion on forest land in Oregon, 2001–2005.

### Interpretation

Oregon’s forests appear to have abundant resources of vascular plant species used as NTFPs, including those used for floral, medicinal, and woodcraft businesses and those important for subsistence and recreation (e.g., swordfern, St. John’s wort, greenleaf manzanita, Oregon grape, and thinleaf huckleberry). The proportion of plants of a species that produce the desired quality of greens or fruits is unknown, so the actual resource may be somewhat less than that reported here. These figures will provide an important baseline for changes over time and could be used for more detailed analyses by ownership or geography.

### Nontimber Forest Products Tables in Appendix 2

Table 59—Estimated area of forest land covered by vascular plant nontimber forest products, by plant group and species, Oregon, 2001–2005

Table 60—Percentage of forested plots with selected lichen nontimber forest products present, by species, Oregon, 2001–2005



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## Chapter 7: Conclusions

We hope this report has provided a better understanding of Oregon's forest resources, highlighting information that is new as well as confirming things you may already know from personal experience or from other data and publications. Because this report is an overview, touching briefly on many relevant topics, we expect some readers will be eager to see more indepth research and analysis on selected topics to fully understand current status, change, and relationships in Oregon forests. Some possible areas of future work may include more-comprehensive analysis and reporting of forest fuels, and indepth work on forest health issues, carbon dynamics, and forest productivity.

We expect that our own Pacific Northwest Forest Inventory and Analysis (PNW-FIA) research staff as well as researchers and analysts from other programs and institutes will investigate many of the questions that can be addressed with the annual inventory data, especially once a full cycle of data has been collected.

The annual FIA inventory, as currently designed, will continue into the future, provided funding and support for it are maintained. As directed by the 1998 Farm Bill (Section 253(c) of the Agricultural Research, Extension, and Education Reform Act of 1998), findings from the inventory will be published every 5 years. For Oregon, the next report will be written in about 2012, after all FIA plots have been visited and the first full cycle of data collection is completed.

### Glossary

**abiotic**—Pertaining to nonliving factors such as temperature, moisture, and wind (Goheen and Willhite 2006).

**aerial photography**—Imagery acquired from an aerial platform (typically aircraft or helicopter) by means of a specialized large-format camera with well-defined optical characteristics. The geometry of the aircraft orientation at the time of image acquisition is also recorded. The resultant photograph will be of known scale, positional accuracy, and precision. Aerial photography for natural resource use is usually either natural color or color-infrared, and is film based or acquired using digital electronic sensors.

**air quality index**—Value or set of values derived from a multivariate model that examines the composition of lichen communities at each plot to provide a relative estimate of air quality.

**anthropogenic**—Of human origin or influence (Helms 1998).

**aspect**—Compass direction that a slope faces.

**basal area**—The cross-sectional area of a tree's trunk.

**biodiversity**—Variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be defined as the number of different items and their relative frequencies. <http://www.epa.gov/OCEPA-terms/bterms.html>. (21 March 2008).

**bioenergy**—Renewable energy made available from materials derived from biological sources. <http://en.wikipedia.org/wiki/Bioenergy>. (21 March 2008).

**biomass**—The aboveground weight of wood and bark in live trees 1.0 inch diameter at breast height (d.b.h.) and larger from the ground to the tip of the tree, excluding all foliage. The weight of wood and bark in lateral limbs, secondary limbs, and twigs under 0.5 inch in diameter at the point of occurrence on sapling-size trees is included in the measure, but on poletimber- and sawtimber-sized trees this material is excluded. Biomass is typically expressed as green or oven-dry weight in tons (USDA Forest Service 2006).

**biosite index, ozone**—A value calculated from the amount and severity of ozone injury at a site (biosite) that reflects local air quality and plant response and therefore potential risk of ozone impact in the area represented by that biosite (Campbell et al. 2007).

**biotic**—Pertaining to living organisms and their ecological and physiological relations (Helms 1998).

**board foot**—A volume measure of lumber 1 foot wide, 1 foot long, and 1 inch thick (12 in × 12 in × 1 in = 144 cubic inches). <http://www.cffa-oswa.org/B.html>. (21 March 2008).

**bole**—Trunk or main stem of a tree (USDA Forest Service 2006).

**bulk density**—Mass of soil per unit volume. A measure of the ratio of pore space to solid materials in a given soil, expressed in units of grams per cubic centimeter of oven-dry soil (USDA Forest Service 2006).

**carbon mass**—The estimated weight of carbon stored within wood tissues. On average, carbon mass values are about half of biomass values for trees, and are summarized as thousand tons or mean tons per acre.

**carbon sequestration**—Incorporation of carbon dioxide into permanent plant tissues (Helms 1998).

**chaparral**—A shrubland or heathland plant community found primarily in California, USA, that is shaped by a Mediterranean climate (mild, wet winters and hot dry summers) and wildfire. A typical chaparral plant community consists of densely-growing evergreen scrub oaks and other drought-resistant shrubs. It often grows so densely that it is all but impenetrable to large animals and humans. <http://en.wikipedia.org/wiki/Chaparral>. (21 March 2008).

**climate index**—A value or set of values derived from a multivariate model that examines the composition of lichen communities at each plot that provides a relative estimate of air quality.

**coarse woody material**—Down dead tree and shrub boles, large limbs, and other woody pieces that are severed from their original source of growth. Coarse woody material also includes dead trees that are supported by roots, severed from roots, or uprooted, and leaning >45 degrees from vertical (USDA Forest Service 2006).

**cogeneration facilities**—One or more parallel generation units producing both electrical energy and steam or another form of useful energy for industrial, commercial, heating, or cooling purposes. <http://www.srpnet.com/about/econ/terms.aspx>. (21 March 2008).

**compaction (soil)**—Process by which soil grains are rearranged so as to come into closer contact with one another, resulting in a decrease in void space and an increase in soil bulk density (Helms 1998).

**corporate forest land**—An ownership class of private forest lands owned by a company, corporation, legal partnership, investment firm, bank, timberland investment management organization (TIMO), or real-estate investment trust (REIT).

**crook**—Abrupt bend in a tree or log (Helms 1998).

**crown**—The part of a tree or woody plant bearing live branches or foliage (Helms 1998).

**crown density**—The amount of crown stem, branches, twigs, shoots, buds, foliage, and reproductive structures that block light penetration through the visible crown. Dead branches and dead tops are part of the crown. Live and dead branches below the live crown base are excluded. Broken or missing tops are visually reconstructed when forming this crown outline by comparing outlines of adjacent healthy trees of the same species and d.b.h. or diameter at root collar (d.r.c.) (USDA Forest Service 2006).

**crown dieback**—Recent mortality of branches with fine twigs, which begins at the terminal portion of a branch and proceeds toward the trunk. Dieback is only considered when it occurs in the upper and outer portions of the tree (USDA Forest Service 2006).

**crown fire**—Fire that spreads across the tops of trees or shrubs more or less independently of a surface fire. Crown fires are sometimes classed as running (independent or active) or dependent (passive) to distinguish the degree of independence from the surface fire (Helms 1998).

**current gross annual growth**—The total growth of a given stand of trees, within a defined area, over the period of 1 year.

**cyanolichens**—Lichen species containing cyanobacteria, which fixes atmospheric nitrogen into a form that plants can use.

**damage**—Damage to trees caused by biotic agents such as insects, diseases, and animals or abiotic agents such as weather, fire, or mechanical equipment.

**defoliation**—Premature removal of foliage (Goheen and Willhite 2006).

**diameter at breast height**—The diameter of a tree stem, located at 4.5 feet above the ground (breast height) on the uphill side of a tree. The point of diameter measurement may vary on abnormally formed trees (USDA Forest Service 2006).

**diameter at root collar**—The diameter of a tree (usually a woodland species), measured outside of the bark at the ground line or stem root collar (USDA Forest Service 2006).

**dieback**—Progressive dying from the extremity of any part of the plant. Dieback may or may not result in death of the entire plant (Helms 1998).

**disturbance**—Any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment (Helms 1998).

**down woody material (DWM)**—Dead material on the ground in various stages of decay, including coarse and fine woody material. Previously named down woody debris (DWD). The DWM indicator for Forest Inventory and Analysis includes measurements of depth of duff layer, litter layer, and overall fuelbed; fuel loading on the microplot; and residue piles (USDA Forest Service 2006).

**ecological region**—A top-level scale in a hierarchical classification of ecological units subdivided on the basis of global, continental, and regional climatic regimes and broad physiography. Ecological regions (ecoregions) are further subdivided into domains, divisions, and provinces. The next level down in the hierarchy, subregion, is divided into ecological sections (ecosections) and subsections (Cleland et al. 1997).

**ecosection**—A level in a hierarchical classification of ecological units for a geographic area delineated on the basis of similar climate, geomorphic processes, stratigraphy, geologic origin, topography, and drainage systems (Cleland et al. 1997).

**ecosystem**—A spatially explicit, relatively homogeneous unit of the Earth that includes all interacting organisms and components of the abiotic environment within its boundaries. An ecosystem can be of any size: a log, a pond, a field, a forest, or the Earth's biosphere (Helms 1998).

**elevation**—Height above a fixed reference point, often the mean sea level. <http://en.wikipedia.org/wiki/Elevation>. (21 March 2008).

**endemic**—(1) Indigenous to or characteristic of a particular restricted geographical area. Antonym: exotic. (2) Referring to a disease constantly infecting a few plants throughout an area. (3) A population of potentially injurious plants, animals, or viruses that are at low levels (see epidemic) (Helms 1998).



**epidemic**—(1) Entomology: pertaining to populations of plants, animals, and viruses that build up, often rapidly, to unusually and generally injuriously high levels. Synonym: outbreak. Many insect and other animal populations cycle periodically or irregularly between endemic and epidemic levels. (2) Pathology: a disease sporadically infecting a large number of hosts in an area and causing considerable loss (Helms 1998).

**epiphyte**—Plant growing on but not nourished by another plant (Helms 1998).

**erosion**—The wearing away of the land surface by running water, wind, ice, or other geological agents (USDA Forest Service 2006).

**exchangeable cations**—Positively charged ions, often nutrients that are available for exchange and uptake by plants.

**federal forest land**—An ownership class of public lands owned by the U.S. government (USDA Forest Service 2006).

**fine woody material (FWM)**—Down dead branches, twigs, and small tree or shrub boles <3 inches in diameter not attached to a living or standing dead source (USDA Forest Service 2006).

**fire regime**—The characteristic frequency, extent, intensity, severity, and seasonality of fires within an ecosystem (Helms 1998).

**fixed-radius plot**—A circular sampled area with a specified radius in which all trees of a given size, shrubs, and other items are tallied (USDA Forest Service 2006).

**foliage transparency**—The amount of skylight visible through micro-holes in the live portion of the crown, i.e. where you see foliage, normal or damaged, or remnants of its recent presence (USDA Forest Service 2006).

**forb**—A broad-leaved herbaceous plant, as distinguished from grasses, shrubs, and trees (USDA Forest Service 2006).

**forest industry land**—An ownership class of private lands owned by a company or an individual(s) operating a primary wood-processing plant (USDA Forest Service 2006).

**forest land**—Land that is at least 10 percent stocked by forest trees of any size, or land formerly having such tree cover, and not currently developed for a nonforest use. The minimum area for classification as forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must be at least 120 feet wide to qualify as forest land (USDA Forest Service 2006).

**forest type**—A classification of forest land based on and named for the tree species that forms the plurality of live-tree stocking (USDA Forest Service 2006).

**forest type group**—A combination of forest types that share closely associated species or site requirements (USDA Forest Service 2006).

**fork**—The place on a tree where the stem separates into two pieces; usually considered a defect.

**fuel treatment**—Any manipulation or removal of wild-land fuels to reduce the likelihood of ignition or to lessen potential fire damage and resistance to control; e.g., lopping, chipping, crushing, piling, and burning. Synonym: fuel modification, hazard reduction (Helms 1998).

**fuelwood**—Wood salvaged from mill waste, cull logs, branches, etc., and used to fuel fires in a boiler or furnace. [http://nfdp.ccfm.org/compendium/products/terminology\\_e.php](http://nfdp.ccfm.org/compendium/products/terminology_e.php). (21 March 2008).

**fungus**—Member of a group of saprophytic and parasitic organisms that lack chlorophyll, have cell walls made of chitin, and reproduce by spores; includes molds, rusts, mildews, smuts, and mushrooms. Fungi absorb nutrients from the organic matter in which they live. Not classified as plants; instead fungi are placed in the Kingdom: Fungi (Goheen and Willhite 2006).

**geospatial**—The combination of spatial software and analytical methods with terrestrial or geographic data sets. Often used in conjunction with geographic information systems and geomatics. <http://en.wikipedia.org/wiki/Geospatial>. (21 March 2008).

**geothermal energy**—The word “geothermal” is derived from words literally meaning “Earth” plus “heat.” To produce electric power from geothermal resources, underground reservoirs of steam or hot water are tapped by wells and the steam rotates turbines that generate electricity. <http://www.ngdc.noaa.gov/seg/hazard/stratoguide/glossary.html>. (21 March 2008).

**graminoid**—Grasses (family Gramineae or Poaceae) and grasslike plants such as sedges (family Cyperaceae) and rushes (family Juncaceae). <http://www.biology-online.org/dictionary/Graminoid>. (21 March 2008).

**grassland**—Land on which the vegetation is dominated by grasses, grasslike plants, or forbs (Helms 1998).

**greenhouse gas**—A gas, such as carbon dioxide or methane, that contributes to potential climate change. <http://www.epa.gov/OCEPAterms/gterms.html>. (21 March 2008).

**growing stock**—All live trees 5 inches d.b.h or larger that are considered merchantable in terms of saw-log length, and grade; excludes rough and rotten cull trees (USDA Forest Service 2006).

**hardwood**—Tree species belonging to the botanical subdivision Angiospermae, class Dicotyledonous, usually broad-leaved and deciduous (USDA Forest Service 2006).

**herbivory**—The consumption of herbaceous vegetation by organisms ranging from insects to large mammals such as deer, elk, or cattle. <http://www.biology-online.org/dictionary/Herbivory>. (21 March 2008).

**increment borer**—An auger-like instrument with a hollow bit and an extractor, used to extract thin radial cylinders of wood (increment cores) from trees having annual growth rings, to determine increment or age (Helms 1998).

**interpolation**—A method of reallocating attribute data from one spatial representation to another. Kriging is a more complex example that allocates data from sample points to a surface. <http://hds.essex.ac.uk/g2gp/gis/sect101.asp>. (21 March 2008).

**invasive plant**—Plants that are not native to the ecosystem under consideration and that cause or are likely to cause economic or environmental harm or harm to human, animal, or plant health. <http://www.invasivespeciesinfo.gov/docs/council/isacdef.pdf>. (21 March 2008).

**ladder fuel**—Combustible material that provides vertical continuity between vegetation strata and allows fire to climb into the crowns of trees or shrubs with relative ease. Ladder fuels help initiate and ensure the continuation of a crown fire (Helms 1998).

**late-successional reserves (LSRs)**—Federally managed forests held in reserve for wildlife habitat and thus set aside from most commercial logging. The LSRs may contain old clearcuts as well as old-growth forests. Logging may be allowed in an LSR if it will accelerate development of old-growth characteristics. [http://www.umpqua-watersheds.org/glossary/gloss\\_1.html](http://www.umpqua-watersheds.org/glossary/gloss_1.html). (21 March 2008).

**lichen**—An organism consisting of a fungus and an alga or cyanobacterium living in symbiotic association. Lichens look like masses of small, leafy, tufted or crustlike plants (USDA Forest Service 2006).

**live trees**—All living trees, including all size classes, all tree classes, and both commercial and noncommercial species for tree species listed in the FIA field manual (USDA Forest Service 2006).

**mean annual increment (MAI) at culmination**—A measure of the productivity of forest land expressed as the average increase in cubic feet of wood volume per acre per year. For a given species and site index, the mean is based on the age at which the MAI culminates for fully stocked natural stands. The MAI is based on the site index of the plot (Azuma et al. 2004b).

**mensuration**—Determination of dimensions, form, weight, growth, volume, and age of trees, individually, or collectively, and of the dimensions of their products (Helms 1998).

**mesic**—Describes sites or habitats characterized by intermediate moisture conditions; i.e., neither decidedly wet nor dry (Helms 1998).

**microclimate**—The climate of a small area, such as that under a plant or other cover, differing in extremes of temperature and moisture from the larger climate outside (Helms 1998).

**mineral soil**—A soil consisting predominantly of products derived from the weathering of rocks (e.g., sands, silts, and clays) (USDA Forest Service 2006).

**MMBF**—A million board feet of wood in logs or lumber (Helms 1998).

**model**—(1) An abstract representation of objects and events from the real world for the purpose of simulating a process, predicting an outcome, or characterizing a phenomenon. (2) Geographic information system (GIS) data representative of reality (e.g., spatial data models), including the arc-node, georelational model, rasters or grids, polygon, and triangular irregular networks (Helms 1998).

**Montréal Process**—In September 1993, the Conference on Security and Cooperation in Europe (CSCE) sponsored an international seminar in Montréal, Canada, on the sustainable development of boreal and temperate forests, with a focus on developing criteria and indicators for the assessment of these forests. After the seminar, Canada drew together countries from North and South America, Asia, and the Pacific Rim to develop criteria and indicators for nontropical forests and, in June 1994, the initiative now known as the Montréal Process began. The European countries elected to work as a region in the Pan-European Forest Process in the followup to the Ministerial Conferences on the Protection of Forests in Europe. [http://www.mpci.org/rep-pub/1999/broch\\_e.html#2](http://www.mpci.org/rep-pub/1999/broch_e.html#2). (21 March 2008).

**mortality**—The death of trees from natural causes, or subsequent to incidents such as storms, wildfire, or insect and disease epidemics (Helms 1998).

**multivariate analysis**—Branch of statistics concerned with analyzing multiple measurements that have been made on one or several individuals (Helms 1998).

**municipal land**—Land owned by municipalities or land leased by them for more than 50 years (USDA Forest Service 2006).

**mycelium**—Vegetative part of a fungus, composed of hyphae and forming a thallus (Helms 1998).

**mycorrhiza**—The usually symbiotic association between higher plant roots (host) and the mycelia of specific fungi. Mycorrhizae often aid plants in the uptake of water and certain nutrients and may offer protection against other soil-borne organisms (Helms 1998).

**national forest lands**—Federal lands that have been designated by Executive order or statute as national forest or purchase units and other lands under the administration of the U.S. Department of Agriculture, Forest Service, including experimental areas and Bankhead-Jones Title III lands (Azuma et al. 2004b).

**Native American lands**—Tribal lands, and allotted lands held in trust by the federal government. Native American lands are grouped with farmer-owned and miscellaneous private lands as other private lands (Azuma et al. 2004b).

**native species**—Plant species that were native to an American region prior to Euro-American settlement. For vascular plants, they are the species that are not present on the USDA Natural Resources Conservation Service (NRCS) (2000) list of nonnative species (see nonnative species) (USDA NRCS 2000).

**net primary production (NPP)**—NPP represents the amount of chemical energy that is available to consumers in an ecosystem. It is the remaining energy from gross primary productivity discounting the loss of energy required by primary producers for respiration (adapted from Campbell 1990).

**net volume**—Gross volume less deductions for sound and rotten defects. Growing-stock net volume is gross volume (in cubic feet) less deductions for rot and missing bole sections on poletimber and sawtimber growing-stock trees. Sawtimber net volume is gross volume (in board feet) less deductions for rot, sweep, crook, missing bole sections, and other defects that affect the use of sawtimber trees for lumber (Azuma et al. 2004b).

**nitrogen oxides (NO<sub>x</sub>)**—Gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules, produced in the emissions of vehicle exhausts and from power stations. Atmospheric NO<sub>x</sub> contributes to formation of photochemical ozone (smog), which can impair visibility and harm human health. [http://www.climatechange.ca.gov/glossary/letter\\_n.html](http://www.climatechange.ca.gov/glossary/letter_n.html). (21 March 2008).

**nitrophyte**—One of a group of lichen species that grow in nitrogen-rich habitats.

**noncorporate forest land**—Private forest land owned by nongovernmental conservation or natural resource organizations; unincorporated partnerships, associations, or clubs; individuals or families; or Native Americans.

**nonforest inclusion**—An area that is not forested and is less than 1.0 acre and does not qualify as its own condition class (USDA Forest Service 2006).

**nonnative species**—Plant species that were introduced to America subsequent to Euro-American settlement. Nonnative vascular plants are present on the USDA NRCS (2000) list of nonnative species.

**nonstocked areas**—Timberland that is less than 10 percent stocked with live trees. Recent clearcuts scheduled for planting are classified as nonstocked area (Azuma et al. 2004b).

**nontimber forest products (NTFP)**—Species harvested from forests for reasons other than production of timber commodities. Vascular plants, lichens, and fungi are the primary organisms included in NTFPs.

**old-growth forest**—Old-growth forest is differentiated from younger forest by its structure and composition, and often by its function. Old-growth stands are typified by the presence of large older trees; variety in tree species, sizes, and spacing; multiple canopy layers; high amounts of standing and down dead wood; and broken, deformed, or rotting tops, trunks, and roots (Franklin et al. 1986).

**other private forest lands**—Lands in private ownership and not reported separately. These may include coal companies, land trusts, and other corporate private landowners (USDA Forest Service 2006).

**overrun**—Difference between the log scale of a shipment of timber and the actual volume of lumber obtained from it. <http://forestry.about.com/library/glossary/blforglo.htm>. (21 March 2008).

**overstory**—That portion of the trees, in a forest of more than one story, forming the uppermost canopy layer (Helms 1998).

**owner class**—A variable that classifies land into categories of ownership. Current ownership classes are listed in the FIA field manual (USDA Forest Service 2006).

**owner group**—A variable that combines owner classes into the following groups: Forest Service, other federal agency, state and local government, and private. Differing categories of owner group on a plot require different conditions (USDA Forest Service 2006).

**ownership**—A legal entity having an ownership interest in land, regardless of the number of people involved. An ownership may be an individual; a combination of persons; a legal entity such as corporation, partnership, club, or trust; or a public agency. An ownership has control of a parcel or group of parcels of land (USDA Forest Service 2006).

**ozone (O<sub>3</sub>), tropospheric**—A regional, gaseous air pollutant produced primarily through sunlight-driven chemical reactions of nitrogen oxide (NO<sub>2</sub>) and hydrocarbons in the troposphere (the lowest layer of the atmosphere). Ozone plays a significant role in greenhouse warming and urban smog and causes foliar injury to deciduous trees, conifers, shrubs, and herbaceous species (Air and Waste Management Association 1998).

**paleoecology**—Study of the relationships of past organisms and the environment in which they lived (Helms 1998).

**pathogen**—Parasitic organism directly capable of causing disease (Helms 1998).

**photointerpretation (aerial photography)**—A process where points, or areas of interest on an aerial photograph are studied to determine information about land cover. The FIA Pprogram uses photointerpretation to determine whether field plots are forested or not, the possible forest type and size class, and in analysis for land cover and land use changes.

**phytotoxic**—Poisonous to plants (Helms 1998).

**prescribed burn**—Deliberate burning of wildland fuels in either their natural or their modified state and under specified environmental conditions, usually to make the site less susceptible to severe wildfire. Synonym: controlled burn, prescribed fire (adapted from Helms 1998).

**productive forest land**—Forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment (MAI) without regard to reserved status (USDA Forest Service 2006).

**public land**—An ownership group that includes all federal, state, county, and municipal lands (USDA Forest Service 2006).

**pulpwood**—Whole trees, tree chips, or wood residues used to produce wood pulp for the manufacture of paper products. Pulpwood is usually wood that is too small, of inferior quality, or the wrong species for the manufacture of lumber or plywood (adapted from Helms 1998; also [http://nfdp.ccfm.org/compendium/products/terminology\\_e.php](http://nfdp.ccfm.org/compendium/products/terminology_e.php). (21 March 2008).)

**quadrat**—The basic 3.28 square feet sampling unit for the Phase 3 Vegetation Indicator (USDA Forest Service 2006).

**rangeland**—Expansive, mostly unimproved lands on which a significant proportion of the natural vegetation is native grasses, grass-like plants, forbs, and shrubs. Rangelands include natural grasslands, savannas, shrublands, many deserts, tundra, alpine communities, coastal marshes, and wet meadows. <http://en.wikipedia.org/wiki/Rangeland> (21 March 2008).

**regeneration (artificial and natural)**—The established progeny from a parent plant, seedlings or saplings existing in a stand, or the act of renewing tree cover by establishing young trees naturally or artificially. May be artificial (direct seeding or planting) or natural (natural seeding, coppice, or root suckers) (adapted from Helms 1998).

**remote sensing**—Capture of information about the Earth from a distant vantage point. The term is often associated with satellite imagery but also applies to aerial photography, airborne digital sensors, ground-based detectors, and other devices. <http://www.nsc.org/ehc/glossar2.htm>. (21 March 2008).

**reserved forest land**—Land permanently reserved from wood products utilization through statute or administrative designation. Examples include national forest wilderness areas and national parks and monuments (USDA Forest Service 2006).

**richness**—The number of different species in a given area, often referred to at the plot scale as alpha diversity and at the region scale as gamma diversity (USDA NRCS 2000).

**riparian**—Related to, living in, or associated with a wetland, such as the bank of a river or stream or the edge of a lake or tidewater. The riparian biotic community significantly influences and is influenced by the neighboring body of water (Helms 1998).

**salvage cutting**—Removal of dead trees, or trees damaged or dying because of injurious agents other than competition, to recover economic value that would otherwise be lost. Synonym: salvage felling, salvage logging (Helms 1998).

**sampling error**—Difference between a population value and a sample estimate that is attributable to the sample, as distinct from errors due to bias in estimation, errors in observation, etc. Sampling error is measured as the standard error of the sample estimate (Helms 1998).

**sapling**—A live tree 1.0 to 4.9 inches in diameter (USDA Forest Service 2006).

**saw log**—A log meeting minimum standards of diameter, length, and defect for manufacture into lumber or plywood. The definition includes logs with a minimum diameter outside bark for softwoods of 7 inches (9 inches for hardwoods) (Azuma et al. 2004b).

**sawtimber trees**—Live softwood trees of commercial species at least 9.0 inches in d.b.h. and live hardwood trees of commercial species at least 11.0 inches in d.b.h. At least 25 percent of the board foot volume in a sawtimber tree must be free from defect. Softwood trees must contain at least one 12-foot saw log with a top diameter of not less than 7 inches outside bark; hardwood trees must contain at least one 8-foot saw log with a top diameter of not less than 9 inches outside bark (Azuma et al. 2004b).

**seedlings**—Live trees <1.0 inch d.b.h. and at least 6 inches in height (softwoods) or 12 inches in height (hardwoods) (USDA Forest Service 2006).

**shrub**—Perennial, multistemmed woody plant, usually less than 13 to 16 feet in height, although under certain environmental conditions shrubs may be single-stemmed or taller than 16 feet. Includes succulents (e.g., cacti) (USDA Forest Service 2007b).

**shrubland**—A shrub-dominated vegetation type that does not qualify as forest.

**slope**—Measure of change in surface value over distance, expressed in degrees or as a percentage (Helms 1998).

**snag**—Standing dead tree  $\geq 5$  inches d.b.h. and  $\geq 4.5$  feet in length, with a lean of  $< 45$  degrees. Dead trees leaning more than 45 degrees are considered to be DWM. Standing dead material shorter than 4.5 feet are considered stumps (USDA Forest Service 2007b).

**species group**—A collection of species used for reporting purposes (USDA Forest Service 2006).

**species turnover**—A measure of difference in species composition among plots within an area (e.g., ecological section). Also known as beta diversity. Species turnover is calculated by dividing the total number of species in an area by the mean number of species per plot (USDA NRCS 2000).

**specific gravity constants**—Ratio of the density (weight per unit volume) of an object (such as wood) to the density of water at 4 degrees C (39.2 degrees F) (Helms 1998).

**stand age**—Average age of the live dominant and codominant trees in the predominant stand size class (USDA Forest Service 2006).

**state land**—An ownership class of public lands owned by states or lands leased by states for more than 50 years (USDA Forest Service 2006).

**stocked/nonstocked**—In the FIA Program, a minimum stocking value of 10 percent live trees is required for accessible forest land (USDA Forest Service 2007b).

**stocking**—(1) At the tree level, the density value assigned to a sampled tree (usually in terms of numbers of trees or basal area per acre), expressed as a percentage of the total tree density required to fully use the growth potential of the land. (2) At the stand level, the sum of the stocking values of all trees sampled (Bechtold and Patterson 2005).

**stratification**—A statistical tool used to reduce the variance of the attributes of interest by partitioning the population into homogenous strata (Bechtold and Patterson 2005).

**succession**—The gradual supplanting of one community of plants by another (Helms 1998).

**surface fire**—A fire that burns only surface fuels, such as litter, loose debris, and small vegetation (Helms 1998).

**sustainability**—The capacity of forests, ranging from stands to ecoregions, to maintain their health, productivity, diversity, and overall integrity in the long run, in the context of human activity and use (Helms 1998).

**terrestrial**—Of or relating to the earth or its inhabitants; of or relating to land as distinct from air or water. <http://www.merriam-webster.com/dictionary/terrestrial>. (21 March 2008).

**timberland**—Forest land that is producing or capable of producing >20 cubic feet per acre per year of wood at culmination of mean annual increment (MAI). Timberland excludes reserved forest lands (USDA Forest Service 2006).

**transect**—A narrow sample strip or a measured line laid out through vegetation chosen for study (Helms 1998).

**tree**—A woody perennial plant, typically large, with a single well-defined stem carrying a more or less definite crown; sometimes defined as attaining a minimum diameter of 3 inches and a minimum height of 15 feet at maturity. For FIA, any plant on the tree list in the current field manual is measured as a tree (USDA Forest Service 2006).

**understory**—All forest vegetation growing under an overstory (Helms 1998).

**unproductive forest land**—Forest land that is not capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of MAI without regard to reserved status (USDA Forest Service 2006).

**unreserved forest land**—Forest land that is not withdrawn from harvest by statute or administrative regulation. Includes forest lands that are not capable of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands (Smith et al. 2004).

**upland**—Any area that does not qualify as a wetland because the associated hydrologic regime is not sufficiently wet to produce vegetation, soils, or hydrologic characteristics associated with wetlands. In flood plains, such areas are more appropriately termed nonwetlands. <http://www.biology-online.org/dictionary/Upland>. (21 March 2008).

**vascular plant**—A plant possessing a well-developed system of conducting tissue to transport water, mineral salts, and sugars. [http://www.biology-online.org/dictionary/Vascular\\_plant](http://www.biology-online.org/dictionary/Vascular_plant). (21 March 2008).

**veneer log**—A high-quality log of a desirable species suitable for conversion to veneer. Veneer logs must be large, straight, of minimum taper, and free of defects. <http://www.agnr.umd.edu/MCE/Publications/Publication.cfm?ID=78>. (21 July 2007).

**wilderness**—(1) According to the Wilderness Act of 1964, “a wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.” (2) A roadless land legally classified as a component area of the National Wilderness Preservation System and managed to protect its qualities of naturalness, solitude, and opportunity for primitive recreation. Wilderness areas are usually of sufficient size to make maintenance in such a state feasible (Helms 1998).

**wildfire**—Any uncontained fire, other than prescribed fire, occurring on wildland. Synonym: wildland fire (adapted from Helms 1998).

**wildland**—Land other than that dedicated for uses such as agriculture, urban, mining, or parks (Helms 1998).

**wildland forest**—A large continuous tract of forest with few or no developed structures on it. Delineated on aerial imagery for the purpose of detecting land use change. The PNW-FIA Program and the Oregon Department of Forestry jointly use a minimum of 640 acres with fewer than five developed structures to designate wildland forest.

**wildland-urban interface (WUI)**—A term used to describe an area where various structures (most notably private homes) and other human developments meet or are intermingled with forest and other vegetative fuel types. <http://www.borealforest.org/nwGLOSS13.htm>. (21 March 2008).

**xeric**—Pertaining to sites or habitats characterized by decidedly dry conditions (Helms 1998).

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## Scientific and Common Plant Names

Scientific name	Common name
Trees:	
<i>Abies</i> spp.	True fir species
<i>Abies amabilis</i> (Dougl. ex Loud.) Dougl. ex Forbes	Pacific silver fir
<i>Abies concolor</i> (Gord. & Glend.) Lindl. ex Hildebr.	White fir
<i>Abies grandis</i> (Dougl. ex D. Don) Lindl.	Grand fir
<i>Abies lasiocarpa</i> (Hook.) Nutt.	Subalpine fir
<i>Abies magnifica</i> A. Murr.	California red fir
<i>Abies magnifica</i> A. Murr. var. <i>shastensis</i> Lemmon	Shasta red fir
<i>Abies procera</i> Rehd.	Noble fir
<i>Acer</i> spp.	Maple
<i>Acer glabrum</i> Torr.	Rocky Mountain maple
<i>Acer macrophyllum</i> Pursh	Bigleaf maple
<i>Alnus</i> spp.	Alder
<i>Alnus rhombifolia</i> Nutt.	White alder
<i>Alnus rubra</i> Bong.	Red alder
<i>Arbutus menziesii</i> Pursh	Pacific madrone
<i>Betula</i> spp.	Birch
<i>Calocedrus decurrens</i> (Torr.) Florin	Incense-cedar
<i>Cercocarpus ledifolius</i> Nutt.	Curl-leaf mountain mahogany
<i>Chamaecyparis lawsoniana</i> (A. Murr.) Parl.	Port-Orford-cedar
<i>Chamaecyparis nootkatensis</i> (D. Don) Spach	Alaska yellow-cedar
<i>Chrysolepis chrysophylla</i> (Dougl. ex Hook.) Hjelmqvist	Giant chinquapin, golden chinquapin
<i>Cornus nuttallii</i> Audubon ex Torr. & Gray	Pacific dogwood
<i>Crataegus</i> spp.	Hawthorn
<i>Fraxinus</i> spp.	Ash
<i>Fraxinus latifolia</i> Benth.	Oregon ash
<i>Juniperus</i> spp.	Redcedar, juniper
<i>Juniperus occidentalis</i> Hook.	Western juniper
<i>Larix</i> spp.	Larch
<i>Larix occidentalis</i> Nutt.	Western larch
<i>Lithocarpus densiflorus</i> (Hook. & Arn.) Rehd.	Tanoak
<i>Malus</i> spp.	Apple
<i>Malus fusca</i> (Raf.) Schneid.	Oregon crabapple
<i>Picea</i> spp.	Spruce
<i>Picea engelmannii</i> Parry ex Engelm.	Engelmann spruce
<i>Picea sitchensis</i> (Bong.) Carr.	Sitka spruce
<i>Pinus</i> spp.	Pine, Pinyon
<i>Pinus albicaulis</i> Engelm.	Whitebark pine
<i>Pinus aristata</i> Engelm.	Bristlecone pine
<i>Pinus attenuata</i> Lemmon	Knobcone pine
<i>Pinus contorta</i> Dougl. ex Loud.	Lodgepole pine
<i>Pinus coulteri</i> D. Don	Coulter pine
<i>Pinus discolor</i> D.K. Bailey & Hawksw.	Border pinyon
<i>Pinus edulis</i> Engelm.	Twoneedle pinyon, Colorado pinyon
<i>Pinus flexilis</i> James	Limber pine
<i>Pinus jeffreyi</i> Grev. & Balf.	Jeffrey pine
<i>Pinus lambertiana</i> Dougl.	Sugar pine
<i>Pinus longaeva</i> D.K. Bailey	Great Basin bristlecone pine
<i>Pinus monophylla</i> Torr. & Frém.	Singleleaf pinyon

Scientific name	Common name
<i>Pinus monticola</i> Dougl. ex D. Don	Western white pine
<i>Pinus ponderosa</i> P.& C. Lawson	Ponderosa pine
<i>Populus</i> spp.	Cottonwood
<i>Populus balsamifera</i> L. ssp. <i>trichocarpa</i> (Torr. & A. Gray ex Hook.) Brayshaw	Black cottonwood
<i>Populus tremuloides</i> Michx.	Quaking aspen
<i>Prunus</i> spp.	Cherry and plum spp.
<i>Prunus emarginata</i> (Dougl. ex Hook.) D. Dietr.	Bitter cherry
<i>Prunus virginiana</i> L.	Chokecherry
<i>Pseudotsuga menziesii</i> (Mirbel) Franco	Douglas-fir
<i>Quercus</i> spp.	Oak
<i>Quercus chrysolepis</i> Liebm.	Canyon live oak
<i>Quercus garryana</i> Dougl. ex Hook.	Oregon white oak
<i>Quercus kelloggii</i> Newberry	California black oak
<i>Quercus lobata</i> Née	California white oak
<i>Sequoia sempervirens</i> (Lamb. ex D. Don) Endl.	Redwood
<i>Taxus brevifolia</i> Nutt.	Pacific yew
<i>Thuja</i> spp.	Cedar
<i>Thuja plicata</i> Donn ex D. Don	Western redcedar
<i>Tsuga</i> spp.	Hemlock
<i>Tsuga heterophylla</i> (Raf.) Sarg.	Western hemlock
<i>Tsuga mertensiana</i> (Bong.) Carr.	Mountain hemlock
<i>Ulmus</i> spp.	Elm
<i>Umbellularia californica</i> (Hook. & Arn.) Nutt.	California-laurel
<b>Shrubs:</b>	
<i>Acer circinatum</i> Pursh	Vine maple
<i>Arceuthobium</i> spp.	Dwarf mistletoe
<i>Arctostaphylos</i> spp.	Manzanita
<i>Arctostaphylos columbiana</i> Piper	Hairy manzanita
<i>Arctostaphylos nevadensis</i> Gray	Pinemat manzanita
<i>Arctostaphylos patula</i> Greene	Greanleaf manzanita
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	Kinnikinnick
<i>Arctostaphylos viscida</i> Parry	Sticky whiteleaf manzanita
<i>Ceanothus velutinus</i> Dougl. ex Hook.	Snowbrush ceanothus
<i>Chimaphila umbellata</i> (L.) W. Bart.	Pipsissewa
<i>Cytisus scoparius</i> (L.) Link	Scotch broom
<i>Eriodictyon californicum</i> (Hook. & Arn.) Torr.	California yerba santa
<i>Fragula purshiana</i> (DC.) Cooper	Pursh's buckthorn
<i>Gaultheria shallon</i> Pursh	Salal
<i>Ilex aquifolium</i> L.	English holly
<i>Ilex opaca</i> Aiton	American holly
<i>Mahonia aquifolium</i> (Pursh) Nutt.	Oregon grape
<i>Mahonia nervosa</i> (Pursh) Nutt.	Dwarf Oregon grape
<i>Mahonia repens</i> (Lindl.) G. Don	Creeping barberry
<i>Oplopanax horridus</i> Miq.	Devilsclub
<i>Paxistima myrsinites</i> (Pursh) Raf.	Oregon boxleaf
<i>Ribes</i> spp.	Currant
<i>Rosa</i> spp.	Rose
<i>Rubus discolor</i> Weihe & Nees	Himalayan blackberry
<i>Rubus laciniatus</i> Willd.	Cutleaf blackberry
<i>Rubus ursinus</i> Cham. & Schlecht.	Trailing blackberry
<i>Salix</i> spp.	Willow

Scientific name	Common name
<i>Salix scouleriana</i> Barratt ex Hook.	Scouler's willow
<i>Sambucus nigra</i> L.	European black elderberry
<i>Sambucus nigra</i> L. ssp. <i>cerulea</i> (Raf.) R. Bolli	Blue elderberry
<i>Sambucus racemosa</i> L.	Red elderberry
<i>Symphoricarpos</i> spp.	Snowberry
<i>Vaccinium membranaceum</i> Dougl. ex Torr.	Thinleaf huckleberry
<i>Vaccinium ovatum</i> Pursh	California huckleberry
Forbs:	
<i>Achillea millefolium</i> L.	Common yarrow
<i>Anaphalis margaritacea</i> (L.) Benth.	Western pearly everlasting
<i>Arnica cordifolia</i> Hook.	Heartleaf arnica
<i>Asarum caudatum</i> Lindl.	British Columbia wildginger
<i>Centaurea solstitialis</i> L.	Yellow star-thistle
<i>Cirsium</i> spp.	Thistle
<i>Cirsium arvense</i> (L.) Scop.	Canada thistle
<i>Cirsium vulgare</i> (Savi) Ten.	Bull thistle
<i>Digitalis purpurea</i> L.	Purple foxglove
<i>Equisetum</i> spp.	Horsetail
<i>Hypericum perforatum</i> L.	St. John's wort
<i>Hypochaeris radicata</i> L.	Hairy cat's ear
<i>Leucanthemum vulgare</i> Lam.	Oxeye daisy
<i>Polystichum munitum</i> (Kaulfuss) K. Presl	Swordfern
<i>Pteridium aquilinum</i> (L.) Kuhn	Brackenfern
<i>Trillium ovatum</i> Pursh	Pacific trillium
<i>Urtica dioica</i> L.	Stinging nettle
<i>Xerophyllum tenax</i> (Pursh) Nutt.	Common beargrass
Graminoids:	
<i>Aira caryophyllea</i> L.	Silver hairgrass
<i>Avena fatua</i> L.	Wild oat
<i>Brachypodium sylvaticum</i> (Huds.) Beauv.	False brome
<i>Bromus diandrus</i> Roth	Ripgut brome
<i>Bromus tectorum</i> L.	Cheatgrass
<i>Cynosurus echinatus</i> L.	Bristly dogstail grass
<i>Dactylis glomerata</i> L.	Orchardgrass
<i>Elymus elymoides</i> (Raf.) Swezey	Bottlebrush squirreltail
<i>Holcus lanatus</i> L.	Common velvetgrass
<i>Taeniatherum caput-medusae</i> (L.) Nevski	Medusahead
Lichens:	
<i>Alectoria sarmentosa</i> (Ach.) Ach.	Witch's hair lichen
<i>Bryoria fremontii</i> (Tuck.) Brodo & D. Hawksw.	Old man's beard
<i>Letharia vulpina</i> (L.) Hue	Wolf lichen
<i>Lobaria</i> spp.	Lungwort lichens
<i>Lobaria oregana</i> (Tuck.) Mull. Arg.	Oregon lung lichen
<i>Lobaria pulmonaria</i> (L.) Hoffm.	Lungwort lichen
<i>Parmelia saxatilis</i> (L.) Ach.	Crottle
<i>Pseudocyphellaria</i> spp.	Pseudocyphellaria lichen
<i>Usnea</i> spp.	Beard lichens
<i>Usnea hirta</i> (L.) F.H. Wigg.	Beard lichen
<i>Vulpicida canadensis</i> (Rasanen) J. E. Mattsson & M.J. Lai	Brown-eyed sunshine lichen
<i>Xanthoria polycarpa</i> (Hoffm.) Rieber	Orange wall lichen

## Metric Equivalents

When you know:	Multiply by:	To find:
Inches	2.54	Centimeters
Feet	0.3048	Meters
Miles	1.609	Kilometers
Acres	0.405	Hectares
Board feet	0.0024	Cubic meters
Cubic feet	0.0283	Cubic meters
Cubic feet per acre	0.06997	Cubic meters per hectare
Square feet	0.0929	Square meters
Square feet per acre	0.229	Square meters per hectare
Ounce	28349.5	Milligrams
Pounds	0.453	Kilograms
Pounds per cubic foot	16.018	Kilograms per cubic meter
Tons per acre	2.24	Megagrams per hectare
Degrees Fahrenheit	17.22	Degrees Celcius
Kilowatt hours	3,409	B.t.u. (mean)

## Literature Cited

- Air and Waste Management Association. 1998.**  
Recognition of air pollution injury to vegetation: a pictorial atlas. 2<sup>nd</sup> ed. Sec. 2.0—Ozone. Pittsburgh, PA: Air and Waste Management Association. <http://secure.awma.org/OnlineLibrary/ProductDetails.aspx?ProductID=226>. (21 March 2008).
- Andrews, A.; Kutara, K. 2005.** Oregon's timber harvests: 1849–2004. Salem, OR: Oregon Department of Forestry. 152 p.
- Antoine, M.E. 2004.** An ecophysiological approach to quantifying nitrogen fixation by *Lobaria oregana*. *The Bryologist*. 107: 82–87.
- Azuma, D.L.; Birch, K.R.; DelZotto, P.; Herstrom, A.A.; Lettman, G.J. 1999.** Land use change on nonfederal land in western Oregon, 1973–1994. Salem, OR: Oregon Department of Forestry. 55 p.
- Azuma, D.L.; Donnegan, J.; Gedney, D. 2004a.** Southwest Oregon's Biscuit Fire: an analysis of forest resources and fire severity. Res. Pap. PNW-RP-560. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.
- Azuma, D.L.; Dunham, P.A.; Hiserote, B.A.; Veneklas, C.F. 2004b.** 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.
- Azuma, D.L.; Hiserote, B.A.; Dunham, P.A. 2005.** The western juniper resource of eastern Oregon. 2005. Resour. Bull. PNW-RB-249. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 18 p.
- Barbour, R.J.; Fried, J.S.; Daugherty, P.J.; Fight, R. 2008.** Predicting the potential mix of wood products available from timbershed scale fire hazard reduction treatments. *Forest Policy and Economics*. 10: 400–407.
- Bechtold, W.A.; Patterson, P.L. 2005.** The enhanced forest inventory and analysis program—national sampling design and estimation procedures. Gen. Tech. Rep. GTR-SRS-80. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 85 p.
- Blackard, J.; Finco, M.; Helmer, E.; Holden, G.; Hoppus, M.; Jacobs, D.; Lister, A.; Moisen, G.; Nelson, M.; Riemann, R.; Ruefenacht, B.; Salajanu, D.; Weyermann, D.; Winterberger, K.; Brandeis, T.; Czaplewski, R.; McRoberts, R.; Patterson, P.; Tymcio, R. 2008.** Mapping U.S. forest biomass using nationwide forest inventory data and moderate resolution information. [Biomass map with forest/non-forest mask, 250 m resolution]. *Remote Sensing of the Environment*. 112: 1658–1677.
- Bolsinger, C.L.; Waddell, K. 1993.** Area of old-growth forests in California, Oregon, and Washington. Resour. Bull. PNW-RB-197. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 26 p.
- Booth, D.E. 1991.** Estimating prelogging old-growth in the Pacific Northwest. *Journal of Forestry*. 89: 25–29.

- Brandt, J.P.; Morgan, T.A.; Dillon, T.; Lettman, G.J.; Keegan, C.E.; Azuma, D.L. 2006.** Oregon's forest products industry and timber harvest, 2003. Gen. Tech. Rep. PNW-GTR-681. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.
- British Columbia Ministry of Forests. 2006.** British Columbia's mountain pine beetle action plan, 2006–2011. [http://www.for.gov.bc.ca/hfp/mountain\\_pine\\_beetle/actionplan/2006/Beetle\\_Action\\_Plan.pdf](http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/actionplan/2006/Beetle_Action_Plan.pdf). (21 March 2008).
- Butler, B.J.; Leatherberry, E.C.; Williams, M.S. 2005.** Design, implementation, and analysis methods for the national woodland owner survey. Gen. Tech. Rep. NE-GTR-336. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 43 p.
- Campbell, N.A. 1990.** Biology. 2<sup>nd</sup> ed. Redwood City, CA: Benjamin/Cummings Publishing Company, Inc. 1165 p.
- Campbell, S.; Dunham, P.A.; Azuma, D.A. 2004.** Timber resource statistics for Oregon. Resour. Bull. PNW-RB-242. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 67 p.
- Campbell, S.; Liegel, L. 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. 121 p.
- Campbell, S.J.; Wanek, R.; Coulston, J.W. 2007.** Ozone injury in west coast forests: results of 6 years of monitoring. Gen. Tech. Rep. PNW-GTR-722. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.
- Cleland, D.T.; Avers, P.E.; McNab, W.H.; Jensen, M.E.; Bailey, R.G.; King, T.; Russell, W.E. 1997.** National hierarchical framework of ecological units. In: Boyce, M.S.; Haney, A., eds. Ecosystem management: applications for sustainable forest and wildlife resources. New Haven, CT: Yale University Press: 181–200.
- Cleland, D.T.; Freeouf, J.A.; Keys, J.E., Jr.; Nowacki, G.J.; Carpenter, C.A.; McNab, W.H. 2005.** Ecological subregions: sections and subsections of the conterminous United States, 1:3,500,000, CD-ROM. Washington, DC: U.S. Department of Agriculture, Forest Service.
- Coulston, J.W.; Smith, G.C.; Smith, W.D. 2003.** Regional assessment of ozone sensitive tree species using bioindicator plants. Environmental Monitoring and Assessment. 83: 113–127.
- Cowlin, R.W.; Briegleb, P.A.; Moravets, F.L. 1942.** Forest resources of the ponderosa pine region of Washington and Oregon. Misc. Publ. 490. Washington, DC: U.S. Department of Agriculture, Forest Service. 99 p.
- D'Antonio, C.M.; Vitousek, P.M. 1992.** Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics. 23: 63–87.
- Daugherty, P.J.; Fried, J.S. 2007.** Jointly optimizing selection of fuel treatments and siting of biomass facilities for landscape-scale fire hazard reduction. INFOR: Information Systems and Operational Research. 45(1): 353–372.
- Department of Environmental Quality (DEQ) Air Quality Division. 2005.** 2004 Oregon Air Quality Data Summaries. <http://www.deq.state.or.us/aq/forms/2004ar/2004ar-full.pdf>. (21 March 2008).
- Donato, D.C.; Fontaine, J.B.; Campbell, J.L.; Robinson, W.D.; Kauffman, J.B.; Law, B.E. 2006.** Post-wildfire logging hinders regeneration and increases fire risk. Science. 311(5759): 352.
- Eilers, J.M.; Rose, C.L.; Sullivan, T.J. 1994.** Status of air quality and effects of atmospheric pollutants on ecosystems in the Pacific Northwest Region of the National Park Service. Technical Report NPS/NRAQD/NRTR-94/160. <http://www2.nature.nps.gov/air/pubs/PacificNW.Review/index.html>. (December 2006).

- Everett, Y. 1997.** A guide to selected nontimber forest products of the Hayfork Adaptive Management Area, Shasta-Trinity and Six Rivers National Forests, California. Gen. Tech. Rep. PSW-GTR-162. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 64 p.
- Fenn, M.E.; Baron, J.S.; Allen, E.B.; Rueth, H.M.; Nydick, K.R.; Geiser, L.; Bowman, W.D.; Sickman, J.O.; Meixner, T.; Johnson, D.W.; Neitlich, P. 2003.** Ecological effects of nitrogen deposition in the Western United States. *BioScience*. 53: 404–420.
- Fenn, M.E.; Geiser, L.; Bachman, R.; Blubaugh, T.J.; Bytnerowicz, A. 2007.** Atmospheric deposition inputs and effects on lichen chemistry and communities in the Columbia River Gorge, USA. *Environmental Pollution*. 146(1): 77–91.
- Finney, M.A. 2001.** Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. *Forest Science*. 47(2): 219–228.
- Fitzpatrick, M.** Personal communication. Predictive Services Support Staff, Northwest Coordination, U.S. Department of the Interior, Bureau of Land Management. 333 SW First Avenue, Portland, OR 97204.
- Franklin, J.F.; Cromack, K.; Denison, W.; McKee, A.; Maser, C.; Sedell, J.; Swanson, F.; Juday, G. 1981.** Ecological characteristics of old-growth Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-118. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 48 p.
- Franklin, J.F.; Dyrness, C.T. 1973.** Natural vegetation of Oregon and Washington. Gen. Tech. Rep. PNW-GTR-8. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 417 p.
- Franklin, J.F.; Hall, F.; Laudenslayer, W. 1986.** Interim definitions for old-growth Douglas-fir and mixed conifer forests in the Pacific Northwest and California. Res. Note PNW-RN-447. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.
- Fried, J.S. 2003.** Evaluating landscape-scale fuel treatment policies with FIA data. *Western Forester*. 48(1): 6–7.
- Fried, J.S.; Barbour, J.; Fight, R. 2003.** FIA BioSum: applying a multi-scale evaluation tool in southwest Oregon. *Journal of Forestry*. 101(2): 8.
- Fried, J.S.; Christensen, G. 2004.** FIA BioSum: a tool to evaluate financial costs, opportunities, and effectiveness of fuel treatments. *Western Forester*. 49(5): 12–13.
- Fried, J.S.; Christensen, G.; Weyermann, D.; Barbour, J.R.; Fight, R.; Hiserote, B.; Pinjuv, G. 2005.** Modeling opportunities and feasibility of siting wood-fired electrical generating facilities to facilitate landscape-scale fuel treatment with FIA BioSum. In: Bevers, M.; Barrett, T.M., tech. comps. Systems analysis in forest resources: proceedings of the 2003 symposium. Gen. Tech. Rep. PNW-GTR-656. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 207–216.
- Gedney, D.R.; Azuma, D.L.; Bolsinger, C.L.; McKay, N. 1999.** Western juniper in eastern Oregon. Gen. Tech. Rep. PNW-GTR-464. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.
- Geiser, L.H.; Neitlich, P.N. 2007.** Air pollution and climate gradients in western Oregon and Washington indicated by epiphytic macrolichens. *Environmental Pollution*. 145: 203–218.
- Gholz, H.L. 1980.** Structure and productivity of *Juniperus occidentalis* in central Oregon. *American Midland Naturalist*. 103(2): 251–261.
- Goheen, E.M.; Willhite, E.A. 2006.** Field guide to common diseases and insect pests of Oregon and Washington conifers. R6-NR-FID-PR-01-06. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 327 p.
- Gray, A. 2005.** Eight nonnative plants in western Oregon forests: associations with environment and management. *Environmental Monitoring and Assessment*. 100: 109–127.

- Gray, A.N.; Azuma, D.L. 2005.** Repeatability and implementation of a forest vegetation indicator. *Ecological Indicators*. 5: 57–71
- Hardy, C.C.; Bunnell, D.L.; Menakis, J.P.; Schmidt, K.M.; Long, D.G.; Limmerman, D.G.; Johnston, C.M. 1999.** Course-scale spatial data for wildland fire and fuel management. Prescribed Fire and Fire Effects Research Work Unit. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. <http://www.fs.fed.us/fire/fuelman>. (21 March 2008).
- Harmon, M.E.; Franklin, J.F.; Swanson, F.J.; Sollins, P.; Gregory, S.V.; Lattin, J.D.; Anderson, N.H.; Cline, S.P.; Aumen, N.G.; Sedell, J.R.; Lienkaemper, G.W.; Cromack, K., Jr. 1986.** Ecology of coarse woody debris in temperate ecosystems. *Advances in Ecological Research* 15. 302 p.
- Heinz Center [H. John Heinz III Center for Science, Economics, and the Environment]. 2002.** The state of the Nation's ecosystems: measuring the lands, waters, and living resources of the United States. New York: Cambridge University Press. 270 p.
- Helms, J.A., ed. 1998.** The dictionary of forestry. Bethesda, MD: The Society of American Foresters. 210 p.
- 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.
- Homer, C.C.; Huany, L.; Wylie, B.; Coan, M. 2004.** Development of a 2001 national landcover database for the United States. *Photogrammetric Engineering and Remote Sensing*. 70(7): 829–840.
- Houghton, R.A. 2005.** Aboveground forest biomass and the global carbon balance. *Global Change Biology*. 11: 945–958.
- Jenkins, J.C.; Birdsey, R.A.; Pan, Y. 2001.** Biomass and net primary productivity estimation for the mid-Atlantic region using plot-level forest inventory data. *Ecological Applications*. 11(4): 1174–1193.
- Jenny, H. 1941.** Factors of soil formation; a system of quantitative pedology. New York: McGraw-Hill. 281 p.
- Jones, E.T. 1999.** Nontimber forest products web site. <http://www.ifcae.org/ntfp/>. (16 January 2007).
- Jovan, S. 2008.** Lichen bioindication of biodiversity, air quality, and climate: baseline results from monitoring in Washington, Oregon, and California. Gen. Tech. Rep. PNW-GTR-737. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 115 p.
- Kagan, J.; Caicco, S. 1992.** Manual of Oregon actual vegetation. Moscow, ID: Idaho Cooperative Fish and Wildlife Research Unit. 190 p.
- Kline, J.D.; Azuma, D.A.; Alig, R. 2003.** Population growth, urban expansion, and private forestry in western Oregon. *Forest Science*. 50(1): 33–43.
- Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E.; Weatherspoon, C.P.; Lisle, T.E. 2002.** Proceedings of a symposium on the ecology and management of dead wood in western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 949 p.
- Lettman, G.J.; Azuma, D.L.; Birch, K.R.; Herstrom, A.A.; Kline, J.D. 2002.** Land use change on nonfederal land in western Oregon, 1973–2000. Salem, OR: Oregon Department of Forestry. 48 p.
- Lettman, G.J.; Azuma, D.L.; Birch, K.R.; Herstrom, A.A.; Kline, J.D. 2004.** Land use change on nonfederal land in eastern Oregon, 1975–2001. Salem, OR: Oregon Department of Forestry. 42 p.
- MacArthur, R.H.; MacArthur, J.W. 1961.** On bird species diversity. *Ecology*. 42: 594–598.

- McNab, W.H.; Cleland, D.T.; Freeouf, J.A.; Keys, J.E., Jr.; Nowacki, G.J.; Carpenter, C.A., comps. 2005.** Description of ecological subregions: sections of the conterminous United States [CD-ROM]. Ecomap team. Washington, DC: U.S. Department of Agriculture, Forest Service. [http://www.na.fs.fed.us/sustainability/ecomap/section\\_descriptions.pdf](http://www.na.fs.fed.us/sustainability/ecomap/section_descriptions.pdf). (21 March 2008).
- Mengel, K.; Kirkby, E.A.; Kosegarten, H.; Appel, T. 2001.** Principles of plant nutrition. 5<sup>th</sup> ed. Norwell, MA: Kluwer Academic Publishers. 864 p.
- Miller, R.F.; Angell, R.F.; Eddleman, L.E. 1987.** Water use by western juniper. In: Everett, R.L., ed. Proceedings, pinyon-juniper conference. Gen. Tech. Rep. INT-GTR-215. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 418–422.
- Miller, R.F.; Rose, J.A. 1995.** Historic expansion of *Juniper occidentalis* (western juniper) in southeastern Oregon. Great Basin Naturalist. 55: 37–45.
- Miller, R.F.; Svejcar, T.J.; Rose, J.A. 2000.** Impacts of western juniper on plant community composition and structure. Journal of Range Management. 53: 574–585.
- Miller, R.F.; Wigand, P.E. 1994.** Holocene changes in semiarid pinyon-juniper woodlands. BioScience. 44: 465–474.
- Mooney, H.A.; Hobbs, R.J.H. 2000.** Invasive species in a changing world. Washington, DC: Island Press. 780 p.
- Moore, D.S.; McCabe, G.P. 1989.** Introduction to the practice of statistics. New York: W.H. Freeman and Co. 790 p.
- National Research Council Committee to Evaluate Indicators for Monitoring Aquatic and Terrestrial Environments. 2000.** Ecological Indicators for the Nation. Washington, DC: National Academy Press. 180 p.
- Ohmann, J.L.; Waddell, K.L. 2002.** Regional patterns of dead wood in forested habitats of Oregon and Washington. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E.; Weatherspoon, C.P.; Lisle, T.E., tech. coords. Proceedings of a symposium on the ecology and management of dead wood in western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 535–560.
- Old-Growth Definition Task Group. 1986.** Interim definitions for old-growth Douglas-fir and mixed-conifer forests in the Pacific Northwest and California. Res. Note PNW-RN-447. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 7 p.
- O'Neill, K.P.; Amacher, M.C.; Perry, C.H. 2005.** Soils as an indicator of forest health: a guide to the collection, analysis, and interpretation of soil indicator data in the Forest Inventory and Analysis Program. Gen. Tech. Rep. NC-GTR-258. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 53 p.
- Oregon Department of Forestry. 2006a.** Ownership/land use allocation for the state of Oregon. [Map, GIS layer]. Salem, OR: Resources Planning Section.
- Oregon Department of Forestry. 2006b.** Draft Oregon indicators of sustainable forest management. Salem, OR: Oregon Department of Forestry.
- Oregon Department of Forestry. 2006c.** 2005 Oregon timber harvest report, Salem, OR: Oregon Department of Forestry.
- Parsons, A.; Orlemann, A. 2002.** BAER (Burn Area Emergency Rehabilitation) burn severity mapping: methods and definitions. [http://www.biscuitfire.com/burn\\_severity.htm](http://www.biscuitfire.com/burn_severity.htm). (21 March 2008).
- Pedersen, L. 2003.** Premier's mountain pine beetle symposium. [http://www.for.gov.bc.ca/hfp/mountain\\_pine\\_beetle/symposium/](http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/symposium/). (21 March 2008).



- Perry, D.A. 1994.** Forest ecosystems. Baltimore, MD: Johns Hopkins University Press.
- Pimentel, D.; Zuniga, R.; Morrison, D. 2005.** Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics*. 52: 273–288.
- Randolph, K.C. 2006.** Descriptive statistics of tree crown condition in the Southern United States and impacts on data analysis and interpretation. Gen. Tech. Rep. SRS-GTR-94. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 17 p.
- Reeves, G.H.; Bisson, P.A.; Rieman, B.E.; Benda, L.E. 2006.** Post fire logging in riparian areas. *Conservation Biology*. 20(4): 994–1004.
- Reinhardt, E.; Crookston, N.L., tech. eds. 2003.** The fire and fuels extension to the forest vegetation simulator. Gen. Tech. Rep. RMRS-GTR-116. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 209 p.
- Ripple, W.J. 1994.** Historic spatial patterns of old forests of western Oregon. *Journal of Forestry*. 92: 45–49.
- Rose, C.L.; Marcot, B.G.; Mellen, T.K.; Ohmann, J.L.; Waddell, K.L.; Lindley, D.L.; Schreiber, B. 2001.** Decaying wood in Pacific Northwest forests: concepts and tools for habitat management. In: Johnson, D.H.; O’Neil, T.A., manag. dirs. *Wildlife-habitat relationships in Oregon and Washington*. Corvallis, OR: Oregon State University Press: 580–612. Chapter 24.
- Schmidt, K.M.; Menakis, J.P.; Hardy, C.C.; Hann, W.J.; Bunnell, D.L. 2002.** Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 41 p.
- Schulz, B. 2003.** Forest inventory and analysis: vegetation indicator, FIA Fact Sheet Series. Washington, DC: U.S. Department of Agriculture, Forest Service. <http://fia.fs.fed.us/library/fact-sheets/p3-factsheets/vegetation.pdf>. (21 March 2008).
- Sessions, J.; Bettinger, P.; Buckman, R.; Newton, M.; Hamann, J. 2004.** Hastening the return of complex forests following fire: the consequences of delay. *Journal of Forestry* 102(3): 38–45.
- Sessions, J.; Buckman, R.; Newton, M.; Hamann, J. 2003.** The Biscuit Fire: management options for forest regeneration, fire and insect risk reduction, and timber salvage. Unpublished report. On file with: John Sessions, College of Forestry, Oregon State University, Corvallis, OR.
- Smith, W.B.; Miles, P.D.; Vissage, J.S.; Pugh, S.A. 2004.** Forest resources of the United States, 2002. Gen. Tech. Rep. NC-GTR-241. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 137 p.
- Teensma, P.D.A.; Rienstra, J.T.; Yeiter, M.A. 1991.** Preliminary reconstruction and analysis of change in forest stand age classes of the Oregon Coast Range from 1850 to 1940. Technical Note T/N OR-9: 9217. Portland, OR: U.S. Department of the Interior, Bureau of Land Management. 9 p.
- U.S. Department of Agriculture, Forest Service. 1997.** First approximation report for sustainable forest management: report of the United States on the criteria and indicators for sustainable management of temperate and boreal forests. Washington, DC.
- U.S. Department of Agriculture, Forest Service. 2004.** National Report on Sustainable Forests, 2003. FS-766. Washington, DC. 139 p.
- U.S. Department of Agriculture, Forest Service. 2006.** Forest Inventory and Analysis glossary. [http://socrates.lv-hrc.nevada.edu/fia/ab/issues/pending/glossary/Glossary\\_5\\_30\\_06.pdf](http://socrates.lv-hrc.nevada.edu/fia/ab/issues/pending/glossary/Glossary_5_30_06.pdf). (21 March 2008).
- U.S. Department of Agriculture, Forest Service. 2007a.** Forest Vegetation Simulator. <http://www.fs.fed.us/fmcs/fvs/index.php>. (21 March 2008).

- U.S. Department of Agriculture, Forest Service.**  
**2007b.** Forest Inventory and Analysis Program: field instructions for the annual inventory of Washington, Oregon, and California. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- U.S. Department of Agriculture, Natural Resources Conservation Service [USDA NRCS]. 2000.** The PLANTS Database. Baton Rouge, LA: National Plant Data Center. <http://plants.usda.gov/>. (21 March 2008).
- U.S. Environmental Protection Agency. 2006.** Technology Transfer Network Air Quality System. <http://www.epa.gov/ttn/airs/airsaqs>. (21 March 2008).
- U.S. Geological Survey. 2001.** URBANAP020—National Atlas Urban Areas of the United States [vector digital data]. Reston, VA. <http://nationalatlas.gov/atlasftp.html>. (21 March 2008).
- Vance, N.C.; Borsting, M.; Pilz, D.; Freed, J. 2001.** Special forest products: species information guide for the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-513. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 169 p.
- Vance, N.; Gray, A.; Haberman, R. 2002.** Assessment of western Oregon forest inventory for evaluating commercially important understory plants. In: Johnson, A.C.; Haynes, R.W.; Monserud, R.A., eds. Congruent management of multiple resources: proceedings of the Wood Compatibility Initiative workshop. Gen. Tech. Rep. PNW-GTR-563. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 183–190.
- Vitousek, P.M.; D'Antonio, C.M.; Loope, L.L.; Westbrooks, R. 1996.** Biological invasions as global environmental change. *American Scientist*. 84: 468–478.
- Vogt, C.A.; Winter, G.; Fried, J.S. 2005.** Predicting homeowners' approval of fuel management at the wildland-urban interface using the Theory of Reasoned Action. *Society and Natural Resources*. 18(4): 337–354.
- Walker, R.; Rosenberg, M.; Warbington, R.; Schwind, B.; Beardsley, D.; Ramirez, C.; Fischer, L.; Frerichs, B. 2006.** Inventory of tree mortality in southern California mountains (2001-2004) due to bark beetle impacts. Santa Rosa, CA: Fire and Resource Assessment Program, California Department of Forestry and Fire Protection. [http://www.frap.cdf.ca.gov/projects/mast/reports/FULL\\_REPORT\\_6.14.06.pdf](http://www.frap.cdf.ca.gov/projects/mast/reports/FULL_REPORT_6.14.06.pdf). (21 March 2008).
- Whittaker, R.H.; Likens, G.E. 1975.** The biosphere and man. In: Leith, H.; Whittaker, R.H., eds. Primary productivity of the biosphere. New York: Springer-Verlag: 305–328.
- Wimberly, M.C.; Spies, T.A.; Long, C.J.; Whitlock, C. 2000.** Simulating historical variability in the amount of old forests in the Oregon Coast Range. *Conservation Biology*. 14: 167–180.
- Winter, L.E.; Brubaker, L.B.; Franklin, J.F.; Miller, E.A.; DeWitt, D.Q. 2002.** Canopy disturbances over the five-century lifetime of an old-growth Douglas-fir stand in the Pacific Northwest. *Canadian Journal of Forest Research*. 32: 1057–1070.
- Young, J.A.; Evans, R.A. 1984.** Stem flow on western juniper (*Juniperus occidentalis*) trees. *Weed Science*. 32: 320–327.

# Appendix 1: Methods and Design

## Field Design and Sampling Method

The Pacific Northwest Research Station's Forest Inventory and Analysis (PNW-FIA) Program implemented the new annual inventory across all ownerships in Oregon in 2001. The overall sampling design is a significant change from that of previous periodic inventories; the differences will be discussed more fully below.

In the annual inventory system for the Pacific Northwest (Alaska, Washington, Oregon, and California), the objective is to measure approximately 10 percent of the annual plots across an entire state each year. This annual subsample is referred to as a panel. The plots measured in a single panel are selected to ensure systematic coverage within each county, spanning both public and privately owned forests, and including lands reserved from industrial wood production such as national parks, wilderness areas, and natural areas. Estimates of forest attributes can be derived from measurements of a single panel for areas as small as a survey unit or ecosection; however, such estimates are often imprecise because one panel represents only 10 percent of the full inventory sample. More-precise statistics are obtained by combining data from multiple panels. After at least 60 percent of plots have been sampled, change can be estimated through a comparison of different sets of panels, using a moving average. Estimates from sampled plots in the five panels measured from 2001 to 2005 were combined to produce the statistics in this report. Once all panels have been measured (2010), we will remeasure each one approximately every 10 years.

The FIA Program collects information in three phases. In phase 1, a sample of points is interpreted from remotely sensed imagery, either aerial photos or satellite data, and the landscape is stratified into meaningful groupings, such as forested and nonforested areas, ecologically similar regions, and forest types. In phase 2, field plots are measured for a variety of indicators that describe forest composition, structure, and the physical geography of the landscape. Phase 2 plots are spaced at approximate 3-mile intervals on a hexagonal grid throughout the forest. In phase 3, a 1/16 sample of phase 2 plots is measured to assess forest health indicators.

## Phase 1

The goal of phase 1 is to reduce the variance associated with estimates of forest land area and volume. Digital imagery collected by remote-sensing satellites is classed into a few similar strata (such as forest or nonforest) by means of standard techniques for image classification, and the total area of each of these strata is used to assign a representative acreage to each sample plot. Source data were derived from Landsat Thematic Mapper (98.4 foot resolution) imagery collected between 1990 and 1992. An image-filtering technique is used to classify individual plots by a summary of the 5- by 5-pixel region that surrounds the pixel containing a sample plot. The resulting 26 classes, or strata (ranging from entirely forested to entirely nonforested, for example), are combined with other geographic attributes likely to improve stratification effectiveness, such as owner class. The resulting strata are evaluated for each estimation unit (county, or combination of small counties), and collapsed as necessary to ensure that at least four plots are in each stratum. Stratified estimation is applied by assigning each plot to one of these collapsed strata and by calculating the area of each collapsed stratum in each estimation unit. The estimates from stratified data are usually more precise than those from unstratified estimates.

## Phase 2

The plot installed at each forested phase 2 location is a cluster of four subplots spaced 120 feet apart (fig. 93). Subplot 1 is in the center, with subplots 2 through 4 uniformly distributed radially around it. Each point serves as the center of a 1/24-acre circular subplot used to sample all trees at least 5.0 inches in diameter at breast height (d.b.h.). A 1/300-acre microplot, with its center located just east of each subplot center, is used to sample trees 1.0 to 4.9 inches d.b.h., as well as seedlings (trees less than 1.0 inch d.b.h.). On national forests in Oregon, a hectare plot (a 185.1-foot fixed-radius plot centered on subplot 1) is also established to tally trees larger than 32 inches d.b.h. in eastern Oregon and 48 inches d.b.h. in western Oregon.

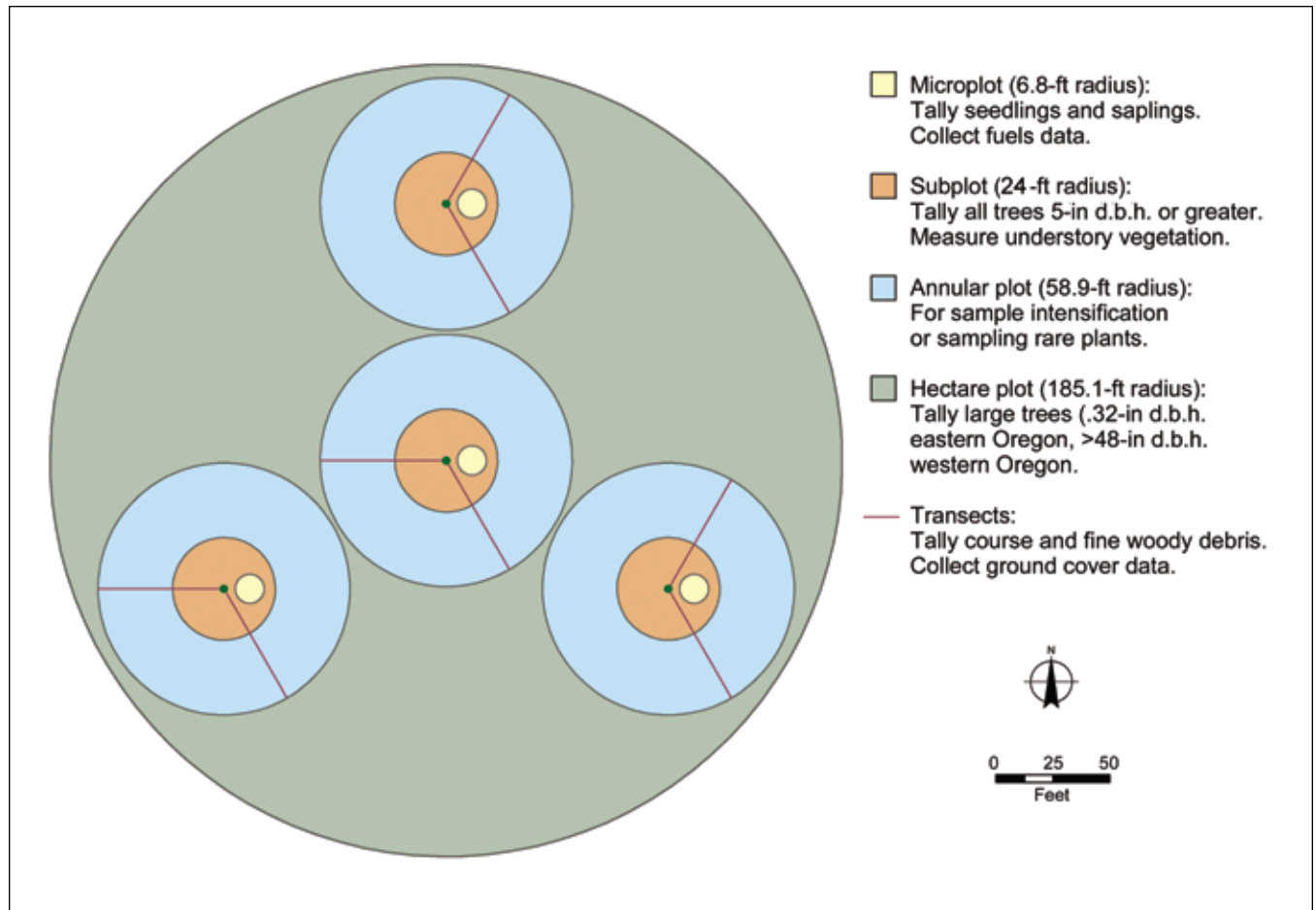


Figure 93—The Forest Inventory and Analysis plot design used in the Oregon annual inventory, 2001–2005.

All phase 2 plots classified through aerial photography as possibly being forested are established in the field without regard to land use or land cover. Field crews delineate areas that are comparatively less heterogeneous than the plot as a whole with regard to reserved status, owner group, forest type, stand size class, regeneration status, and tree density; these areas are described as condition classes. The process of delineating these condition classes on a fixed-radius plot is called mapping. All measured trees are assigned to the mapped condition class in which they are located.

On phase 2 plots, crews assess physical characteristics such as slope, aspect, and elevation; stand characteristics such as age, size class, forest type, disturbance, site productivity, and regeneration status; and tree characteristics such as tree species, diameter, height, damages, decay,

and vertical crown dimensions. They also collect general descriptive information such as soil depth, proximity to water and roads, and the geographic position of the plot in the larger landscape. In Oregon, crews also assess height and cover of understory species, the structure of live and dead fuels, and the structure and composition of downed wood as regional variables (see “Core, Core-Optional, and Regional Variables” section below).

The PNW-FIA Program sampled 2,619 forested phase 2 plots in Oregon between 2001 and 2005. Estimates of timber volume and other forest attributes were derived from tree measurements and classifications made at each plot. Volumes for individual tally trees were computed with equations for each of the major species in Oregon. Estimates of growth, removals, and mortality were determined from the remeasurement of 1,437 permanent

sample plots established in the previous inventory in conjunction with increment cores taken during the annual inventory.

### Phase 3

More-extensive forest health measurements are collected in a 16-week period during the growing season (when most plants are in full leaf and many are flowering) on a subset (1/16) of phase 2 sample locations. At the phase 3 plots, measurements are taken on tree crowns, soils, lichens, down woody material, and understory vegetation, in addition to the phase 2 variables. One forest health measurement, ozone injury, is conducted on a separate grid with all 35 ozone plots measured annually.

The PNW-FIA Program sampled 333 forested phase 3 plots in Oregon between 2001 and 2005. The relatively small number of phase 3 samples is intended to serve as a broad-scale detection monitoring system for forest health problems.

### Core, Core-Optional, and Regional Variables

The majority of FIA variables collected in Oregon are identical to those collected by FIA elsewhere in the United States—these are national “core” or “core optional” variables (as the name suggests, collection of core optional variables is optional but, if collected, they must be collected in the same way everywhere). A number of other variables are unique to PNW-FIA—these are “regional” variables and include such items as down woody material and understory vegetation on phase 2 plots (not to be confused with down woody and understory vegetation on phase 3 plots, which are measured using a slightly different protocol), as well as insect and disease damage, a record of previous disturbance on the plot, and measurements for special studies (such as nesting habitat assessment for the marbled murrelet (*Brachyramphus marmoratus*)).

### Data Processing

The data used for this report are stored in the FIA National Information Management System (NIMS). NIMS provides a means to input, edit, process, manage, and distribute FIA data. NIMS includes a process for data loading, a

national set of edit checks to ensure data consistency, an error-correction process, approved equations and algorithms, code to compile and calculate attributes, a table report generator, and routines to populate the presentation database. NIMS applies numerous algorithms and equations to calculate, for example, stocking, forest type, stand size, volume, and biomass. NIMS generates estimates and associated statistics based on county areas and stratum weights developed outside of NIMS. Additional FIA statistical design and estimation techniques are further reviewed in Bechtold and Patterson (2005).

### Statistical Estimates

Throughout this report we have published standard errors (SE) for most of our estimates. These standard errors account for the fact that we measured only a small sample of the forest (thereby producing a sample-based estimate) and not the entire forest (which is the population parameter of interest). Because of small sample sizes or high variability within the population, some estimates can be very imprecise. The reader is encouraged to take the standard error into account when drawing any inference. One way to consider this type of uncertainty is to construct confidence intervals. Customarily, 66 percent or 95-percent confidence intervals are used. A 95-percent confidence interval means that one can be 95-percent confident that the interval contains the true population parameter of interest. For more details about confidence intervals, please consult Moore and McCabe (1989) or other statistical literature.

It is relatively easy to construct approximate 66-percent or 95-percent confidence intervals by multiplying the standard error by 1.0 (for 66-percent confidence intervals) or 1.96 (for 95-percent confidence intervals) and subtracting from and adding this to the estimate itself. For example, in table 2 of appendix 2 we estimated the total timberland in Oregon to be 24,735 thousand acres with a SE of 256. A 95 percent confidence interval for the total timberland area ranges from 24,233 to 25,237 thousand acres.

The reader may want to assess whether or not two estimates are significantly different from each other. The statistically correct way to address this is to estimate the SE of the difference of two estimates, and either construct

a confidence interval or use the equivalent z-test. However, this requires the original inventory data. It is often reasonable to assume that two estimates are nearly uncorrelated. For example, plots usually belong to one and only one owner. The correlation between estimates for different owners will be very small. If both estimates can be assumed to be nearly uncorrelated, the SE of the difference can be estimated by

$$SE_{Difference} = \sqrt{SE_{Estimate 1}^2 + SE_{Estimate 2}^2}$$

Using the SE of the difference, a confidence interval for the difference can be constructed with this method.

If two estimates are based on data that occur on the same plot at the same time, the above equation should not be used. For example, table 17 in appendix 2 contains estimates of tree volume by diameter class. If the reader wants to compare the volume of trees in the diameter class 9.0 to 10.9 d.b.h. (21.6 billion board feet) with that of trees in the diameter class 21.0 to 22.9 d.b.h. (33.15 billion board feet), the covariance between the estimates is not zero and this equation should not be used.

There are two other approaches the reader could possibly consider, but we do not recommend them. The first is to construct a confidence interval for one estimate and evaluate whether the other estimates fall within the interval. The problem is that unless both estimates are **highly positively** correlated, this approach will lead to a too-small confidence interval. The second approach is to construct confidence intervals for both estimates and determine whether or not they overlap. The problem here is that unless **both** estimates are highly negatively correlated, this approach will be very conservative. For more complex and indepth analysis, the reader may contact the PNW-FIA Program.

All estimates—means, totals and their associated SE—are based on the poststratification methods described by Bechtold and Patterson (2005).

### Access Denied, Hazardous, or Inaccessible Plots

Although every effort was made to visit all field plots that were entirely or partially forested, some were not sampled for a variety of reasons. Field crews may have been unable

to obtain permission from the landowner to access the plot (“denied access”), and there were some plots that were impossible for crews to safely reach or access (“hazardous/inaccessible”). Some private landowners deny access to their land. Although permission to visit public lands is almost always granted, some public land lies in higher elevation areas that can be very difficult or impossible to reach.

This kind of missing data can introduce bias into the estimates if the nonsampled plots tend to be different from the entire population. Plots that are obviously nonforested (based on aerial photos) are rarely visited, and therefore the proportion of denied-access, hazardous, or inaccessible plots is significantly smaller than it is for forested plots.

The poststratification approach outlined in Bechtold and Patterson (2005) removes nonsampled plots from the sample. Estimates are adjusted for plots that are partially nonsampled by increasing the estimates by the nonsampled proportion within each stratum. To reduce the possible bias introduced by nonsampled plots, we delineated five broad strata groups: census water, forested public land, nonforested public land, forested private land, and nonforested private land. Some of these five broad strata groups were further divided into smaller strata to reduce the variance.

Percentage of denied-access and hazardous/inaccessible plots for each of the five broad strata groups for Oregon, 2001–2005 are as follows:

Strata group	Total plots	Denied access	Hazardous/inaccessible
		---- Percent ----	
Census water	147	0.68	0.17
Private forest	1,189	10.04	0.42
Private nonforest	1,133	3.00	0.03
Public forest	1,701	0.57	0.90
Public nonforest	1,111	0.29	0.40
Total	5,281	3.17	0.48

### Timber Products Output Survey

The timber products information presented in this report was based on a census of Oregon's timber processors and out-of-state processors that use Oregon timber. The census was conducted by the University of Montana's

Bureau of Business and Economic Research in cooperation with PNW-FIA (Brandt et al. 2006). Through a written questionnaire or a phone interview, forest products manufacturers provided the following information for each of their facilities: plant production capacity and employment; volume of raw material received by county and ownership; species of timber received; finished product volumes, types, sales value, and market locations; and utilization and marketing of manufacturing residue. This survey is designed to determine the size and composition of Oregon's timber harvest and forest products industry, the industry's use of forest resources, and the generation and disposition of wood residues.

### **National Woodland Owner Survey**

This survey of private forest owners is conducted annually by the FIA Program to increase our understanding of private woodland owners. Questionnaires are mailed to individuals and private groups who own woodlands in which FIA has established forest inventory plots. Nationally, 20 percent of these owners (about 50,000) are contacted each year, with more-detailed questionnaires sent to coincide with national census, inventory, and assessment programs. For Oregon, 161 private noncorporate woodland owners were sent questionnaires, and the 92 that were returned provide the data that were summarized and presented in this report.

### **Periodic Versus Annual Inventories**

The PNW-FIA Program began fieldwork for the fifth inventory of Oregon in 2001. This was the first inventory that used the annual inventory system, in which 1/10 of all forested plots (referred to as one panel) were visited each year. The first statewide panel of field plots was completed in 2001, and half of all field plots in the state were measured by 2006, prompting production of this congressionally mandated 5-year analysis of Oregon's forest resources.

Data from new inventories are often compared with those from earlier inventories to determine trends in forest

resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar. Previous inventories of Oregon's forest resources were completed in 1964, 1976, 1985, 1992, and 1998. These were periodic inventories in which all forested plots outside of national forests in the state were visited within a 2- or 3-year window.

As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have been made since the last Oregon inventory in 1998. These changes include an increase in plot density of about 18 percent, a new plot footprint (changing from a five-subplot configuration in which about 2.5 acres were sampled, to a four-subplot configuration in which about 1 acre is sampled) (figs. 93 and 94), a new set of nationally consistent measurement protocols, and a plot visitation schedule that calls for sampling of 10 percent of all forested plots in the state each year. Although these changes will have little impact on statewide estimates of forest area, timber volume, and tree biomass, they may significantly affect plot classification variables such as forest type and stand size class (especially county-level estimates).

Estimates of growth, removals, and mortality (GRM) are particularly dependent on comparisons between inventories, and thus are most likely to be valid when based on remeasurements of the same plots and trees. Only half of the field plots (5 out of 10 panels) have been visited under the annual system to date, and the increase in plot density means about 18 percent of the plots are new and were not visited during a previous inventory. Unlike the five-subplot, variable-radius design used in the 1998 periodic inventory, the annual inventory uses fixed-radius sampling on four subplots, with only one subplot center coinciding with that of a periodic subplot (fig. 94). Thus, relatively few of the trees sampled at the periodic inventory were or will be remeasured in the annual inventory. Estimates of GRM will improve as the annual inventory becomes fully implemented and several panels of plots are remeasured.

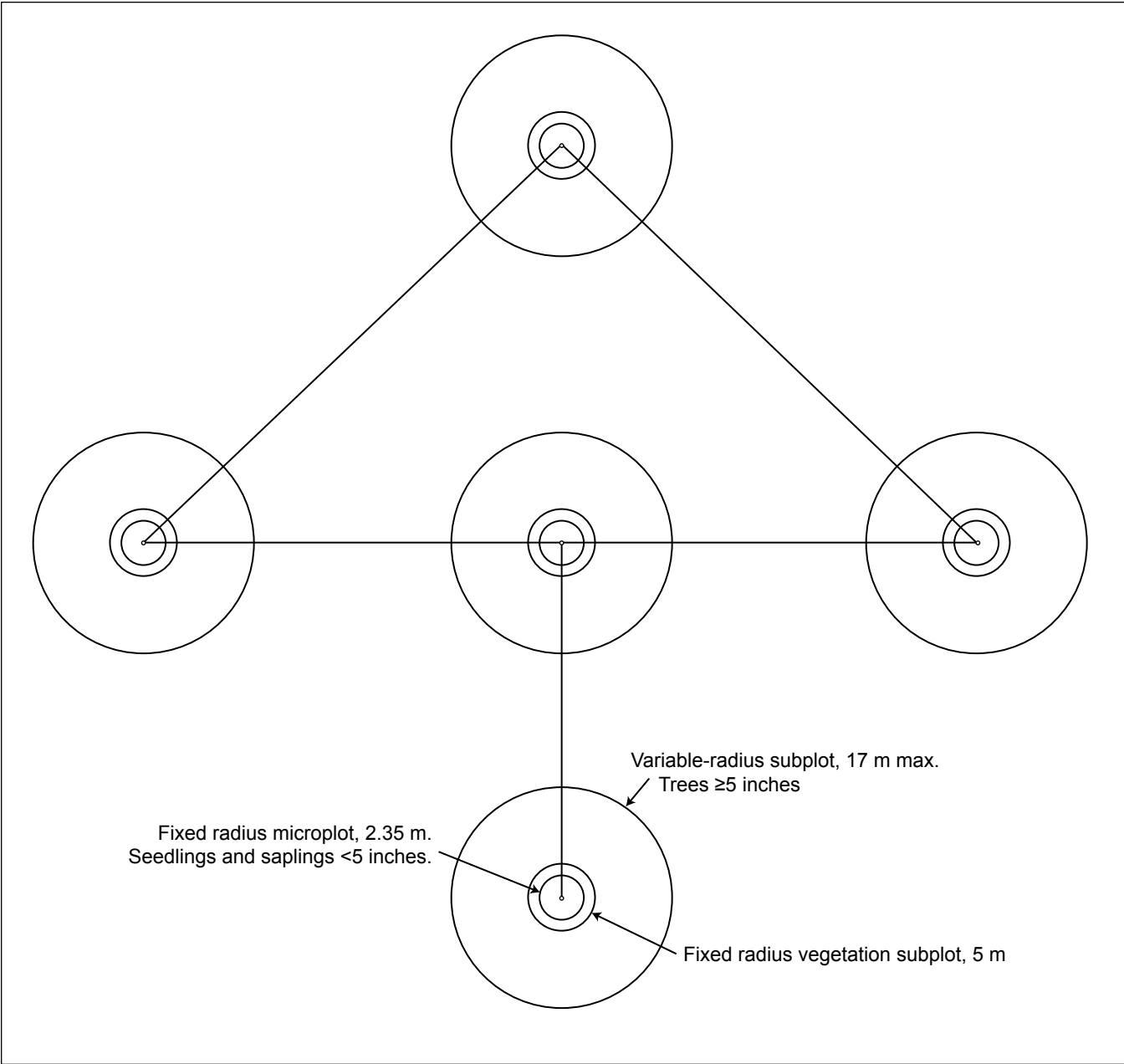


Figure 94—Typical plot design used in Oregon periodic inventories.



## Appendix 2: Summary Data Tables

The following tables contain basic information about the forest resources of Oregon as they relate to the discussions of current forest issues and basic resource information presented in this report. These tables aggregate data to a variety of levels, including county (fig. 5), ecosection (fig. 6), owner group (fig. 7), survey unit (fig. 8), and forest type, allowing FIA inventory results to be applied at various scales and used for various analyses. Many other tables could be generated from the Oregon annual data, but space limits us to a few (60+) key ones. Data are also available for download in nonsummarized form at <http://www.fia.fs.fed.us>.

The national FIA Web site (<http://www.fia.fs.fed.us/tools-data/data/>) contains a tool for querying the Oregon annual data and generating custom tables or maps. Some

of the tables below contain summaries of regional variables; data for regional variables currently are not included in the national FIA database (FIADB). Additional information on regional variables can be requested from our office by e-mailing Karen Waddell ([kwaddell@fs.fed.us](mailto:kwaddell@fs.fed.us)).

Please note that information in tables presented here and in those generated from the FIADB may differ. As new data are added each year to FIADB, any tables generated from it will be based on the current full set of data in FIADB (e.g., 2001–2006, 2001–2007, etc.), whereas tables in this publication contain data from only 2001–2005. The user can take a snapshot of data from FIADB by selecting the desired years and generating tables that are similar, but probably not identical, to those presented here.

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**Table 1—Number of Forest Inventory and Analysis plots measured from 2001 to 2005, by land class, sample status, ownership group, Oregon**

Land class and sample status	National forest	Other public	Private	Total
Forest land plots:				
Softwood types	1,202	386	762	2,350
Hardwood types	83	66	207	356
Nonstocked	46	8	33	87
Total	1,331	460	1,002	2,793
Nonforest land plots:	330	1,239	1,435	3,004
Unsampled plots:				
Denied access	10	8	169	187
Hazardous	33	11	16	60
Total	43	19	185	247
Total all plots	1,704	1,718	2,622	6,044

Table 2—Estimated area of forest land, by owner class and forest land status, Oregon, 2001–2005

Owner class	Unreserved forests						Reserved forests						All forest land	
	Timberland <sup>a</sup>		Other forest <sup>b</sup>		Total		Productive <sup>a</sup>		Other forest <sup>b</sup>		Total			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Thousand acres</i>														
USDA Forest Service:														
National forest	11,756	187	378	66	12,133	183	2,058	144	81	32	2,139	146	14,272	125
National grassland	—	—	11	12	11	12	—	—	—	—	—	—	11	12
Total	11,756	187	389	67	12,145	183	2,058	144	81	32	2,139	146	14,283	125
Other federal government:														
National Park Service	—	—	—	—	—	—	147	31	12	12	159	34	159	34
Bureau of Land Management	2,238	108	1,393	116	3,632	145	58	26	71	30	129	39	3,760	144
U.S. Fish and Wildlife Service	—	—	—	—	—	—	16	14	—	—	16	14	16	14
Departments of Defense and Energy	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other federal	27	17	—	—	27	17	—	—	—	—	—	—	27	17
Total	2,266	110	1,393	116	3,659	146	221	43	83	32	304	53	3,963	144
State and local government:														
State	871	90	46	24	917	93	23	15	—	—	23	15	940	94
Local	135	40	—	—	135	40	12	12	—	—	12	12	146	42
Other public	10	10	—	—	10	10	—	—	—	—	—	—	10	10
Total	1,015	99	46	24	1,061	101	34	19	—	—	34	19	1,096	103
Corporate private	5,844	196	156	42	6,000	199	—	—	—	—	—	—	6,000	199
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	233	52	—	—	233	52	—	—	—	—	—	—	233	52
Unincorporated partnerships, associations, or clubs	74	30	33	19	106	36	—	—	—	—	—	—	106	36
Native American	358	60	105	35	463	67	—	—	—	—	—	—	463	67
Individual	3,190	169	1,139	108	4,329	193	—	—	—	—	—	—	4,329	193
Total	3,855	180	1,277	113	5,131	204	—	—	—	—	—	—	5,131	204
All owners	24,735	256	3,261	180	27,996	274	2,313	151	164	45	2,477	157	30,473	233

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 acres were estimated.

<sup>a</sup> Forest land that is capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

<sup>b</sup> Forest land that is not capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment

**Table 3—Estimated area of forest land, by forest type group and productivity class, Oregon, 2001–2005**

Forest type group	Site productivity class <sup>a</sup> (cubic feet/acre/year)												All productivity classes			
	0–19		20–49		50–84		85–119		120–164		165–224		225+		Total	SE
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE		
<i>Thousand acres</i>																
<b>Softwoods:</b>																
Douglas-fir	23	17	857	98	1,440	123	1,990	144	3,948	190	2,060	145	62	28	10,380	245
Fir/spruce/mountain hemlock	133	40	990	106	1,411	125	855	98	454	73	116	36	—	—	3,960	193
Hemlock/Sitka spruce	—	—	35	20	68	28	141	40	367	63	218	50	227	51	1,055	105
Lodgepole pine	68	29	1,346	120	445	72	40	21	139	42	—	—	—	—	2,039	143
Other western softwoods	24	18	15	13	16	13	4	3	—	—	—	—	—	—	59	25
Pinyon/juniper	3	3	—	—	—	—	—	—	—	—	—	—	—	—	3	3
Ponderosa pine	30	18	2,138	147	2,359	155	516	77	211	49	—	—	—	—	5,254	204
Western juniper	2,645	161	325	60	129	37	25	17	33	21	12	12	—	—	3,170	174
Western larch	—	—	52	24	97	33	54	25	14	12	—	—	—	—	218	49
Western white pine	12	12	23	17	—	—	17	15	—	—	—	—	—	—	52	26
<b>Total</b>	<b>2,938</b>	<b>171</b>	<b>5,782</b>	<b>221</b>	<b>5,965</b>	<b>229</b>	<b>3,642</b>	<b>194</b>	<b>5,167</b>	<b>216</b>	<b>2,406</b>	<b>155</b>	<b>290</b>	<b>58</b>	<b>26,191</b>	<b>275</b>
<b>Hardwoods:</b>																
Alder/maple	—	—	19	14	10	8	130	37	650	82	455	68	76	29	1,340	111
Aspen/birch	30	18	22	17	15	11	—	—	1	2	—	—	—	—	69	27
Elm/ash/cottonwood	12	8	13	11	1	1	32	18	23	16	13	12	—	—	93	30
Other hardwoods	33	20	59	26	164	43	46	24	121	38	10	6	—	—	432	69
Tanoak/laurel	25	18	56	26	70	28	162	42	249	54	34	19	—	—	597	79
Western oak	257	55	169	44	231	51	77	28	42	21	17	12	—	—	793	92
Woodland hardwoods	78	30	72	29	46	22	12	12	5	5	—	—	—	—	213	49
<b>Total</b>	<b>435</b>	<b>71</b>	<b>410</b>	<b>68</b>	<b>538</b>	<b>76</b>	<b>458</b>	<b>70</b>	<b>1,091</b>	<b>107</b>	<b>529</b>	<b>73</b>	<b>76</b>	<b>29</b>	<b>3,538</b>	<b>176</b>
Nonstocked	52	24	164	43	210	49	104	32	144	38	60	24	11	11	745	88
<b>All forest types</b>	<b>3,425</b>	<b>184</b>	<b>6,356</b>	<b>231</b>	<b>6,712</b>	<b>242</b>	<b>4,205</b>	<b>207</b>	<b>6,403</b>	<b>233</b>	<b>2,995</b>	<b>172</b>	<b>377</b>	<b>66</b>	<b>30,473</b>	<b>233</b>

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 acres were estimated.  
<sup>a</sup> Site productivity class refers to the potential productivity of forest land expressed as the mean annual increment (in cubic feet/acre/year) at culmination in fully stocked stands.

**Table 4—Estimated area of forest land, by forest type group, ownership, and land status, Oregon, 2001–2005**

Forest type group	USDA Forest Service			Other federal			State and local government			Corporate private			Noncorporate private										
	Timberland <sup>a</sup>		Other forest land	Timberland <sup>a</sup>		Other forest land	Timberland <sup>a</sup>		Other forest land	Timberland <sup>a</sup>		Other forest land	Timberland <sup>a</sup>		Other forest land								
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE							
<i>Thousand acres</i>																							
<b>Softwoods:</b>																							
Douglas-fir	3,416	148	562	77	1,474	99	29	19	644	80	12	12	2,842	151	—	—	1,390	118	11	12	10,380	245	
Fir/spruce/mountain hemlock	2,181	147	892	99	50	25	119	34	30	19	—	—	447	73	—	—	197	48	43	23	3,960	193	
Hemlock/Sitka spruce	326	57	94	34	74	28	—	—	62	27	12	12	376	63	—	—	111	35	—	—	1,055	105	
Lodgepole pine	1,245	112	247	54	72	29	58	26	—	—	—	—	317	61	—	—	99	32	—	—	2,039	143	
Other western softwoods	21	14	24	18	—	—	12	12	—	—	—	—	—	—	—	—	2	2	—	—	59	25	
Pinyon/juniper	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3	3	3
Ponderosa pine	3,283	162	178	45	192	44	—	—	62	27	—	—	807	92	12	11	709	82	11	12	5,254	204	
Western juniper	246	51	188	46	60	25	1,347	114	—	—	34	21	51	24	115	37	156	43	973	99	3,170	174	
Western larch	120	35	54	25	—	—	—	—	—	—	—	—	21	16	—	—	23	17	—	—	218	49	
Western white pine	29	19	23	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	52	26	
<b>Total</b>	<b>10,869</b>	<b>194</b>	<b>2,262</b>	<b>151</b>	<b>1,923</b>	<b>110</b>	<b>1,565</b>	<b>121</b>	<b>798</b>	<b>88</b>	<b>58</b>	<b>27</b>	<b>4,861</b>	<b>189</b>	<b>127</b>	<b>38</b>	<b>2,686</b>	<b>155</b>	<b>1,042</b>	<b>103</b>	<b>26,191</b>	<b>275</b>	
<b>Hardwoods:</b>																							
Alder/maple	164	40	—	—	48	22	—	—	139	39	—	—	493	71	—	—	496	71	—	—	1,340	111	
Aspen/birch	32	19	—	—	1	2	29	18	—	—	—	—	—	—	—	—	6	6	1	1	69	27	
Elm/ash/cottonwood	1	1	—	—	—	—	—	—	—	—	8	8	12	8	8	7	60	27	4	3	93	30	
Other hardwoods	50	23	20	15	70	27	—	—	22	16	2	3	95	34	—	—	141	40	33	20	432	69	
Tanoak/laurel	151	39	128	39	67	27	—	—	—	—	—	—	164	42	—	—	88	32	—	—	597	79	
Western oak	83	30	37	20	133	39	43	22	29	18	—	—	80	31	17	15	198	44	173	44	793	92	
Woodland hardwoods	63	24	36	21	12	12	47	24	—	—	—	—	—	—	4	3	51	25	—	—	213	49	
<b>Total</b>	<b>543</b>	<b>72</b>	<b>220</b>	<b>50</b>	<b>332</b>	<b>60</b>	<b>119</b>	<b>37</b>	<b>190</b>	<b>46</b>	<b>11</b>	<b>9</b>	<b>844</b>	<b>93</b>	<b>29</b>	<b>17</b>	<b>1,039</b>	<b>101</b>	<b>211</b>	<b>49</b>	<b>3,538</b>	<b>176</b>	
Nonstocked	343	60	46	22	11	7	13	11	27	17	12	12	140	38	—	—	129	36	24	17	745	88	
<b>All forest types</b>	<b>11,756</b>	<b>187</b>	<b>2,528</b>	<b>159</b>	<b>2,266</b>	<b>110</b>	<b>1,697</b>	<b>126</b>	<b>1,015</b>	<b>99</b>	<b>81</b>	<b>31</b>	<b>5,844</b>	<b>196</b>	<b>156</b>	<b>42</b>	<b>3,855</b>	<b>180</b>	<b>1,277</b>	<b>113</b>	<b>30,473</b>	<b>233</b>	

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 acres were estimated.  
<sup>a</sup> Unreserved forest land that is capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

**Table 5—Estimated area of forest land, by forest type group and stand size class, Oregon, 2001–2005**

Forest type group	Large-diameter stands <sup>a</sup>		Medium-diameter stands <sup>b</sup>		Small-diameter stands <sup>c</sup>		All size classes	
	Total	SE	Total	SE	Total	SE	Total	SE
<i>Thousand acres</i>								
Softwoods:								
Douglas-fir	7,906	231	867	97	1,607	126	10,380	245
Fir/spruce/mountain hemlock	3,330	178	221	52	409	69	3,960	193
Hemlock/Sitka spruce	892	97	50	23	114	34	1,055	105
Lodgepole pine	645	84	474	72	920	100	2,039	143
Other western softwoods	28	18	5	3	26	18	59	25
Pinyon / juniper	3	3	—	—	—	—	3	3
Ponderosa pine	4,405	192	295	57	554	78	5,254	204
Western juniper	2,045	145	362	62	762	94	3,170	174
Western larch	112	35	15	12	90	32	218	49
Western white pine	32	19	—	—	20	15	52	26
Total	19,399	293	2,288	155	4,503	212	26,191	275
Hardwoods:								
Alder/maple	697	82	420	65	224	50	1,340	111
Aspen/birch	6	6	19	13	45	23	69	27
Elm/ash/cottonwood	54	24	—	—	39	19	93	30
Other hardwoods	153	41	107	35	172	45	432	69
Tanoak/laurel	185	44	172	44	240	52	597	79
Western oak	325	59	307	58	161	42	793	92
Woodland hardwoods	144	39	—	—	69	28	213	49
Total	1,563	122	1,025	103	950	102	3,538	176
Nonstocked	—	—	—	—	—	—	745	88
All forest types	20,963	294	3,313	182	5,453	230	30,473	233

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 acres were estimated.

<sup>a</sup> Stands with a majority of trees at least 11.0 inches diameter at breast height for hardwoods and 9.0 inches diameter at breast height for softwoods.

<sup>b</sup> Stands with a majority of trees at least 5.0 inches diameter at breast height but not as large as large-diameter trees.

<sup>c</sup> Stands with a majority of trees less than 5.0 inches diameter at breast height.

**Table 6—Estimated area of forest land, by forest type group and stand age class, Oregon, 2001–2005**

Forest type group	Stand age class (years)														All forest land												
	1–20		21–40		41–60		61–80		81–100		101–120		121–140		141–160		161–180		181–200		201+		Total	SE			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE					
<i>Thousand acres</i>																											
<b>Softwoods:</b>																											
Douglas-fir	2,027	140	2,271	151	1,513	123	940	100	1,107	109	484	74	392	66	280	55	142	41	254	53	937	98	32	20	10,380	245	
Fir/spruce/mountain hemlock	148	40	202	47	403	70	528	77	788	94	361	64	228	52	276	57	229	53	332	63	465	73	—	—	3,960	193	
Hemlock/Sitka spruce	155	40	223	50	233	52	102	34	34	19	67	25	17	14	48	24	—	—	52	25	125	36	—	—	1,055	105	
Lodgepole pine	386	64	375	65	320	60	401	67	362	64	101	35	45	24	14	12	11	12	22	17	—	—	1	1	2,039	143	
Other western softwoods	2	2	—	—	18	14	—	—	13	12	15	13	12	12	—	—	—	—	—	—	—	—	—	—	59	25	
Pinyon / juniper	—	—	—	—	—	—	3	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3	
Ponderosa pine	322	60	319	61	1,007	103	1,273	118	1,220	115	279	57	163	44	212	50	124	37	154	43	181	46	—	—	5,254	204	
Western juniper	132	38	260	56	552	80	916	101	609	84	160	42	64	28	59	26	73	30	137	41	191	47	16	13	3,170	174	
Western larch	48	23	35	19	12	12	0	0	47	22	42	22	—	—	22	16	—	—	—	—	11	12	—	—	218	49	
Western white pine	—	—	—	—	—	—	11	12	—	—	12	12	—	—	—	—	12	12	—	—	17	15	—	—	52	26	
<b>Total</b>	3,219	176	3,687	192	4,057	200	4,176	204	4,179	202	1,521	128	921	102	911	101	592	84	952	105	1,927	140	49	23	26,191	275	
<b>Hardwoods:</b>																											
Alder/maple	402	66	447	67	288	55	85	29	20	11	18	15	20	11	7	6	17	15	4	4	13	13	20	15	1,340	111	
Aspen/birch	13	12	12	12	12	12	11	12	20	12	—	—	—	—	—	—	—	—	1	2	—	—	—	—	69	27	
Elm/ash/cottonwood	20	11	31	20	5	4	24	17	13	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	93	30	
Other hardwoods	72	29	90	32	112	36	79	30	65	27	—	—	—	—	—	—	14	13	—	—	—	—	—	—	432	69	
Tanoak/laurel	164	43	138	40	132	39	39	22	54	23	11	11	—	—	—	—	13	13	—	—	34	18	12	12	597	79	
Western oak	24	17	51	25	225	51	233	50	150	41	53	25	57	26	1	1	—	—	—	—	—	—	—	—	793	92	
Woodland hardwoods	14	12	33	19	29	16	27	18	77	30	—	—	9	9	—	—	—	—	—	—	—	—	24	17	213	49	
<b>Total</b>	709	87	802	91	802	92	498	74	399	64	82	31	85	30	7	6	44	24	5	4	48	22	56	26	3,538	176	
Nonstocked	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	745	88
<b>All forest types</b>	4,095	194	4,533	206	4,933	217	4,738	217	4,667	213	1,603	132	1,007	106	930	102	636	87	976	106	1,985	141	105	35	30,473	233	

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 acres were estimated.



**Table 7—Estimated area of timberland, by forest type group and stand size class, Oregon, 2001–2005**

Forest type group	Large-diameter stands <sup>a</sup>		Medium-diameter stands <sup>b</sup>		Small-diameter stands <sup>c</sup>		All size classes	
	Total	SE	Total	SE	Total	SE	Total	SE
<i>Thousand acres</i>								
Softwoods:								
Douglas-fir	7,354	228	866	97	1,547	123	9,767	242
Fir/spruce/mountain hemlock	2,376	156	196	49	334	62	2,906	172
Hemlock/Sitka spruce	785	91	50	23	114	34	949	99
Lodgepole pine	551	77	363	63	820	95	1,734	133
Other western softwoods	2	3	5	3	15	13	23	14
Ponderosa pine	4,219	190	295	57	539	78	5,053	202
Western juniper	360	63	42	20	110	34	513	75
Western larch	79	29	4	3	80	30	163	42
Western white pine	20	15	—	—	9	9	29	19
Total	15,748	287	1,821	139	3,568	188	21,137	281
Hardwoods:								
Alder/maple	697	82	420	65	224	50	1,340	111
Aspen/birch	6	6	13	12	20	15	39	20
Elm/ash/cottonwood	42	22	—	—	31	17	73	28
Other hardwoods	151	41	107	35	119	37	377	65
Tanoak/laurel	154	41	147	40	169	43	470	71
Western oak	270	54	177	44	76	29	523	75
Woodland hardwoods	74	27	—	—	52	25	126	37
Total	1,393	115	864	95	692	87	2,948	161
Nonstocked	—	—	—	—	—	—	650	82
All forest types	17,141	291	2,684	165	4,260	202	24,735	256

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 acres were estimated. About 12 percent of timberland in Oregon is considered limited-use timberland. This land is not reserved by Congressional act or law, but may be limited in use for wood production. Examples include riparian corridors, late-successional reserves, administratively withdrawn areas, and adaptive management areas.

<sup>a</sup> Stands in which the majority of trees are at least 11.0 inches diameter at breast height for hardwoods and 9.0 inches diameter at breast height for softwoods.

<sup>b</sup> Stands in which the majority of trees are at least 5.0 inches diameter at breast height but not as large as large-diameter trees.

<sup>c</sup> Stands in which the majority of trees are less than 5.0 inches diameter at breast height.

**Table 8—Estimated number of live trees on forest land, by species group and diameter class, Oregon, 2001–2005**

Species group	Diameter class (inches)															
	1.0–2.9		3.0–4.9		5.0–6.9		7.0–8.9		9.0–10.9		11.0–12.9		13.0–14.9		15.0–16.9	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Thousand trees</i>																
<b>Softwoods:</b>																
Douglas-fir	778,704	57,410	350,040	26,726	288,074	13,559	245,687	11,760	200,325	9,164	153,076	7,297	103,608	4,955	78,946	3,893
Engelmann and other spruces	29,709	9,143	5,994	3,167	5,310	985	3,768	772	3,486	700	3,104	681	1,804	477	1,652	458
Incense-cedar	67,235	12,342	31,082	7,510	11,845	1,752	7,641	1,272	4,831	1,049	2,937	644	3,513	734	1,240	396
Lodgepole pine	752,029	95,387	256,811	30,125	142,237	11,709	86,936	6,905	52,250	4,193	24,024	2,280	11,193	1,352	4,424	664
Other western softwoods	169,187	26,472	82,315	13,736	41,307	4,991	24,684	2,922	18,985	2,332	15,073	1,962	10,529	1,446	8,669	1,332
Ponderosa and Jeffrey pines	376,059	36,713	204,704	21,728	121,311	8,316	91,628	5,176	72,570	4,180	50,770	3,044	38,873	2,615	23,941	1,793
Redwood	20,967	22,380	8,387	8,952	471	503	67	72	—	—	67	72	—	—	—	—
Sitka spruce	6,117	2,409	6,316	3,530	3,893	828	2,739	801	3,210	1,076	2,603	885	2,201	673	1,660	655
Sugar pine	10,105	3,667	839	895	994	391	1,124	433	347	162	420	248	284	147	359	194
True fir	712,923	58,934	300,074	26,266	171,535	10,041	110,945	6,428	73,620	4,239	52,197	3,269	33,373	2,262	22,090	1,696
Western hemlock	331,548	51,829	122,562	16,282	68,648	5,582	50,117	4,049	34,633	2,762	28,975	2,610	20,845	2,059	15,299	1,619
Western juniper	64,707	9,792	44,906	8,281	40,481	3,299	30,638	2,551	20,605	2,034	13,183	1,250	7,795	861	6,048	814
Western larch	24,958	9,357	16,505	5,042	5,598	1,495	5,224	1,152	4,348	862	3,525	675	2,245	525	2,040	410
Western redcedar	68,134	13,791	22,959	6,145	11,025	1,636	6,560	1,025	4,866	853	4,008	775	2,885	592	2,183	480
Western white pine	20,365	7,011	12,455	4,749	3,860	967	2,410	657	1,822	438	917	282	1,163	400	352	163
<b>Total</b>	<b>3,432,747</b>	<b>152,211</b>	<b>1,465,951</b>	<b>61,036</b>	<b>916,589</b>	<b>23,323</b>	<b>670,171</b>	<b>16,390</b>	<b>495,899</b>	<b>12,142</b>	<b>354,881</b>	<b>9,234</b>	<b>240,311</b>	<b>6,626</b>	<b>168,901</b>	<b>5,199</b>
<b>Hardwoods:</b>																
Cottonwood and aspen	12,273	7,144	4,253	3,229	1,741	931	1,112	828	784	339	996	446	457	259	323	194
Oak	91,459	19,828	81,038	17,185	47,011	6,099	22,493	3,007	11,478	1,728	5,592	892	3,780	654	3,227	605
Other western hardwoods	484,831	61,476	198,020	23,538	126,279	8,657	77,607	5,916	44,416	3,749	23,626	2,326	12,137	1,255	8,157	1,031
Red alder	113,497	18,870	59,768	10,745	54,522	5,688	41,564	4,398	29,025	2,926	20,035	2,206	12,848	1,521	8,298	1,105
Western woodland hardwoods	120,961	48,305	23,738	8,909	10,853	1,855	9,833	1,725	4,716	1,143	2,942	731	1,668	503	962	320
<b>Total</b>	<b>823,022</b>	<b>82,927</b>	<b>366,818</b>	<b>33,103</b>	<b>240,406</b>	<b>12,302</b>	<b>152,610</b>	<b>8,116</b>	<b>90,419</b>	<b>5,134</b>	<b>53,191</b>	<b>3,426</b>	<b>30,891</b>	<b>2,156</b>	<b>20,967</b>	<b>1,674</b>
<b>All species groups</b>	<b>4,255,770</b>	<b>174,546</b>	<b>1,832,768</b>	<b>69,552</b>	<b>1,156,996</b>	<b>26,778</b>	<b>822,780</b>	<b>18,172</b>	<b>586,318</b>	<b>12,945</b>	<b>408,072</b>	<b>9,742</b>	<b>271,202</b>	<b>6,928</b>	<b>189,868</b>	<b>5,417</b>

**Table 8—Estimated number of live trees on forest land, by species group and diameter class, Oregon, 2001–2005 (continued)**

Species group	Diameter class (inches)															
	17.0–18.9		19.0–20.9		21.0–24.9		25.0–28.9		29.0–32.9		33.0–36.9		37+		All classes	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Thousand trees</i>																
<b>Softwoods:</b>																
Douglas-fir	55,795	3,006	41,110	2,373	52,406	2,986	31,367	2,422	16,481	1,156	11,141	702	22,501	1,395	2,429,262	86,200
Engelmann and other spruces	1,418	353	697	249	1,806	536	256	70	196	77	144	63	67	37	59,411	12,378
Incense-cedar	1,353	362	1,169	360	1,441	384	781	258	416	124	274	67	707	137	136,465	19,829
Lodgepole pine	2,530	515	1,148	340	585	229	87	40	11	12	14	13	34	20	1,334,313	126,641
Other western softwoods	5,603	915	5,144	953	6,478	997	2,504	522	968	242	545	133	485	202	392,476	45,575
Ponderosa and Jeffrey pines	16,806	1,463	11,502	1,082	14,359	1,151	8,765	727	4,671	383	2,349	214	1,551	182	1,039,861	61,745
Redwood	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29,960	31,978
Sitka spruce	1,600	513	765	322	1,464	543	1,047	559	294	110	178	71	361	146	34,449	7,113
Sugar pine	302	151	439	181	588	207	452	211	324	147	271	69	716	148	17,563	4,162
True fir	19,328	1,617	11,780	1,158	16,933	1,563	9,715	1,307	4,558	529	2,116	277	2,010	296	1,543,200	91,995
Western hemlock	9,950	1,204	6,985	899	10,052	1,097	5,136	739	2,171	361	894	178	1,008	172	708,823	66,512
Western juniper	4,410	650	2,056	447	2,887	498	1,043	155	445	92	247	63	130	40	239,580	19,595
Western larch	1,592	397	1,265	337	1,090	299	380	87	232	72	91	47	34	20	69,127	13,127
Western redcedar	1,973	438	1,569	450	2,617	548	2,627	622	1,037	218	791	151	1,312	216	134,546	19,491
Western white pine	641	241	275	144	576	203	215	109	294	120	68	34	177	93	45,590	11,402
Total	123,300	4,208	85,904	3,249	113,283	3,964	64,374	3,222	32,100	1,443	19,121	854	31,091	1,557	8,214,623	211,639
<b>Hardwoods:</b>																
Cottonwood and aspen	370	168	68	72	—	—	61	69	35	27	54	33	100	66	22,628	10,951
Oak	1,390	343	1,187	316	822	273	709	280	137	79	24	17	60	28	270,406	34,389
Other western hardwoods	4,666	713	1,898	434	3,071	541	1,439	339	468	143	231	61	176	47	987,022	83,428
Red alder	3,615	646	3,317	624	1,928	526	951	286	148	83	33	20	24	17	349,573	30,323
Western woodland hardwoods	281	146	203	124	286	146	—	—	—	—	—	—	—	—	176,445	52,025
Total	10,322	1,052	6,673	828	6,106	816	3,161	525	789	197	341	80	361	86	1,806,075	109,478
All species groups	133,622	4,328	92,576	3,389	119,389	4,084	67,535	3,263	32,888	1,457	19,463	861	31,451	1,565	10,020,699	238,064

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 trees were estimated.

**Table 9—Estimated number of growing-stock trees<sup>a</sup> on timberland, by species group and diameter class, Oregon, 2001–2005**

Species group	Diameter class (inches)																
	1.0–2.9		3.0–4.9		5.0–6.9		7.0–8.9		9.0–10.9		11.0–12.9		13.0–14.9		15.0–16.9		
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	
<i>Thousand trees</i>																	
Softwoods:																	
Douglas-fir	754,899	56,756	341,189	26,588	277,989	13,235	236,487	11,609	190,696	8,983	145,355	7,127	96,459	4,856	72,730	3,767	
Engelmann and other spruces	19,129	6,986	3,251	2,750	3,637	776	2,720	600	2,980	636	2,447	567	1,673	468	1,392	404	
Incense-cedar	60,492	11,441	24,694	6,373	10,456	1,563	6,329	1,045	3,916	861	2,012	416	3,304	724	1,036	363	
Lodgepole pine	649,800	89,395	202,892	25,083	113,144	10,134	67,194	5,704	39,980	3,626	16,798	1,702	8,476	1,181	3,389	603	
Other western softwoods	87,478	18,712	35,925	8,628	20,254	3,581	10,890	1,861	7,765	1,414	6,832	1,323	3,558	707	2,913	653	
Ponderosa and Jeffrey pines	366,005	36,266	199,413	21,620	117,166	8,246	88,541	5,094	70,369	4,097	48,219	2,986	37,461	2,578	23,042	1,777	
Redwood	20,967	22,380	8,387	8,952	471	503	67	72	—	—	67	72	—	—	—	—	
Sitka spruce	6,117	2,409	6,316	3,530	3,615	803	2,229	612	2,918	1,034	1,930	654	1,819	600	1,497	646	
Sugar pine	10,105	3,667	839	895	907	383	1,124	433	347	162	420	248	284	147	359	194	
True fir	529,937	53,169	226,070	22,773	129,930	8,989	84,892	5,734	54,678	3,677	39,037	2,790	25,257	1,966	17,525	1,546	
Western hemlock	313,523	51,265	111,428	15,682	60,581	5,234	45,201	3,869	32,055	2,672	26,439	2,495	18,981	1,951	14,089	1,576	
Western juniper	30,482	7,046	12,463	3,852	11,899	1,791	8,448	1,432	4,634	805	3,323	649	1,593	372	1,441	427	
Western larch	24,958	9,357	15,692	4,972	3,966	858	3,910	764	3,676	790	2,938	610	1,788	476	1,704	368	
Western redcedar	67,334	13,769	22,959	6,145	9,686	1,541	5,786	939	3,992	736	3,684	754	2,506	553	1,837	456	
Western white pine	10,914	3,438	8,229	3,068	2,284	573	1,321	385	1,148	381	699	251	711	293	135	101	
Total	2,952,140	146,048	1,219,748	56,012	765,984	22,014	565,138	15,733	419,154	11,647	300,198	8,880	203,872	6,431	143,088	4,974	
Hardwoods:																	
Cottonwood and aspen	6,035	3,258	1,579	1,733	865	466	1,112	828	711	331	859	434	384	249	249	180	
Oak	74,204	17,786	43,707	9,233	29,994	4,237	15,652	2,363	8,583	1,526	4,449	796	3,055	586	2,082	459	
Other western hardwoods	464,329	60,408	183,572	22,735	114,127	7,864	68,883	5,308	39,948	3,465	21,813	2,277	11,310	1,228	7,730	1,003	
Red alder	113,497	18,870	59,768	10,745	53,712	5,558	41,173	4,374	28,854	2,914	19,973	2,205	12,714	1,517	8,163	1,102	
Total	658,066	65,792	288,626	27,364	198,697	10,735	126,820	7,315	78,096	4,762	47,094	3,303	27,463	2,060	18,224	1,582	
All species groups	3,610,206	162,314	1,508,374	62,952	964,681	25,312	691,959	17,441	497,250	12,447	347,291	9,422	231,355	6,748	161,312	5,202	

Table 9—Estimated number of growing-stock trees<sup>a</sup> on timberland, by species group and diameter class, Oregon, 2001–2005 (continued)

Species group	Diameter class (inches)												All classes			
	17.0–18.9		19.0–20.9		21.0–24.9		25.0–28.9		29.0–32.9		33.0–36.9		37.0+		Total	SE
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE		
<i>Thousand trees</i>																
Softwoods:																
Douglas-fir	51,066	2,886	37,162	2,264	46,425	2,826	28,172	2,353	14,521	1,099	9,887	676	19,950	1,338	2,322,985	85,470
Engelmann and other spruces	1,191	329	498	194	1,236	421	189	58	154	72	111	60	56	35	40,664	9,188
Incense-cedar	1,219	348	897	281	1,305	372	713	248	382	122	240	59	571	114	117,568	16,798
Lodgepole pine	1,444	384	881	294	501	214	87	40	11	12	—	—	22	17	1,104,619	115,047
Other western softwoods	1,532	380	2,016	534	3,512	771	1,439	452	418	149	215	70	345	187	185,091	29,148
Ponderosa and Jeffrey pines	16,320	1,453	10,743	1,045	13,397	1,126	8,126	678	4,362	374	2,146	206	1,361	167	1,006,669	61,311
Redwood	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29,960	31,978
Sitka spruce	1,258	444	456	219	1,016	357	435	253	224	94	123	57	258	130	30,213	6,539
Sugar pine	302	151	439	181	577	207	452	211	300	147	234	64	620	136	17,310	4,161
True fir	15,655	1,489	8,996	1,040	12,635	1,394	7,505	1,261	3,148	463	1,402	202	1,185	210	1,157,851	82,660
Western hemlock	8,999	1,170	6,169	868	9,064	1,052	4,751	719	1,877	327	810	169	818	144	654,784	65,446
Western juniper	673	225	348	162	499	198	116	42	33	20	23	17	23	17	75,997	11,638
Western larch	1,387	379	936	282	909	260	278	69	198	69	12	12	23	17	62,375	12,827
Western redcedar	1,779	411	1,311	417	2,423	527	2,377	560	898	204	652	135	1,045	187	128,269	19,422
Western white pine	217	128	141	103	152	104	163	105	201	115	68	34	177	93	26,558	6,277
Total	103,041	3,980	70,994	2,977	93,650	3,752	54,802	3,112	26,728	1,363	15,922	806	26,454	1,475	6,960,913	203,364
Hardwoods:																
Cottonwood and aspen	232	134	68	72	—	—	61	69	10	11	42	31	39	22	12,246	4,705
Oak	1,131	291	958	269	368	166	557	259	120	78	24	17	48	25	184,931	26,463
Other western hardwoods	4,594	702	1,738	403	2,909	531	1,367	332	447	142	219	60	176	47	923,161	81,420
Red alder	3,382	633	3,145	605	1,858	521	815	268	148	83	23	17	24	17	347,251	30,225
Total	9,339	1,009	5,908	776	5,134	758	2,801	501	725	194	307	77	287	60	1,467,589	91,519
All species groups	112,381	4,103	76,902	3,124	98,784	3,862	57,604	3,156	27,453	1,379	16,229	813	26,742	1,482	8,428,502	225,501

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500 trees were estimated.

<sup>a</sup> Growing-stock trees are live trees of commercial species that meet certain merchantability standards; excludes trees that are entirely cull (rough or rotten tree classes).

**Table 10—Estimated net volume of all live trees on forest land, by owner class and forest land status, Oregon, 2001–2005**

Owner class	Unreserved forests						Reserved forests						All forest land	
	Timberland <sup>a</sup>		Other forest <sup>b</sup>		Total		Productive <sup>a</sup>		Other forest <sup>b</sup>		Total		Total	SE
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million cubic feet</i>														
USDA Forest Service:														
National forest	45,928	1,586	361	110	46,289	1,580	10,101	930	180	123	10,281	936	56,570	1,498
National grassland	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	45,928	1,586	361	110	46,289	1,580	10,101	930	180	123	10,281	936	56,570	1,498
Other federal government:														
National Park Service	—	—	—	—	—	—	707	163	18	18	724	164	724	164
Bureau of Land Management	11,603	825	344	52	11,947	822	306	142	18	9	324	142	12,271	810
U.S. Fish and Wildlife Service	—	—	—	—	—	—	9	8	—	—	9	8	9	8
Departments of Defense and Energy	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other federal	113	83	—	—	113	83	—	—	—	—	—	—	113	83
Total	11,716	830	344	52	12,059	826	1,021	216	36	20	1,057	217	13,116	809
State and local government:														
State	5,173	639	4	3	5,177	639	124	89	—	—	124	89	5,300	645
Local	359	128	—	—	359	128	153	159	—	—	153	159	512	203
Other public	1	1	—	—	1	1	—	—	—	—	—	—	1	1
Total	5,533	651	4	3	5,537	651	277	182	—	—	277	182	5,813	675
Corporate private	15,029	880	38	16	15,066	880	—	—	—	—	—	—	15,066	880
Noncorporate private														
Nongovernmental conservation or natural resource organizations	637	181	—	—	637	181	—	—	—	—	—	—	637	181
Unincorporated partnerships, associations, or clubs	273	147	7	5	280	147	—	—	—	—	—	—	280	147
Native American	1,368	311	110	69	1,478	315	—	—	—	—	—	—	1,478	315
Individual	7,953	645	327	70	8,280	646	—	—	—	—	—	—	8,280	646
Total	10,231	734	444	98	10,675	736	—	—	—	—	—	—	10,675	736
All owners	88,436	2,047	1,190	157	89,626	2,038	11,398	972	216	125	11,614	978	101,240	1,967

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 cubic feet were estimated.

<sup>a</sup> Forest land that is capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

<sup>b</sup> Forest land that is not capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

**Table 11—Estimated net volume of all live trees on forest land, by forest type group and stand size class, Oregon, 2001–2005**

Forest type group	Large-diameter stands <sup>a</sup>		Medium-diameter stands <sup>b</sup>		Small-diameter stands <sup>c</sup>		All size classes	
	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million cubic feet</i>								
Softwoods:								
Douglas-fir	53,964	1,949	1,304	177	373	70	55,640	1,935
Fir/spruce/mountain hemlock	15,482	1,057	222	59	180	40	15,885	1,057
Hemlock/Sitka spruce	7,243	904	112	50	19	10	7,374	907
Lodgepole pine	1,513	235	648	120	345	52	2,506	261
Ponderosa pine	9,858	582	193	41	189	42	10,241	580
Western juniper	776	79	54	14	44	10	874	80
Western larch	373	132	30	29	33	16	436	136
Western white pine	74	54	—	—	6	5	80	55
Other western softwoods	51	39	10	7	5	5	66	40
Total	89,335	2,031	2,573	232	1,194	105	93,102	1,996
Hardwoods:								
Alder/maple	3,106	406	857	154	40	14	4,003	427
Aspen/birch	27	27	21	17	16	11	64	34
Elm/ash/cottonwood	145	74	—	—	7	5	152	75
Tanoak/laurel	999	264	560	156	44	19	1,602	304
Western oak	856	188	311	72	53	20	1,220	200
Woodland hardwoods	100	31	—	—	26	15	126	34
Other hardwoods	457	136	374	143	50	18	881	195
Total	5,689	528	2,124	268	236	41	8,048	573
Nonstocked	—	—	—	—	—	—	90	28
All forest types	95,024	2,030	4,696	349	1,430	112	101,240	1,967

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 cubic feet were estimated.

<sup>a</sup> Stands in which the majority of trees are at least 11.0 inches diameter at breast height for hardwoods and 9.0 inches diameter at breast height for softwoods.

<sup>b</sup> Stands in which the majority of trees are at least 5.0 inches diameter at breast height but not as large as large-diameter trees.

<sup>c</sup> Stands in which the majority of trees are less than 5.0 inches diameter at breast height.

**Table 12—Estimated net volume of all live trees on forest land, by species group and ownership, Oregon, 2001–2005**

Species group	USDA Forest Service		Other federal		State and local government		Corporate private		Noncorporate private		All owners	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million cubic feet</i>												
Softwoods:												
Douglas-fir	25,481	1,190	8,319	666	3,682	515	8,605	649	5,070	547	51,157	1,591
Engelmann and other spruces	636	114	—	—	—	—	14	10	84	58	733	129
Incense-cedar	432	85	167	47	15	13	147	37	75	25	837	107
Lodgepole pine	2,157	176	231	83	20	17	224	53	130	65	2,762	213
Other western softwoods	2,715	374	277	78			74	41	179	100	3,245	397
Ponderosa and Jeffrey pines	6,725	346	561	120	179	75	695	87	1,195	147	9,354	403
Sitka spruce	442	264	—	—	141	80	357	159	107	56	1,047	326
Sugar pine	512	107	199	61	2	2	46	24	11	6	771	125
True fir	9,748	666	959	258	128	64	595	92	667	120	12,097	732
Western hemlock	4,036	408	871	166	692	196	1,883	331	433	107	7,915	589
Western juniper	122	20	300	38	4	3	22	8	216	27	664	51
Western larch	670	94	—	—	3	2	47	14	40	18	759	97
Western redcedar	1,152	193	154	59	59	37	191	56	259	80	1,815	228
Western white pine	362	81	89	57	—	—	—	—	2	2	454	99
Total	55,189	1,489	12,127	784	4,925	601	12,901	799	8,469	660	93,612	1,915
Hardwoods:												
Cottonwood and aspen	29	22	11	5	34	34	7	5	89	35	169	54
Oak	125	37	174	35	66	50	108	39	460	92	933	121
Other western hardwoods	746	95	645	100	118	38	1,030	141	957	132	3,495	234
Red alder	433	95	131	43	670	138	1,020	150	680	120	2,934	249
Western woodland hardwoods	48	9	27	17	1	1	—	—	20	12	97	23
Total	1,381	145	988	117	888	162	2,165	226	2,206	214	7,629	369
All species groups	56,570	1,498	13,116	809	5,813	675	15,066	880	10,675	736	101,240	1,967

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 cubic feet were estimated.



**Table 13—Estimated net volume of all live trees on forest land, by species group and diameter class, Oregon, 2001–2005**

Species group	Diameter class (inches)													
	5.0–6.9		7.0–8.9		9.0–10.9		11.0–12.9		13.0–14.9		15.0–16.9		17.0–18.9	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million cubic feet</i>														
Softwoods:														
Douglas–fir	721	36	1,697	83	2,637	125	3,369	173	3,356	169	3,702	194	3,365	189
Engelmann and other spruces	12	2	21	4	43	9	62	14	52	14	76	21	92	24
Incense–cedar	27	4	33	6	38	9	31	7	62	13	32	11	42	12
Lodgepole pine	331	31	552	48	638	56	481	49	323	41	167	26	127	27
Other western softwoods	61	8	105	13	175	23	253	35	271	40	335	55	282	48
Ponderosa and Jeffrey pines	173	12	357	21	572	34	680	44	830	57	737	57	743	67
Redwood	1	1	—	—	—	—	1	1	—	—	—	—	—	—
Sitka spruce	10	2	15	5	38	13	56	20	67	23	79	33	97	33
Sugar pine	2	1	5	2	3	1	5	3	7	4	10	6	14	7
True fir	362	22	628	39	828	52	978	65	989	71	911	73	1,053	94
Western hemlock	165	15	360	32	490	42	711	70	784	82	807	90	696	90
Western juniper	43	4	75	6	92	10	88	9	75	9	71	10	66	11
Western larch	14	4	36	8	56	11	73	14	73	17	88	18	92	23
Western redcedar	25	4	39	6	52	9	73	15	75	16	80	18	98	22
Western white pine	8	2	12	3	19	5	19	6	31	11	17	8	33	14
Total	1,954	57	3,935	110	5,678	156	6,879	208	6,995	216	7,112	246	6,799	256
Hardwoods:														
Cottonwood and aspen	4	2	6	4	11	5	21	10	16	10	17	10	20	10
Oak	110	14	120	18	112	18	87	15	98	17	104	22	68	17
Other western hardwoods	363	25	498	40	497	42	449	45	333	36	308	40	236	36
Red alder	155	16	320	34	424	45	460	54	428	51	382	53	203	37
Western woodland hardwoods	10	2	19	4	15	4	15	4	13	4	9	3	4	2
Total	642	34	962	56	1,059	63	1,032	72	888	66	820	71	532	57
All species groups	2,596	68	4,897	124	6,737	167	7,912	220	7,884	225	7,932	255	7,331	262

Species group	Diameter class (inches)													
	19.0–20.9		21.0–24.9		25.0–28.9		29.0–32.9		33.0–36.9		37.0+		All classes	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million cubic feet</i>														
Softwoods:														
Douglas–fir	3,284	203	5,772	356	5,046	431	3,652	263	3,219	220	11,337	784	51,157	1,591
Engelmann and other spruces	48	17	174	52	40	11	40	17	46	20	28	17	733	129
Incense–cedar	53	17	86	24	76	27	54	16	49	12	255	54	837	107
Lodgepole pine	67	21	44	17	8	4	2	2	2	2	20	15	2,762	213
Other western softwoods	338	67	604	97	324	70	174	44	130	35	194	83	3,245	397
Ponderosa and Jeffrey pines	687	66	1,215	98	1,224	104	903	76	611	58	621	77	9,354	403
Redwood	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Sitka spruce	60	25	152	62	170	111	64	26	49	21	190	79	1,047	326
Sugar pine	22	10	60	21	64	31	59	23	83	21	436	92	771	125
True fir	864	89	1,706	175	1,514	220	937	114	558	71	768	127	12,097	732
Western hemlock	609	84	1,211	140	887	135	515	85	280	53	399	70	7,915	589
Western juniper	30	8	60	11	29	4	16	4	10	3	8	3	664	51
Western larch	89	23	102	28	55	13	46	15	22	11	15	9	759	97
Western redcedar	103	29	215	47	275	65	171	38	159	33	452	87	1,815	228
Western white pine	20	11	63	23	31	16	60	26	22	11	119	65	454	99
Total	6,274	259	11,465	451	9,745	561	6,692	319	5,240	257	14,843	850	93,612	1,915
Hardwoods:														
Cottonwood and aspen	5	5	—	—	10	11	7	6	16	10	38	25	169	54
Oak	58	16	46	17	77	37	24	18	5	5	24	13	933	121
Other western hardwoods	111	26	293	56	179	46	91	29	61	16	75	22	3,495	234
Red alder	230	47	191	55	112	36	19	8	5	3	6	4	2,934	249
Western woodland hardwoods	4	2	8	5	—	—	—	—	—	—	—	—	97	23
Total	408	56	538	81	377	70	141	36	87	22	143	36	7,629	369
All species groups	6,682	269	12,003	461	10,122	565	6,833	321	5,327	258	14,986	853	101,240	1,967

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 cubic feet were estimated.

**Table 14—Estimated net volume of growing-stock trees<sup>a</sup> on timberland, by species group and diameter class, Oregon, 2001–2005**

Species group	Diameter class (inches)														All classes							
	5.0–6.9		7.0–8.9		9.0–10.9		11.0–12.9		13.0–14.9		15.0–16.9		17.0–18.9		19.0–20.9		21.0–28.9		29.0+			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE		
<i>Million cubic feet</i>																						
<b>Softwoods:</b>																						
Douglas-fir	698	35	1,639	82	2,516	122	3,217	170	3,144	167	3,436	189	3,118	184	2,989	195	9,769	662	16,672	1,024	47,199	1,591
Engelmann and other spruces	8	2	15	3	36	8	49	12	49	14	64	19	79	22	36	14	147	46	95	49	577	113
Incense-cedar	24	4	27	5	31	7	22	5	59	13	28	10	39	11	40	13	147	35	322	62	738	97
Lodgepole pine	261	26	423	39	487	48	330	35	237	35	131	24	67	18	47	16	45	18	16	14	2,043	174
Other western softwoods	32	6	48	9	71	15	113	23	83	18	115	28	76	20	137	39	540	129	277	108	1,492	278
Ponderosa and Jeffrey pines	166	12	344	20	553	33	649	43	801	56	712	57	723	66	639	63	2,278	161	1,968	157	8,833	398
Redwood	1	1	0	0	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Sitka spruce	9	2	11	3	35	13	40	15	52	19	71	33	72	28	33	16	139	46	210	87	671	191
Sugar pine	2	1	5	2	3	1	5	3	7	4	10	6	14	7	22	10	122	39	506	101	698	122
True fir	278	20	481	34	623	45	730	54	752	61	723	67	862	87	664	81	2,489	343	1,545	205	9,148	680
Western hemlock	150	14	329	31	457	41	651	67	727	80	744	87	630	88	547	82	1,928	219	1,057	153	7,219	578
Western juniper	14	2	23	4	24	4	27	5	19	4	19	6	13	4	7	4	17	6	4	2	167	23
Western larch	10	2	27	5	47	10	61	13	57	15	74	17	79	22	63	19	124	28	52	17	594	84
Western redcedar	23	4	35	6	43	8	67	15	66	15	70	17	86	20	84	27	445	89	668	113	1,587	203
Western white pine	5	1	7	2	12	4	14	5	18	7	7	5	13	8	8	7	42	20	187	79	314	90
<b>Total</b>	<b>1,681</b>	<b>53</b>	<b>3,415</b>	<b>105</b>	<b>4,939</b>	<b>151</b>	<b>5,976</b>	<b>202</b>	<b>6,071</b>	<b>210</b>	<b>6,204</b>	<b>237</b>	<b>5,870</b>	<b>246</b>	<b>5,317</b>	<b>241</b>	<b>18,234</b>	<b>850</b>	<b>23,578</b>	<b>1,150</b>	<b>81,283</b>	<b>1,987</b>
<b>Hardwoods:</b>																						
Cottonwood and aspen	2	1	6	4	10	5	19	10	15	10	14	10	17	10	5	5	10	11	29	14	127	42
Oak	75	10	88	15	89	16	74	14	81	16	73	17	58	15	47	14	96	42	54	26	735	104
Other western hardwoods	335	24	453	37	453	40	420	44	316	36	303	40	236	36	106	25	461	80	228	49	3,312	229
Red alder	155	16	320	34	424	45	459	54	423	51	377	53	198	37	229	47	289	71	29	10	2,904	248
<b>Total</b>	<b>568</b>	<b>31</b>	<b>866</b>	<b>53</b>	<b>977</b>	<b>61</b>	<b>972</b>	<b>72</b>	<b>836</b>	<b>66</b>	<b>766</b>	<b>69</b>	<b>510</b>	<b>56</b>	<b>387</b>	<b>55</b>	<b>856</b>	<b>116</b>	<b>340</b>	<b>59</b>	<b>7,078</b>	<b>360</b>
<b>All species groups</b>	<b>2,248</b>	<b>64</b>	<b>4,281</b>	<b>119</b>	<b>5,915</b>	<b>162</b>	<b>6,948</b>	<b>214</b>	<b>6,907</b>	<b>220</b>	<b>6,970</b>	<b>247</b>	<b>6,380</b>	<b>253</b>	<b>5,704</b>	<b>253</b>	<b>19,090</b>	<b>862</b>	<b>23,917</b>	<b>1,157</b>	<b>88,361</b>	<b>2,047</b>

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 cubic feet were estimated.

<sup>a</sup> Growing-stock trees are trees of commercial species that meet certain merchantability standards; excludes trees that are entirely cull (rough or rotten tree classes).

**Table 15—Estimated net volume of growing-stock trees<sup>a</sup> on timberland, by species group and ownership, Oregon, 2001–2005**

Species group	USDA Forest Service		Other federal		State and local government		Corporate private		Noncorporate private		All owners	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million cubic feet</i>												
Softwoods:												
Douglas-fir	21,744	1,187	8,169	672	3,617	510	8,600	649	5,070	547	47,199	1,591
Engelmann and other spruces	480	96	—	—	—	—	14	10	84	58	577	113
Incense-cedar	335	72	166	47	15	13	147	37	75	25	738	97
Lodgepole pine	1,636	150	38	16	20	17	224	53	125	65	2,043	174
Other western softwoods	1,264	259	26	12	—	—	74	41	127	92	1,492	278
Ponderosa and Jeffrey pines	6,269	340	519	118	179	75	686	87	1,180	147	8,833	398
Redwood	—	—	—	—	—	—	1	1	—	—	1	1
Sitka spruce	140	73	—	—	67	28	357	159	107	56	671	191
Sugar pine	458	103	180	60	2	2	46	24	11	6	698	122
True fir	7,213	615	596	243	128	64	587	92	625	117	9,148	680
Western hemlock	3,367	393	871	166	666	195	1,882	330	433	107	7,219	578
Western juniper	95	17	13	6	—	—	14	7	45	12	167	23
Western larch	504	81	—	—	3	2	47	14	40	18	594	84
Western redcedar	957	166	154	59	28	17	191	56	258	80	1,587	203
Western white pine	247	73	64	53	—	—	0	0	2	2	314	90
Total	44,709	1,569	10,796	802	4,725	583	12,869	799	8,183	658	81,283	1,987
Hardwoods:												
Cottonwood and aspen	29	22	3	2	—	—	6	5	89	35	127	42
Oak	99	34	154	33	66	50	101	39	315	70	735	104
Other western hardwoods	621	88	626	99	88	28	1,030	141	946	131	3,312	229
Red alder	421	95	131	43	653	137	1,020	150	679	120	2,904	248
Total	1,170	141	914	115	807	152	2,158	226	2,029	206	7,078	360
All species groups	45,880	1,586	11,710	830	5,532	651	15,027	880	10,212	734	88,361	2,047

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 cubic feet were estimated.

<sup>a</sup> Growing-stock trees are trees of commercial species that meet certain merchantability standards; excludes trees that are entirely cull (rough or rotten tree classes).

**Table 16—Estimated net volume (International ¼-inch rule) of sawtimber trees<sup>a</sup> on timberland, by species group and diameter class, Oregon, 2001–2005**

Species group	Diameter class (inches)											
	9.0–10.9		11.0–12.9		13.0–14.9		15.0–16.9		17.0–18.9		19.0–20.9	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million board feet (International ¼-inch rule)</i>												
Softwoods:												
Douglas-fir	11,282	558	16,936	914	17,840	960	20,585	1,148	19,160	1,141	18,908	1,252
Engelmann and other spruces	160	34	250	63	269	78	380	112	490	140	219	88
Incense-cedar	121	28	95	21	283	63	144	53	209	60	222	70
Lodgepole pine	2,141	217	1,696	186	1,307	193	754	140	400	107	279	98
Other western softwoods	291	62	554	113	436	96	665	163	446	119	843	243
Ponderosa and Jeffrey pines	2,143	129	2,997	203	4,095	291	3,862	314	4,140	384	3,783	376
Redwood	—	—	2	3	—	—	—	—	—	—	—	—
Sitka spruce	151	56	209	79	290	108	424	201	436	171	203	100
Sugar pine	10	5	25	14	39	21	55	30	81	43	133	57
True fir	2,693	202	3,690	277	4,190	347	4,221	394	5,204	536	4,134	510
Western hemlock	2,088	193	3,516	371	4,271	476	4,561	542	3,981	562	3,536	533
Western juniper	89	17	112	24	85	20	88	26	60	21	35	18
Western larch	209	47	313	67	322	84	436	98	478	130	388	116
Western redcedar	181	35	338	75	359	84	398	97	506	118	508	160
Western white pine	52	17	76	28	100	38	39	30	77	46	49	42
Total	21,611	683	30,810	1,079	33,886	1,204	36,612	1,437	35,667	1,527	33,242	1,539
Hardwoods:												
Cottonwood and aspen	—	—	88	47	89	57	86	60	105	63	27	29
Oak	—	—	77	15	88	18	77	19	71	19	63	19
Other western hardwoods	—	—	939	114	768	102	666	96	518	90	248	70
Red alder	—	—	2,165	258	2,332	285	2,210	313	1,199	225	1,413	295
Total	—	—	3,269	288	3,276	309	3,039	332	1,892	253	1,752	304
All species groups	21,611	683	34,079	1,113	37,162	1,249	39,652	1,479	37,560	1,556	34,994	1,602

Species group	Diameter class (inches)											
	21.0–22.9		23.0–24.9		25.0–26.9		27.0–28.9		29.0+		All classes	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million board feet (International ¼-inch rule)</i>												
Softwoods:												
Douglas-fir	17,229	1,269	16,406	1,462	17,064	1,604	13,790	1,662	116,516	7,262	285,716	10,690
Engelmann and other spruces	444	170	291	146	124	39	81	41	660	342	3,369	701
Incense-cedar	241	79	211	97	158	80	255	136	2,139	422	4,078	589
Lodgepole pine	127	62	97	57	41	21	10	10	94	81	6,947	718
Other western softwoods	1,208	311	1,002	310	847	307	414	181	1,892	744	8,600	1,727
Ponderosa and Jeffrey pines	3,625	415	3,359	358	3,195	289	4,228	501	13,372	1,081	48,799	2,379
Redwood	—	—	—	—	—	—	—	—	—	—	2	3
Sitka spruce	539	223	88	69	141	94	105	76	1,438	605	4,025	1,201
Sugar pine	44	45	328	128	258	129	156	108	3,625	729	4,754	849
True fir	4,288	568	4,040	695	4,541	857	3,457	723	10,694	1,433	51,151	4,263
Western hemlock	3,540	566	3,776	639	2,654	498	2,985	600	7,406	1,079	42,313	3,628
Western juniper	46	22	17	9	10	5	12	7	20	9	575	86
Western larch	258	101	264	105	158	45	109	38	350	113	3,287	493
Western redcedar	591	154	598	186	1,022	296	575	206	4,468	756	9,543	1,269
Western white pine	126	93	10	10	127	94	18	14	1,349	573	2,023	636
Total	32,306	1,653	30,488	1,862	30,341	2,040	26,196	2,095	164,023	8,142	475,182	13,184
Hardwoods:												
Cottonwood and aspen	—	—	—	—	—	—	62	70	197	93	653	221
Oak	25	13	—	—	81	42	22	21	84	40	589	109
Other western hardwoods	306	77	334	120	117	46	234	90	472	115	4,602	478
Red alder	514	171	636	240	316	142	357	161	172	59	11,313	1,193
Total	845	188	970	268	515	155	675	197	924	172	17,157	1,336
All species groups	33,151	1,665	31,458	1,889	30,856	2,053	26,871	2,105	164,947	8,159	492,339	13,372

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 board feet were estimated.

<sup>a</sup> Sawtimber trees have merchantability limits that differ for softwood and hardwood species as follows: ≥9 inches diameter at breast height for softwoods and ≥11 inches diameter at breast height for hardwoods.

**Table 17—Estimated net volume (Scribner rule)<sup>a</sup> of sawtimber trees<sup>b</sup> on timberland, by species group and diameter class, Oregon, 2001-2005**

Species group	Diameter class (inches)											
	9.0–10.9		11.0–12.9		13.0–14.9		15.0–16.9		17.0–18.9		19.0–20.9	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million board feet (Scribner rule)</i>												
Softwoods:												
Douglas-fir	6,595	328	10,742	586	11,900	643	14,346	810	13,666	818	13,934	934
Engelmann and other spruces	119	26	198	50	219	64	321	95	417	118	185	74
Incense-cedar	54	12	51	12	146	32	78	29	124	37	129	40
Lodgepole pine	1,553	157	1,309	142	1,058	157	622	116	332	89	238	84
Other western softwoods	233	40	432	78	343	64	532	119	373	91	650	182
Ponderosa and Jeffrey pines	1,560	95	2,293	157	3,256	232	3,118	252	3,410	320	3,144	315
Redwood	—	—	1	1	—	—	—	—	—	—	—	—
Sitka spruce	81	31	126	49	181	70	288	140	297	121	142	71
Sugar pine	6	3	16	10	25	13	42	23	55	29	92	40
True fir	1,794	135	2,598	197	3,107	262	3,253	310	4,068	418	3,336	416
Western hemlock	1,217	117	2,245	244	2,903	331	3,217	389	2,886	417	2,627	402
Western larch	157	36	248	53	265	69	366	83	409	112	336	101
Western redcedar	94	19	195	45	215	51	248	61	325	77	336	105
Western white pine	34	11	55	21	64	25	30	24	58	35	33	31
Total	13,499	421	20,509	712	23,681	836	26,460	1,041	26,419	1,133	25,182	1,171
Hardwoods:												
Cottonwood and aspen	—	—	66	36	65	42	74	52	88	55	18	19
Oak	—	—	59	12	68	14	60	15	55	15	49	14
Other western hardwoods	—	—	722	88	606	81	533	77	418	74	203	58
Red alder	—	—	1,717	206	1,924	236	1,864	265	1,027	194	1,232	259
Total	—	—	2,564	228	2,663	254	2,530	280	1,589	216	1,502	266
All species groups	13,499	421	23,072	746	26,344	879	28,990	1,082	28,008	1,161	26,685	1,230

Species group	Diameter class (inches)											
	21.0–22.9		23.0–24.9		25.0–26.9		27.0–28.9		29.0+		All classes	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million board feet (Scribner rule)</i>												
Softwoods:												
Douglas-fir	12,842	954	12,444	1,125	13,157	1,251	10,712	1,309	94,335	6,008	214,674	8,472
Engelmann and other spruces	389	149	258	130	112	36	73	38	611	319	2,902	620
Incense-cedar	130	43	133	62	100	51	161	88	1,618	329	2,723	418
Lodgepole pine	108	53	86	51	36	18	9	9	61	49	5,413	565
Other western softwoods	947	235	792	240	666	234	340	142	1,635	664	6,943	1,405
Ponderosa and Jeffrey pines	3,080	355	2,884	307	2,795	248	3,649	404	12,059	973	41,247	2,024
Redwood	—	—	—	—	—	—	—	—	—	—	1	1
Sitka spruce	387	165	62	50	87	59	68	49	1,123	483	2,843	884
Sugar pine	31	31	240	93	197	97	111	77	3,057	618	3,872	698
True fir	3,481	476	3,249	544	3,684	669	2,853	577	9,160	1,220	40,583	3,420
Western hemlock	2,669	435	2,906	498	2,063	393	2,371	481	5,998	880	31,101	2,753
Western larch	219	86	235	93	142	40	98	34	318	103	2,793	423
Western redcedar	383	102	416	130	704	206	395	145	3,321	565	6,632	895
Western white pine	98	72	9	9	93	70	16	13	1,146	491	1,636	534
Total	24,763	1,277	23,713	1,445	23,835	1,595	20,855	1,658	134,445	6,757	363,362	10,508
Hardwoods:												
Cottonwood and aspen	—	—	—	—	—	—	55	62	176	85	541	188
Oak	19	10	—	—	63	33	17	16	66	32	459	86
Other western hardwoods	247	63	280	103	92	36	192	76	396	97	3,689	391
Red alder	452	152	561	211	281	127	317	143	147	51	9,521	1,019
Total	719	164	841	235	437	136	582	173	785	149	14,211	1,133
All species groups	25,482	1,288	24,554	1,471	24,271	1,606	21,437	1,668	135,230	6,771	377,573	10,672

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 board feet were estimated.

<sup>a</sup> Volume is based on Scribner board foot rule.

<sup>b</sup> Sawtimber trees have merchantability limits that differ for softwood and hardwood species as follows:  $\geq 9$  inches diameter at breast height for softwoods and  $\geq 11$  inches diameter at breast height for hardwoods.

**Table 18—Estimated net volume (cubic feet) of sawtimber trees<sup>a</sup> on timberland, by species group and ownership, Oregon, 2001–2005**

Species group	USDA Forest Service		Other federal		State and local government		Corporate private		Noncorporate private		All owners	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million cubic feet</i>												
Softwoods:												
Douglas-fir	20,816	1,174	7,571	658	3,402	494	7,450	611	4,612	524	43,852	1,563
Engelmann and other spruces	450	93	—	—	—	—	10	8	80	57	541	109
Incense-cedar	315	69	157	45	15	13	129	35	60	23	675	93
Lodgepole pine	987	104	25	11	18	15	138	41	77	49	1,246	125
Other western softwoods	1,174	249	23	11	—	—	64	35	120	90	1,380	268
Ponderosa and Jeffrey pines	5,838	328	497	116	171	73	569	79	1,037	134	8,112	381
Sitka spruce	136	71	—	—	65	27	333	155	102	55	637	185
Sugar pine	450	102	178	60	2	2	45	24	10	6	685	121
True fir	6,474	590	566	236	110	55	463	77	549	106	8,162	650
Western hemlock	3,122	381	784	156	604	184	1,665	307	383	95	6,558	549
Western juniper	74	15	9	4	—	—	11	6	29	9	123	18
Western larch	467	77	—	—	1	1	39	13	33	18	540	80
Western redcedar	915	162	147	58	28	17	171	54	244	78	1,505	198
Western white pine	232	72	63	52	—	—	—	—	1	1	296	89
Total	41,450	1,542	10,020	782	4,416	560	11,089	749	7,339	623	74,313	1,945
Hardwoods:												
Cottonwood and aspen	22	18	2	2	—	—	6	5	69	28	99	33
Oak	13	5	26	8	15	12	24	10	56	15	134	23
Other western hardwoods	208	47	142	26	17	6	278	55	231	38	877	86
Red alder	297	82	81	29	461	107	526	98	430	91	1,795	188
Total	541	98	252	39	493	109	834	120	786	111	2,905	215
All species groups	41,990	1,550	10,272	792	4,909	606	11,923	781	8,125	655	77,219	1,976

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 cubic feet were estimated.

<sup>a</sup> Sawtimber trees have merchantability limits that differ for softwood and hardwood species as follows:  $\geq 9$  inches diameter at breast height for softwoods and  $\geq 11$  inches diameter at breast height for hardwoods.

**Table 19—Estimated aboveground biomass of all live trees on forest land, by owner class and forest land status, Oregon, 2001–2005**

Owner class	Unreserved forests						Reserved forests						All forest land	
	Timberland <sup>a</sup>		Other forest <sup>b</sup>		Total		Productive <sup>a</sup>		Other forest <sup>b</sup>		Total		Total	SE
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE		
<i>Million bone-dry tons</i>														
USDA Forest Service:														
National forest	922.3	31.1	9.0	2.6	931.3	30.9	199.0	17.9	3.4	2.2	202.4	18.0	1,133.6	29.0
Other federal government:														
National Park Service	—	—	—	—	—	—	13.9	3.2	0.3	0.3	14.2	3.3	14.2	3.3
Bureau of Land Management	232.6	16.0	11.5	1.8	244.1	15.9	6.5	3.0	0.7	0.4	7.3	3.0	251.3	15.7
U.S. Fish and Wildlife Service	—	—	—	—	—	—	0.5	0.5	—	—	0.5	0.5	0.5	0.5
Other federal	2.3	1.6	—	—	2.3	1.6	—	—	—	—	—	—	2.3	1.6
Total	234.9	16.1	11.5	1.7	246.3	16.0	21.0	4.4	1.0	0.5	22.0	4.5	268.3	15.7
State and local government:														
State	98.4	12.1	0.2	0.1	98.5	12.1	2.2	1.5	—	—	2.2	1.5	100.7	12.2
Local	7.4	2.5	—	—	7.4	2.5	2.8	2.9	—	—	2.8	2.9	10.1	3.8
Other public	0.0	0.0	—	—	0	0	—	—	—	—	—	—	0	0
Total	105.8	12.3	0.2	0.1	105.9	12.3	4.9	3.2	—	—	4.9	3.2	110.8	12.7
Corporate private	305.8	16.9	1.1	0.5	306.9	16.9	—	—	—	—	—	—	306.9	16.9
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	13.8	3.9	—	—	13.8	3.9	—	—	—	—	—	—	13.8	3.9
Unincorporated partnerships, associations, or clubs	5.3	2.8	0.2	0.2	5.5	2.8	—	—	—	—	—	—	5.5	2.8
Native American Individual	25.8	5.7	2.3	1.3	28.1	5.8	—	—	—	—	—	—	28.1	5.8
Total	163.1	12.4	9.7	1.9	172.8	12.5	—	—	—	—	—	—	172.8	12.5
Total	208.0	14.1	12.2	2.3	220.2	14.1	—	—	—	—	—	—	220.2	14.1
All owners	1,776.7	39.5	33.9	3.9	1,810.6	39.3	224.9	18.7	4.4	2.3	229.3	18.8	2,039.9	37.6

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 bone-dry tons were estimated; includes all live trees  $\geq 1$  inch diameter at breast height.

<sup>a</sup> Forest land that is capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

<sup>b</sup> Forest land that is not capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

Table 20—Estimated aboveground biomass of all live trees on forest land, by species group and diameter class, Oregon, 2001–2005

Species group	Diameter class (inches)															
	1.0–2.9		3.0–4.9		5.0–6.9		7.0–8.9		9.0–10.9		11.0–12.9		13.0–14.9		15.0–16.9	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million bone-dry tons</i>																
<b>Softwoods:</b>																
Douglas-fir	4.7	0.4	7.4	0.6	19.4	0.9	35.6	1.7	51.4	2.4	63.7	3.2	62.8	3.1	68.9	3.6
Engelmann and other spruces	0.7	0.2	0.2	0.1	0.3	0.1	0.4	0.1	0.7	0.1	0.9	0.2	0.7	0.2	1.0	0.3
Incense-cedar	0.3	0.1	0.4	0.1	0.4	0.1	0.6	0.1	0.6	0.1	0.5	0.1	1.0	0.2	0.5	0.2
Lodgepole pine	10.5	1.3	6.5	0.8	8.3	0.7	10.0	0.9	10.4	0.9	7.5	0.8	5.0	0.6	2.6	0.4
Other western softwoods	1.3	0.2	1.3	0.2	1.8	0.2	2.3	0.3	3.5	0.5	4.9	0.7	5.1	0.8	6.3	1.0
Ponderosa and Jeffrey pines	1.3	0.1	3.0	0.3	5.1	0.4	8.1	0.5	11.6	0.7	13.1	0.8	15.3	1.1	13.2	1.0
Redwood	0.3	0.3	0.7	0.7	0.1	0.1	0.0	0.0	—	—	0.0	0.0	—	—	—	—
Sitka spruce	0.1	0.0	0.1	0.1	0.3	0.1	0.3	0.1	0.7	0.2	0.9	0.3	1.1	0.4	1.3	0.5
Sugar pine	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.1
True fir	9.2	0.9	7.3	0.7	9.9	0.6	12.7	0.8	15.1	0.9	17.2	1.1	16.9	1.2	15.7	1.3
Western hemlock	0.9	0.2	2.1	0.3	4.3	0.4	7.5	0.7	9.6	0.8	13.6	1.3	15.1	1.6	15.5	1.7
Western juniper	0.3	0.1	0.7	0.1	1.7	0.1	2.4	0.2	2.7	0.3	2.6	0.3	2.1	0.2	2.2	0.3
Western larch	0.7	0.3	0.7	0.2	0.5	0.1	0.9	0.2	1.2	0.2	1.4	0.3	1.4	0.3	1.7	0.4
Western redcedar	0.4	0.1	0.5	0.1	0.5	0.1	0.7	0.1	0.8	0.2	1.1	0.2	1.2	0.3	1.3	0.3
Western white pine	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.3	0.1	0.3	0.1	0.5	0.2	0.3	0.1
Total	31.0	1.8	31.1	1.6	52.8	1.5	81.8	2.2	108.6	2.9	127.7	3.8	128.3	3.9	130.4	4.5
<b>Hardwoods:</b>																
Cottonwood and aspen	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.3	0.2	0.3	0.2	0.3	0.2
Oak	0.5	0.1	2.2	0.5	3.5	0.4	3.7	0.5	3.3	0.5	2.5	0.4	2.7	0.5	3.0	0.6
Other western hardwoods	2.0	0.2	5.5	0.7	10.2	0.7	13.1	1.1	12.7	1.1	10.7	1.1	7.5	0.8	6.8	0.9
Red alder	0.4	0.1	1.4	0.2	3.7	0.4	6.1	0.6	7.7	0.8	8.2	1.0	7.7	0.9	6.9	1.0
Western woodland hardwoods	0.2	0.1	0.1	0.1	0.2	0.0	0.3	0.1	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1
Total	3.2	0.3	9.3	0.9	17.7	1.0	23.3	1.4	24.2	1.5	22.1	1.5	18.4	1.3	17.2	1.4
All species groups	34.2	1.8	40.4	1.8	70.5	1.8	105.1	2.6	132.8	3.2	149.8	4.1	146.7	4.2	147.7	4.7



**Table 20—Estimated aboveground biomass of all live trees on forest land, by species group and diameter class, Oregon, 2001–2005 (continued)**

Species group	Diameter class (inches)												All classes			
	17.0–18.9		19.0–20.9		21.0–24.9		25.0–28.9		29.0–32.9		33.0–36.9		37.0+		Total	SE
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE				
<i>Million bone-dry tons</i>																
<b>Softwoods:</b>																
Douglas-fir	62.9	3.5	61.3	3.7	108.4	6.6	96.3	8.0	69.3	4.9	63.0	4.2	235.0	16.2	1,010.1	30.5
Engelmann and other spruces	1.2	0.3	0.7	0.2	2.4	0.7	0.6	0.2	0.6	0.2	0.6	0.3	0.4	0.2	11.4	1.9
Incense-cedar	0.8	0.2	0.9	0.3	1.5	0.4	1.4	0.5	1.0	0.3	0.9	0.2	5.1	1.1	15.9	2.0
Lodgepole pine	2.0	0.4	1.1	0.3	0.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.3	0.2	65.0	4.5
Other western softwoods	5.2	0.9	6.4	1.3	11.5	1.9	6.2	1.3	3.3	0.8	2.6	0.7	4.4	2.0	66.1	7.9
Ponderosa and Jeffrey pines	13.0	1.2	11.8	1.1	20.4	1.7	20.3	1.8	14.7	1.2	9.8	0.9	9.9	1.2	170.6	7.1
Redwood	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.1	1.2
Sitka spruce	1.6	0.5	1.0	0.4	2.4	1.0	2.8	1.8	1.1	0.4	0.8	0.4	3.1	1.3	17.4	5.3
Sugar pine	0.2	0.1	0.4	0.2	1.0	0.3	1.1	0.5	1.1	0.5	1.5	0.4	8.9	1.9	14.7	2.4
True fir	18.4	1.6	15.0	1.5	30.4	3.1	27.0	3.9	17.7	2.1	11.0	1.5	17.3	2.7	240.6	13.9
Western hemlock	13.4	1.7	12.1	1.6	24.3	2.8	18.8	2.8	10.8	1.8	6.0	1.2	9.2	1.6	163.2	11.8
Western juniper	2.0	0.3	1.1	0.2	2.1	0.4	1.0	0.1	0.5	0.1	0.4	0.1	0.3	0.1	21.8	1.6
Western larch	1.7	0.4	1.7	0.5	2.0	0.5	1.1	0.2	0.9	0.3	0.4	0.2	0.3	0.2	16.5	1.9
Western redcedar	1.6	0.4	1.6	0.5	3.7	0.8	5.2	1.2	3.1	0.7	3.2	0.6	9.6	1.8	34.5	4.1
Western white pine	0.5	0.2	0.3	0.2	0.9	0.3	0.5	0.2	1.0	0.4	0.3	0.2	1.8	1.0	7.5	1.5
Total	124.5	4.7	115.2	4.7	211.6	8.2	182.1	10.2	125.0	6.0	100.5	5.0	305.7	17.6	1,856.3	36.5
<b>Hardwoods:</b>																
Cottonwood and aspen	0.3	0.2	0.1	0.1	—	—	0.2	0.2	0.1	0.1	0.3	0.2	0.7	0.5	3.0	0.9
Oak	1.8	0.4	1.7	0.5	1.4	0.5	2.4	1.0	0.6	0.4	0.1	0.1	0.6	0.3	30.1	3.4
Other western hardwoods	5.1	0.8	2.6	0.6	6.0	1.1	3.9	0.9	1.8	0.5	1.2	0.3	1.4	0.4	90.6	5.9
Red alder	3.9	0.7	4.6	0.9	3.7	1.1	2.5	0.8	0.5	0.2	0.2	0.1	0.5	0.4	57.8	4.7
Western woodland hardwoods	0.1	0.0	0.1	0.0	0.2	0.1	—	—	—	—	—	—	—	—	2.1	0.4
Total	11.2	1.2	9.0	1.2	11.3	1.6	9.0	1.6	3.0	0.7	1.8	0.4	3.2	0.7	183.6	8.3
All species groups	135.7	4.8	124.2	4.9	222.8	8.4	191.0	10.4	128.0	6.1	102.2	5.0	308.8	17.6	2,039.9	37.6

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 bone-dry tons were estimated; includes all live trees ≥1 inch diameter at breast height.

**Table 21—Estimated mass of carbon of all live trees on forest land, by owner class and forest land status, Oregon, 2001–2005**

Owner class	Unreserved forests						Reserved forests						All forest land	
	Timberland <sup>a</sup>		Other forest <sup>b</sup>		Total		Productive <sup>a</sup>		Other forest <sup>b</sup>		Total		Total	SE
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Million bone-dry tons</i>														
USDA Forest Service:														
National forest	479.6	16.2	4.6	1.3	484.2	16.1	103.5	9.3	1.8	1.2	105.3	9.4	589.5	15.1
Other federal government:														
National Park Service	—	—	—	—	—	—	7.2	1.7	0.2	0.2	7.4	1.7	7.4	1.7
Bureau of Land Management	120.5	8.3	6.0	0.9	126.4	8.3	3.4	1.6	0.4	0.2	3.7	1.6	130.2	8.1
U.S. Fish and Wildlife Service	—	—	—	—	—	—	0.3	0.3	—	—	0.3	0.3	0.3	0.3
Other federal	1.2	0.8	—	—	1.2	0.8	—	—	—	—	—	—	1.2	0.8
Total	121.6	8.3	6.0	0.9	127.6	8.3	10.9	2.3	0.5	0.2	11.4	2.3	139.0	8.1
State and local government:														
State	50.8	6.2	0.1	0.1	50.9	6.2	1.1	0.8	—	—	1.1	0.8	52.0	6.3
Local	3.8	1.3	—	—	3.8	1.3	1.4	1.5	—	—	1.4	1.5	5.2	2.0
Total	54.6	7.6	0.1	0.1	54.7	7.6	2.5	2.3	—	—	2.5	2.3	57.2	8.3
Corporate private	157.8	8.7	0.6	0.2	158.4	8.7	—	—	—	—	—	—	158.4	8.7
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	7.0	2.0	—	—	7.0	2.0	—	—	—	—	—	—	7.0	2.0
Unincorporated partnerships, associations, or clubs	2.8	1.4	0.1	0.1	2.9	1.4	—	—	—	—	—	—	2.9	1.4
Native American	13.4	3.0	1.2	0.7	14.6	3.0	—	—	—	—	—	—	14.6	3.0
Individual	83.8	6.4	4.9	0.9	88.7	6.4	—	—	—	—	—	—	88.7	6.4
Total	106.9	7.3	6.2	1.2	113.1	7.3	—	—	—	—	—	—	113.1	7.3
All owners	920.6	20.5	17.5	2.0	938.1	20.4	117.0	9.7	2.3	1.2	119.2	9.8	1,057.3	19.5

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 bone-dry tons were estimated; includes all live trees ≥1 inch diameter at breast height.

<sup>a</sup> Forest land that is capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

<sup>b</sup> Forest land that is not capable of producing in excess of 20 cubic feet/acre/year of wood at culmination of mean annual increment.

**Table 22—Estimated biomass and carbon mass of live trees, snags, and down wood on forest land, by forest type group, Oregon, 2001–2005**

Forest type group	Biomass							Carbon						
	Live trees (≥1 in d.b.h.)		Snags (≥5 in d.b.h.)		Down wood <sup>a</sup> (≥3 in l.e.d.)		Biomass total	Live trees (≥1 in d.b.h.)		Snags (≥5 in d.b.h.)		Down wood <sup>a</sup> (≥3 in l.e.d.)		Carbon total
	Total	SE	Total	SE	Total	SE		Total	SE	Total	SE	Total	SE	
<i>Million bone-dry tons</i>														
Softwoods:														
Douglas-fir	1,102.4	37.6	74.1	5.1	176.6	7.5	1,353.1	572.6	19.6	38.5	2.6	91.8	3.9	702.9
Fir/spruce/mountain hemlock	315.1	20.3	46.1	3.6	62.3	4.2	423.5	164.1	10.6	24	1.9	32.4	2.2	220.5
Lodgepole pine	61.3	5.7	6.9	1.2	19.3	2.1	87.5	31.9	3	3.6	0.6	10.0	1.1	45.5
Other western softwoods	26.7	2.2	1.5	0.3	3.1	0.6	31.3	13.9	1.2	0.8	0.1	1.7	0.3	16.4
Ponderosa pine	196.8	11	13.3	1.6	29.3	1.8	239.4	102.4	5.7	6.9	0.8	15.2	1	124.5
Western hemlock/Sitka spruce	142.3	17.2	11.8	1.9	31.2	4.1	185.3	73.9	8.9	6.2	1	16.3	2.1	96.4
Western larch	9.5	2.7	2.3	1.1	2.6	0.8	14.4	4.9	1.4	1.2	0.6	1.3	0.4	7.4
Western white pine <sup>b</sup>	1.5	1	0.8	0.6	0.9	0.7	3.2	0.8	0.5	0.4	0.3	0.5	0.4	1.7
Total	1,855.5	38.3	156.8	6.2	325.3	8.8	2,337.6	964.6	19.9	81.5	3.2	169.2	4.6	1,215.3
Hardwoods:														
Alder/maple	78	8.1	7.1	1.3	19.8	2.8	104.9	39.2	4.1	3.7	0.7	10.3	1.5	53.2
Aspen/birch	1.3	0.6	0.1	0.1	0.3	0.2	1.7	0.7	0.3	0.1	0	0.2	0.1	1.0
Elm/ash/cottonwood	3	1.4	0.1	0.1	0.2	0.1	3.3	1.5	0.7	0.1	0.1	0.1	0.1	1.7
Other hardwoods	22.1	4.8	1.8	0.9	3.5	1	27.4	11.1	2.4	0.9	0.5	1.8	0.5	13.8
Tanoak/laurel	42.2	7.7	5.5	1.2	8.4	1.8	56.1	21.2	3.9	2.8	0.6	4.4	0.9	28.4
Western oak	33.2	5.1	3.2	0.7	2.5	0.5	38.9	16.6	2.6	1.6	0.4	1.3	0.3	19.5
Woodland hardwoods	2.8	0.7	0.3	0.1	0.9	0.4	4.0	1.4	0.4	0.1	0.1	0.5	0.2	2.0
Total	182.6	12.6	18.1	2.1	35.7	3.5	236.4	91.7	6.4	9.3	1.1	18.5	1.8	119.5
Nonstocked	1.8	0.5	8.3	3	5.9	1.2	16.0	0.9	0.3	4.3	1.5	3.1	0.6	8.3
All forest types	2,039.9	37.6	183.3	7.0	366.9	9	2,590.1	1,057.3	19.5	95.1	3.6	190.8	4.7	1,343.2

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 500,000 bone-dry tons were estimated; d.b.h. = diameter at breast height; l.e.d. = large-end diameter of the log.

<sup>a</sup> Down wood in this table includes coarse woody material only; an additional 127 million tons of biomass and 65 million tons of carbon were estimated for fine woody material.

<sup>b</sup> This forest type group is represented by less than five plots.

**Table 23—Average biomass and carbon mass of live trees, snags, and down wood on forest land, by forest type group, Oregon, 2001–2005**

Forest type group	Biomass							Carbon						
	Live trees (≥1 in d.b.h.)		Snags (≥5 in d.b.h.)		Down wood <sup>a</sup> (≥3 in l.e.d.)		Mean of total	Live trees (≥1 in d.b.h.)		Snags (≥5 in d.b.h.)		Down wood <sup>a</sup> (≥3 in l.e.d.)		Mean of total
	Total	SE	Total	SE	Total	SE		Total	SE	Total	SE	Total	SE	
<i>Bone-dry tons per acre</i>														
Softwoods:														
Douglas-fir	106.2	2.9	7.1	0.5	17.0	0.6	130.3	55.2	1.5	3.7	0.2	8.8	0.3	67.7
Fir/spruce/mountain hemlock	79.6	3.4	11.6	0.7	15.7	0.7	106.9	41.4	1.8	6.1	0.4	8.2	0.4	55.7
Lodgepole pine	30.1	1.8	3.4	0.6	9.5	0.7	43.0	15.7	0.9	1.8	0.3	4.9	0.4	22.4
Other western softwoods	8.3	0.5	0.5	0.1	1.0	0.2	9.8	4.3	0.3	0.2	0.2	0.5	0.1	5.0
Ponderosa pine	37.5	1.5	2.5	0.3	5.6	0.3	45.6	19.5	0.8	1.3	0.1	2.9	0.1	23.7
Western hemlock/Sitka spruce	134.8	9.1	11.2	1.4	29.6	2.4	175.6	70.1	4.7	5.8	0.8	15.4	1.2	91.3
Western larch	43.6	7.4	10.3	4.4	12.0	2.4	65.9	22.7	3.9	5.4	2.3	6.2	1.2	34.3
Western white pine <sup>b</sup>	28.9	11.5	14.7	8.7	16.6	10.7	60.2	15.0	6.0	7.7	4.6	8.7	5.6	31.4
Total	70.8	1.4	6.0	0.2	12.4	0.3	89.2	36.8	0.7	3.1	0.1	6.5	0.2	46.4
Hardwoods:														
Alder/maple	58.2	3.8	5.3	0.9	14.8	1.7	78.3	29.3	1.9	2.7	0.4	7.6	0.9	39.6
Aspen/birch	18.9	6.9	1.8	1.0	4.3	1.6	25.0	9.4	3.4	0.9	0.5	2.2	0.8	12.5
Elm/ash/cottonwood	32.4	10.0	1.6	0.9	1.7	0.5	35.7	16.1	4.9	0.8	0.4	0.9	0.3	17.8
Other hardwoods	51.1	7.6	4.2	2.0	8.2	1.8	63.5	25.7	3.8	2.2	1.0	4.2	0.9	32.1
Tanoak/laurel	70.6	9.1	9.2	1.6	14.1	2.4	93.9	35.5	4.6	4.7	0.8	7.3	1.2	47.5
Western oak	41.8	4.4	4.0	0.8	3.2	0.5	49.0	20.9	2.2	2.0	0.4	1.6	0.3	24.5
Woodland hardwoods	13.2	1.8	1.2	0.6	4.4	1.4	18.8	6.7	0.9	0.6	0.3	2.3	0.7	9.6
Total	51.6	2.6	5.1	0.5	10.1	0.8	66.8	25.9	1.3	2.6	0.3	5.2	0.4	33.7
Nonstocked	2.4	0.7	11.2	3.7	7.9	1.4	21.5	1.2	0.3	5.8	1.9	4.1	0.7	11.1
All forest types	66.9	1.2	6.0	0.2	12.1	0.3	85.0	34.7	0.6	3.1	0.1	6.3	0.2	44.1

Note: Means are calculated using a ratio of means formula across plots within forest type groups; data subject to sampling error; SE = standard error; d.b.h. = diameter at breast height; l.e.d. = large-end diameter of the log.

<sup>a</sup> Down wood in this table includes coarse woody material only.

<sup>b</sup> This forest type group is represented by less than five plots.

**Table 24—Index of vascular plant species richness on forest land, by ecological section, Oregon, 2005**

Ecological section	Number of plots	Species richness/plot		Total richness	Species turnover	Native richness/plot		Nonnative richness/plot		Native species cover (sum)		Nonnative cover (sum)	
		Mean	SE			Mean	SE	Mean	SE	Mean	SE	Mean	SE
Blue Mountain Foothills	5	44.6	7.6	156	3.5	25.2	5.7	5.4	2.0	40.2	9.2	10.4	4.7
Blue Mountains	27	47.4	3.3	504	10.6	31.6	2.3	3.6	0.8	59.0	9.8	4.0	1.7
Eastern Cascades	13	27.3	3.1	194	7.1	19.8	2.1	1.1	0.4	22.4	5.9	1.4	1.2
Klamath Mountains	9	37.8	5.0	173	4.6	27.4	4.0	1.3	0.4	49.6	15.8	0.3	0.2
Modoc Plateau	5	26.8	5.1	108	4.0	13.0	3.1	1.0	0.4	14.4	7.7	4.1	4.0
Northwestern Basin and Range	5	30.8	5.2	98	3.2	21.2	4.2	1.2	0.2	37.3	12.1	0.7	0.4
Oregon and Washington Coast Ranges	15	42.1	5.0	231	5.5	31.3	3.3	4.1	1.6	64.8	14.8	2.2	1.3
Owyhee Uplands	1	30.0	—	30	1.0	19.0	—	2.0	—	56.0	—	10.3	—
Western Cascades	25	45.8	4.2	381	8.3	34.6	3.3	2.8	0.7	65.2	9.8	3.0	1.5
Willamette Valley	5	55.8	12.8	188	3.4	26.4	5.6	11.4	4.3	85.8	23.1	41.9	21.4

Note: Data subject to sampling error; SE = standard error; — = value can't be estimated (N = 1). Native and nonnative species values only include vegetation records identified to the species level. Species' cover at the plot level were summed with no overlap assumptions (id est, total cover could exceed 100 percent).

**Table 25—Index of lichen richness on forest land, by ecological section, Oregon, 1998–2001, 2003**

Ecosection	Number of plots	Minimum richness	Maximum richness	Mean richness	SD <sup>a</sup>
Blue Mountain Foothills	24	1	17	8.3	4.1
Blue Mountains	59	4	31	15.1	6.6
Eastern Cascades	34	3	26	9.1	5.2
Klamath Mountains	31	4	45	20.9	8.6
Modoc Plateau	15	7	15	10.3	2.8
Northwestern Basin and Range	7	1	8	5.4	2.4
Oregon and Washington Coast Ranges	44	0	27	12.8	8.1
Owyhee Uplands	1	5	5	5	—
Southern Cascades	4	19	22	20.8	1.3
Western Cascades	61	0	36	19.6	7.8
Willamette Valley	12	13	43	24.7	9.7

Note: Data subject to sampling error; SE = standard error; — = value can not be estimated (N = 1).

<sup>a</sup> SD = standard deviation.

**Table 26—Summary of lichen community indicator species richness on forest land, Pacific Northwest and Oregon, 1998–2001, 2003**

Parameter	Pacific Northwest	Oregon	Western Oregon	Eastern Oregon
Number of plots <sup>a</sup>	491	292	144	148
Number of plots by lichen species richness category:				
0 to 6 species	60	44	15	29
7–15 species	186	118	35	83
16–25 species	188	94	63	31
>25 species	57	36	31	5
Median	15	14	19	10
Range of species richness per plot (low–high)	0–45	0–45	0–45	1–31
Average lichen species richness per plot (alpha diversity)	15.85	15	18.47	11.64
Standard deviation of lichen species richness per plot	7.99	8.45	9	6.29
Species turnover rate (beta diversity) <sup>b</sup>	13.12	12.13	9.2	7.73
Total number of species per area (gamma diversity)	208	182	170	90

<sup>a</sup> Plot totals do not include quality assurance surveys.

<sup>b</sup> Beta diversity is calculated as gamma diversity divided by alpha diversity.

**Table 27—Estimated average biomass, volume, and density of down wood on forest land, by forest type group and diameter class, Oregon, 2001–2005**

Forest type group	Biomass						Volume						Density <sup>b</sup>									
	Diameter class (inches) <sup>a</sup>			Total	Diameter class (inches) <sup>a</sup>			Total	Diameter class (inches) <sup>a</sup>			Total	Diameter class (inches) <sup>a</sup>			Total						
	CWM				CWM				CWM				CWM									
	FWM	3 to 19 in	≥20 in	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE					
----- Bone-dry tons per acre -----																						
Softwoods:																						
Douglas-fir	5.4	0.2	7.0	0.2	10.1	0.5	22.5	0.8	390.3	13.5	812.7	22.4	1,201.5	59.8	2,404.5	96.1	245.2	6.6	17.0	0.9	262.2	6.8
Fir/spruce/mountain hemlock	4.5	0.2	9.4	0.4	6.4	0.5	20.3	0.9	376.6	13.6	1,149.8	47.5	835.7	68.1	2,362.1	95.4	300.0	10.7	11.4	0.9	311.4	10.7
Lodgepole pine	4.2	0.2	8.4	0.6	1.1	0.2	13.7	0.9	350.6	19.5	995.8	79.2	155.6	30.8	1,502.0	111.5	339.1	20.1	3.0	0.6	342.1	20.1
Other western softwoods	1.5	0.4	0.6	0.1	0.4	0.1	2.5	1.0	96.6	28.0	61.2	9.6	44.0	13.6	201.8	136.9	28.1	3.9	1.0	0.3	29.1	4.0
Ponderosa pine	2.9	0.1	3.6	0.2	1.9	0.2	8.4	0.8	235.2	8.6	435.6	19.9	271.9	25.1	942.7	72.4	210.1	8.6	4.6	0.5	214.7	8.7
Western hemlock/Sitka spruce	5.8	0.7	9.5	0.6	20.0	2.2	35.3	2.9	454.8	52.1	1,211.8	71.6	2,628.0	290.4	4,294.6	377.6	342.2	27.3	33.2	3.5	375.4	27.4
Western larch	3.3	0.6	10.4	2.1	1.6	0.7	15.3	5.3	247.7	41.0	1,212.6	245.8	243.6	108.1	1,703.9	551.1	409.6	49.4	4.6	2.5	414.2	50.3
Western white pine	1.9	0.5	3.4	1.7	13.3	9.0	18.6	10.7	168.8	44.7	407.0	191.6	1,494.2	1,012.8	2,070.0	1,197.5	112.7	21.9	11.8	7.4	124.5	23.5
Total	4.2	0.1	6.1	0.1	6.3	0.3	16.6	0.5	318.8	7.6	736.5	15.8	784.1	30.4	1,839.4	52.7	232.0	4.5	11.1	0.4	243.1	4.6
Hardwoods:																						
Alder/maple	4.8	0.3	4.5	0.3	10.2	1.6	19.5	2.3	371.1	27.4	601.7	47.7	1,281.9	186.2	2,254.7	251.1	197.5	12.4	17.2	2.5	214.7	12.9
Aspen/birch	1.5	0.4	3.6	1.2	0.7	0.4	5.8	1.7	139.0	35.5	440.5	172.3	120.0	71.9	699.5	255.5	191.1	50.2	4.2	3.0	195.3	51.7
Elm/ash/cottonwood	1.6	0.5	1.7	0.5	—	—	3.3	0.7	145.1	52.2	190.8	41.5	—	—	335.9	73.5	91.7	12.3	—	—	91.7	12.3
Other hardwoods	4.3	0.6	4.1	0.7	4.0	1.4	12.4	2.5	275.2	42.5	429.3	68.9	474.1	181.5	1,178.6	381.5	185.1	36.0	5.8	2.0	190.9	37.1
Tanoak/laurel	5.6	1.1	5.7	0.8	8.4	2.1	19.7	4.4	375.9	70.7	608.3	69.6	946.6	213.1	1,930.8	450.5	242.5	31.6	11.9	2.9	254.4	32.6
Western oak	2.6	0.3	2.3	0.4	0.9	0.3	5.8	0.7	153.2	15.4	238.6	36.6	109.9	37.4	501.7	66.9	101.4	12.8	2.6	1.0	104.0	12.9
Woodland hardwoods	5.0	2.1	2.5	1.0	1.9	0.9	9.4	2.7	343.7	158.5	307.2	140.4	225.9	102.0	876.8	260.1	135.1	41.2	2.6	1.3	137.7	41.1
Total	4.2	0.3	4.0	0.2	6.1	0.8	14.3	1.3	299.2	20.0	468.7	27.8	743.9	86.9	1,511.8	141.3	175.4	9.8	10.0	1.2	185.4	10.1
Nonstocked	4.4	0.6	4.9	0.7	3.0	0.8	12.3	1.8	333.0	46.9	478.8	62.2	340.2	88.6	1,152.0	157.1	220.0	29.0	9.5	3.1	229.5	30.9
All forest types	4.2	0.1	5.8	0.1	6.3	0.2	16.3	0.4	316.8	7.0	692.0	14.1	769.9	27.9	1,778.7	48.2	225.1	4.1	10.9	0.4	236.0	4.2

Note: Means are calculated using a ratio of means formula across plots within forest type groups; data subject to sampling error; SE = standard error; — = less than 0.05 bone-dry tons per acre, 0.05 cubic feet per acre, and 0.05 logs per acre were estimated; CWM = coarse woody material; FWM = fine woody material.

<sup>a</sup> The diameter of the large end is used to classify CWM with decay classes of 1–4; diameter at the point of intersection with the transect is used for heavily decomposed CWM (decay class 5) and for all FWM.

<sup>b</sup> An estimate of pieces per acre is not possible for fine woody material.

Table 28—Estimated biomass and carbon mass of down wood<sup>a</sup> on forest land, by forest type group and owner, Oregon, 2001–2005

Forest type group	USDA											
	Forest Service		Other federal		State and local governments		Corporate private		Other private		All owners	
	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon
<i>Million bone-dry tons</i>												
Softwoods:												
Douglas-fir	76.2	39.6	28.8	15.0	15.8	8.2	43.4	22.6	12.3	6.4	176.6	91.8
Fir/spruce/mountain hemlock	50.6	26.3	2.3	1.2	0.5	0.3	5.6	2.9	3.3	1.7	62.3	32.4
Lodgepole pine	15.4	8.0	0.6	0.3	—	—	2.4	1.2	0.9	0.5	19.3	10.0
Other western softwoods	1.5	0.8	0.9	0.5	—	—	0.1	0.1	0.6	0.3	3.1	1.7
Ponderosa pine	20.7	10.8	0.9	0.4	0.3	0.2	4.3	2.2	3.1	1.6	29.3	15.2
Western hemlock/Sitka spruce	13.5	7.0	3.0	1.6	2.5	1.3	9.8	5.1	2.4	1.3	31.2	16.3
Western larch	2.1	1.1	—	—	—	—	0.5	0.2	0.1	—	2.6	1.3
Western white pine	0.9	0.5	—	—	—	—	—	—	—	—	0.9	0.5
Total	180.9	94.1	36.5	19.0	19.1	10.0	66.1	34.3	22.7	11.8	325.3	169.2
Hardwoods:												
Alder/maple	4.8	2.5	1.1	0.6	2.4	1.3	7.3	3.7	4.2	2.2	19.8	10.3
Aspen/birch	0.1	0.1	0.2	0.1	—	—	—	—	—	—	0.3	0.2
Other hardwoods	0.4	0.2	0.6	0.3	0.1	0.1	1.9	1.0	0.7	0.3	3.7	1.8
Tanoak/laurel	3.4	1.7	1.7	0.9	—	—	2.4	1.2	0.9	0.5	8.5	4.4
Western oak	0.5	0.2	0.7	0.4	—	—	0.6	0.3	0.8	0.4	2.5	1.3
Woodland hardwoods	0.6	0.3	—	—	—	—	—	—	0.3	0.1	0.9	0.5
Total	9.8	5.0	4.3	2.3	2.5	1.4	12.2	6.2	6.9	3.5	35.7	18.5
Nonstocked	2.1	1.1	0.1	—	0.6	0.3	2.8	1.5	0.4	0.2	5.9	3.1
All forest types	192.8	100.2	40.9	21.3	22.2	11.7	81.1	42.0	30.0	15.5	366.9	190.8

Note: Totals may be off because of rounding; data subject to sampling error; — = less than 50,000 bone-dry tons were estimated. Standard errors available upon request.

<sup>a</sup> In this table, down wood includes logs  $\geq 3$  inches in diameter at the large end (coarse woody material); an additional 127 million tons of biomass and 65 million tons of carbon were estimated for fine woody material in the state.



**Table 29—Estimated average biomass, volume, and density of snags on forest land, by forest type group and diameter class, Oregon, 2001–2005**

Forest type group	Biomass						Volume						Density											
	5 to 19		20 to 39		≥40		5 to 19		20 to 39		≥40		5 to 19		20 to 39		≥40							
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE						
----- <i>Bone-dry tons per acre</i> -----																								
Softwoods:																								
Douglas-fir	2.6	0.2	3.0	0.3	1.5	0.2	7.1	0.5	119.4	0.5	129.4	7.7	52.0	13.6	300.7	22.5	16.6	0.8	2.2	0.2	0.4	0.4	19.2	0.9
Fir/spruce/mountain hemlock	5.7	0.4	4.7	0.4	1.3	0.3	11.7	0.7	304.8	0.7	239.3	22.1	52.5	23.2	596.6	36.4	31.1	2.2	3.7	0.3	0.2	0.2	35.0	2.2
Lodgepole pine	2.8	0.5	0.5	0.2	—	—	3.3	0.6	153.5	0.6	30.8	25.8	2.7	9.1	187.0	30.9	24.0	3.7	0.4	0.1	—	—	24.4	3.8
Other western softwoods	0.3	0.1	0.2	0.1	—	—	0.5	0.1	11.5	0.1	9.8	2.5	1.2	4.0	22.5	5.0	2.7	0.4	0.2	0.1	—	—	2.9	0.5
Ponderosa pine	1.4	0.2	0.9	0.1	0.2	0.1	2.5	0.3	71.1	0.3	52.1	9.0	11.8	7.8	135.0	15.5	9.3	1.0	0.6	0.1	—	—	10.0	1.0
Western hemlock/Sitka spruce	3.0	0.4	3.8	0.9	4.4	0.8	11.2	1.4	145.4	1.4	166.8	19.5	146.2	44.9	458.5	68.4	20.3	2.2	2.9	0.6	1.1	0.2	24.3	2.2
Western larch	5.7	1.7	4.6	3.3	—	—	10.3	4.4	303.2	4.4	278.0	96.9	—	—	581.2	260.1	33.9	8.0	2.5	1.4	—	—	36.4	8.6
Western white pine	1.3	0.5	4.6	2.9	8.9	6.3	14.7	8.7	65.2	8.7	318.0	23.0	617.0	201.7	1,000.2	617.5	15.8	10.1	1.2	0.6	1.0	0.7	18.0	9.4
Total	2.6	0.1	2.3	0.1	1.0	0.1	6.0	0.2	129.5	0.2	111.2	5.5	38.4	7.1	279.1	11.9	16.5	0.6	1.8	0.1	0.2	0.2	18.5	0.6
Hardwoods:																								
Alder/maple	1.6	0.2	1.3	0.4	2.5	0.6	5.3	0.9	72.6	0.9	47.9	10.0	75.3	17.2	195.8	38.3	12.4	1.4	1.2	0.2	0.7	0.1	14.3	1.4
Aspen/birch	1.7	1.0	0.1	0.1	—	—	1.8	1.0	89.4	1.0	3.8	55.5	—	3.7	93.2	54.7	16.5	7.1	0.2	0.2	—	—	16.7	7.0
Elm/ash/cottonwood	0.4	0.2	1.2	1.0	—	—	1.6	0.9	24.4	0.9	45.2	13.5	—	36.5	69.6	34.0	2.1	1.0	1.0	0.8	—	—	3.1	1.0
Other hardwoods	2.0	0.4	2.0	1.8	0.3	0.2	4.2	2.0	76.0	2.0	129.3	16.0	6.2	120.5	211.6	128.7	16.1	3.4	0.9	0.7	0.2	0.1	17.2	3.6
Tanoak/laurel	4.1	1.0	2.7	0.7	2.4	0.8	9.2	1.6	172.4	1.6	112.6	41.1	99.7	34.1	384.7	75.0	30.8	7.5	2.0	0.5	0.5	0.1	33.2	7.6
Western oak	2.5	0.4	1.2	0.4	0.3	0.2	4.0	0.8	107.5	0.8	63.0	21.9	12.1	21.8	182.6	39.7	15.7	2.2	1.1	0.3	—	—	16.7	2.3
Woodland hardwoods	0.5	0.2	0.7	0.4	—	—	1.2	0.6	28.0	0.6	40.0	15.7	—	—	68.0	33.1	8.0	2.2	0.9	0.6	—	—	8.9	2.1
Total	2.1	0.2	1.5	0.3	1.5	0.3	5.1	0.5	94.1	0.5	70.7	9.9	48.8	17.9	213.6	26.7	16.2	1.6	1.2	0.2	0.4	0.1	17.8	1.6
Nonstocked	6.8	2.2	3.8	1.5	0.6	0.3	11.2	3.7	355.7	3.7	200.3	118.0	14.8	80.7	570.8	191.9	26.0	7.6	2.3	0.8	0.2	0.1	28.4	8.0
All forest types	2.6	0.1	2.3	0.1	1.1	0.1	6.0	0.2	131.0	0.2	108.7	5.7	39.0	6.7	278.7	11.6	16.7	0.6	1.7	0.1	0.3	0.3	18.6	0.6

Note: Means are calculated using a ratio of means formula across plots within forest type groups; data subject to sampling error; SE = standard error; — = less than 0.05 bone-dry tons per acre, 0.05 cubic feet per acre, and 0.05 trees per acre were estimated; includes snags ≥5 inches diameter at breast height.

Table 30—Estimated biomass and carbon mass of snags on forest land, by forest type group and owner, Oregon, 2001–2005

Forest type group	USDA						State and local governments						Other private		All owners	
	Forest Service		Other federal		State and local governments		Corporate		Other private		All owners		Biomass		Carbon	
	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon	Biomass	Carbon
<i>Million bone-dry tons</i>																
Softwoods:																
Douglas-fir	48.6	24.3	11.1	5.6	4.8	2.4	6.9	3.5	2.8	1.4	74.2	38.5				
Fir/spruce/mountain hemlock	41.2	20.6	2.2	1.1	0.2	0.1	1.0	0.5	1.5	0.8	46.1	24.0				
Hemlock/Sitka spruce	7.3	3.7	1.4	0.7	0.4	0.2	2.2	1.1	0.5	0.2	11.8	6.2				
Lodgepole pine	6.5	3.2	0.2	0.1	—	—	0.1	0	0.1	0.1	6.9	3.6				
Other western softwoods	0.5	0.2	0.8	0.4	—	—	0	0	0.2	0.1	1.5	0.8				
Ponderosa pine	10.7	5.4	0.5	0.2	0.1	0.1	0.8	0.4	1.2	0.6	13.3	6.9				
Western larch	2.2	1.1	—	—	—	—	0	0	—	—	2.3	1.2				
Western white pine	0.8	0.4	—	—	—	—	—	—	—	—	0.8	0.4				
Total	117.8	58.9	16.2	8.1	5.5	2.8	11.0	5.5	6.3	3.1	156.8	81.5				
Hardwoods:																
Alder/maple	2.6	1.3	0	0	1.1	0.6	2.3	1.1	1.1	0.5	7.2	3.7				
Aspen/birch	0	0	—	—	—	—	—	—	0.1	0.0	0.1	0.1				
Elm/ash/cottonwood	—	—	—	—	—	—	—	—	0.1	0.1	0.1	0.1				
Other hardwoods	0.9	0.4	0.2	0.1	0.1	0	0.3	0.1	0.4	0.2	1.8	0.9				
Tanoak/laurel	3.8	1.9	0.4	0.2	—	—	1.0	0.5	0.2	0.1	5.5	2.8				
Western oak	1.1	0.6	0.8	0.4	—	—	0.3	0.2	0.9	0.5	3.2	1.6				
Woodland hardwoods	0.2	0.1	0	0	—	—	0	0	0.1	0.0	0.3	0.1				
Total	8.7	4.3	1.4	0.7	1.2	0.6	3.9	1.9	3.0	1.5	18.1	9.3				
Nonstocked	8.0	4.0	—	—	0.1	0.0	0.2	0.1	0.1	0.0	8.3	4.3				
All forest types	134.4	67.2	17.7	8.8	6.8	3.4	15.1	7.5	9.3	4.7	183.3	95.1				

Note: Totals may be off because of rounding; data subject to sampling error; — = less than 50,000 bone-dry tons were estimated; includes snags  $\geq 5$  inches in diameter at breast height. Standard errors available upon request.

**Table 31—Estimated area and net volume of live trees on riparian forest land by location, Oregon, 2001–2005**

Location	Forest land area				Net volume of live trees			
	Riparian <sup>a</sup>		Proportion of forest land		Riparian <sup>a</sup>		Proportion of forest land	
	Total	SE	Percent <sup>b</sup>	SE	Total	SE	Percent <sup>b</sup>	SE
	<i>Thousand acres</i>		<i>Percent</i>		<i>Million cubic feet</i>		<i>Percent</i>	
Western Oregon:								
North	477	59	12.56	1.52	2,236	361	11.44	1.78
Central	507	59	11.42	1.29	3,501	580	13.40	2.08
South	603	61	8.65	0.87	2,994	480	8.86	1.36
Total	1,588	103	10.43	0.67	8,730	834	10.99	1.00
Eastern Oregon:								
Central	195	39	2.24	0.45	498	151	3.21	0.96
Blue Mountains	374	53	5.71	0.81	1,067	209	10.05	1.85
Total	569	66	3.73	0.43	1,566	258	5.99	0.96
Total Oregon	2,157	122	7.08	0.40	10,296	872	9.75	0.79

Note: Data subject to sampling error; SE = standard error.

<sup>a</sup> Riparian forest land is defined as forest land within 100 feet of a permanent water body.

<sup>b</sup> Riparian as a percentage of all forest land within each category.

**Table 32—Estimated area of riparian forest land by forest type group, owner, and location, Oregon, 2001–2005**

Location	Western Oregon				Eastern Oregon				All Oregon			
	Riparian <sup>a</sup>		Proportion of forest land		Riparian <sup>a</sup>		Proportion of forest land		Riparian <sup>a</sup>		Proportion of forest land	
	Total	SE	Percent <sup>b</sup>	SE	Total	SE	Percent <sup>b</sup>	SE	Total	SE	Percent <sup>b</sup>	SE
	<i>Thousand acres</i>		<i>Percent</i>		<i>Thousand acres</i>		<i>Percent</i>		<i>Thousand acres</i>		<i>Percent</i>	
Softwoods:												
Public	679	69	9.21	0.92	415	56	4.09	0.56	1,094	89	6.25	0.50
Private	409	55	9.05	1.17	104	27	2.50	0.65	513	61	5.90	0.69
Total	1,088	88	9.15	0.72	519	63	3.63	0.44	1,607	108	6.13	0.41
Hardwoods:												
Public	125	27	11.05	2.25	31	18	10.79	5.61	157	32	11.00	2.13
Private	343	46	17.89	2.17	7	8	3.44	3.97	350	46	16.53	2.02
Total	468	53	15.35	1.61	38	19	7.80	3.75	506	56	14.30	1.48
Nonstocked	32	13	11.52	4.53	12	10	2.67	2.13	44	16	6.06	2.19
All public	829	75	9.63	0.86	458	60	4.25	0.55	1,287	96	6.64	0.49
All private	759	72	11.48	1.06	111	28	2.48	0.63	870	77	7.85	0.69
Total Oregon	1,588	103	10.43	0.67	569	66	3.73	0.43	2,157	122	7.08	0.40

Note: Data subject to sampling error; SE = standard error.

<sup>a</sup> Riparian forest land is defined as forest land within 100 feet of a permanent water body.

<sup>b</sup> Riparian as a percentage of all forest land area within each category.

**Table 33—Estimated net volume of live trees on riparian forest land by species group, owner, and location, Oregon, 2001–2005**

Location	Western Oregon				Eastern Oregon				All Oregon			
	Riparian <sup>a</sup>		Proportion of forest land		Riparian <sup>a</sup>		Proportion of forest land		Riparian <sup>a</sup>		Proportion of forest land	
	Total	SE	Percent <sup>b</sup>	SE	Total	SE	Percent <sup>b</sup>	SE	Total	SE	Percent <sup>b</sup>	SE
	<i>Million cubic feet</i>		<i>Percent</i>		<i>Million cubic feet</i>		<i>Percent</i>		<i>Million cubic feet</i>		<i>Percent</i>	
Softwoods:												
Public	5,107	690	9.32	1.22	1,183	221	5.52	1.01	6,290	724	8.25	0.92
Private	2,032	354	11.84	1.88	358	131	7.99	2.74	2,389	377	11.04	1.60
Total	7,139	773	9.92	1.03	1,541	257	5.94	0.96	8,680	815	8.87	0.80
Hardwoods:												
Public	510	114	15.95	3.11	16	16	12.99	11.57	526	115	15.84	3.02
Private	1,081	152	25.00	2.83	9	7	9.45	6.91	1,090	152	24.67	2.78
Total	1,591	188	21.15	2.10	25	17	11.47	7.33	1,616	189	20.88	2.05
All public	5,617	721	9.69	1.20	1,199	221	5.56	1.00	6,817	754	8.57	0.92
All private	3,113	426	14.49	1.78	366	132	8.02	2.69	3,479	445	13.35	1.54
Total Oregon	8,730	834	10.99	1.00	1,566	258	5.99	0.96	10,296	872	9.75	0.79

Note: Data subject to sampling error; SE = standard error.

<sup>a</sup> Riparian forest land is defined as forest land within 100 feet of a permanent water body.

<sup>b</sup> Net volume in riparian forests as a percentage of net volume in forest land within each category.

**Table 34—Estimated mean crown density and other statistics<sup>a</sup> for live trees on forest land, by species group, Oregon, 2001–2005**

Species group	Plots	Trees	Crown density				
			Mean	SE	Minimum	Median	Maximum
	<i>-- Number --</i>		<i>----- Percent -----</i>				
Softwoods:							
Douglas-fir	169	2,020	46.4	1.4	5	45	95
Engelmann and other spruces	10	49	49.1	1.2	15	50	80
Incense-cedar	18	55	49.7	3.4	15	50	95
Lodgepole pine	50	540	43.3	3.3	5	40	85
Other western softwoods	76	597	45.2	1.4	5	45	99
Ponderosa and Jeffrey pines	86	747	37.7	1.7	5	35	95
Sitka spruce	8	83	46.3	11.6	10	50	85
Sugar pine	9	31	42.6	3.6	15	40	95
True fir	81	861	43.9	1.7	0	45	99
Western hemlock	51	364	45.0	2.6	5	45	90
Western larch	13	30	42.5	4.6	5	40	75
Western redcedar	17	54	37.0	3.0	15	35	65
Western white pine	11	23	39.1	4.4	10	40	85
Total	303	5,454	44.2	0.9	0	40	99
Hardwoods:							
Oak	24	144	37.6	2.5	0	40	80
Other western hardwoods	58	399	39.3	1.8	0	40	80
Red alder	38	313	40.8	3.5	0	40	85
Western woodland hardwoods	9	34	30.7	6.9	5	25	75
Total	98	903	39.2	1.7	0	40	85
All species	307	6,357	43.5	0.8	0	40	99

Note: Data subject to sampling error; SE = standard error; includes live trees > 4.9 inches in diameter at breast height.

<sup>a</sup> The mean, standard error (SE), and median calculations consider the clustering of trees on plots.

**Table 35—Mean foliage transparency and other statistics<sup>a</sup> for live trees on forest land, by species group, Oregon, 2001–2005**

Species group	Plots	Trees	Foliage transparency				
			Mean	SE	Minimum	Median	Maximum
	<i>-- Number --</i>		<i>----- Percent -----</i>				
Softwoods:							
Douglas-fir	169	2,020	19.2	0.5	0	15	90
Engelmann and other spruces	10	49	12.7	0.6	5	15	20
Incense-cedar	18	55	16.9	2.8	5	15	80
Lodgepole pine	50	540	17.0	1.0	5	15	35
Other western softwoods	76	597	20.6	3.4	5	15	80
Ponderosa and Jeffery pines	86	747	23.0	2.5	0	20	90
Sitka spruce	8	83	16.9	3.4	10	15	45
Sugar pine	9	31	19.4	1.4	5	20	35
True fir	81	861	17.3	0.9	5	15	99
Western hemlock	51	364	19.6	1.3	0	15	90
Western larch	13	30	18.8	1.0	15	20	35
Western redcedar	17	54	23.0	1.3	15	20	50
Western white pine	11	23	18.5	2.2	10	15	45
Total	303	5,454	19.3	0.7	0	15	99
Hardwoods:							
Oak	24	144	23.3	2.6	10	20	99
Other western hardwoods	58	399	26.3	1.5	10	25	99
Red alder	38	313	34.0	4.8	0	30	99
Western woodland hardwoods	9	34	34.7	3.2	10	35	75
Total	98	903	28.7	2.0	0	25	99
All species	307	6,357	20.6	0.7	0	20	99

Note: Data subject to sampling error; SE = standard error; includes live trees > 4.9 inches in diameter at breast height.

<sup>a</sup> The mean, standard error (SE), and median calculations consider the clustering of trees on plots.

**Table 36—Mean crown dieback and other statistics<sup>a</sup> for live trees on forest land, by species group, Oregon, 2001–2005**

Species group	Plots	Trees	Crown dieback				
			Mean	SE	Minimum	Median	Maximum
	<i>-- Number --</i>		<i>----- Percent -----</i>				
Softwoods:							
Douglas-fir	170	2,039	1.3	0.2	0	0	95
Engelmann and other spruces	10	49	1.9	1.4	0	0	30
Incense-cedar	18	55	0.9	0.5	0	0	20
Lodgepole pine	50	558	3.2	0.7	0	0	90
Other western softwoods	76	602	4.7	1.8	0	0	90
Ponderosa and Jeffrey pines	86	753	1.1	0.2	0	0	95
Sitka spruce	8	83	1.2	0.5	0	0	20
Sugar pine	9	31	1.8	1.3	0	0	20
True fir	81	862	2.3	0.6	0	0	95
Western hemlock	51	364	1.2	0.4	0	0	95
Western larch	13	30	5.2	3.1	0	0	95
Western redcedar	17	54	0.1	0.1	0	0	5
Western white pine	11	23	2.6	1.4	0	0	30
Total	303	5,503	2	0.3	0	0	95
Hardwoods:							
Oak	24	145	2.8	1.0	0	0	60
Other western hardwoods	59	416	2.3	0.7	0	0	99
Red alder	38	313	2.9	1.2	0	0	99
Western woodland hardwoods	9	34	12.2	2.9	0	5	95
Total	99	921	2.9	0.6	0	0	99
All species	307	6,424	2.1	0.3	0	0	99

Note: Data subject to sampling error; SE = standard error; includes live trees > 4.9 inches in diameter at breast height.

<sup>a</sup> The mean, standard error (SE), and median calculations consider the clustering of trees on plots.

**Table 37—Properties of the forest floor layer on forest land, by forest type, Oregon, 2001, 2003–2005**

Forest type	Moisture content (oven-dry basis)		Organic carbon	Total nitrogen
	Samples			
	<i>Number</i>	<i>Percent</i>	<i>----- Percent -----</i>	
Aspen	2	51.27	37.13	1.36
Bigleaf maple	2	138.42	28.56	1.07
California black oak	1	19.22	38.34	0.88
California laurel	1	61.05	18.89	0.47
Canyon live oak	1	14.50	36.20	0.63
Douglas-fir	85	79.43	34.54	0.91
Engelmann spruce	2	14.14	35.24	1.00
Giant chinquapin	1	98.61	30.50	1.05
Grand fir	7	18.10	35.44	1.03
Lodgepole pine	19	19.07	39.15	0.82
Mountain brush woodland	2	7.12	28.78	1.07
Mountain hemlock	6	56.91	41.04	0.98
Noble fir	3	39.86	38.32	1.01
Oregon white oak	4	10.86	29.01	0.96
Pacific madrone	3	30.90	29.85	0.67
Ponderosa pine	39	23.14	35.72	0.86
Red alder	12	137.52	34.99	1.32
Sitka spruce	2	100.24	44.82	1.44
Subalpine fir	5	172.09	38.39	1.21
Sugar pine	1	7.82	31.57	0.48
Tanoak	6	58.08	39.99	0.87
Western hemlock	6	177.66	39.23	1.14
Western juniper	34	13.53	27.70	0.74
Western larch	1	65.90	43.24	1.36
Western white pine	1	21.10	43.46	0.65
White fir	10	38.99	32.57	0.74
Other hardwoods	2	39.82	36.48	1.29
Nonstocked	9	89.06	35.69	0.96

Note: Data subject to sampling error.



**Table 38—Properties of the mineral soil layer on forest land, by depth of layer and forest type, Oregon, 2001, 2003–2005**

Depth of layer and forest type	Samples <i>Number</i>	Soil properties			
		Texture <i>Most common</i>	Moisture content (oven-dry basis) <i>----- Percent -----</i>	Coarse fragments	Bulk density <i>g/cm<sup>3</sup></i>
Mineral layer 1 (0–10 cm):					
Aspen	1	Clayey	21.08	17.48	—
Bigleaf maple	2	Loamy	28.28	38.47	0.87
California black oak	1	Clayey	9.83	42.30	1.19
Canyon live oak	1	Coarse sand	6.95	57.52	0.94
Douglas-fir	75	Loamy	30.24	34.45	0.75
Engelmann spruce	1	Loamy	8.08	13.85	0.38
Giant chinquapin	1	Organic	77.90	31.94	0.28
Grand fir	7	Loamy	19.14	17.69	0.82
Lodgepole pine	17	Sandy	13.92	12.67	0.71
Mountain brush woodland	2	Loamy	4.16	19.60	1.42
Mountain hemlock	3	Coarse sand	33.60	26.70	0.65
Noble fir	3	Loamy	12.42	31.99	0.76
Nonstocked	5	Clayey	13.18	12.34	0.86
Oregon white oak	5	Clayey	19.32	26.07	1.09
Other hardwoods	2	Loamy	25.52	26.15	0.69
Pacific madrone	2	Sandy	8.83	36.51	1.33
Ponderosa pine	36	Loamy	9.78	23.00	0.88
Red alder	10	Loamy	53.69	21.40	0.58
Sitka spruce	2	Clayey	40.34	2.62	1.18
Subalpine fir	4	Loamy	23.73	19.52	0.76
Sugar pine	1	Clayey	21.04	11.93	0.70
Tanoak	5	Clayey	21.25	37.57	0.98
Western hemlock	5	Loamy	41.05	44.45	0.56
Western juniper	23	Sandy	7.52	16.54	0.96
Western larch	1	Loamy	16.91	27.55	0.25
Western white pine	1	Sandy	22.77	9.77	0.33
White fir	10	Loamy	16.74	23.84	0.79
Mineral layer 2 (10–20 cm):					
Aspen	1	Clayey	24.39	27.66	—
Bigleaf maple	2	Loamy	19.72	20.68	0.90
California black oak	1	Clayey	10.09	49.20	1.43
Canyon live oak	1	Coarse sand	8.19	5.48	1.10
Douglas-fir	75	Clayey	28.38	36.42	0.94
Engelmann spruce	1	Loamy	8.91	1.47	0.87
Giant chinkapin	1	Loamy	23.66	45.78	0.74
Grand fir	7	Clayey	15.10	17.95	0.79
Lodgepole pine	16	Sandy	15.02	11.58	0.85
Mountain brush woodland	2	Loamy	7.20	22.63	0.97
Mountain hemlock	3	Coarse sand	28.09	27.88	0.86
Noble fir	3	Loamy	15.34	30.51	0.84
Nonstocked	5	Clayey	16.11	13.11	0.98
Oregon white oak	4	Clayey	21.36	37.82	1.04
Other hardwoods	2	Loamy	29.62	26.48	0.69
Pacific madrone	2	Sandy	7.29	40.19	1.44
Ponderosa pine	33	Loamy	10.29	28.07	0.96
Red alder	10	Clayey	45.73	27.28	0.85
Sitka spruce	1	Clayey	29.32	14.08	0.96
Subalpine fir	3	Loamy	13.07	32.65	0.93
Sugar pine	1	Clayey	31.45	9.98	0.84
Tanoak	4	Clayey	21.97	38.47	0.94
Western hemlock	5	Clayey	41.86	43.64	0.81
Western juniper	18	Loamy	8.83	22.83	1.21
Western larch	1	Clayey	11.47	38.09	0.60
Western white pine	1	Sandy	31.31	3.71	0.70
White fir	10	Loamy	11.36	25.48	0.95

Note: Data subject to sampling error; — = No data available for this sample.

**Table 39—Chemical properties of mineral soil layers on forest land, by depth of layer and forest type, Oregon, 2001, 2003–2005**

Depth of layer and forest type	Samples Number	pH			Organic carbon	Inorganic carbon	Total nitrogen	Extractable phosphorus	Exchangeable cations					Extractable sulfur mg/kg					
		H <sub>2</sub> O	CaCl <sub>2</sub>	CaCl <sub>2</sub>					Na	K	Mg	Ca	Al		EC <sub>EC</sub> <sup>a</sup>				
		-----mg/kg-----									-----cmole/kg-----								
Mineral layer 1 (0–10 cm):																			
Aspen	1	5.92	5.20	8.94	0.35	0.81	127.00	0	676.65	219.50	2,896.0	9.63	18.09	1.85					
Bigleaf maple	2	5.8	5.20	5.17	0.20	0.26	21.97	0.78	352.54	226.25	1,714.5	37.17	11.73	2.33					
California black oak	1	5.64	4.88	3.31	0.18	0.11	5.90	3.32	105.81	350.40	1,421.0	5.16	10.31	0.18					
Canyon live oak	1	6.3	5.77	5.59	0.38	0.18	43.75	7.63	465.20	303.30	2,990.0	2.70	18.67	1.57					
Douglas-fir	74	5.59	4.90	5.85	0.24	0.26	37.22	17.25	330.54	317.27	1,979.2	115.81	14.69	6.89					
Engelmann spruce	1	6.16	5.42	3.79	0.17	0.20	32.90	7.77	297.80	255.50	2,215.0	0	13.95	2.66					
Giant chinquapin	1	5.58	4.88	21.30	0.31	0.62	25.33	15.10	335.50	200.10	3,631.0	14.54	20.85	14.55					
Grand fir	7	6.5	5.86	3.78	0.21	0.20	51.87	16.40	834.06	231.43	2,445.9	6.62	16.39	13.75					
Lodgepole pine	17	5.89	5.11	3.89	0.16	0.15	67.77	11.19	318.80	115.32	1,072.4	22.21	7.41	3.87					
Mountain brush woodland	2	6.48	5.81	3.61	0.24	0.15	58.46	13.54	415.00	710.40	3,356.5	0.98	23.72	1.27					
Mountain hemlock	3	5.14	4.58	2.57	0.15	0.06	38.62	7.86	38.74	8.59	125.3	48.93	1.37	9.55					
Noble fir	3	5.94	5.20	4.06	0.24	0.14	10.00	3.61	252.29	33.86	750.8	15.34	4.86	7.52					
Nonstocked	5	6.52	5.91	2.81	0.13	0.22	19.97	37.57	619.13	401.92	2,429.4	1.25	17.19	4.09					
Oregon white oak	3	6.44	5.82	2.54	0.25	0.16	26.62	10.36	270.22	379.23	3,493.1	1.73	21.30	2.70					
Other hardwoods	2	5.15	4.54	8.60	0.32	0.52	23.14	11.99	522.27	256.18	2,417.9	434.90	20.40	4.80					
Pacific madrone	2	6.12	5.52	2.53	0.26	0.14	30.91	6.02	176.31	283.95	2,398.0	1.49	14.79	1.04					
Ponderosa pine	35	6.21	5.50	2.91	0.18	0.13	50.65	16.20	432.92	311.55	1,900.8	9.14	13.33	3.01					
Red alder	10	4.71	4.14	8.01	0.30	0.50	11.60	33.29	239.18	336.81	1,329.4	361.48	14.18	10.69					
Sitka spruce	2	4.44	3.70	11.79	0.38	0.71	4.07	107.36	94.69	183.95	165.0	626.80	10.01	18.45					
Subalpine fir	4	6.16	5.51	6.56	0.27	0.38	33.51	3.98	497.37	204.46	2,748.0	82.55	17.60	7.75					
Sugar pine	1	5.09	4.23	3.88	0.10	0.15	0.51	8.76	122.10	83.52	244.3	484.90	7.65	12.13					
Tanoak	4	4.94	4.17	6.32	0.20	0.24	6.93	17.00	125.50	76.37	278.8	303.90	5.79	10.92					
Western hemlock	5	5.07	4.36	15.23	0.36	0.55	9.28	29.20	217.07	372.73	1,510.2	255.10	14.12	15.29					
Western juniper	23	6.55	5.92	2.78	0.19	0.24	27.86	26.48	458.82	518.41	2,288.5	6.42	17.04	4.84					
Western larch	1	5.63	4.80	7.27	0.21	0.34	20.00	11.49	453.40	179.8	1,340.0	32.16	9.73	11.30					
Western white pine	1	5.05	4.24	9.84	0.09	0.20	23.55	2.71	147.90	20.15	220.2	51.99	2.23	13.24					
White fir	10	6.10	5.30	3.72	0.22	0.15	75.05	9.55	380.25	126.99	1,341.1	12.45	8.89	3.24					

Table 39—Chemical properties of mineral soil layers on forest land, by depth of layer and forest type, Oregon, 2001, 2003–2005 (continued)

Depth of layer and forest type	Samples	pH		Organic carbon			Inorganic carbon		Total nitrogen	Extractable phosphorus	Exchangeable cations					ECEC <sup>a</sup>	Extractable sulfur
		H <sub>2</sub> O	CaCl <sub>2</sub>	mg/kg	mg/kg	Percent	mg/kg	mg/kg			mg/kg	mg/kg	mg/kg	cmolc/kg			
															Number		
Mineral layer 2 (10–20 cm):																	
Aspen	1	6.12	5.47	5.26	0.27	0.54	76.60	17.75	1164.18	208.10	2,448.0	4.60	17.03	6.90			
Bigleaf maple	2	5.33	4.72	5.81	0.22	0.37	16.36	0	232.26	76.89	667.4	215.58	6.95	5.28			
California black oak	1	6.15	5.21	1.22	0.15	0.06	1.52	5.42	44.04	481.20	1,068.0	4.42	9.47	2.99			
Canyon live oak	1	5.83	5.23	1.84	0.32	0.11	52.06	0	503.60	202.30	1,374.0	6.58	9.88	0			
Douglas-fir	74	5.60	4.93	4.02	0.21	0.19	23.89	8.19	269.42	257.38	1,636.4	131.37	12.47	7.37			
Engelmann spruce	1	5.75	5.17	1.12	0.16	0.07	21.12	22.27	177.60	230.00	1,599.0	0	10.42	5.67			
Giant chinquapin	1	5.81	5.07	7.67	0.22	0.29	110.92	38.68	154.60	122.10	1,524.0	465.10	14.34	146.50			
Grand fir	7	6.32	5.62	1.44	0.17	0.10	40.33	12.94	466.47	180.21	1,889.0	3.19	12.19	3.46			
Lodgepole pine	16	6.10	5.30	1.87	0.16	0.09	40.63	18.39	315.35	204.54	1,576.0	7.63	10.52	33.73			
Mountain brush woodland	2	6.40	5.66	3.55	0.24	0.15	21.75	14.15	271.66	783.95	4,220.0	1.19	28.27	4.58			
Mountain hemlock	3	5.44	5.02	2.00	0.15	0.06	12.72	3.15	37.93	6.71	43.9	9.71	0.49	23.09			
Noble fir	3	5.86	5.15	2.18	0.21	0.09	7.64	0	209.65	39.21	501.6	40.68	3.81	12.82			
Nonstocked	5	6.24	5.61	2.25	0.11	0.17	15.19	15.46	564.92	277.01	1,763.2	2.60	12.62	5.71			
Oregon white oak	2	6.15	5.38	1.36	0.17	0.10	43.26	12.20	210.05	622.45	5,825.0	1.30	34.79	2.08			
Other hardwoods	2	5.57	4.98	5.60	0.36	0.35	13.16	0.44	540.50	205.06	2,460.9	205.15	17.63	7.45			
Pacific madrone	2	6.10	5.37	2.86	0.28	0.15	10.78	5.32	140.45	232.00	2,535.5	1.21	14.96	1.35			
Ponderosa pine	33	6.31	5.54	1.90	0.18	0.10	26.63	8.23	356.99	285.53	1,844.9	5.67	12.57	4.26			
Red alder	10	4.98	4.35	4.63	0.26	0.30	8.23	2.58	131.62	298.24	1,243.1	308.88	12.44	17.05			
Sitka spruce	1	5.18	4.36	5.84	0.37	0.33	1.71	76.05	34.89	177.80	281.5	294.80	6.56	9.30			
Subalpine fir	3	6.15	5.57	5.19	0.25	0.23	43.06	4.84	315.59	563.55	2,024.4	3.66	15.60	9.30			
Sugar pine	1	5.10	4.10	0.97	0.13	0.07	0.17	16.28	80.50	80.07	174.2	1277.73	16.01	0			
Tanoak	3	5.10	4.34	4.13	0.21	0.18	2.62	2.12	85.21	41.47	156.9	253.78	4.17	14.26			
Western hemlock	5	4.93	4.26	6.70	0.31	0.33	6.03	11.70	236.47	129.95	452.9	628.14	10.97	21.16			
Western juniper	17	6.82	6.12	1.63	0.21	0.14	18.32	33.17	656.32	647.51	2,629.6	3.71	20.31	4.02			
Western larch	1	6.51	4.80	4.59	0.20	0.24	19.32	10.57	328.60	65.61	486.0	0	3.85	3.31			
Western white pine	1	5.43	4.58	3.05	0.14	0.08	61.08	27.93	94.69	28.93	19.3	51.37	1.27	0.92			
White fir	10	6.04	5.26	1.98	0.17	0.09	54.56	4.31	315.37	108.18	939.3	12.94	6.55	3.77			

Note: Data subject to sampling error.

<sup>a</sup> ECEC = effective cation exchange capacity, H<sub>2</sub>O = water, CaCl<sub>2</sub> = calcium chloride, Na = sodium, K = potassium, Mg = magnesium, Ca = calcium, and Al = aluminum.

**Table 40—Chemical properties (trace elements) of mineral soils on forest land, by forest type, Oregon, 2001, 2003–2005**

Depth of layer and forest type	Samples	Extractable						
		Manganese	Iron	Nickel	Copper	Zinc	Cadmium	Lead
	<i>Number</i>	----- mg/kg -----						
Mineral layer 1 (0–10 cm):								
Aspen	1	14.25	0.19	0.52	—	0.34	0.07	—
Bigleaf maple	2	23.34	0.33	0.01	—	0.08	0.03	0.04
California black oak	1	22.04	—	—	—	—	0.01	—
Canyon live oak	1	18.06	—	—	—	0.01	0.12	—
Douglas-fir	74	42.68	3.36	0.14	—	1.03	0.04	0.06
Engelmann spruce	1	30.25	—	—	—	0.45	0.03	—
Giant chinquapin	1	120.80	—	0.32	—	2.23	0.11	0.93
Grand fir	7	25.48	0.30	0.05	—	0.18	0.03	—
Lodgepole pine	17	25.85	0.23	0.03	—	0.45	0.04	0.13
Mountain brush woodland	2	8.09	—	0.27	—	0.03	0.02	0.03
Mountain hemlock	3	15.04	1.80	0.08	—	0.30	—	—
Noble fir	3	31.51	0.13	—	—	0.13	0.03	0.01
Nonstocked	5	15.90	0.18	0.10	—	0.03	0.05	0.10
Oregon white oak	3	8.40	—	0.18	—	—	0.06	0.12
Other hardwoods	2	12.91	50.95	0.28	—	0.61	0.09	0.58
Pacific madrone	2	7.50	—	—	—	0.02	0.06	—
Ponderosa pine	35	29.15	0.67	0.04	—	0.26	0.05	0.08
Red alder	10	33.29	8.59	0.03	—	1.54	0.05	0.08
Sitka spruce	2	1.58	68.39	0.38	—	0.59	0.09	—
Subalpine fir	4	9.23	0.82	0.05	—	0.08	0.04	0.17
Sugar pine	1	284.60	—	0.14	—	0.67	0.10	—
Tanoak	4	44.84	2.29	0.50	—	1.14	0.03	0.08
Western hemlock	5	75.29	7.28	0.16	—	3.99	0.04	0.32
Western juniper	23	7.81	0.73	0.17	—	0.04	0.05	0.06
Western larch	1	48.53	—	—	—	0.78	0.04	—
Western white pine	1	33.94	—	—	—	1.47	0.06	0.34
White fir	10	22.04	0.11	0.02	—	0.48	0.08	0.04
Mineral layer 2 (10–20 cm):								
Aspen	1	8.65	—	—	—	—	0.04	—
Bigleaf maple	2	32.88	0.92	0.06	—	0.58	0.02	0.19
California black oak	1	12.30	—	—	—	—	—	—
Canyon live oak	1	23.89	—	—	—	—	—	0.41
Douglas-fir	74	29.15	1.33	0.07	0.04	0.53	0.02	0.19
Engelmann spruce	1	14.39	—	—	—	—	—	0.63
Giant chinquapin	1	45.86	—	0.18	—	2.44	0.03	0.17
Grand fir	7	14.30	—	0.07	0.23	0.09	0.03	0.15
Lodgepole pine	16	12.17	0.24	0.05	—	0.20	0.01	0.33
Mountain brush woodland	2	4.15	—	—	—	—	—	0.01
Mountain hemlock	3	4.96	0.94	0.01	—	0.12	—	0.04
Noble fir	3	23.68	0.14	—	—	0.14	—	0.16
Nonstocked	5	11.02	—	0.10	0.06	0.16	0.04	0.29
Oregon white oak	2	18.03	—	—	—	1.37	0.02	—
Other hardwoods	2	7.67	5.11	0.08	—	—	—	0.08
Pacific madrone	2	8.66	—	—	—	—	—	0.33
Ponderosa pine	33	17.01	0.14	0.01	0.01	0.04	0.02	0.12
Red alder	10	24.79	0.18	0.01	—	2.12	0.01	0.33
Sitka spruce	1	1.28	5.69	—	—	—	—	0.85
Subalpine fir	3	6.95	—	0.11	—	0.05	0.01	0.15
Sugar pine	1	93.30	—	0.34	0.09	0.52	—	0.09
Tanoak	3	10.46	1.88	0.01	—	0.06	—	—
Western hemlock	5	44.39	11.33	0.13	—	1.99	—	0.14
Western juniper	17	6.00	0.16	0.08	0.06	0.02	0.03	0.16
Western larch	1	19.35	—	0.13	—	0.05	0.04	0.43
Western white pine	1	4.07	2.25	—	—	0.72	—	1.41
White fir	10	13.35	0.01	0.02	0.04	0.20	0.02	0.02

Note: Data subject to sampling error; — = less than 0.005 mg/kg were estimated.

**Table 41—Compaction, bare soil, and slope properties of forest land, by forest type, Oregon, 2001, 2003–2005**

Forest type	Plots sampled	Plots reporting compaction	Compacted area per plot	Bare soil cover	Slope
	<i>Number</i>		<i>Percent</i>		
Aspen	1	0	0	17.50	26.00
Bigleaf maple	2	1	18.75	3.00	30.50
California black oak	1	0	0	1.00	42.00
Canyon live oak	1	0	0	5.00	65.00
Douglas-fir	69	27	7.58	5.21	33.37
Engelmann spruce	2	2	17.08	5.29	28.00
Giant chinquapin	1	0	0	10.00	33.00
Grand fir	7	3	5.29	4.10	25.43
Lodgepole pine	18	7	4.93	17.44	9.31
Mountain brush woodland	2	1	2.63	9.50	40.50
Mountain hemlock	4	1	10.00	13.25	9.50
Noble fir	2	1	14.38	10.75	23.00
Oregon white oak	4	1	18.75	4.94	31.25
Pacific madrone	2	0	0	2.50	48.00
Ponderosa pine	36	10	1.62	6.78	17.94
Red alder	9	3	12.59	17.89	35.11
Sitka spruce	1	0	0	1.00	0
Subalpine fir	4	1	0.31	6.71	48.75
Sugar pine	1	0	0	4.00	2.00
Tanoak	5	3	6.25	15.77	54.00
Western hemlock	5	3	27.33	11.68	50.20
Western juniper	34	11	1.68	26.65	16.52
Western larch	1	0	0	0.50	0
Western white pine	1	0	0	2.33	19.00
White fir	10	3	6	13.44	16.44
Other hardwoods	1	0	0	5.00	35.00
Nonstocked	10	2	0.63	26.15	14.50

Note: Data subject to sampling error.

**Table 42—Mean cover of understory vegetation on forest land, by forest type group and life form, Oregon, 2001–2005**

Forest type class <sup>a</sup> and age class	Seedlings and saplings		Shrubs		Forbs		Graminoids		All understory plants		Bare soil	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	<i>Percent</i>											
Douglas-fir	4.4	0.2	36.9	0.8	18.9	0.6	4.8	0.3	58.6	0.8	2.5	0.2
Fir/spruce/mountain hemlock	7.2	0.4	20.9	1.0	14.3	0.9	7.8	0.6	44.8	1.3	4.3	0.4
Hemlock/Sitka spruce	4.2	0.6	29.6	1.9	21.9	1.7	0.7	0.2	50.3	2.3	1.1	0.2
Lodgepole pine	8.5	0.7	15.6	1.2	5.0	0.6	9.2	0.8	35.3	1.6	11.4	1.0
Other western softwoods	1.4	0.1	11.2	0.7	4.7	0.4	20.1	1.1	35.3	1.3	18.1	1.1
Pinyon/juniper	1.0	1.0	9.0	9.0	1.0	1.0	1.0	1.0	12.0	12.0	15.0	15.0
Ponderosa pine	2.9	0.2	13.5	0.6	8.3	0.5	18.3	0.7	40.1	1.0	6.5	0.4
Western larch	7.7	1.5	26.0	3.9	15.0	2.8	19.1	3.2	61.5	4.6	5.4	2.1
Western white pine	3.7	2.1	27.9	13.1	14.3	4.1	20.8	14.3	65.6	13.5	13.5	7.6
Total	4.5	0.1	24.6	0.5	13.3	0.3	10.2	0.3	47.8	0.5	6.2	0.2
Hardwoods:												
Alder/maple	2.5	0.3	43.1	2.0	33.8	1.9	6.6	0.9	73.2	1.8	1.9	0.3
Aspen/birch	11.0	3.1	23.9	7.0	28.2	8.6	16.9	4.4	63.6	9.5	2.2	0.9
Elm/ash/cottonwood	1.9	0.6	52.0	7.2	9.6	2.8	25.5	8.7	81.5	4.3	3.0	1.5
Other western hardwoods	5.7	0.7	27.4	2.9	9.3	1.4	12.0	1.8	50.6	3.4	3.4	0.7
Tanoak/laurel	11.3	1.9	26.8	3.1	13.5	2.5	1.5	0.9	49.5	3.7	5.6	1.4
Western oak	5.8	0.9	23.0	2.3	8.3	1.1	26.6	2.8	57.7	2.9	4.5	1.1
Total	5.5	0.5	32.8	1.3	19.4	1.1	11.9	1.0	61.6	1.4	3.4	0.4
Nonstocked	1.2	0.2	16.6	2.5	12.5	1.7	19.3	2.5	46.9	3.3	13.4	1.7
All forest type groups	4.5	0.1	25.3	0.4	14.0	0.3	10.6	0.3	49.4	0.5	6.0	0.2

Note: Data subject to sampling error; SE = standard error.

**Table 43—Mean cover of understory vegetation on forest land, by forest type class, age class, and life form, Oregon, 2001–2005**

Forest type class <sup>a</sup> and age class	Seedlings and saplings		Shrubs		Forbs		Graminoids		All understory plants		Bare soil	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
<i>Percent</i>												
Dry conifer:												
0–19	9.8	1.7	14.9	1.9	9.0	1.4	18.1	2.1	46.9	3.0	12.7	1.9
20–39	6.3	1.0	25.0	2.6	7.1	1.4	12.6	1.9	45.5	3.2	10.3	1.6
40–79	3.9	0.3	14.2	0.9	5.7	0.4	14.0	0.9	35.4	1.3	8.1	0.7
80–159	3.9	0.3	12.7	0.8	9.2	0.7	17.1	0.9	39.9	1.4	6.0	0.5
160+	3.9	0.5	15.1	2.3	7.3	1.2	19.9	2.6	44.0	3.0	8.9	1.6
All ages	4.6	0.3	14.5	0.6	7.6	0.4	15.9	0.6	39.6	0.9	7.9	0.4
Wet conifer:												
0–19	4.7	0.4	33.1	1.5	18.4	1.0	9.4	1.0	59.2	1.7	6.0	0.7
20–39	3.3	0.4	36.2	1.4	17.6	1.0	4.0	0.6	55.4	1.5	3.1	0.5
40–79	3.1	0.2	25.5	1.0	15.6	0.8	10.2	0.7	50.0	1.2	7.0	0.6
80–159	4.6	0.3	24.7	1.0	15.0	0.7	10.4	0.6	48.7	1.1	5.6	0.5
160+	6.3	0.4	28.3	1.4	12.2	0.9	4.0	0.5	46.2	1.5	6.1	0.8
All ages	4.3	0.1	28.2	0.6	15.5	0.4	8.3	0.3	51.0	0.6	5.8	0.3
Dry hardwood:												
0–19	12.2	2.6	28.9	5.9	7.0	1.7	3.5	2.1	48.1	6.4	12.2	3.9
20–39	10.8	3.6	36.2	4.6	17.4	3.9	6.8	2.7	64.1	5.2	2.1	0.6
40–79	6.6	0.9	26.1	2.4	9.6	1.4	15.5	2.1	53.7	2.8	2.5	0.5
80–159	5.0	0.9	18.7	2.4	9.8	1.7	22.0	3.1	50.3	3.6	4.4	0.9
160+	7.6	1.8	26.5	7.1	6.6	2.1	11.3	7.5	49.5	10.0	7.0	2.7
All ages	7.4	0.7	25.5	1.6	10.1	0.9	14.6	1.5	53.1	1.9	4.5	0.6
Wet hardwood:												
0–19	5.9	1.1	46.7	3.8	22.9	3.1	12.5	2.5	76.4	2.8	1.7	0.5
20–39	1.9	0.4	37.2	3.1	36.2	3.1	6.5	1.5	69.9	3.0	1.7	0.4
40–79	1.8	0.6	46.5	3.4	36.9	3.4	5.5	1.5	76.5	2.8	1.5	0.4
80–159	3.1	0.9	42.1	7.6	29.2	7.2	17.1	5.6	72.8	5.7	3.3	1.3
160+	0.7	0.5	36.9	12.4	18.7	5.9	1.4	1.0	56.9	14.1	7.1	5.7
All ages	2.8	0.4	42.8	1.9	32.1	1.8	8.2	1.1	73.3	1.7	2.0	0.3
All forest type classes:												
0–19	6.2	0.5	31.1	1.3	16.5	0.8	10.7	0.8	58.1	1.4	7.1	0.6
20–39	4.0	0.4	34.7	1.2	18.3	0.9	5.8	0.6	56.2	1.2	4.0	0.4
40–79	3.6	0.2	23.3	0.7	13.3	0.6	11.5	0.5	47.4	0.9	6.6	0.4
80–159	4.4	0.2	20.6	0.7	13.0	0.5	13.3	0.5	46.2	0.9	5.7	0.3
160+	5.9	0.4	26.4	1.2	11.4	0.8	6.6	0.7	46.1	1.3	6.6	0.7
All ages	4.5	0.1	25.3	0.4	14.0	0.3	10.6	0.3	49.4	0.5	6.0	0.2

Note: Data subject to sampling error; SE = standard error.

<sup>a</sup> Dry conifer includes the pinyon/juniper, ponderosa, western white, and lodgepole pines; and western larch forest type groups. Wet conifer includes the Douglas-fir, fir/spruce/mountain hemlock, hemlock/Sitka spruce, other softwoods, and nonstocked forest type groups. Dry hardwood includes the western oak, tanoak/laurel, and other hardwoods forest type groups. Wet hardwood includes the elm/ash/cottonwood, aspen/birch, and alder/maple forest type groups.

**Table 44—Estimated number of live trees with damage on forest land, by species and type of damage, Oregon, 2001–2005**

Species	Total number of live trees <sup>a</sup>		Number of live trees with damage <sup>b</sup>		Type of damage												
	Total	SE	Total	SE	Animal	Bark beetles	Cankers	Defoliators	Dwarf mistletoe	Leafy mistletoe	Foliage diseases	Stem decay	Other insects	Physical damage or defect	Root disease	Weather	
<i>Thousand trees</i>																	
Softwoods:																	
Alaska yellow-cedar	1,800	1,734	782	855	—	—	—	—	—	—	—	10	—	772	—	—	
California red fir	6,800	4,211	1,718	1,079	—	—	764	—	34	—	—	34	—	379	1,193	—	
Douglas-fir	2,429,262	86,200	362,948	19,066	8,800	5,955	28,331	10,106	36,622	—	15,705	11,289	1,828	219,337	60,112	4,942	
Engelmann spruce	59,411	12,378	19,063	4,723	—	403	1,135	140	889	—	196	32	2,024	12,165	2,860	263	
Grand fir	510,780	48,328	158,870	22,841	2,993	6,174	6,215	20,747	4,327	—	6,016	1,732	4,075	93,932	36,519	3,863	
Incense-cedar	136,465	19,829	11,667	2,829	—	—	156	78	—	22	—	865	—	10,663	277	1,366	
Jeffrey pine	11,384	6,172	183	114	—	—	—	—	—	—	—	—	—	183	—	—	
Knobcone pine	1,066	640	920	631	—	—	457	—	291	—	—	—	—	920	—	—	
Lodgepole pine	1,334,313	126,641	812,234	82,882	6,874	26,828	276,888	2,192	364,304	—	1,377	1,372	4,076	324,146	41,634	19,864	
Mountain hemlock	295,997	41,385	108,617	20,689	274	145	1,024	1,091	26,970	—	124	1,175	124	32,409	55,028	11,650	
Noble fir	42,396	10,078	7,627	2,295	74	—	1,000	575	862	—	—	66	—	3,999	1,485	—	
Pacific silver fir	301,023	45,475	106,476	20,973	64	405	6,565	1,670	16,004	—	927	1,388	739	43,347	38,257	10,661	
Pacific yew	29,684	8,229	5,636	2,035	—	—	73	—	—	—	—	582	—	5,111	—	—	
Ponderosa pine	1,028,476	61,472	333,004	28,754	15,498	21,930	34,887	11,521	89,676	—	3,489	715	676	193,238	18,605	894	
Port-Orford-cedar	30,680	11,898	7,207	4,742	480	—	73	—	—	—	—	169	—	6,142	4,310	—	
Redwood	29,960	31,978	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Shasta red fir	80,533	21,992	17,275	4,714	—	617	952	—	24	—	1,264	337	—	7,731	5,885	3,440	
Sitka spruce	34,449	7,113	5,496	1,484	168	—	310	219	—	—	70	84	446	3,820	827	—	
Subalpine fir	157,149	28,965	78,422	18,058	261	275	3,479	1,208	2,778	—	570	647	1,972	60,410	16,043	5,421	
Sugar pine	17,563	4,162	1,518	326	—	192	262	—	—	—	15	245	—	1,022	13	—	
Western hemlock	708,823	66,512	147,143	16,358	5,132	745	3,166	213	50,837	—	10	3,255	107	72,112	33,096	4,541	
Western juniper	239,580	19,595	57,365	9,162	2,094	—	231	319	—	1,000	34,281	5,009	—	20,207	—	528	
Western larch	69,127	13,127	21,305	4,643	885	377	87	309	6,408	—	—	109	74	14,727	1,461	300	
Western redcedar	134,546	19,491	28,914	6,673	278	—	11	—	11	—	—	2,361	68	22,835	4,514	221	
Western white pine	45,590	11,402	16,575	5,473	67	151	7,441	—	—	—	—	278	—	8,642	4,127	915	
White fir	444,518	53,944	116,673	15,336	141	2,383	8,387	5,623	12,123	—	67	2,305	129	55,230	38,687	10,290	
Whitebark pine	33,249	11,424	18,681	7,397	1,261	83	312	—	—	—	67	166	—	10,601	14	8,969	



**Table 44—Estimated number of live trees with damage on forest land, by species and type of damage, Oregon, 2001–2005 (continued)**

Species	Total number of live trees <sup>a</sup>		Number of live trees with damage <sup>b</sup>		Type of damage											
	Total	SE	Total	SE	Animal	Bark beetles	Cankers	Defoliators	Dwarf mistletoe	Leafy mistletoe	Foliage diseases	Stem decay	Other insects	Physical damage or defect	Root disease	Weather
<i>Thousand trees</i>																
Hardwoods:																
Bigleaf maple	183,883	36,787	17,217	3,588	18	—	73	—	—	—	—	2,878	—	14,476	74	—
Bitter cherry	25,150	7,903	2,394	1,482	—	1,064	—	—	—	—	—	74	—	1,257	90	—
Black cottonwood	3,814	1,537	589	375	24	—	—	—	—	—	—	—	—	565	—	—
California black oak	34,646	8,179	14,979	4,345	—	—	72	1,175	—	—	—	1,011	—	13,163	—	—
California-laurel	48,978	16,326	8,975	2,868	135	—	1,442	—	—	—	—	2,348	—	6,514	—	—
Canyon live oak	94,048	21,618	29,900	11,365	—	—	5,421	—	—	—	—	1,911	—	25,668	—	73
Cherry and plum spp.	23,713	18,145	62	69	—	—	—	—	—	—	—	—	—	62	—	—
Chokecherry	11,567	5,350	1,125	942	—	—	—	—	—	—	—	70	—	1,055	—	—
Curl-leaf mountain mahogany	64,367	15,689	6,656	2,620	351	—	—	—	—	—	—	334	—	5,970	—	—
Golden chinquapin	136,583	24,001	28,751	9,900	163	—	2,726	7,519	—	—	—	1,658	—	17,251	846	73
Holly	490	509	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oregon ash	19,885	6,150	367	179	—	—	—	—	—	—	—	10	—	358	—	—
Oregon crabapple	417	268	269	246	—	—	—	—	—	—	—	90	—	269	—	—
Oregon white oak	141,711	25,790	30,033	6,902	72	—	1,370	403	—	3,041	—	2,473	—	24,093	—	—
Other or unknown tree	361	331	90	83	90	—	—	—	—	—	—	—	—	—	—	—
Pacific dogwood	26,717	7,713	3,500	2,122	—	—	—	—	—	—	—	—	—	3,500	—	—
Pacific madrone	187,337	22,572	52,166	8,423	—	—	892	—	—	—	621	3,686	—	48,327	—	—
Quaking aspen	18,814	10,843	6,455	5,822	—	—	5,089	—	—	—	—	143	—	1,366	—	—
Red alder	349,573	30,323	35,884	6,104	5,286	204	1,245	287	—	—	140	3,422	70	24,962	829	148
Rocky Mountain maple	112,078	49,679	4,061	2,288	218	—	—	—	—	—	—	—	—	4,061	—	—
Tanoak	312,203	56,823	60,400	17,769	1,198	—	162	—	—	—	—	3,305	—	58,640	—	145
White alder	9,507	6,238	63	70	—	—	—	—	—	—	—	—	—	63	—	—
Willow spp.	230	169	75	75	—	—	—	—	—	—	—	—	—	75	—	—
Total, all species	10,020,699	238,064	2,750,332	107,694	52,897	67,933	395,277	70,815	612,159	4,063	64,939	57,635	16,408	1,475,776	366,785	88,567

Note: Data subject to sampling error; SE = standard error; — = less than 500 trees were estimated.

<sup>a</sup> Includes live trees  $\geq 1$  inch diameter at breast height.

<sup>b</sup> Number of live trees  $\geq 1$  inch diameter at breast height with one or more types of damage recorded.

**Table 45—Estimated area of forest land with more than 25 percent of the tree basal area damaged, by forest type and type of damage, Oregon, 2001–2005**

Species	Total forest land		Forest land with damage <sup>a</sup>		Type of damage										Weather	
	Total	SE	Total	SE	Animal	Bark beetles		Defoliators	Dwarf mistletoe	Leafy mistletoe	Foliage diseases	Stem decay	Other insects	Physical damage or defect		Root disease
						Cankers	Bark beetles									
<i>Thousand acres</i>																
Softwoods:																
Douglas-fir	10,363	245	3,806	186	22	57	51	46	466	—	117	198	—	2,247	481	19
Engelmann spruce/subalpine fir	151	42	96	34	—	—	—	—	—	—	—	—	—	85	11	—
Engelmann spruce	124	37	70	28	—	—	—	—	—	—	—	—	—	40	34	—
Fir/spruce/mountain hemlock	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Grand fir	1,096	106	859	95	—	59	—	45	43	—	12	15	15	619	151	3
Incense-cedar	84	30	50	24	—	11	—	—	—	—	—	—	—	39	—	15
Jeffrey pine	29	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Juniper woodland	3	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lodgepole pine	2,039	143	1,736	132	11	107	732	—	760	—	—	19	—	1,037	77	—
Misc. western softwoods	9	5	3	2	—	—	—	—	2	—	—	—	—	3	—	—
Mountain hemlock	578	81	398	67	—	—	—	10	99	—	—	5	—	162	191	1
Noble fir	141	40	60	27	—	—	—	11	17	—	—	—	—	11	—	—
Pacific silver fir	320	61	250	54	—	—	—	—	62	—	—	—	—	137	66	—
Ponderosa pine	5,095	200	3,193	172	101	159	114	64	782	—	40	6	11	2,101	171	—
Port-Orford-cedar	18	7	3	3	—	—	—	—	—	—	—	—	—	3	—	—
Red fir	229	51	132	38	—	—	—	—	23	—	—	—	—	75	33	—
Sitka spruce	87	33	32	19	—	—	—	—	—	—	—	—	—	8	24	—
Subalpine fir	144	39	107	33	—	—	—	—	—	—	—	7	—	96	18	22
Sugar pine	47	24	47	24	—	—	—	—	—	—	—	—	—	11	—	—
Western hemlock	836	94	484	72	—	—	—	—	150	—	—	13	—	279	63	—
Western juniper	3,170	174	1,306	118	37	18	12	12	—	6	342	222	—	816	—	14
Western larch	218	49	162	43	—	—	—	—	77	—	—	—	—	94	—	—
Western redcedar	132	38	80	30	8	3	—	—	20	—	—	—	—	69	—	—
Western white pine	52	26	40	23	—	—	—	—	—	—	—	9	—	40	17	—
White fir	1,175	113	824	96	9	18	11	27	106	—	—	37	—	405	164	8
Whitebark pine	50	25	28	18	—	—	—	—	—	—	—	—	—	14	—	14

**Table 45—Estimated area of forest land with more than 25 percent of the tree basal area damaged, by forest type and type of damage, Oregon, 2001–2005 (continued)**

Species	Total forest land		Forest land with damage <sup>a</sup>		Type of damage												
	Total	SE	Total	SE	Animal	Bark beetles	Cankers	Defoliators	Dwarf mistletoe	Leafy mistletoe	Foliage diseases	Stem decay	Other insects	Physical damage or defect	Root disease	Weather	
<i>Thousand acres</i>																	
Hardwoods:																	
Aspen	69	27	49	23	—	—	26	—	—	—	—	—	—	—	23	—	—
Bigleaf maple	268	53	63	22	—	—	—	—	—	—	12	27	—	—	44	—	—
California black oak	103	35	33	19	—	—	11	—	—	—	—	11	—	—	22	—	—
California laurel	96	34	49	25	—	—	—	—	—	—	—	—	—	—	34	—	—
Canyon live oak	142	38	99	33	—	—	11	—	11	—	—	4	—	—	69	—	—
Cottonwood	36	18	8	8	—	—	—	—	—	—	—	—	—	—	—	—	—
Cottonwood / willow	26	17	13	11	—	—	—	—	—	—	—	—	—	—	13	—	—
Giant chinquapin	134	38	72	28	—	—	11	—	—	—	—	9	—	—	52	—	—
Intermountain maple	69	28	24	17	—	—	—	—	—	—	—	—	—	—	15	—	—
Mountain brush woodland	144	40	27	17	—	—	—	—	—	—	12	—	—	—	15	—	—
Oregon ash	30	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oregon white oak	549	78	316	60	—	—	8	—	—	—	—	14	—	—	220	—	—
Other hardwoods	126	37	66	27	9	—	9	—	—	—	—	—	—	—	58	—	—
Pacific madrone	306	59	153	42	—	—	—	—	—	—	—	9	—	—	142	—	—
Red alder	1,073	101	258	52	6	7	—	—	32	—	—	21	—	—	192	8	—
Tanoak	367	64	152	41	—	13	—	—	—	—	—	15	—	—	139	—	—
Willow	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nonstocked	745	88	174	43	13	11	13	7	31	—	—	—	—	—	—	—	—
Total	30,473	233	15,321	296	217	462	1,055	222	2,681	21	535	641	33	9,553	1,522	96	96

Note: Data subject to sampling error; SE = standard error; — less than 500 acres were estimated.

<sup>a</sup> Acres of forest land with >25 percent of tree basal area with recorded damage.

**Table 46—Estimated gross volume of live trees with damage on forest land, by species and type of damage, Oregon, 2001–2005**

Species	Total gross volume of live trees <sup>a</sup>		Gross volume of trees with damage <sup>a</sup>		Type of damage												
	Total	SE	Total	SE	Bark Animal	beetles	Cankers	Defoliators	Dwarf mistletoe	Leafy mistletoe	Foliage diseases	Stem decay	Other insects	Physical damage or defect	Root disease	Weather	
<i>Softwoods:</i>																	
Alaska yellow-cedar	7,610	8,520	1,755	1,965	—	—	—	—	—	—	—	1,755	—	—	—	—	—
California red fir	235,400	95,297	108,183	60,242	—	—	28,060	—	13,932	—	—	7,940	—	34,415	57,961	—	—
Douglas-fir	52,889,618	1,659,621	14,483,068	723,053	133,766	269,039	443,183	119,425	1,316,573	—	229,021	2,510,568	30,909	8,445,750	2,837,121	122,721	—
Engelmann spruce	739,481	128,962	190,226	41,625	—	8,239	3,470	9,108	2,540	—	4,631	5,210	611	114,301	57,624	14,156	—
Grand fir	3,911,120	309,162	1,755,372	170,719	4,068	111,356	16,016	143,738	94,456	—	28,437	178,623	23,456	1,149,697	280,441	103,504	—
Incense-cedar	909,076	115,679	307,311	54,131	—	—	5,207	3,167	—	7,894	—	78,891	—	245,266	6,035	157	—
Jeffrey pine	34,168	16,904	3,907	2,801	—	—	—	—	—	—	—	—	—	3,907	—	—	—
Knobcone pine	9,678	6,305	8,700	6,264	—	—	5,821	—	1,187	—	—	—	—	8,700	—	—	—
Lodgepole pine	2,844,611	218,179	1,898,030	151,183	20,203	197,941	658,133	13,212	690,635	—	1,440	23,645	6,422	900,530	163,782	17,780	—
Mountain hemlock	3,058,152	411,403	1,205,664	207,466	10,535	4,604	40,265	8,078	241,141	—	355	115,464	13,568	599,904	499,192	14,118	—
Noble fir	863,850	179,370	250,837	59,315	89	—	8,086	8,598	55,197	—	—	34,798	—	103,648	82,665	—	—
Pacific silver fir	2,234,347	449,394	908,246	169,044	2,360	3,257	43,130	33,786	159,901	—	5,250	34,201	3,575	497,940	239,919	22,183	—
Pacific yew	32,214	9,559	11,845	4,413	—	—	398	—	—	—	—	3,101	—	9,581	—	—	—
Ponderosa pine	9,479,821	410,884	3,913,506	222,414	162,606	324,791	130,494	88,136	740,093	—	80,382	91,919	8,519	2,809,483	276,426	19,313	—
Port-Orford-cedar	198,553	70,273	105,017	48,615	3,543	—	1,179	—	—	—	—	8,876	—	98,861	8,510	—	—
Redwood	1,353	1,444	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Shasta red fir	983,595	229,170	362,496	105,097	—	11,179	20,765	—	4,143	—	—	53,740	—	212,375	122,041	16,864	—
Sitka spruce	1,056,493	328,683	158,168	57,640	258	—	2,797	2,833	—	—	81	5,292	1,406	109,897	38,002	—	—
Subalpine fir	409,692	67,943	219,684	42,240	2,035	887	2,035	23,189	13,842	—	3,780	11,786	1,906	156,308	37,668	20,588	—
Sugar pine	820,710	136,537	311,118	65,400	—	27,553	34,245	—	—	—	9,449	65,124	—	236,069	5,780	—	—
Western hemlock	8,222,009	607,452	3,258,346	313,218	71,660	19,944	58,149	5,656	1,225,097	—	3,549	315,058	17,473	1,847,606	552,460	55,097	—
Western juniper	724,687	56,623	258,416	28,578	5,576	—	2,490	3,955	—	6,083	70,978	47,482	—	148,429	—	8,254	—
Western larch	775,636	98,420	403,470	63,578	157	21,599	5,131	15,566	235,146	—	—	9,027	59	193,593	21,383	10,616	—
Western redcedar	2,069,135	252,634	914,963	145,170	24,577	—	3,208	—	2,542	—	—	238,295	1,137	754,111	41,645	9,923	—
Western white pine	477,088	102,776	246,801	63,078	67	4,932	72,788	—	—	—	—	15,202	—	156,152	71,978	4,040	—
White fir	3,995,624	439,427	1,783,157	222,736	212	50,196	91,151	36,065	306,842	—	121	274,854	468	920,323	436,644	68,720	—
Whitebark pine	56,300	18,058	29,044	9,438	2,639	66	2,165	—	—	—	269	263	—	22,089	2,489	3,008	—

*Thousand cubic feet*

Table 46—Estimated gross volume of live trees with damage on forest land, by species and type of damage, Oregon, 2001–2005 (continued)

Species	Total gross volume of live trees <sup>a</sup>		Gross volume of trees with damage <sup>a</sup>		Type of damage												
	Total	SE	Total	SE	Animal beetles	Bark beetles	Cankers	Defoliators	Dwarf mistletoe	Leafy mistletoe	Foliage diseases	Stem decay	Other insects	Physical damage or defect	Root disease	Weather	
<i>Thousand cubic feet</i>																	
Hardwoods:																	
Bigleaf maple	1,454,575	146,175	319,428	48,646	11,789	—	2,222	—	—	—	—	84,029	—	247,344	896	—	—
Bitter cherry	31,324	8,759	4,039	2,584	—	281	—	—	—	—	—	2,486	—	1,272	376	—	—
Black cottonwood	121,729	47,711	20,364	11,862	6,955	—	—	—	—	—	—	—	—	13,409	—	—	—
California black oak	236,021	45,121	112,251	28,354	—	—	4,016	3,035	—	—	—	37,418	—	86,382	—	—	—
California-laurel	158,087	59,485	80,269	35,668	770	—	1,320	—	—	—	—	25,972	—	56,139	—	—	—
Canyon live oak	189,425	44,045	86,319	30,051	—	—	—	—	—	—	—	23,900	—	75,727	—	249	—
Cherry and plum spp.	11,486	5,622	373	414	—	—	—	—	—	—	—	304	—	373	—	—	—
Chokecherry	5,925	3,271	527	399	—	—	—	—	—	—	—	—	—	223	—	—	—
Curly-leaf mountain mahogany	79,474	21,683	11,495	3,672	720	—	—	—	—	—	—	1,150	—	9,625	—	—	—
Giant chinquapin, golden chinquapin	331,690	60,324	105,916	26,035	590	—	1,590	1,243	—	—	—	24,439	—	81,961	—	—	204
Holly	1,912	1,985	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oregon ash	88,189	36,360	15,869	10,609	—	—	—	—	—	—	—	1,989	—	13,879	—	—	—
Oregon crabapple	4,912	3,931	4,253	3,891	—	—	—	—	—	—	—	2,326	—	4,253	—	—	—
Oregon white oak	594,498	112,210	195,345	49,345	2,984	—	3,514	1,154	—	20,541	—	52,705	—	130,979	—	—	—
Other or unknown tree	1,808	1,658	561	515	561	—	—	—	—	—	—	—	—	—	—	—	—
Pacific dogwood	5,213	1,840	2,606	1,441	—	—	—	—	—	—	—	—	—	2,606	—	—	—
Pacific madrone	1,048,684	118,483	467,730	72,377	—	—	14,095	—	—	—	2,551	76,757	—	411,570	—	—	—
Quaking aspen	49,712	26,514	9,915	5,160	—	—	7,176	—	—	—	—	212	—	2,740	—	—	—
Red alder	2,998,555	251,863	362,762	49,816	4,016	16,398	2,636	3,662	—	—	1,245	55,955	233	285,573	9,795	1,282	—
Rocky Mountain maple	17,542	6,300	2,028	1,806	1,752	—	—	—	—	—	—	—	—	2,028	—	—	—
Tanoak	496,842	97,167	187,583	46,510	454	—	3,766	—	—	—	—	50,959	—	153,611	—	—	210
White alder	25,393	10,559	416	464	—	—	—	—	—	—	—	—	—	416	—	—	—
Willow spp.	1,596	1,338	145	145	—	—	—	—	—	—	—	—	—	145	—	—	—
Total	104,994,613	2,055,041	35,087,522	1,008,593	474,941	1,072,265	1,718,703	523,604	5,103,267	34,518	441,536	4,571,714	109,742	21,359,189	5,850,834	512,987	—

Note: Data subject to sampling error; SE = standard error; — less than 500 cubic feet were estimated.

<sup>a</sup> Includes gross volume of live trees  $\geq 5$  inches diameter at breast height.

<sup>b</sup> Includes gross volume of live trees  $\geq 5$  inches diameter at breast height with one or more damages recorded.

**Table 47—Estimated number of live trees with damage, acres of forest land with greater than 25 percent of the basal area damaged, and gross volume of live trees with damage, by geographic region and ownership group, Oregon, 2001–2005**

Geographic region and ownership group	Number of live trees with damage <sup>a</sup>		Acres of forest land with damage <sup>b</sup>		Gross volume of live trees with damage <sup>c</sup>	
	Total	SE	Total	SE	Total	SE
	<i>Thousand trees</i>		<i>Thousand acres</i>		<i>Thousand cubic feet</i>	
Western Oregon:						
Public	704,664	44,904	4,136	155	19,833,352	893,481
Private	289,290	26,048	1,619	121	3,768,367	278,969
Total	993,954	51,651	5,755	194	23,601,719	931,380
Eastern Oregon:						
Public	1,411,721	88,318	7,073	193	9,717,670	378,447
Private	344,657	36,155	2,494	134	1,768,133	129,249
Total	1,756,378	94,845	9,566	229	11,485,803	397,848
Total Oregon:						
Public	2,116,385	98,896	11,208	244	29,551,022	967,266
Private	633,948	44,475	4,113	180	5,536,500	306,941
Total	2,750,332	107,694	15,321	296	35,087,522	1,008,593

Note: Data subject to sampling error; SE = standard error.

<sup>a</sup> Number of live trees  $\geq 1$  inch diameter at breast height.

<sup>b</sup> Number of forest land acres with  $\geq 25$  percent of the basal area damaged.

<sup>c</sup> Gross volume of live trees  $\geq 5$  inches diameter at breast height.

**Table 48—Estimated area of forest land covered by selected nonnative vascular plant species and number of sample plots,<sup>a</sup> by life form and species, Oregon, 2001–2005**

Plant		Area covered		Number of plots
Scientific name	Common name	Total	SE	
<i>Acres</i>				
Shrubs:				
<i>Cytisus scoparius</i>	Scotch broom	18,800	6,800	24
<i>Ilex aquifolium</i>	English holly	500	200	8
<i>Rubus discolor</i>	Himalayan blackberry	148,900	24,500	129
<i>Rubus laciniatus</i>	Cutleaf blackberry	11,800	3,500	34
Forbs:				
<i>Centaurea solstitialis</i>	Yellow star-thistle	100	100	1
<i>Cirsium</i>	Thistle species	26,800	8,400	76
<i>Cirsium arvense</i>	Canada thistle	6,900	3,700	17
<i>Cirsium vulgare</i>	Bull thistle	13,900	4,300	74
<i>Digitalis purpurea</i>	Purple foxglove	10,300	2,100	64
<i>Hypericum perforatum</i>	Common St. Johnswort	6,200	1,700	49
<i>Hypochaeris radicata</i>	Hairy cat's ear	5,800	2,800	11
<i>Leucanthemum vulgare</i>	Oxeye daisy	1,300	600	10
Grasses:				
<i>Aira caryophylla</i>	Silver hairgrass	4,100	2,400	5
<i>Avena fatua</i>	Wild oat	700	600	2
<i>Bromus diandrus</i>	Ripgut brome	300	300	1
<i>Bromus tectorum</i>	Cheatgrass	196,100	21,600	292
<i>Cynosurus echinatus</i>	Bristly dogstail grass	20,100	6,000	29
<i>Dactylis glomerata</i>	Orchardgrass	12,500	3,100	37
<i>Holcus lanatus</i>	Common velvetgrass	22,000	8,200	24
<i>Taeniatherum caput-medusae</i>	Medusahead	18,000	6,700	17

Note: Estimates are likely low for most grasses and some forbs because of short flowering seasons and difficulty of species identification; data subject to sampling error; SE = standard error.

<sup>a</sup> Total number of sample plots was 2,626.

**Table 49—Summary of Forest Inventory and Analysis plots sampled for lichen community, air quality index information, western Pacific Northwest (PNW) and western Oregon, 1998–2001, 2003**

Parameter	Western PNW	Western Oregon	Klamath Mountains	Coast Ranges	Southern Cascades	Western Cascades	Willamette Valley	Eastern Cascades
Number of plots surveyed <sup>a</sup>	243	140	39	38	6	34	15	8
Number of plots by air quality index category: <sup>b</sup>								
Best: -1.4 to -0.11	111	65	18	15	3	22	0	7
Good: -0.11 to 0.02	26	14	3	4	0	3	0	0
Fair: 0.02 to 0.21	40	25	11	9	0	5	4	0
Degraded: 0.21 to 0.35	21	13	3	7	0	1	1	1
Poor: 0.35 to 0.49	13	8	1	2	1	2	2	0
Worst: 0.49 to 2.00	32	15	3	1	2	1	8	0
Air quality score extremes	-1.28 to 1.59	-1.28 to 1.02	-1.28 to 1.02	-0.71 to 0.91	-0.65 to 0.79	-0.77 to 0.97	0 to 0.87	-0.57 to 0.32
Average score on air quality index	-0.06	-0.05	-0.11	-0.03	0.13	-0.23	0.48	-0.33
Standard deviation on air quality index	0.49	0.43	0.43	0.33	0.58	0.38	0.31	0.3

<sup>a</sup> Plot totals do not include quality assurance surveys or plots without lichens present.

<sup>b</sup> Categories are based on the analysis of Geiser and Neitlich (2007).

**Table 50—Summary of Forest Inventory and Analysis plots sampled for lichen community, climate index information, western Pacific Northwest (PNW) and western Oregon, 1998–2001, 2003**

Parameter	Western PNW	Western Oregon	Klamath Mountains	Coast Ranges	Southern Cascades	Western Cascades	Willamette Valley	Eastern Cascades
Number of plots surveyed <sup>a</sup>	243	140	39	38	6	34	15	8
Number of plots by climate index category: <sup>b</sup>								
Maritime (warmest): -1.4 to -0.25	73	32	5	21	0	3	3	0
Lowland: -0.25 to 0.23	54	29	4	10	0	6	9	0
Montane: 0.23 to 0.66	57	38	13	7	3	9	3	3
High elevation (coolest): 0.66 to 1.73	59	41	17	0	3	16	0	5
Climate index extremes	-1.41 to 1.73	-1.21 to 1.73	-1.12 to 1.11	-1.21 to 0.55	0.49 to 1.73	-0.46 to 1.56	-0.48 to 0.32	0.40 To 1.50
Average score on climate index	0.14	0.27	0.46	-0.30	0.88	0.58	-0.08	0.86
Standard deviation on climate index	0.64	0.63	0.54	0.51	0.46	0.49	0.25	0.43

<sup>a</sup> Plot totals do not include quality assurance surveys or plots without lichens present.

<sup>b</sup> Categories are based on the analysis of Geiser and Neitlich (2007).



**Table 51—Ozone injury summary information from ozone biomonitoring plots, by year, Oregon, 2000–2005**

Ozone biomonitoring plots	2000	2001	2002	2003	2004	2005	All years
Number of plots	20	22	34	35	35	35	181
Number of plots with injury	0	0	0	0	0	0	0
Biosite index category <sup>a</sup> (percentage of plots):							
0–4.9 (least injured)	100	100	100	100	100	100	100
5.0–14.9	0	0	0	0	0	0	0
15–24.9	0	0	0	0	0	0	0
≥25 (most injured)	0	0	0	0	0	0	0
Average biosite index score	0	0	0	0	0	0	0
Average number of species per plot	1.7	1.6	2.8	2.8	2.9	2.7	2.6
Number of plants evaluated	964	963	2,746	2,909	2,901	2,845	13,328
Number of plants injured	0	0	0	0	0	0	0
Number of plants evaluated by species:							
Blue elderberry	60	60	53	53	74	67	367
Jeffrey pine	30	0	30	30	30	30	150
Ponderosa pine	351	330	690	690	690	686	3,437
Quaking aspen	90	90	420	420	420	420	1,860
Red alder	132	120	198	221	218	215	1,104
Red elderberry	45	30	90	120	120	120	525
Scouler's willow	46	41	455	505	499	431	1,977
Snowberry	150	180	720	780	760	786	3,376
Thinleaf huckleberry	60	112	90	90	90	90	532
Biosite index category <sup>b</sup> (percentage of forest land):							
0–4.9 (least injured)	100	100	100	100	100	100	100
5.0–14.9	0	0	0	0	0	0	0
15–24.9	0	0	0	0	0	0	0
≥25 (most injured)	0	0	0	0	0	0	0

<sup>a</sup> The biosite index is based on the average injury score (amount × severity) for each species averaged across all species on the plot. Biosite categories represent a relative measure of tree-level response to ambient ozone exposure.

<sup>b</sup> Percentage of forest land is estimated after interpolating the biosite values, 2000–2005, to generate a biological response surface across the landscape.

**Table 52—Total acres of forest land with a forest fire incident, by year and ecosection group, Oregon, 1995–2004**

Year	Ecosection group <sup>a</sup>							
	Total		Coast/ Western Cascades		Southern/Eastern Oregon Cascades		Eastern Oregon	
	Total	SE	Total	SE	Total	SE	Total	SE
	<i>Acres</i>							
1995	122,903	37,731	7,127	7,127	24,750	17,499	91,027	32,678
1996	151,160	42,627	36,799	21,244	12,375	12,375	101,986	34,854
1997	49,268	24,628	—	—	12,375	12,375	36,893	21,297
1998	76,264	29,787	—	—	47,401	23,763	28,863	17,975
1999	116,146	37,182	—	—	37,125	21,430	79,022	30,404
2000	112,498	36,643	12,375	12,375	12,375	12,375	87,748	32,208
2001	131,348	44,028	14,896	14,896	72,205	32,605	44,247	25,602
2002	575,200	106,945	—	—	456,912	95,428	118,288	48,496
2003	219,835	81,206	60,761	42,963	128,323	61,711	30,751	30,751
2004	—	—	—	—	—	—	—	—
Average all years	155,462	16,446	13,196	5,216	80,384	12,525	61,882	9,439

Note: Data subject to sampling error; SE = standard error; — = less than 0.5 acre was estimated.

<sup>a</sup> McNab et al. (2005)

**Table 53—Estimated gross growth of softwood growing-stock volume on timberland, by location and owner, Oregon, 2001–2005**

Location	All owners		National forest		State and local government		Corporate private		Other private	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	<i>Cubic feet/acre/year</i>									
Western Oregon	178.00	8.76	143.05	8.47	219.03	31.95	208.73	14.95	195.86	38.13
Eastern Oregon	50.45	2.16	53.26	2.44	147.21	52.81	39.00	4.85	41.50	6.74
Total Oregon	111.00	4.56	85.83	3.72	211.00	29.15	150.57	10.96	122.11	21.05

**Table 54—Estimated ratio of growth to removal and mortality of softwood growing-stock species on timberland, by owner group and location, Oregon, 2001–2005**

Owner group	Western Oregon		Eastern Oregon		All Oregon	
	Mean	SE	Mean	SE	Mean	SE
National forest	6.19	8.19	2.36	0.63	3.78	1.98
State and local government	8.14	37.19	2.41	4.02	6.89	24.81
Corporate private	1.24	0.22	0.86	0.39	1.20	0.20
Other private	1.32	0.40	4.00	10.15	1.46	0.46
Total all owners	1.95	0.43	2.02	0.51	1.97	0.36

Note: Data subject to sampling error; SE = standard error.

**Table 55—Estimated gross growth, net change, and removals and mortality of softwood growing stock on timberland, by owner and location, Oregon, 2001–2005**

Owner group	Current gross annual growth		Annualized net change		Annualized removal and mortality	
	Total	SE	Total	SE	Total	SE
<i>Thousand cubic feet</i>						
Western Oregon:						
National forest	589,279	43,735	494,111	140,241	95,168	124,115
State and local government	151,515	31,218	132,904	95,568	18,611	84,142
Corporate private	655,613	59,404	127,420	97,904	528,193	88,126
Other private	302,710	57,775	73,107	73,198	229,604	76,835
Total all owners	1,699,117	93,412	827,542	208,901	871,575	189,087
Eastern Oregon:						
National forest	379,724	20,962	218,647	47,450	161,077	41,515
State and local government	12,514	7,132	7,332	9,943	5,182	8,846
Corporate private	59,413	9,485	-9,880	31,515	69,293	32,051
Other private	50,429	9,767	37,834	31,533	12,595	32,423
Total all owners	502,080	25,885	253,933	65,862	248,147	62,281
All Oregon:						
National forest	969,003	44,804	712,758	147,497	256,245	130,782
State and local government	164,029	32,023	140,236	96,084	23,793	84,606
Corporate private	715,026	60,156	117,540	102,852	597,486	93,773
Other private	353,139	58,594	110,941	79,701	242,198	83,395
Total all owners	2,201,197	95,135	1,081,475	218,663	1,119,723	199,020

Note: Data subject to sampling error; SE = standard error.

Table 56—Estimated gross growth, net change, and removals and mortality of softwood growing stock on timberland, by species group and owner, Oregon, 2001–2005

Species group	All owners						National forest					
	Current gross annual growth		Annualized net change		Annualized removal and mortality		Current gross annual growth		Annualized net change		Annualized removal and mortality	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
<i>Thousand cubic feet</i>												
Softwoods:												
Douglas-fir	1,260,268	70,715	595,471	166,986	664,797	151,289	413,717	35,963	384,276	113,451	29,441	102,951
Ponderosa and Jeffrey pines	227,105	16,561	249,441	48,892	-22,336	42,900	165,378	12,893	177,185	40,324	-11,807	34,759
True fir	284,238	50,533	127,653	67,510	156,585	69,557	180,108	18,512	99,646	60,446	80,462	49,280
Western hemlock	245,680	31,173	85,526	64,786	160,154	56,042	85,819	13,892	12,387	34,110	73,432	29,608
Sugar pine	5,891	1,828	-5,668	11,796	11,559	11,314	5,891	1,828	1,152	10,800	4,739	10,270
Western white pine	1,917	647	-19,296	9,820	21,213	9,744	1,821	639	-17,963	9,661	19,784	9,588
Redwood	314	309	30	324	283	226	—	—	-216	216	216	216
Sitka spruce	23,979	8,127	6,133	19,673	17,847	16,691	3,225	1,785	2,111	3,858	1,115	3,909
Engelmann and other spruces	12,067	3,117	13,230	14,271	-1,162	13,784	9,574	2,516	8,058	10,112	1,516	9,321
Western larch	10,379	2,279	1,463	14,397	8,916	13,527	7,263	1,930	-3,525	7,798	10,788	7,084
Incense-cedar	15,624	4,686	-3,204	14,153	18,828	13,073	5,210	2,223	2,877	10,845	2,333	9,742
Lodgepole pine	67,131	6,954	35,312	16,955	31,819	15,718	55,639	6,243	35,998	14,499	19,641	12,864
Western redcedar	27,068	5,347	-2,869	18,060	29,936	16,943	17,204	4,395	6,864	15,239	10,339	13,552
Other western softwoods	19,537	4,471	-1,747	12,398	21,284	10,870	18,154	4,391	3,907	11,628	14,247	9,983
Total	2,201,197	95,135	1,081,475	218,663	1,119,723	199,020	969,003	44,804	712,758	147,497	256,245	130,782
<i>Thousand cubic feet</i>												
Corporate private												
<i>Thousand cubic feet</i>												
Softwoods:												
Douglas-fir	121,675	24,733	86,875	68,679	34,800	61,880	501,600	50,912	46,738	79,626	454,862	73,950
Ponderosa and Jeffrey pines	9,211	6,214	9,490	7,718	-280	3,009	26,267	5,640	18,310	19,760	7,957	19,043
True fir	5,834	3,418	-1,249	6,677	7,083	6,894	25,575	6,899	7,013	23,451	18,562	23,564
Western hemlock	21,849	9,494	41,509	29,971	-19,660	25,559	123,880	25,914	39,252	42,252	84,628	35,981
Sugar pine	—	—	—	—	—	—	—	—	-3,145	3,092	3,145	3,092
Western white pine	—	—	—	—	—	—	—	—	—	—	—	—
Redwood	—	—	—	—	—	—	314	309	246	242	68	67
Sitka spruce	3,339	3,061	7,155	6,573	-3,816	3,514	15,195	7,224	12,820	13,406	2,375	9,704
Engelmann and other spruces	—	—	—	—	—	—	155	155	-1,285	2,417	1,440	2,361
Western larch	349	349	1,156	1,156	-807	807	2,381	1,129	-795	10,931	3,176	10,434
Incense-cedar	161	161	-2,037	2,037	2,198	2,198	7,214	3,576	-1,085	6,881	8,299	5,068
Lodgepole pine	1,610	1,610	-585	585	2,195	2,195	7,114	2,227	6,040	7,075	1,074	6,944
Western redcedar	—	—	-2,079	2,138	2,079	2,138	4,712	2,236	-4,514	7,748	9,225	7,758
Other western softwoods	—	—	—	—	—	—	620	392	-2,056	2,130	2,676	2,081
Total	164,029	32,023	140,236	96,084	23,793	84,606	715,026	60,156	117,540	102,852	597,486	93,773

**Table 56—Estimated gross growth, net change, and removals and mortality of softwood growing stock on timberland, by species group and owner, Oregon, 2001–2005 (continued)**

Species group	Other private					
	Current gross annual growth		Annualized net change		Annualized removal and mortality	
	Total	SE	Total	SE	Total	SE
	<i>Thousand cubic feet</i>					
Softwoods:						
Douglas-fir	223,276	32,606	77,582	63,284	145,694	56,875
Ponderosa and Jeffrey pines	26,249	6,226	44,456	17,776	-18,206	16,144
True fir	72,720	46,447	22,243	17,647	50,478	42,517
Western hemlock	14,133	5,923	-7,622	18,810	21,755	17,678
Sugar pine	—	—	-3,676	3,614	3,676	3,614
Western white pine	96	96	-1,332	1,758	1,429	1,738
Redwood	—	—	—	—	—	—
Sitka spruce	2,219	1,352	-15,953	12,201	18,172	12,512
Engelmann and other spruces	2,338	1,833	6,457	9,776	-4,118	9,877
Western larch	385	273	4,626	5,064	-4,241	4,822
Incense-cedar	3,038	2,092	-2,960	5,585	5,998	6,762
Lodgepole pine	2,767	1,366	-6,142	5,177	8,909	5,343
Western redcedar	5,152	2,085	-3,141	5,446	8,293	6,260
Other western softwoods	763	750	-3,598	3,746	4,360	3,777
<b>Total</b>	<b>353,139</b>	<b>58,594</b>	<b>110,941</b>	<b>79,701</b>	<b>242,198</b>	<b>83,395</b>

Note: Data subject to sampling error; SE = standard error; — = less than 500 cubic feet were estimated.

**Table 57—Total roundwood output by product, species group, and source of material, Oregon, 2003**

<b>Product and species group</b>	<b>Sawtimber</b>	<b>Poletimber</b>	<b>Other sources</b>	<b>All sources</b>
	<i>Thousand cubic feet</i>			
Saw logs:				
Softwoods	659,465	2,445	9,608	671,518
Hardwoods	33,158	123	341	33,622
Total	692,623	2,568	9,950	705,140
Veneer logs:				
Softwoods	197,793	733	2,802	201,342
Hardwoods	14	—	—	14
Total	197,807	733	2,802	201,342
Pulpwood:				
Softwoods	41,497	154	4,020	45,671
Hardwoods	27,419	102	281	27,801
Total	68,915	256	4,301	73,472
Poles and posts:				
Softwoods	1,618	225	46	1,888
Hardwoods	—	—	—	—
Total	1,618	225	46	1,888
Other miscellaneous:				
Softwoods	13,762	51	539	14,352
Hardwoods	—	—	—	—
Total	13,762	51	539	14,352
Total industrial products:				
Softwoods	914,134	3,608	17,015	934,758
Hardwoods	60,591	225	622	61,438
Total	974,725	3,833	17,638	996,195
Fuelwood:				
Softwoods	127	—	55,666	55,793
Hardwoods	327	1	2,772	3,100
Total	455	2	58,437	58,894
All products:				
Softwoods	914,261	3,609	72,681	990,551
Hardwoods	60,918	226	3,394	64,538
Total	975,179	3,835	76,075	1,055,089

Note: Data subject to sampling error; excludes removals from precommercial thinnings; — = less than 500 cubic feet found.

**Table 58—Volume of timber removals by type of removal, source of material, and species group, Oregon, 2003**

Removal type	Growing stock			Other sources			All sources		
	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total
<i>Thousand cubic feet</i>									
Roundwood products:									
Saw logs	661,910	33,281	695,191	9,608	341	9,950	671,518	33,622	705,140
Veneer logs	198,526	14	198,540	2,802	—	2,802	201,328	14	201,342
Pulpwood	41,651	27,520	69,171	4,020	281	4,301	45,671	27,801	73,472
Fuelwood	128	329	456	55,666	2,772	58,437	55,793	3,100	58,894
Posts, poles, and pilings	1,843	—	1,843	46	—	46	1,888	—	1,888
Miscellaneous products	13,813	—	13,813	539	—	539	14,352	—	14,352
Total	917,870	61,144	979,014	72,681	3,394	76,075	990,551	64,538	1,055,089
Logging residues	57,055	3,781	60,835	220,519	20,331	240,850	277,573	24,112	301,685
Total all removals	974,925	64,925	1,039,850	23,725	316,925	1,268,124	1,356,775	—	—

Note: Data subject to sampling error; excludes removals from precommercial thinnings; — = less than 500 cubic feet found.

**Table 59—Estimated area of forest land covered by vascular plant nontimber forest products, by plant group and species, Oregon, 2001–2005**

Plant group and scientific name	Common name	Total	SE
<i>Acres</i>			
Tree seedlings and saplings:			
<i>Abies magnifica</i>	California red fir	2,000	1,000
<i>Abies procera</i>	Noble fir	8,800	2,200
<i>Calocedrus decurrens</i>	Incense-cedar	23,400	2,300
<i>Crataegus</i>	Hawthorn spp.	9,100	4,300
<i>Juniperus occidentalis</i>	Western juniper	45,200	3,100
<i>Pseudotsuga menziesii</i>	Douglas-fir	201,500	11,700
<i>Taxus brevifolia</i>	Pacific yew	13,900	2,700
<i>Thuja plicata</i>	Western redcedar	22,200	2,500
Shrubs:			
<i>Acer circinatum</i>	Vine maple	935,300	54,500
<i>Arctostaphylos</i>	Manzanita spp.	14,500	7,700
<i>Arctostaphylos columbiana</i>	Hairy manzanita	26,200	8,200
<i>Arctostaphylos nevadensis</i>	Pinemat manzanita	89,300	11,700
<i>Arctostaphylos patula</i>	Greenleaf manzanita	108,700	14,900
<i>Arctostaphylos uva-ursi</i>	Kinnikinnick	39,400	10,600
<i>Arctostaphylos viscida</i>	Sticky whiteleaf manzanita	35,700	9,500
<i>Ceanothus velutinus</i>	Snowbrush ceanothus	189,600	23,800
<i>Chimaphila umbellata</i>	Pipsissewa	71,200	6,200
<i>Cytisus scoparius</i>	Scotchbroom	18,800	6,800
<i>Eriodictyon californicum</i>	California yerba santa	400	400
<i>Frangula purshiana</i>	Pursh's buckthorn	75,800	10,500
<i>Gaultheria shallon</i>	Salal	890,800	57,800
<i>Mahonia aquifolium</i>	Oregon grape	11,300	3,000
<i>Mahonia nervosa</i>	Dwarf Oregon grape	546,400	32,600
<i>Mahonia repens</i>	Creeping barberry	31,800	3,400
<i>Oplopanax horridus</i>	Devilsclub	18,100	4,900
<i>Paxistima myrsinites</i>	Oregon boxleaf	26,300	4,600
<i>Ribes</i>	Currant spp.	83,900	6,100
<i>Rosa</i>	Rose spp.	94,500	6,800
<i>Sambucus nigra</i>	European black elderberry	2,400	1,100
<i>Sambucus racemosa</i>	Red elderberry	33,400	7,100
<i>Vaccinium membranaceum</i>	Thinleaf huckleberry	252,300	25,900
<i>Vaccinium ovatum</i>	California huckleberry	185,300	26,600
Herbs:			
<i>Achillea millefolium</i>	Common yarrow	79,800	6,000
<i>Anaphalis margaritacea</i>	Western pearly everlasting	9,400	2,500
<i>Arnica cordifolia</i>	Heartleaf arnica	136,500	12,400
<i>Asarum caudatum</i>	British Columbia wildginger	12,300	2,400
<i>Equisetum</i>	Horsetail spp.	7,500	2,000
<i>Hypericum perforatum</i>	Common St. Johnswort	6,200	1,700
<i>Polystichum munitum</i>	Western swordfern	1,506,600	69,600
<i>Pteridium aquilinum</i>	Western brackenfern	262,700	22,200
<i>Trillium ovatum</i>	Pacific trillium	2,900	500
<i>Urtica dioica</i>	Stinging nettle	8,400	2,600
<i>Xerophyllum tenax</i>	Common beargrass	152,300	19,200

Note: Data subject to sampling error; SE = standard error.



**Table 60—Percentage of forested plots<sup>a</sup> with selected lichen nontimber forest products present, by species, Oregon, 2001–2005**

Scientific name	Common name	Percent
<i>Alectoria sarmentosa</i>	Witch's hair lichen	34.25
<i>Bryoria fremontii</i>	Old man's beard	34.25
<i>Letharia vulpina</i>	Wolf lichen	56.85
<i>Lobaria pulmonaria</i>	Lungwort	16.44
<i>Parmelia saxatilis</i>	Crottle	2.05
<i>Usnea</i>	Beard lichens	56.51
<i>Usnea hirta</i>	Beard lichen	0.34
<i>Vulpicida canadensis</i>	Brown-eyed sunshine lichen	20.21

Note: Data subject to sampling error.

<sup>a</sup> 292 forested plots were sampled.

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