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Washington's Public and Private Forests

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Abstract

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This report summarizes and analyzes 1988-91 timber inventories of western and eastern Washington. These inventories were conducted on all private and public lands except National Forests. Timber resource statistics from National Forest inventories also are presented. Detailed tables provide estimates of forest area, timber volume, growth, mortality, and harvest. Data on change are presented by using comparable statistics from previous inventories, and historical records.

Keywords: Forest surveys, forest inventory, statistics (forest), timber resources, resources (forest), western Washington, eastern Washington, Washington.

Summary

Forests in Washington cover 21 million acres, about half of the land area of the State. About 18 million acres are productive forest-called timberland in this report-of which 16 million acres are nominally available for commodity production. Two million acres are in parks, wilderness, and other reserved areas, and about 3 million acres are classified as "other forest," harsh sites, swampy areas, and oak woodland on the east slopes of the Cascade Range in southern Washington.

The two largest forest ownerships are forest industry and National Forest, each with 29 percent. Farmer and miscellaneous private owners hold 19 percent, other public (mostly State) owners hold 15 percent, and Native Americans hold 8 percent. Ownership patterns and proportions, like the forests themselves, are distinctly different west and east of the Cascade Range. In western Washington, forest industries are the largest land-owning group, whereas in eastern Washington, National Forests are the largest ownership.

Over 85 percent of the State's timberland is occupied by conifers. Douglas-fir is the most extensive forest type in both western and eastern Washington. Hemlock, true firs, ponderosa pine, and several other conifer types make up the balance, whereas hardwoods-mainly red alder, bigleaf maple, and cottonwood-occupy 12 percent of the timberland. Nonstocked areas-mostly recently logged and burned areas-account for less than 3 percent.

Forest industries hold the largest area of the highly productive timberland; 74 percent of the ownership is capable of growing 120 or more cubic feet of wood per acre per year, compared with 39 percent for other private lands, 22 percent for National Forest lands, and 60 percent for other public lands, which are mostly State lands.

Since the mid-1930s physical losses of timberland amounted to more than 2 million acres. In the past 10 years, physical loss of timberland amounted to 279,000 acres (mostly road building and urban expansion). In addition, 92,000 acres were classified as reserved. Ownership changes amount to nearly half a million acres. For the first time in several decades, forest industry area has declined, mainly because of sales to nonindustrial ownerships. Forests on private lands continue to change in character, as older stands of mixed species are replaced with Douglas-fir, and

rotations are shortened. Industry lands are mostly occupied by early seral stands of conifers; currently these lands, although well stocked, support the lowest volume per acre of any ownership group.

Historical data indicate that there were about four times the present volume of timber in Washington in 1869, and about twice the present volume in the mid-1930s. In contrast, timber volume has changed little in the past 10 years for all ownerships combined. Softwood volume on industry lands declined about 16 percent; volume on other ownerships increased. A continuation of the loss of large trees occurred, although at a slackening rate, because most of the old-growth forest is now in National Forests, where timber harvesting has been reduced. In the mid-1930s 54 percent of the old-growth volume in western Washington was in private ownership; in 1992, 5 percent of the old growth was privately owned and most of that was on Native American lands. Douglas-fir has increased considerably, and most other species have decreased or held steady. A notable decrease in the volume of hemlock and Pacific silver fir has occurred.

Forest growth is about equal to average timber harvest across all ownerships statewide. Harvest has exceeded growth on forest industry lands and has been less than growth on all other ownerships. Growth as a percentage of the estimated potential of the land is highest on other public lands. Industry lands, by far the highest in innate productivity, are currently producing less than their potential because most stands are much younger than the age of maximum growth. These lands are well stocked with young conifer trees. If the lands are not sold for real estate development, and the stands are not harvested before they approach growth culmination, future growth and yields on these lands will increase considerably. On other private ownerships and National Forests, timber yields are not necessarily the primary objectives of management. Although the other private ownerships have supplied increasing amounts of timber as National Forests harvests have declined, the rate of forest loss in this ownership casts doubt over its dependability for timber or future greenspace.

Despite drought and insect and disease epidemics, forest mortality over the past 10 years in western Washington was relatively low, on the average no higher than long-term trend-level rates. In the drier forests of eastern Washington, however, mortality was 1.6 to 1.8 times trend-level rates, as vast areas were affected by drought and attendant fire and insect and disease epidemics.

Preface

Forest Inventory and Analysis (FIA) is a nationwide project of the USDA Forest Service authorized by the Forest and Rangeland Renewable Resources Research Act of 1978. Work units, located at Forest Service Research and Experiment Stations, conduct forest resource inventories throughout the 50 States. The Pacific Resources, Inventory, Monitoring, and Evaluation (PRIME) Research, Development and Application Program of the Pacific Northwest Research Station at Portland, Oregon, is responsible for FIA inventories in Alaska, California, Hawaii, Oregon, and Washington.

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Introduction

This report presents forest resource statistics and descriptive text for Washington as developed from inventories conducted by the USDA Forest Service, Pacific Northwest Research Station, and the National Forest System, Pacific Northwest Region. Findings are presented for the entire State and for western and eastern Washington. Where feasible, county-level information is highlighted. Statistics by major owner groups are presented whenever possible; these include National Forests, other public, forest industry, and other private owners. In some cases, owner groups are combined and aggregated data are **shown**; in some instances, statistics are not available for National Forests.

The statistics in this report originally were published in two regional reports, "Timber Resource Statistics for Western Washington" (MacLean and others 1992) and "Timber Resource Statistics for Eastern Washington" (McKay and others **1994**). With minor exception, statistics match those previously published, but for eastern Washington, estimates of sawtimber volume on timberland outside National Forests have been revised **since** the 1994 bulletin **was** published.

The report also identifies change in timberland area and volume, except on National Forests, over an approximate 10-year period based on comparable statistics from the previous inventories. The current inventory **of** western Washington was started in 1988 and completed in 1990; the previous inventory of western Washington was done in 1978 and 1979 (Bassett and Oswald 1981a, 1981b, 1982). The current inventory of eastern Washington was done in 1990 and 1991; the previous inventory in 1980 (Bassett and Oswald 1983).

See "Names of Trees" for scientific nomenclature of all **species** mentioned in this report. See "Terminology" for definitions of terms used.

Forest Area Analysis

Forest Area Classification

Washington has a total land area of 43 million acres, of which 21 million acres (49 percent) are forest (table 6; tables 6 through 39 are in the appendix). Timberland, forest land capable of growing at least 20 cubic feet of industrial wood per acre per year and physically manageable for continuous fiber production, amounts to 18.3 million acres, 88 percent of total forest area. Forest land that is not capable of growing 20 cubic feet of wood, **or** not manageable for continuous fiber production because of steepness, rockiness, or other physical limitations-called "other forest" in this report-makes up the remaining 2.6 million acres (12 percent) (figs.1 and 2).

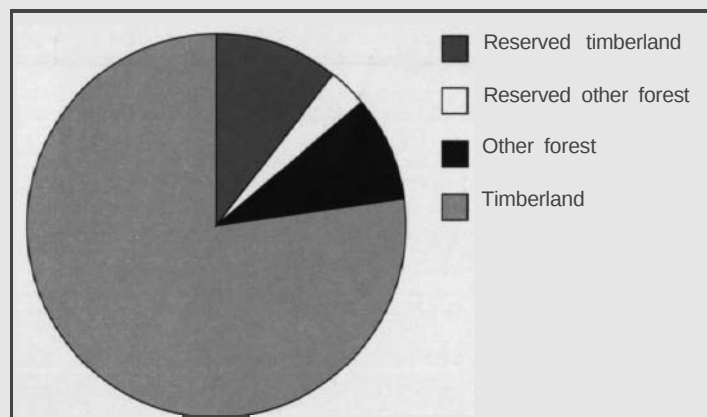


Figure 1-Forest land area in Washington by land class, 1992.



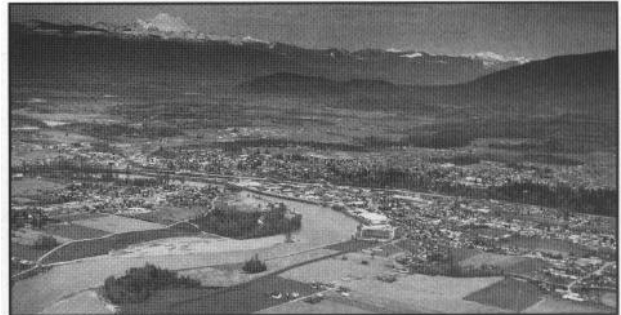
A. North Cascade Range scene. Productive timberland occurs in the valleys and canyon bottoms and on the lower mountain slopes.



B. Timberland that is reserved from timber harvesting and other commodity production, Mount Rainier National Park.



C. Central Washington Cascade Range. Ridgetops are mostly "other forests," of low productivity, that grade into more productive timberland on the lower slopes.



D. Urban-agriculture-forest interface in the Puget Sound lowlands.

Figure 2-Visual images of forest area classification.

Of the 18.3 million acres of timberland, 16.1 million acres are unreserved, nominally available for timber harvesting and other commodity production. The remaining 2.2 million acres of timberland are in reserved areas. Of the 2.6 million acres of other forest, 1.9 million acres are available for commodity production-although productivity for most resources is low-and 717,000 acres are in reserved areas. Reserved areas include wilderness; national, state and county parks; Research Natural Areas; botanical areas; and other areas set aside for their unique features, or for special uses not compatible with most commodity production activities. National Forests contain 1.2 million acres (54 percent) of the reserved timberland, and 208,000 acres (29 percent) of the reserved other forest (table 9, figs. 3 and 4). Much of the National Forest reserved forest is at high elevations and of lower average productivity than unreserved forest. Other public ownerships contain 948,000 acres (43 percent) of the reserved timberland and 501,000 acres (70 percent) of the reserved other forest areas. Examples of other public reserves are Mount Rainier and Olympic National Parks and Deception Pass and Mount Pilchuck State Parks. Private ownerships contain 65,000 acres of reserved timberland (2.9 percent) and 8,000 acres (1.1 percent) of reserved other forest. Most of the privately owned reserved forest is on Native American land-high-elevation forests in eastern Washington consisting of mountain hemlock, true fir, and other upper slope forest types.

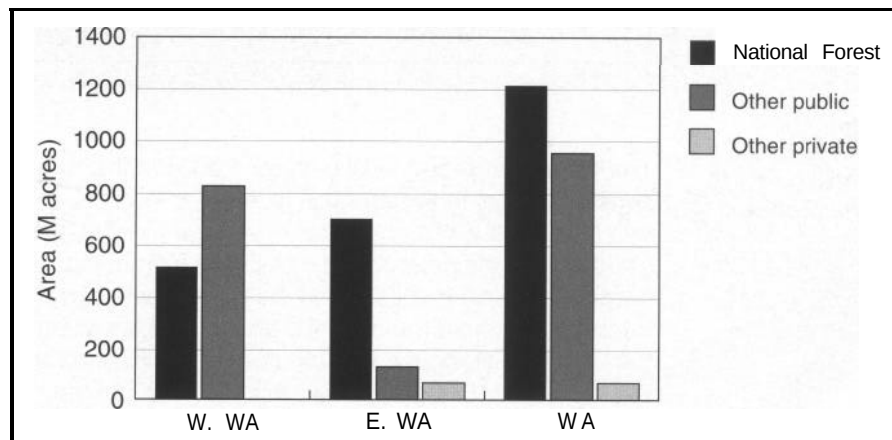


Figure 3-Area of reserved timberland by owner, western and eastern Washington, 1992

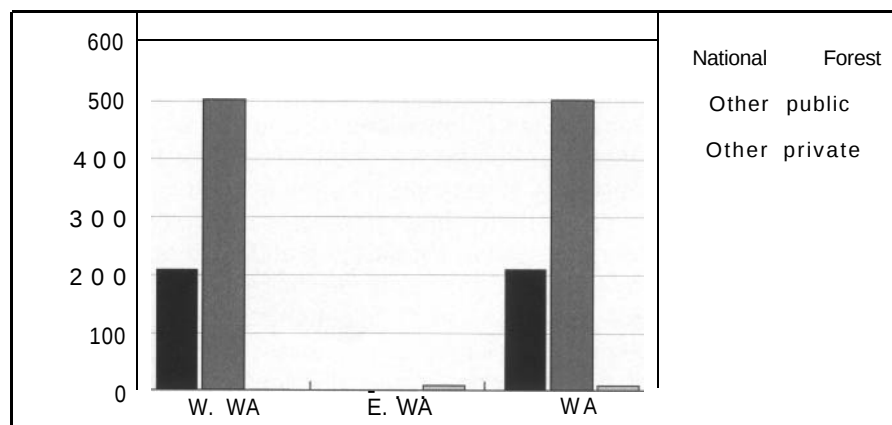


Figure 4-Area of reserved other forest by owner, western and eastern Washington, 1992.

Unreserved other forest totals 1.9 million acres, of which 62 percent is in National Forest and other public ownership, and 38 percent is in private ownership (fig. 5). Although diverse in ecological terms, other forests have these characteristics in common: they are on harsh sites not capable of growing 20 cubic feet of wood per acre per year, or they are on terrain that cannot be managed for continuous crops of timber, or both. Included are forests near upper timberline, sparse timber stands on rocky lands at all elevations, swampy areas, and fringe forests near the arid steppe region of eastern Washington.

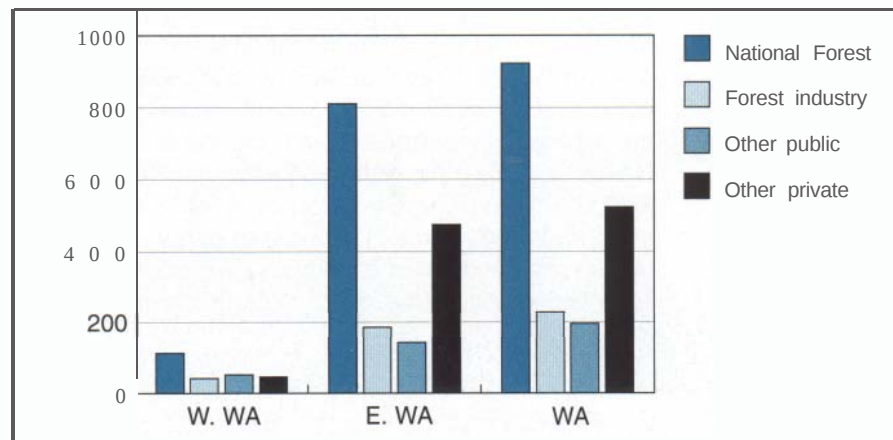


Figure 5-Area of other forest by owner, western and eastern Washington, 1992.

Ecological and Physiographic Zones

The Cascade Range in Washington divides the State into two contrasting climatic **zones**. West of the mountains is the humid zone, characterized by heavy precipitation (over 100 inches per year in several places), mild summers and winters (modified by elevation), and infrequent violent storms. The first Europeans to arrive here were awed by dense forests of hemlock, cedar, spruce, and fir, with giant trees approaching the size of California redwood and sequoia. The area west of the **Cascade** Range in Washington, Oregon, and northwest California has been known as the "Douglas-fir Region," because of the prevalence of that valuable tree species. Franklin and Dyrness (1973) classify western Washington into several physiographic provinces: Olympic Peninsula, Coast Ranges, Puget Trough, Northern Cascades, and Southern Washington Cascades (fig. 6).

East of the mountains, in the rain shadow of the Cascade Range, the seasonal temperatures are more extreme, and the growing season is short. The forests, though impressive compared with those of many parts of the world, are in many areas limited in range and productivity by low precipitation. This area has been called the "Ponderosa Pine Region," because of the predominant use of this species by forest industries (more so in the past than currently). Franklin and Dyrness (1973) classify the forested areas on the east slopes of the Cascade Range as part of the northern and southern Washington Cascades physiographic provinces and the remainder of eastern Washington into Okanogan Highlands, Blue Mountains, and Columbia Basin. Maps in this report show the Franklin and Dyrness physiographic provinces, and most of the tabular data are presented by the two major geographic divisions-western and eastern Washington.

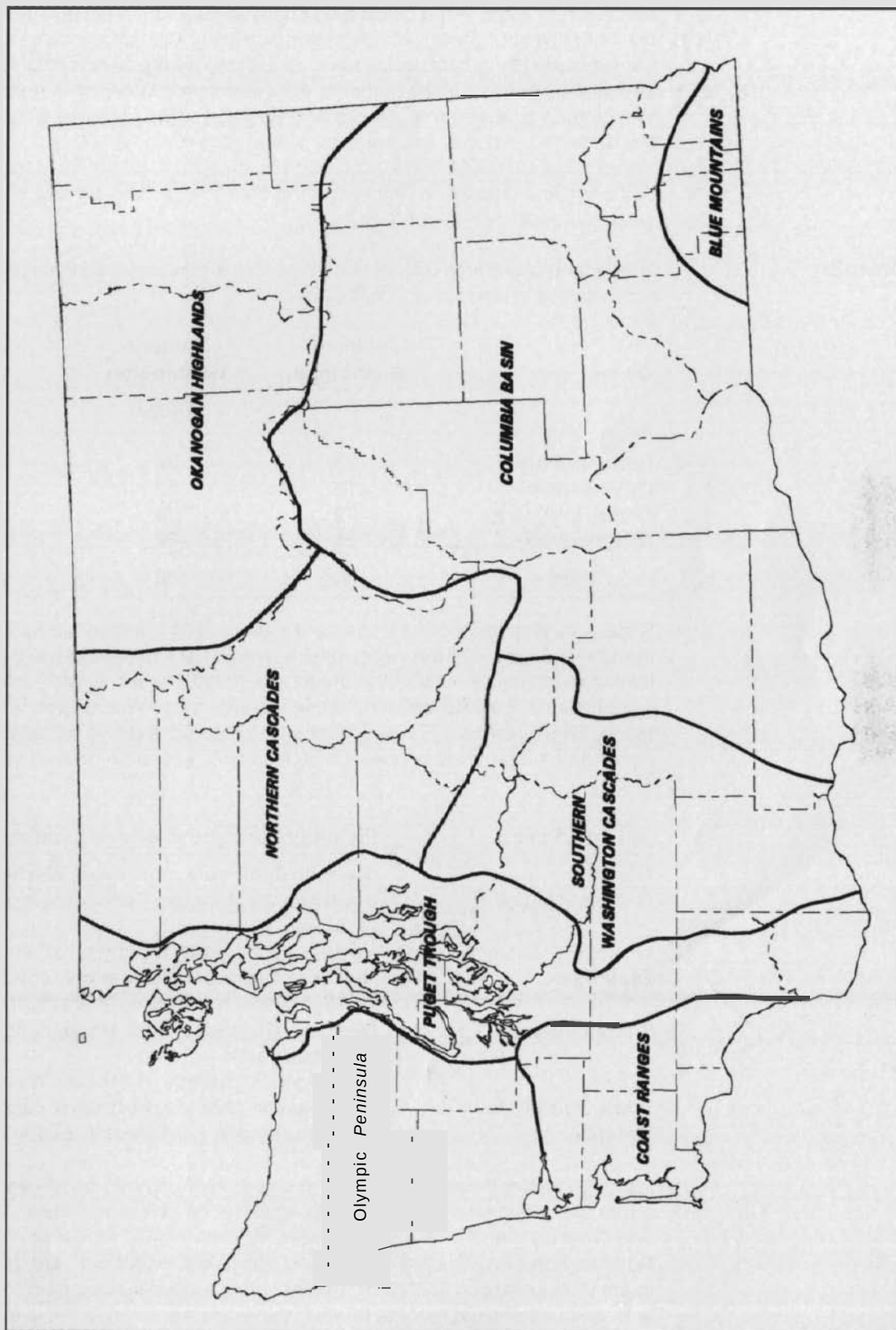


Figure 6-Physiographic provinces of Washington according to Franklin and Dymess (1973).

As shown in figure 7, the dividing line between eastern and western Washington lies to the west of center. Although that portion of Washington west of the crest of the Cascade Range amounts to only 37 percent of the State's total land area, it contains 60 percent of the timberland. As discussed later in this report, western Washington contains an even higher proportion of the standing timber volume of the State.

Following is a discussion of some of the characteristics of the State's timberlands west and east of the mountains.

Ownership

Timberland ownership distribution in eastern and western Washington is summarized in the following tabulation:

Owner	Western Washington	Eastern Washington	State total
	<i>Percent</i>		
National Forest	23	38	29
Other public	17	12	15
Forest industry	39	14	29
Other private	21	36	27
Total	100	100	100

Statewide, National Forest timberland area totals 4.7 million acres (slightly more than the 4.6 million of the forest industry) with 2.2 million acres west of the mountains and 2.5 million east of the mountains (table 10; figs. 8 and 9). Included are eight National Forests, counting those extending into Washington from Oregon and Idaho. These National Forests occupy major portions of five of the seven forested physiographic provinces shown in the following tabulation (Franklin and Dyrness 1973):

National Forest	Physiographic province and location
Olympic	Olympic Peninsula, northwest Washington
Gifford Pinchot	Southern Washington Cascades, mostly west slope
Mount Baker-Snoqualmie	Northern Cascades, mostly west slope
Okanogan	Northern Cascades, east slope, and Okanogan Highlands, north-central Washington
Wenatchee	Northern Cascades, east slope, central Washington
Colville	Okanogan Highlands, northeast Washington
Idaho Panhandle	Okanogan Highlands, northeast Washington
Umatilla	Blue Mountains, southeast Washington

Although timber is just one of several resources National Forests are managed for, it was the dominant management objective for most National Forests between the end of World War II and 1992. Between 1955 and 1992, timber harvests from National Forests averaged more than 1 billion board feet per year, and during peak years they exceeded 1.7 billion. In 1992, they totaled less than 1/2 billion board feet, and uncompiled records for later years are expected to show even smaller

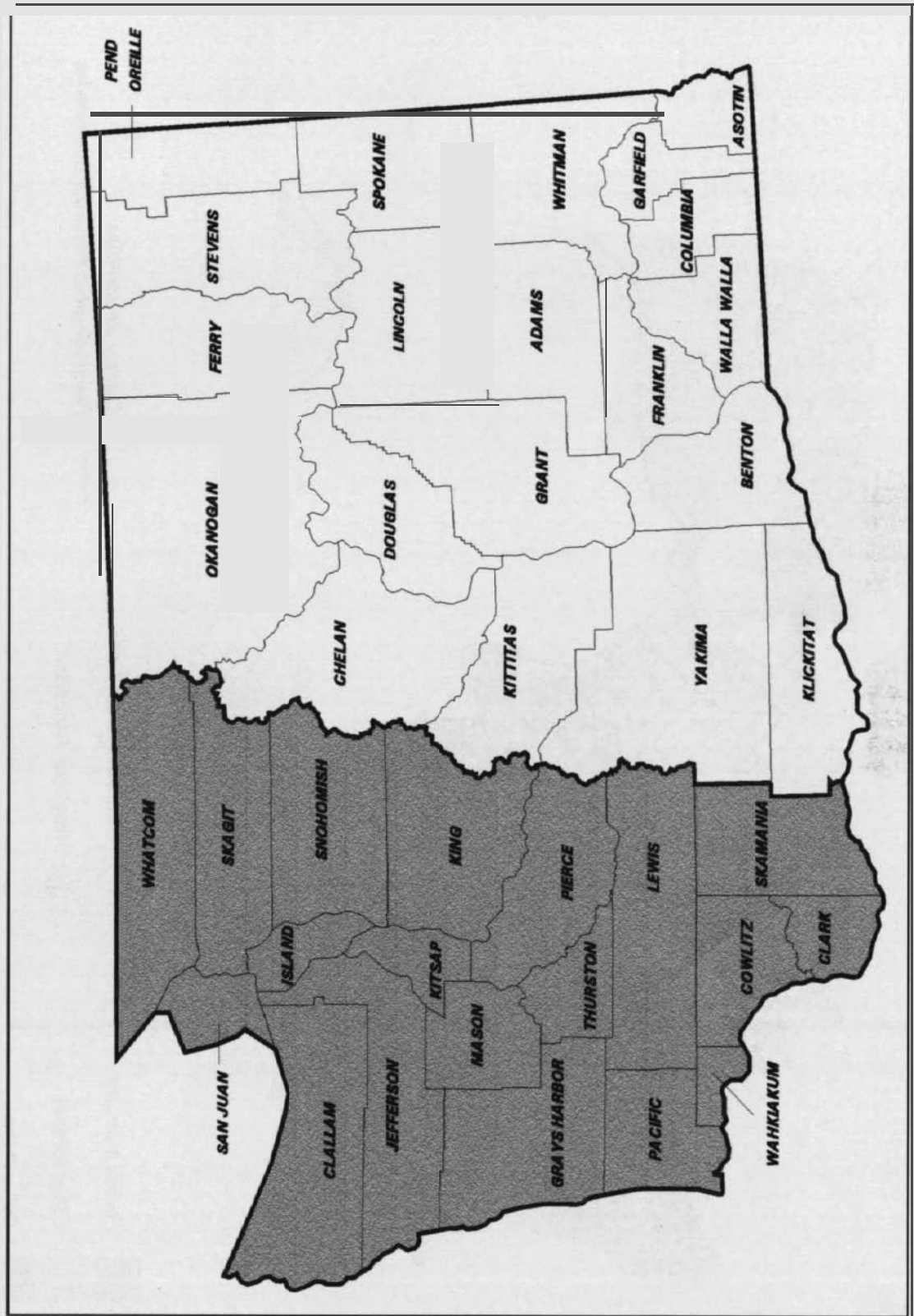


Figure 7-Western and eastern Washington showing county boundaries.

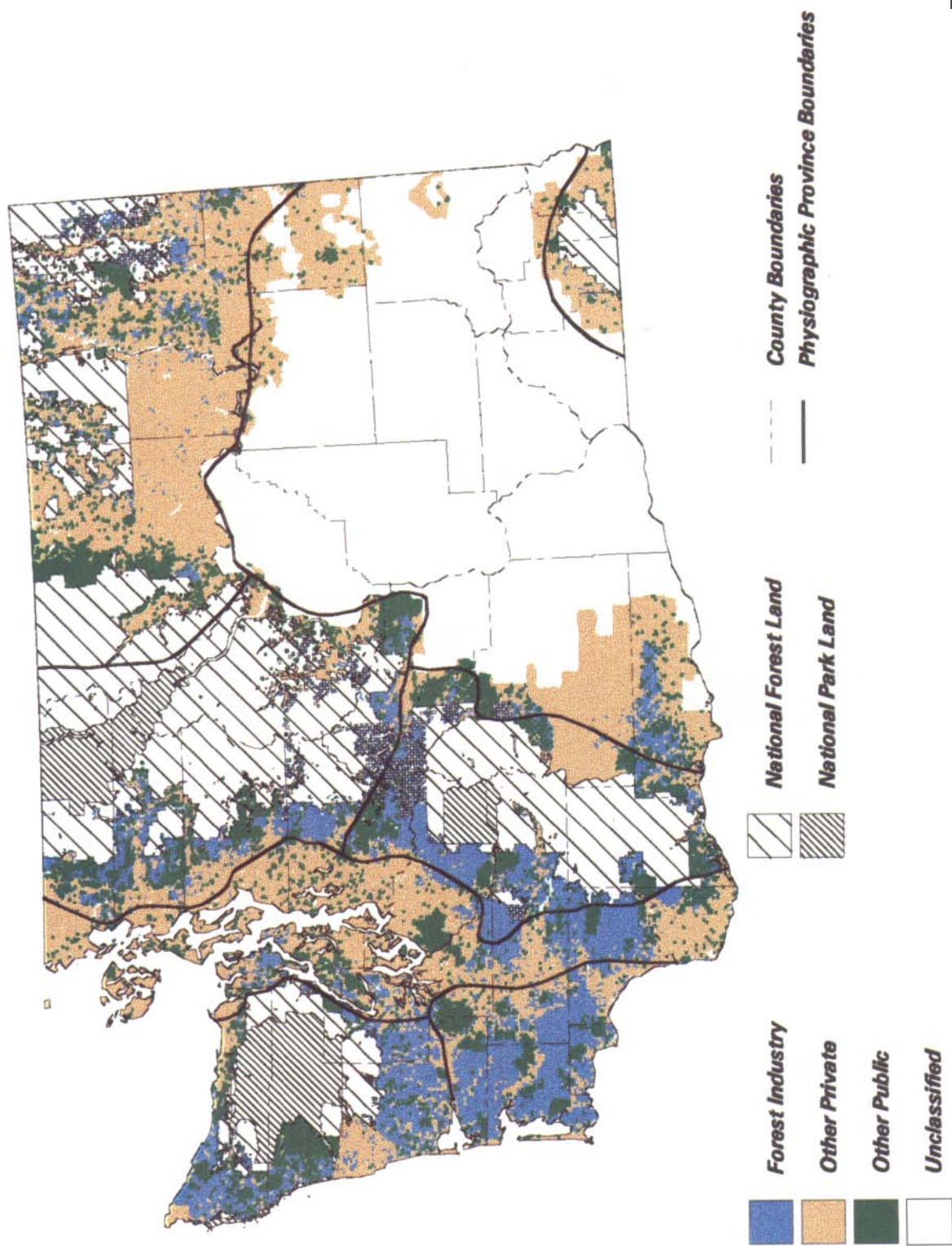


Figure 8-Ownership of forest and nonforest land, Washington, 1992.

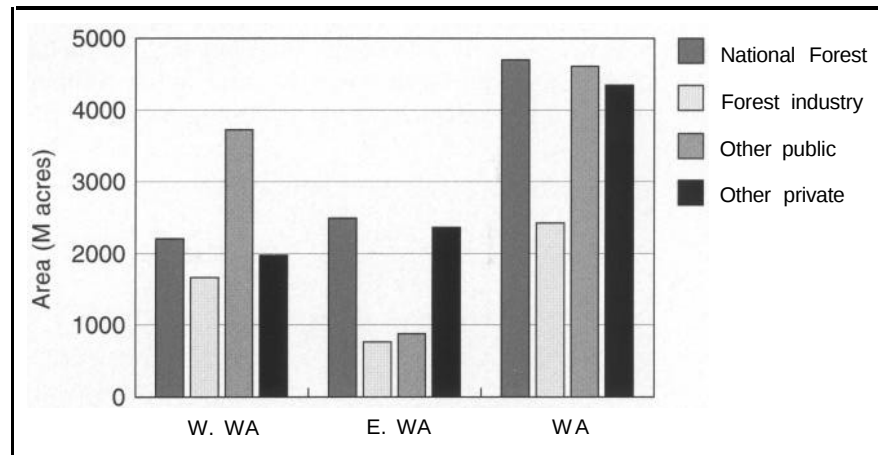


Figure 9--Area of timberland by owner, western and eastern Washington, 1992.

amounts (table 39). Management objectives of National Forests are being decided in the public arena and are currently in a state of flux. Although timber production is expected to remain a major objective, harvest levels are unlikely to approach those of the past three to four decades as more information is developed on forest sustainability; timber yields are balanced with wildlife habitat management, watershed management, preservation of late-seral stage forests (old growth); and consideration must be given to other resources such as medicinal plants and mushrooms.

Timberland managed by other public owners amounts to 2.4 million acres, of which over 2.0 million acres are in State forests managed by the Washington Department of Natural Resources. About two-thirds of the State-owned timberlands are in western Washington. State forests are managed to generate revenue for schools and other State trusts, while maintaining forest productivity and protecting and enhancing other values.

About 200,000 acres are in county and municipal forests, most of which are in western Washington. Included are forests managed mainly for revenue from timber yields as well as some large city watersheds where timber harvesting is limited. Miscellaneous Federal agencies manage 187,000 acres of timberland, 110,000 of which are in eastern Washington. These are mostly in Federal fish and wildlife refuges and military bases.

Forest industry ownership totals 4.6 million acres. These lands are intensively managed for profit through timber harvest. Most, but not all, of these companies operate forest products mills. Although forest industry properties occur in every forested physiographic province in the State, most of these lands (81 percent) are in western Washington in prime tree-growing country. Some forest industry properties are scattered among other private holdings on both sides of the mountains, mostly at lower elevations than National Forests. Also included are lands originally granted to railroads by the Federal Government; they became forest industry properties either by sale to timber companies or by establishment of timber-producing subsidiaries of the railroad companies. Some of these timberlands are intermingled with National Forest and other public lands in a

checkerboard pattern in the mountains. By far, the greatest concentration of forest industry property is in southwest Washington, the Coast Range, and lower foothills of the Cascade Range. Here, several timber companies own large blocks of some of the most productive forest land in the world (fig. 10).

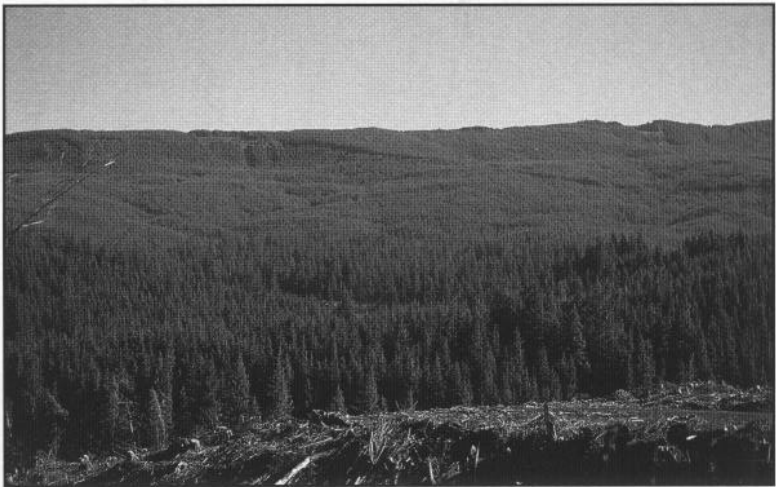


Figure 10-Forest industry land in Pacific County.

Other private timberland totals 4.3 million acres, 27 percent of the total in the State. Private timberland is comprised of three categories of owners as shown in the following tabulation:

Owner	Million acres
Native American	1.3
Farmers (and ranchers)	0.7
Miscellaneous private	2.3

Of the 1.3 million acres of timberland in Native American ownership, 1.1 million acres are in eastern Washington. Most of the Native American timberland east of the mountains is in three large reservations: Yakama, Colville, and Spokane. These reservations include broad expanses of sagebrush steppe and grassland at lower elevations; span the ponderosa pine, western larch, and Douglas-fir forests at midelevations and reach into the true fir, mountain hemlock, and subalpine vegetation types in the high mountains.

In western Washington, most of the Native American reservations are relatively small, but there are many. Almost all are near sea level and contain coastal forests of Sitka spruce, western hemlock, western redcedar, Douglas-fir, and hardwood species.

Management of Native American lands, in past decades guided by the Bureau of Indian Affairs, is undergoing change as tribal groups reevaluate their changing needs and options. Management concerns include timber, livestock, wildlife, salmon, special resources such as huckleberries and medicinal plants, and protection of sites of cultural importance.

Nearly 80 percent of the farmer-owned timberlands are in eastern Washington. These lands—commonly referred to as ranches rather than farms—tend to be at lower elevations near the arid forest fringe. They consist of relatively poor timber-growing sites on the average, and the forests are often intermingled with grassland and arid land shrub types such as sagebrush (*Artemisia tridentata* Nutt.), rabbit-brush (*Chrysothamnus* Nutt.), and bitter-brush, or “greasewood” as it is called by many ranchers (*Purshia tridentata* (Pursh) DC.).

About 70 percent of the miscellaneous private timberlands are in western Washington, also at lower elevations, and commonly in or near urban and suburban areas being developed for nonforest **uses**.

The miscellaneous private timberlands are held and managed for many objectives. Some tracts have been managed for timber production, though in many areas especially in western Washington—the long-term trend has been one of parceling and subdividing and eventual conversion to nonforest. In recent years, as Federal timber sales have declined and forest industry harvests have leveled off, miscellaneous private timberlands have yielded considerable volumes of timber. Many such tracts have yielded their last commercial harvest, as will be the case for many other tracts where harvesting is planned, as urban and suburban developments remove the land from resource production.

Forest Types

Washington is called “the evergreen state,” and indeed most forest stands in the State contain at least one species of evergreen tree. Over 85 percent of the State’s timberland is occupied by softwood (conifer) forest types (table 11), which with the exception of larch are evergreen (larch, unlike most conifers, loses its needles each fall). In addition, evergreen conifers are present in most hardwood (broadleaf) types, and two of the hardwood species—madrone and chinquapin—are evergreen.

The forests of Washington have been classified into eight general types as shown in table 11 and figure 11. Detailed types are shown for western Washington (table 11W); however, only generalized types are available for eastern Washington (table 11E).

Douglas-fir is the most extensive forest type in Washington, covering 7.1 million acres (44 percent of the total timberland area), 4.1 million of which are in western Washington. Douglas-fir forests are found from near sea level to midlevel upper slopes of the mountains in western Washington, and from near the lower reaches of tree growth to midlevel upper slopes of the mountains in eastern Washington. Douglas-fir is the primary species and forest type managed for commercial wood production in both western and eastern Washington. The wood is recognized for its structural properties and widely used in lumber and plywood for construction and many other purposes.

Hemlock-Sitka spruce type is the second most extensive forest type in the State, covering 2.7 million acres. Over 80 percent is in western Washington. Western hemlock is the major component of this type. It was used little for wood products for many decades, and in timber cruises in the early 1900s, it was not even counted as a commercial species. As supplies of old-growth Douglas-fir declined, the use of hemlock increased. Now hemlock is recognized as an all-purpose raw material. It has good pulping characteristics and strength and nail-holding

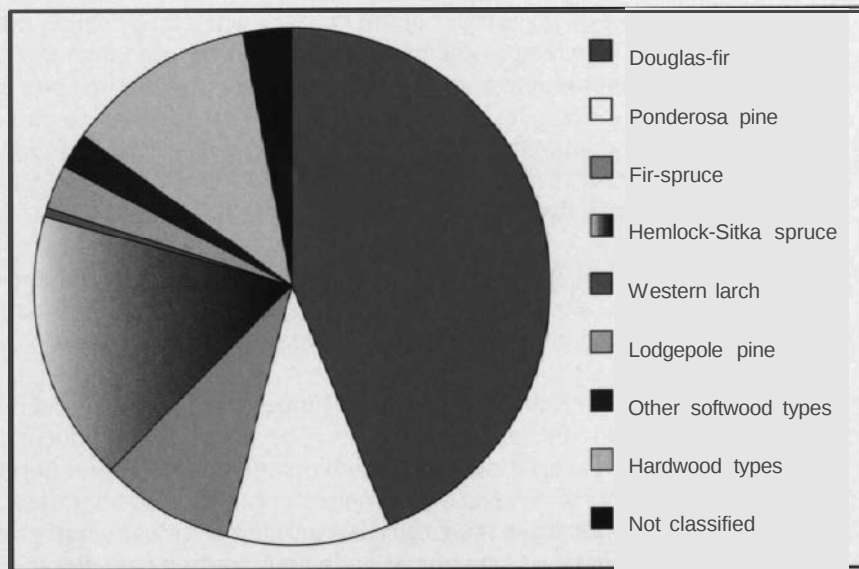


Figure 11-Forest types on timberland, Washington, 1992.

properties. Hemlock is used extensively in treated wood products, such as posts, poles, outdoor decking, and railroad ties. "Hem-fir," a mixture of hemlock and true fir is now widely used in building construction (true firs are in the genus *Abies*, not to be confused with Douglas-fir, genus *Pseudotsuga*).

Hemlock is the State tree of Washington. Although not as impressive in height or girth as Douglas-fir, hemlock has lacy foliage and graceful, drooping branches that impart a unique look to the forests, especially those in western Washington. As a type, hemlock is currently less abundant than Douglas-fir, but many Douglas-fir stands would eventually become hemlock type if allowed to progress to the final successional type (sometimes termed "climax type"). In the western part of the State, western hemlock can be found in almost every timber stand from sea level to the midlevel upper slopes of the mountains. At higher elevations, western hemlock is replaced by the closely related mountain hemlock, which in many places becomes the predominant timberline species.

Sitka spruce plays a minor role in the hemlock-Sitka spruce type, occupying a narrow band near the coast and extending inland along a few of the major rivers. Because of its high strength-to-weight characteristics and its workability, Sitka spruce has long been valued as a commercial wood with diverse uses-ladders, musical instruments, canoe paddles, masts and spars, specialty aircraft parts, and paper, to name a few. A serious deterrent to the management of Sitka spruce in Washington is the tip weevil (*Pissodes strobii* (Peck)), which causes deformities in the tree bole.

Ponderosa pine, the third most abundant forest type, with 1.7 million acres, is found almost exclusively east of the mountains. This area, often referred to as the "ponderosa pine region," actually contains a larger area of Douglas-fir type and more volume in Douglas-fir trees than it does ponderosa pine. Ponderosa pine complements Douglas-fir in that it is used more for interior finish, doors, framing, and woodwork, rather than for construction. This is one of the reasons that pine

lumber producers generally have been less influenced by the ups and downs of housing starts than Douglas-fir lumber producers. Many of the products for which ponderosa pine has been used require clear material, which is becoming scarce as the area and volume of old-growth pine decreases (fig. 12; see “Volume Analysis and Long-Term Changes,” below). In the future, pruning may provide some clear material from ponderosa pine grown in shorter rotations.

Fir-spruce type, **an** aggregate of several species types, occurs mostly at higher elevations. Of the statewide total of 1.3 million acres, 770,000 acres (58 percent) of the fir-spruce type are in western Washington. **Included** are four species of true fir (*Abies* spp.): grand, noble, Pacific silver, and subalpine. Pacific silver fir is the most common true fir in western Washington. **In** eastern Washington, grand fir-locally



Figure 12-Old-growth ponderosa pine trees, such as these, are becoming scarce.

referred to **as** “white fir” **or** “balsam fir”-is most **common**. The spruce in most fir-spruce stands is Engelmann spruce, which is found mostly in eastern Washington, often on north-facing slopes and near streams. Engelmann spruce is a minor species in Washington, amounting to only about 1 percent of the total standing tree **volume** in the State. It is one of the major lumber species in other parts of the Western United States. Before the 1950s there was relatively little commercial use of the fir-spruce type in the Pacific Northwest. This type, as with hemlock, has grown in importance as the supply of old-growth Douglas-fir has declined and the high-elevation areas have been opened up to logging. Lumber sawn from true firs is often sold as “hem-fir” whether mixed with hemlock or not.

Lodgepole pine type covers 425,000 acres statewide, over 90 percent in eastern Washington. Much of this type occurs at mid to high elevations on sites of relatively low productivity. Lodgepole pine often becomes established after wildfire and in some areas is gradually replaced by other tree species. Like Engelmann spruce, lodgepole pine is relatively unimportant in Washington, though it is a major commercial species in other Western States.

Western larch type covers 96,000 acres, all in eastern Washington. Larch, locally called tamarack, is used for some of the same products as Douglas-fir. The straight grain and relative durability of larch make the species desirable for hand-split shakes, once used in barns, cabins, and other rustic buildings. Poles, posts, and decking are other uses. A high-quality wood, larch is relatively unimportant in Washington simply because of its scarcity.

Several minor conifer forest types are grouped as "other softwood types." Included are western redcedar, Alaska-cedar, western white pine, and other species that either are rare or are widespread but seldom form types of their own. Some of these species-western redcedar, for example-are widespread and commercially valuable.

Hardwood types cover 1.9 million acres, or 12 percent of the timberland area. About 94 percent of the area of hardwood types is in western Washington. The most common hardwood species in western Washington are red alder, bigleaf maple, and black cottonwood. Other west-side hardwoods include Oregon white oak, Pacific madrone, Oregon ash, cherry, Pacific dogwood, paper birch, willow, and several minor species of scattered or rare occurrence, such as quaking aspen and golden chinkapin.

In eastern Washington, aspen and black cottonwood are the major hardwoods. Oregon white oak occurs on the east slopes of the Cascade Range in the southern part of the State, and bigleaf maple grows near streams throughout the length of the Cascade Range. Paper birch grows in the far northern part of the State and in a few localities in the Blue Mountains in the southeastern corner.

Hardwoods traditionally have played a relatively minor role in the forest products industry of Washington, for years amounting to no more than 3 or 4 percent of the total volume of logs processed. In recent years, there has been a slight increase in the use of hardwoods: in 1990, for example, 319 million board feet of hardwood logs were processed (5.5 percent of total log consumption). Uses for Washington hardwoods include furniture, pallets, pulp and paper, firewood, and specialty items.

Stage of development of forest stands- Spies and Franklin (1991) developed a classification system by using structural characteristics of undisturbed Douglas-fir stands that had originated after wildfire. They identified age-class groups as follows:

<u>Age</u>	<u>Group</u>
Years	
40-80	Young
81-195	Mature
196-900+	Old growth



This system is logical and useful for forested areas where all age classes are represented. Outside National Forests in Washington, most forests are younger than 50 years, and many stands are being harvested at even younger ages. To portray the span of ages or stages of development in Washington's young forests that more closely relate to common management practices, the following modified classification system was adapted for this report:

Stand age	Stage of development	Spies-Franklin
Years		
Nonstocked and 1-29 (even aged)	Early seral	Pre-young
30-49 (even aged)	Early mid-seral	Pre-young/young
50 to 99 (even aged) 400 (uneven aged)	Late mid-seral	Young/mature
100+ (even aged and uneven aged)	Late seral	Mature/old growth

In western Washington, although all stages of development are represented in substantial numbers, there are striking differences by ownership (figs. 13 and 14). These ownerships tend to be located in different physiographic provinces. Ninety-two percent of the late-seral forest is in public ownership- 85 percent National Forest and 7 percent other public (fig. 15). Most of the late-seral forest is in the mountains and consists mainly of hemlock, true fir, and upper slope forest types (fig. 16). Because of intense harvesting in the past 30 years, 67 percent of forest industry lands are occupied by early and early mid-seral forests (fig. 17). These lands run heavy to Douglas-fir, even in areas that previously supported other species, such as western hemlock, Pacific silver fir, and hardwoods. In many areas of western Washington, the mix of seral stages and diversity of forest vegetation is a direct function of ownership. Forest industry lands support very young, homogeneous conifer stands, whereas other private lands contain more late mid-seral stands and extensive areas of hardwood and

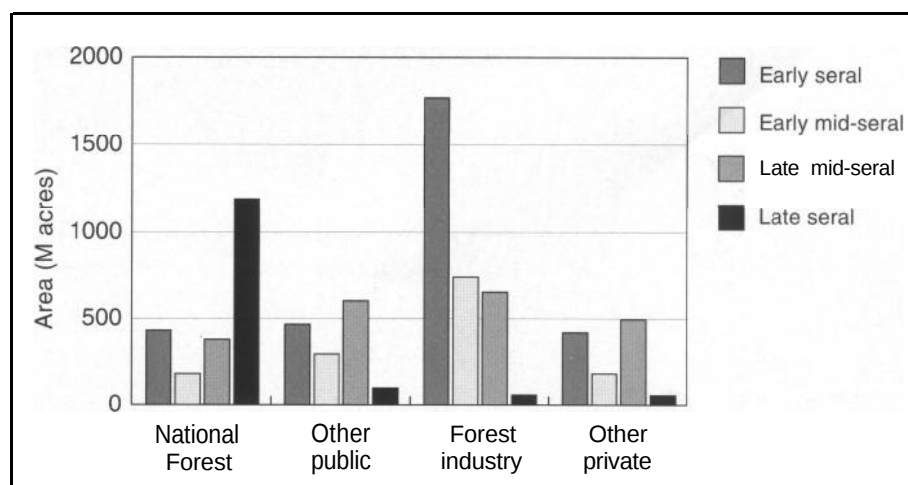


Figure 13-Area of timberland by Seral stage and owner class, western Washington, 1992.

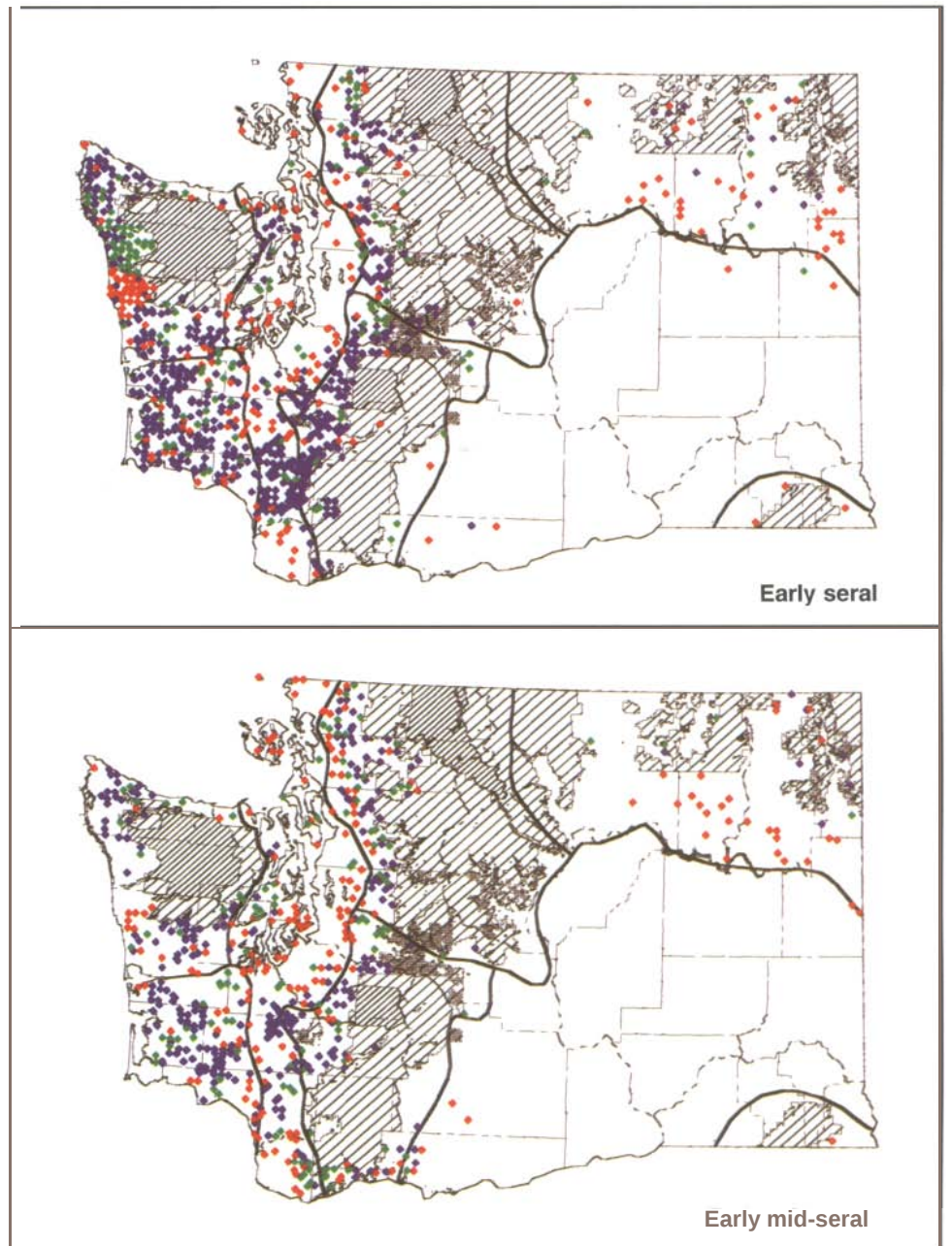
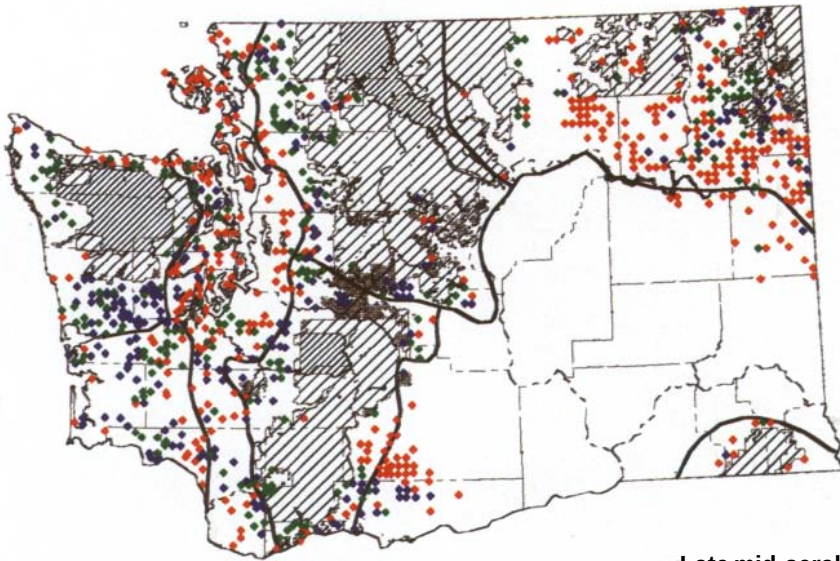
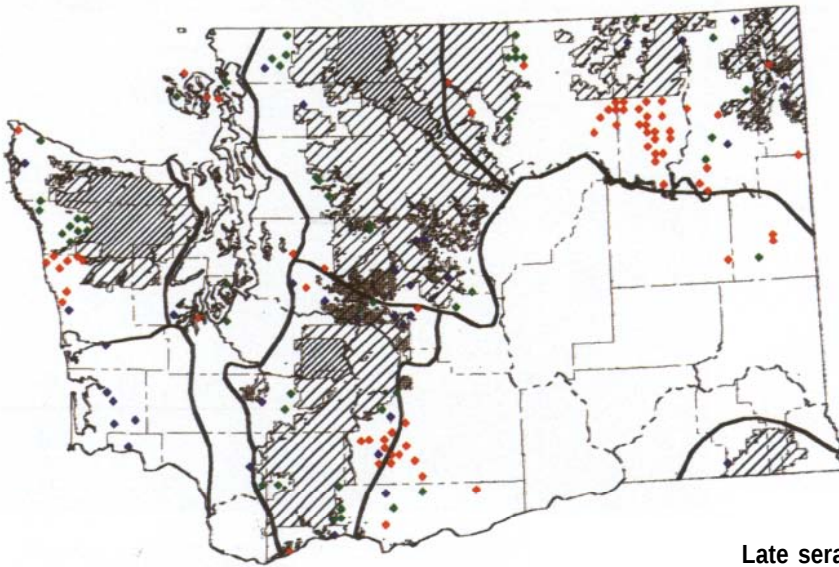


Figure 14A and B-Seral stages of forest vegetation by owner, outside National Forests and parks.

A.



Late mid-seral



Late seral

B.

LEGEND:

- | | | |
|-------------------|---|-------------------------------------|
| ◆ Forest Industry |  National Forest | --- County Boundaries |
| ◆ Other Private |  National Park | — Physiographic Province Boundaries |
| ◆ Other Public | | |



Figure 15 (above)-Late-Seral forests, such as this stand of old-growth Douglas-fir, are found mainly on public lands.

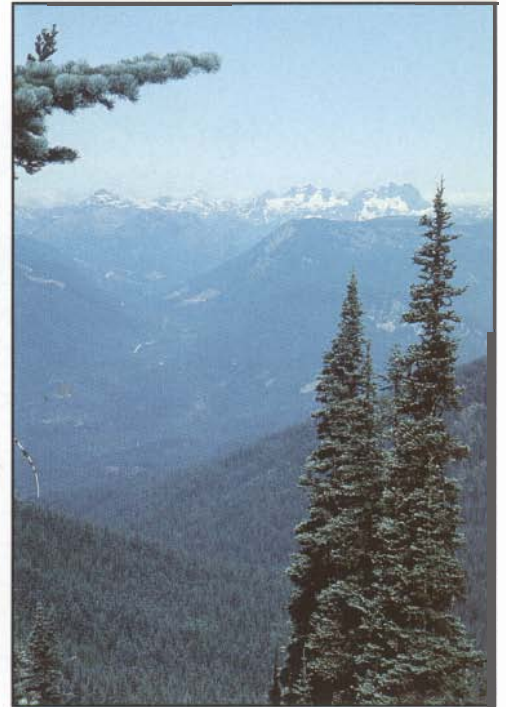


Figure 16 (*above right*)-Upper slope forest of subalpine fir, mountain hemlock, and other high-elevation species, Wenatchee National Forest.

Figure 17 (*right*)-Well-stocked young Douglas-fir forests on forest industry land in southwestern Washington.



Figure 18 (*below*)-Diversity of forest vegetation over small areas often is greater on other private ownerships, or where different ownerships intermingle as in this scene in Lewis County, than on large tracts of forest industry or public land.



open, brushy stands, categorized as unmanageable (see tabulation below and fig. 18):

Stage of development	Forest industry	Other private
<i>Percent of ownership</i>		
Early seral	47	18
Early mid-seral	20	9
Late mid-seral	17	27
Late seral	2	3
Hardwoods and "unmanageable"	14	43

Seral-stage distribution outside National Forests in western Washington differs notably from that in eastern Washington. As shown in the following tabulation, early and early mid-seral forests account for 51 percent in western Washington and 15 percent in eastern Washington; late-seral forests account for 3 percent in western Washington and 15 percent in eastern Washington:

Seral stage	All timberland outside National Forests			
	Western Washington		Eastern Washington	
	Thousands of acres			
Early	2,558	(35%)	406	(10%)
Early mid	1,218	(16%)	212	(5%)
Late mid	1,789	(24%)	2,107	(53%)
Late	213	(3%)	600	(15%)
Unclassifiable'	1,595	(22%)	683	(17%)
Total	7,373	(100%)	4,008	(100%)

Most of the early Seral-stage forest is on the most productive (high-site) lands (see next section), and conversely, most of the late-seral-stage forest is on the lands of lower productivity. In general, the early seral forests are at lower elevations on sites where Douglas-fir, western hemlock, and Sitka spruce **thrive** (fig. 19); the late-seral forests are at higher elevations where true firs and other upper slope species grow and in the less productive region east of the mountains.

The current mix of seral stages in Washington, although affected by disturbances such as forest fires, windstorms, insect and disease infestations, and the 1980 eruption of Mount St. Helens, is to a great extent, the result of forest management practices and recent timber harvest levels. In most of western Washington, shade-intolerant tree species are grown on short rotations and harvested by clearcutting. Where most of the trees in a stand are merchantable, clearcutting is more economical than partial cutting; and on steep **slopes** common in western Washington, clearcutting **by** using cable **systems** is less damaging to the **site** than repeated partial cuttings by using tractors. Because of the favorable environment, forest

¹ Unmanageable stands lack 25 percent desirable stocking on 60 percent of subplots.

² Unclassifiable includes stands in which three-fifths of the sample points had less than 25 percent conifer stocking.



Figure 19-Three phases of early seral forest vegetation (foreground) resulting from timber harvesting and tree planting over the past 6 years. The young alder overtopping the planted conifers has been sprayed with herbicide, and the 50-year-old stand in the background is scheduled for harvesting within the year. Western hemlock seedlings have been planted in the foreground, a practice which if expanded could alter the 30-year trend of decreasing area and volume of that species.

regeneration on most sites in western Washington is relatively easy to attain after clearcutting, and growth of newly established trees is rapid.

In eastern Washington, regeneration is often less successful in clearcuts than in areas where some trees are left standing to provide shade and protection from frost and wind. In general, the terrain in eastern Washington is less steep and broken than the forested areas in western Washington, thereby allowing partial harvesting with tractors and other tracked or wheeled logging equipment. On average, trees are older and larger because of partial cutting. Although they have been portrayed here as late seral, frequent disturbance has created a mosaic of conditions, including openings with early seral vegetation (that is, pioneer forbs, grasses, and shrubs), patches of young trees, strips of bare, compacted soil, and large overstory trees in clumps or as scattered individuals (fig. 20).

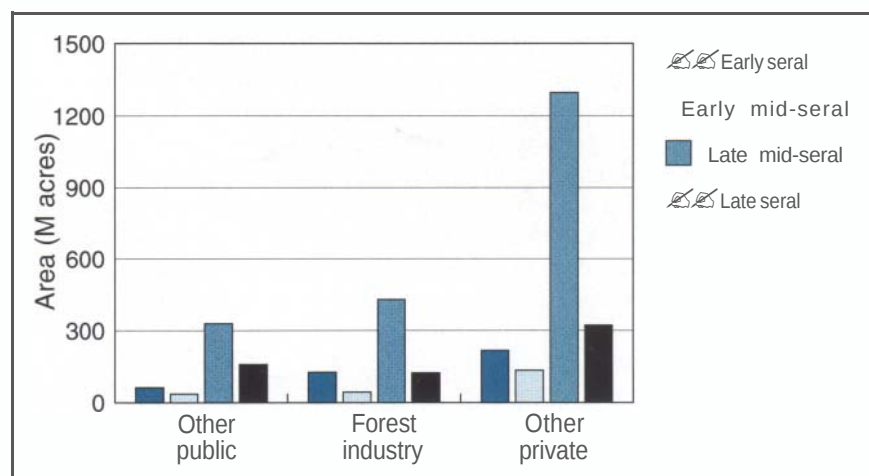


Figure 20-Area of timberland by seral stage and owner class, eastern Washington

Early seral forests: implications- From a timber-production viewpoint, the preponderance of early seral forests in the prime tree-growing country in western Washington means that relatively low volumes on the average are currently available, but high volumes can be expected in the future; how high depends to a great extent on how long owners allow the stands to grow before they cut them. Although rotations longer than currently practiced would result in higher per-year timber yields (Curtis 1994), reduced availability of government timber and various economic considerations lead private timber owners to harvest younger stands of smaller trees (fig. 21). Along with lower timber yields, another result is continuation and possibly acceleration of the long-term trend of decreasing quality of timber produced in the region. To quote a Northwest timber trader: "We built our reputation on supplying longer and wider pieces of clear wood than any other part of the world. Now that's no longer true and we have to decide what we're going to do...." Fewer than 15 traders offer Douglas-fir clears now, compared with 100 ten years ago (Anderson 1994). Although markets for pulp and paper, panelboard, and other products made from low-quality young timber generally have been vigorous, the unavailability of high-quality old-growth timber takes away an important advantage Northwest suppliers have had over competitors in other timber-producing regions. Many forest products firms have reported high profits based on young timber harvested from their own lands. Federal timber policies have been a factor in price increases, and also have forced companies to turn to their own young timber for a resource supply (Sleeth 1995). Although recent large profits by forest industry firms would seem to belie the concerns voiced by traders, questions about the competitive advantage and environmental concerns of ever-shortening rotation lengths remain.



Figure 21-An increasing proportion of the annual timber harvest consists of young, small trees.

In eastern Washington, despite the relatively larger area that supports older trees, primarily the result of partial cutting as opposed to clearcutting, there has been a steady decline in high-quality timber. Ponderosa pine of the quality needed for most of the products it has been used for-shop-type lumber used for doors, framing, molding, and specialty products such as coffins and unfinished utility furniture-is difficult to find.

Early seral forests are occupied by many species of wildlife. In the vast cutovers and young stands in southwestern Washington, deer (*Odocoileus* spp.), elk (*Cervus* sp.), black bear (*Ursus americanus*), and mountain beaver (*Aplodontia rufa*) populations are locally high. For certain wildlife species, early seral forests are of value mainly if they are near older forests. In much of western Washington outside National Forests, the early-seral forests—mainly Douglas-fir at low elevations—are remote from the older forests, which are mainly true firs and other upper slope species in the mountains. Some forest managers are attempting, through thinning and other activities, to create forests with late-seral characteristics (large trees, snags, down trees and logs, and storied canopies) at younger ages. The idea is to provide improved wildlife habitat while also producing high timber yields.

Maintenance of forests in the early seral stages has other environmental implications, some proven, some only speculative (Lehmkuhl and others 1991, Lundquist and Mariani 1991, Ohmann and others 1994, Spies and Franklin 1991). Among the concerns are:

- ✧ More frequent disturbance may reduce soil productivity, cause siltation of fish-bearing streams, harass wildlife, and create unsightly forest vistas.
- ✧ Narrowing and weakening of the gene pool of local strains of native trees and other plant species.
- ✧ Reduced numbers or elimination of plant species that require late-seral conditions, or can develop only in areas that are undisturbed for long periods. Among such plants are valuable mushrooms, certain wildflowers, and species of medicinal value (including those of known value and those whose value has not yet been discovered). The converse of this is that several plants of value are found mainly in early seral conditions, or are most useful when growing in early seral conditions. For example, huckleberry bushes occur in dense forests as well as in openings created by logging and fires; berry production is higher in open areas.
- ✧ Fewer large trees; fewer wildlife snags; fewer large logs on the forest floor for the various fauna that use them—from carpenter ants to cougars—for moisture and nutrient storage, for certain kinds of plants that grow on logs and decaying wood; fewer large logs in streams for fish habitat; and fewer large rootwads and large rootwad holes, valuable in providing minicatchments, soil-horizon mixing, and microdiversity.

Timberland productivity- The productivity of Washington's forests, especially in the humid region west of the Cascade Range, is well known. On some lands where trees with trunks several feet in diameter and up to 300 feet tall were felled in the late 1800s and early 1900s, second-growth forests of trees over 100 feet high now stand. Some of these second-growth forests have been cut and third-growth forests now occupy the land. In western Washington, the site of America's first commercial tree farms (Holbrook 1945), 75 percent of the timberland is capable of growing at least 120 cubic feet per acre of industrial wood per year (see "Terminology" for definitions). Statewide, 47 percent of Washington's timberland is capable of growing 120 cubic feet or more of industrial wood per acre per year. By comparison, 13 percent of the total timberland in the Nation is capable of growing 120 cubic feet or more per acre per year; forest land of this productivity level amounts to only 17 percent of the timberland in the Southern States (fig. 22).



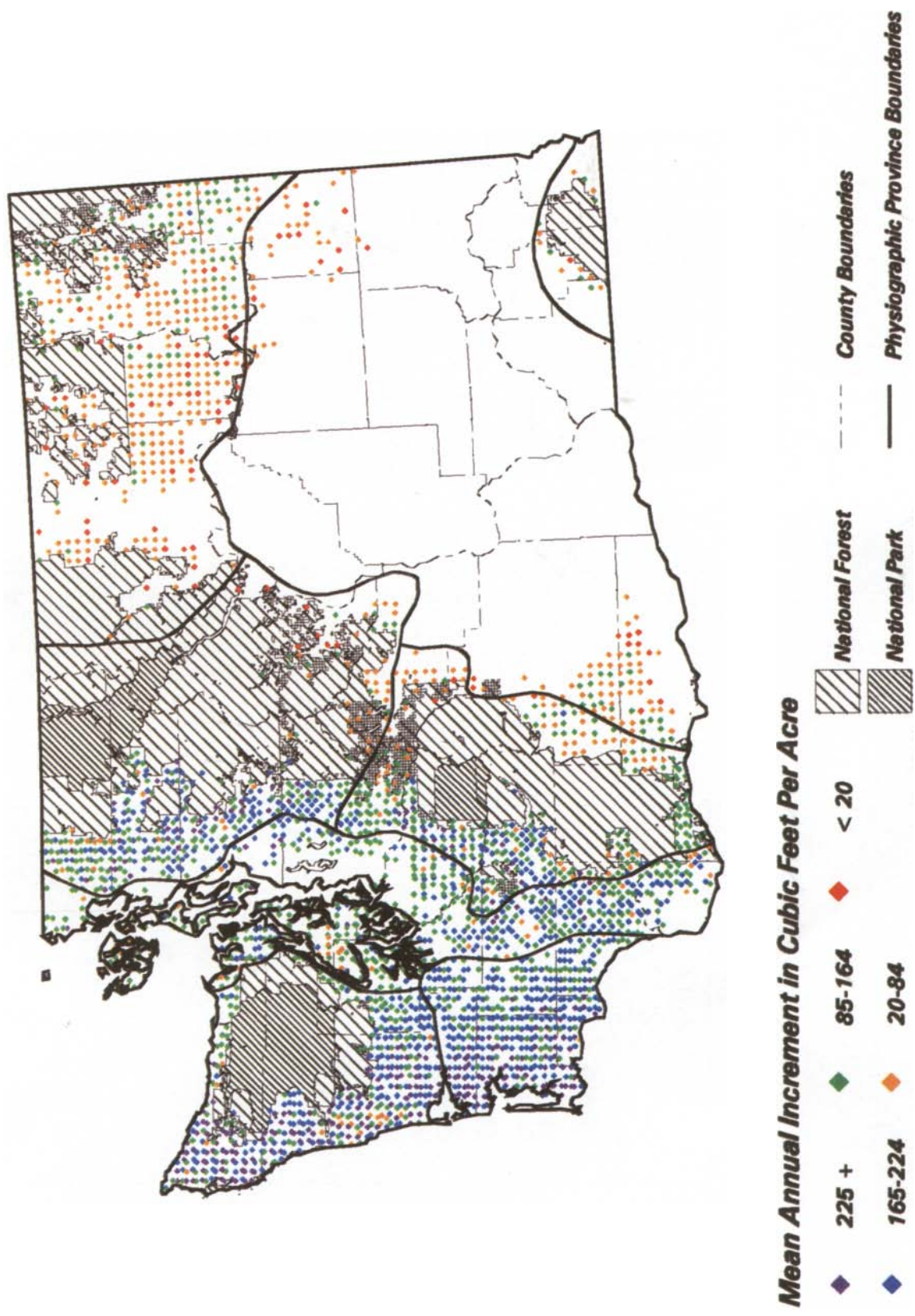


Figure 22-Potential productivity of timberland outside National Forests and parks.

From a national perspective, the highly productive timberlands of Washington could be considered prime candidates for dedication to timber production: few areas grow high-quality timber as rapidly or present fewer management problems. Urbanization and other nontimber developments are reducing the area and in some cases limiting the realizable yields from these lands; but a sizable area of the most productive timberland is currently being used exclusively for timber production. Timberlands in forest industry ownership, and much of those in other public ownership, are managed primarily for timber yields, and these ownerships have a higher proportion of the most productive timberland, as shown in the tabulation below:

**Timberland area capable of growing
120+ft³·acre⁻¹·year⁻¹**

Ownership	Million acres	Percent
National Forest	1.0	22
Other public	1.4	60
Forest industry	3.4	74
Other private	1.7	39

About 1.1 million acres of timberland are in the highest productivity class—225 cubic feet per acre per year (roughly 1,200 board feet·acre⁻¹·year⁻¹). Of that, 681,000 acres (64 percent) are in forest industry ownership and 207,000 acres (19 percent) are in other public ownership. Other private owners have 144,000 acres, or 14 percent of the most productive timberland. This leaves National Forests, the largest single timberland ownership class, with only 3 percent (31,000 acres) of the most productive timberland (tables 13, 13W, 13E, and figs. 23 and 24).

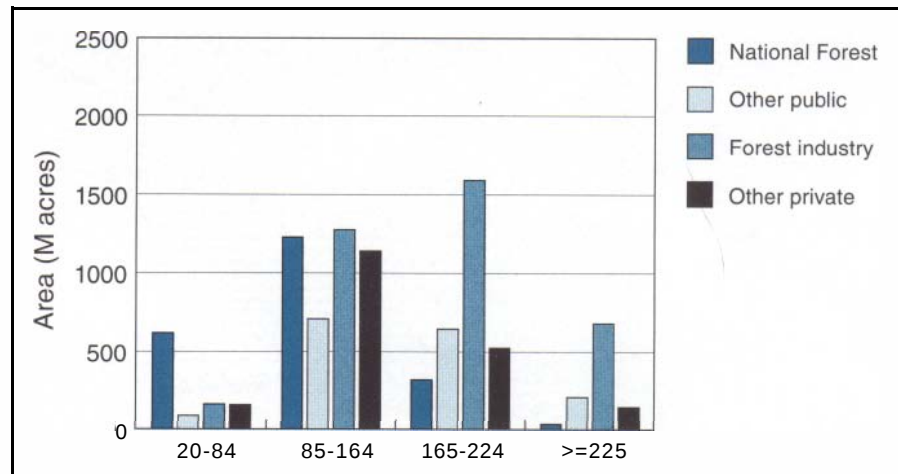
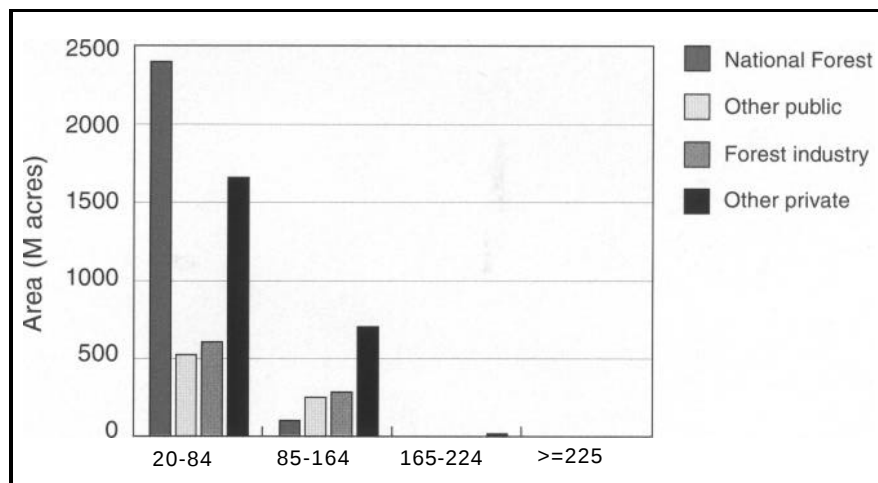


Figure 23—Area of timberland by site class and owner, western Washington.



Changes in timberland area—Between the 1978-80 and the 1988-91 inventories, the area of unreserved timberland outside National Forests in Washington decreased by an estimated 488,000 acres (tables 33, 33W, and 33E). Included in this decrease was a net transfer of 117,000 acres to National Forests in many purchases and land exchanges with private owners and the State, and 92,000 acres (mostly Native American lands) classified as reserved. Physical conversions to nonforest for roads and other right-of-way clearings, urban expansion, and agricultural purposes resulted in a net loss of 279,000 acres.³

Right-of-way clearings (roads, pipelines, for example) accounted for 155,000 acres or 56 percent of the net physical losses, distributed by 1978 to 1980 ownership as shown in the following tabulation:

<u>Owner</u>	<u>Percent</u>
Other public	8
Forest industry	61
Other private	31

Right-of-way clearings on other public and forest industry lands were mostly for logging and other forest access roads. On other private lands, right-of-way clearings were mostly for roads built in connection with residential and commercial developments and widening and rerouting of highways and freeways.

Urban and suburban development accounted for a loss of 89,000 acres of timberland, 92 percent of which was in other private ownership (fig. 25). The remaining 8 percent was forest industry land sold and developed since the 1978-80 inventory.

³ Information is not available on area of timberland in National Forests that was converted to nonforest uses such as roads, skiing areas, and other developments or set aside in reserved areas.



Figure 25-The spread of residential developments in remote forested areas reduces the area of forest manageable for commodity production, wildlife, and other uses, and increases the cost of protection from wildfire and other hazards.

Timberland clearing for agriculture, including cropland, orchards, and pasture, amounted to 53,000 acres, all in other private ownership. Partially offsetting these losses were 12,000 acres of farm and pastureland and 6,000 of Christmas tree land that reverted to forest. The resulting net loss of timberland to agricultural clearings was 35,000 acres.

Reduction in primary forest zone- Direct conversion of timberland to nonforest uses is only part of the picture of forces affecting the area, character, and uses of forest land. Proximity, pattern, and intensity of urban, suburban and agricultural zones influence the management of forests for most uses, including commodity production, wildlife, scenery, and watershed protection. Area in the "primary forest zone" was estimated in the 1978-80 inventory of lands outside National Forests, and again in the 1988-91 inventory. Reductions in the "primary forest zone" during this period are shown in the following tabulation:

Region	Area in primary forest zone		
	1978-80	1988-91	Change
<i>Thousand acres</i>			
Western Washington	7,143	6,729	-414
Eastern Washington	6,397	6,384	-13

The primary forest zone is characterized by large, continuous tracts of forest land (see "Forest Zones" in "Terminology"). In eastern Washington, this zone includes intermingled natural rangeland. More intensively developed lands are classified

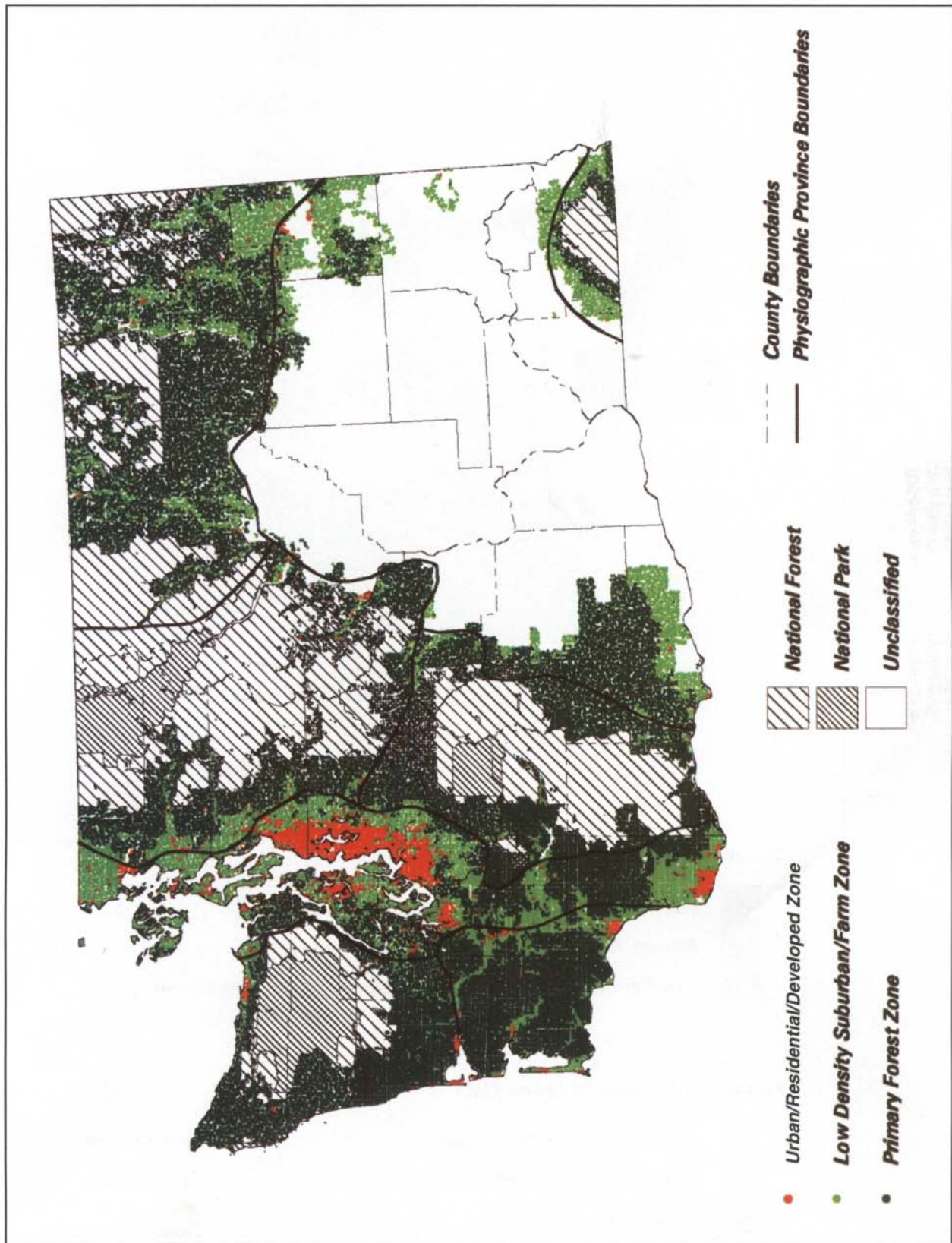


Figure 26—Development zones exclusive of National Forests and parks, Washington, 1992.

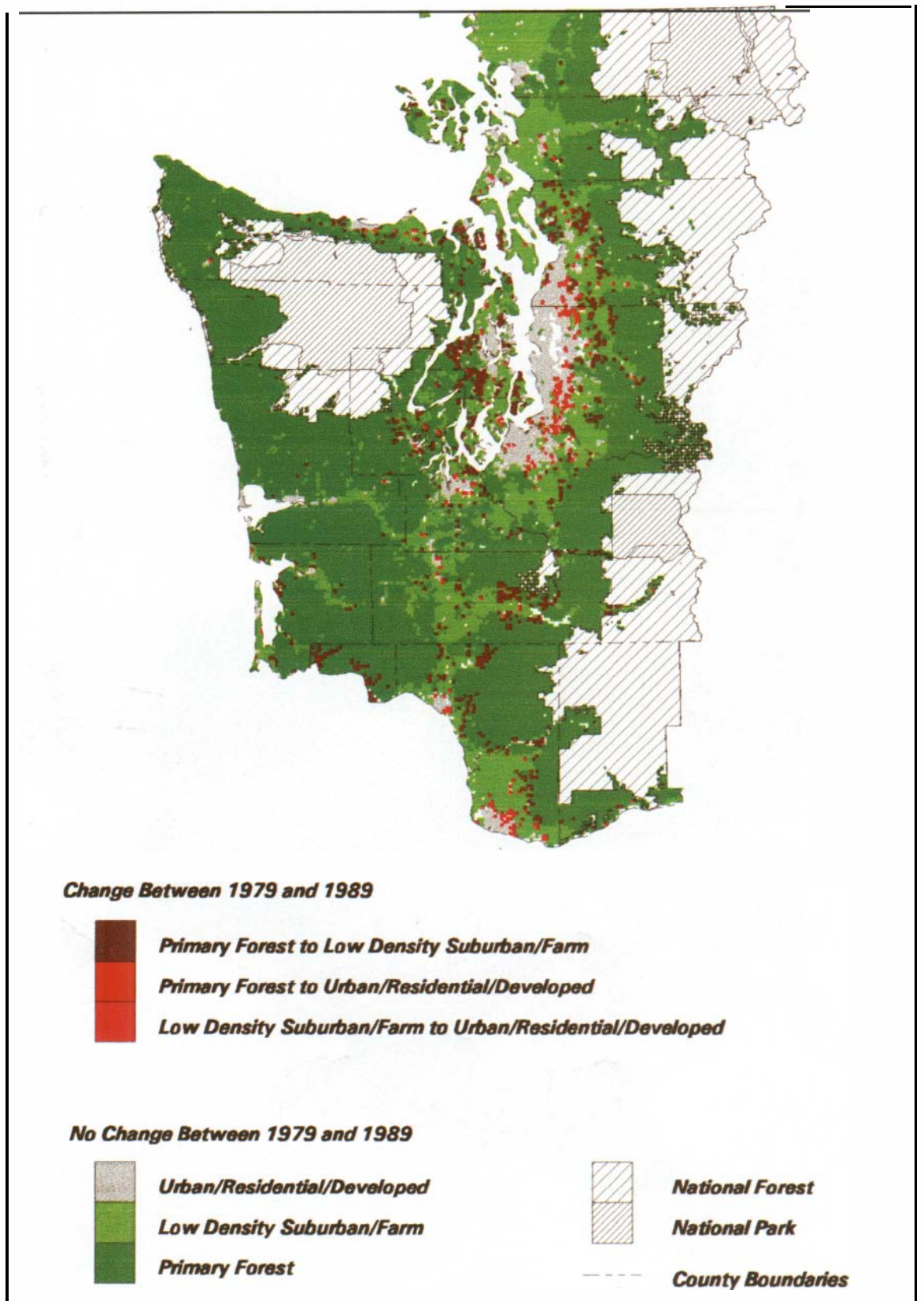


Figure 27-Ten-year change in the primary forest zone in western Washington.

as low-density suburban-farm zone or urban zone. Figure 26 shows these zones. National Forests and national, state, and local parks are classified entirely as primary forest zone.

In the nominal 10-year period between inventories, the primary forest zone decreased by 6 percent in western Washington and 0.2 percent in eastern Washington. As shown in figure 27, shifts out of the primary forest zone in western Washington occurred near the Columbia River and Willapa Bay, along the Interstate 5 corridor, in the eastern part of the Olympic Peninsula near the Strait of Juan de Fuca, and in the Puget Sound lowlands (Thurston County north to Whatcom County and including Island, Kitsap, and San Juan Counties). In the Puget Sound area, the primary zone decreased by 9 percent, nearly 1 percent per year.

The shift from primary forest to more developed zones was greatest on other private land, though in several cases, forest industry lands were sold to other private owners whose lands were in turn developed. In western Washington, 322,000 acres of other private land shifted out of the primary zone over 10 years. This is 25 percent of the 1978 and 1979 total, and amounts to about 32,000 acres per year. In the Puget Sound area, 34 percent of the other private ownership shifted from primary forest zone to more developed zones. This amounts to 3.4 percent per year, a reflection of the rapid urbanization ongoing for decades and State and local land use policies (fig. 28).



Figure 28—Aerial photographs taken in Pierce County in 1976 and 1988 show 12 years of change: suburban developments—roads, houses, and a golf course—have moved into the undeveloped forest in the upper part of the scene, while houses, roads, and other clearings have increased in density in the lower part.

Reserved area classification- Between 1978-80 and 1988-91, 92,000 acres of timberland were set aside in reservations. Most of this-87,000 acres-was in Native American ownership (classified as other private) in eastern Washington and consisted of high-elevation forests of true firs, mountain hemlock, and other subalpine forest types.

Ownership changes- Between 1978-80 and 1988-91, an estimated 766,000 acres of timberland changed ownership. Among the large number of transactions were land trades near Mount St. Helens after the 1980 eruption, transfer of National Forest land to Native Americans, sales of forest industry land to non-industrial owners and government agencies (forest industry led all ownerships in acreage lost), and many sales and subdivisions related to urban and industrial expansion. Not included in the timberland ownership change data are tracts that changed ownership and were then converted to nonforest. Those are included in the forest land loss estimates. Over three-fourths of the timberland acreage that changed ownership was in western Washington. The following tabulation shows gains and losses of timberland due to ownership changes between 1978-80 and 1988-91:

Ownership	Gains	Losses	Change
<i>Thousand acres</i>			
National Forest	175	58	+117
Other public	180	145	+35
Forest industry	235	489	-254
Other private	<u>176</u>	<u>74</u>	<u>+102</u>
Total	766	766	0

Volume Analysis and Long-Term Changes

Timberland in Washington contains 57 billion cubic feet in trees ranging from 5.0 inches in diameter at breast height (d.b.h.) to old-growth trees several feet in diameter. Washington plays a predominant role in the Nation's timber economy. Only two other states, Oregon and California, have greater inventories of softwood and hardwood trees.

Western Washington forests contain 41 billion cubic feet, 72 percent of the total in the State. West-side forests are not only more extensive but also support denser timber stands than east-side forests. West-side stands average about 4,300 cubic feet per acre compared with 2,450 cubic feet per acre in east-side stands.

Timber Volume by Owner

About 53 percent of the growing-stock volume in the State is in public ownership (table 15), with 34 percent on National Forest lands, and 19 percent on other public lands, most of which are State lands managed by the Washington Department of Natural Resources. Privately owned forests contain 47 percent of the growing-stock volume, with 26 percent on forest industry lands and 21 percent on other private lands (table 19 and fig. 29).

In the highly productive west-side forests, average volume per acre is highest for National Forests and lowest for forest industry; in eastern Washington, the highest

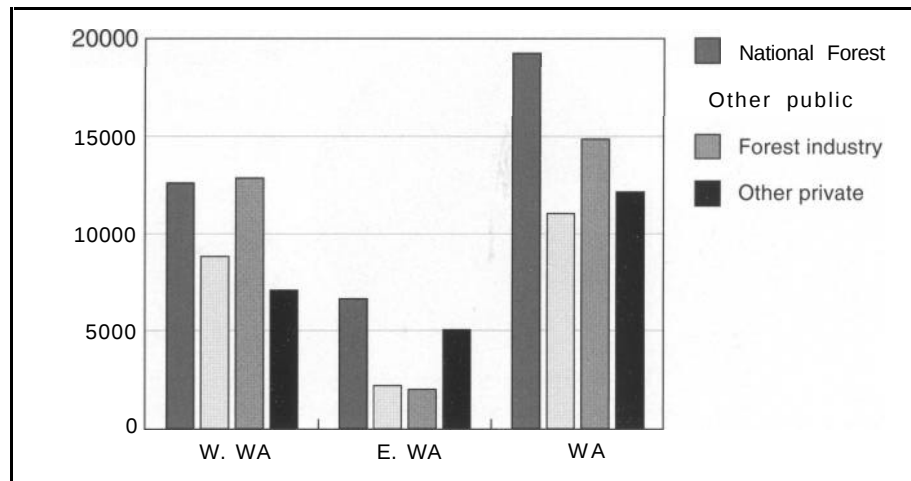


Figure 29-Growing-stock volume by owner, western and eastern Washington, 1992.

average volume is on other public lands and the lowest is on other private, as shown in the following tabulation:

Ownership	Growing stock per acre	
	Western Washington	Eastern Washington
	<i>Cubic feet</i>	
National Forest	5,697	2,666
Other public	5,299	2,910
Forest industry	3,441	2,314
Other private	3,584	2,130

Forests on National Forest and other public lands are older and contain more trees that are larger on the average than those on other ownerships, which explains the greater average volumes shown in the above tabulation. Forest industry lands are stocked with very young trees, resulting in low per-acre volumes. Forest land in other private ownership in western Washington includes extensive areas of low-volume hardwoods and mixtures of trees and shrubs. In eastern Washington, forests in other private ownership include a mixture of older stands, heavily logged and burned stands, and naturally sparse stands on arid sites near the lower forest fringe.

Timber Volume by Species

In western Washington, four softwood species and two hardwood species account for 94 percent of the 41 billion cubic feet of growing stock (table 19W). These species are Douglas-fir, western hemlock, Pacific silver fir, western redcedar, red alder, and bigleaf maple (fig. 30). Two species each had substantially more volume than any other: Douglas-fir with 17 billion cubic feet and western hemlock with 11 billion cubic feet. Six percent of the growing-stock volume is distributed among 11 other softwood species and several hardwood species.

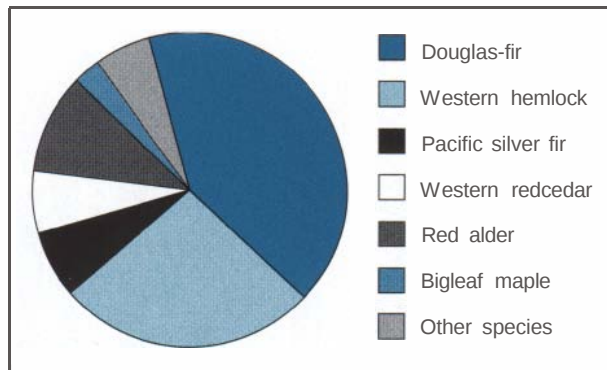


Figure 30-Growing-stock volume by species, western Washington, 1992.

In eastern Washington, Douglas-fir, ponderosa pine, lodgepole pine, western larch, and the true firs as a group account for 88 percent of the 16 billion cubic feet of growing-stock volume (table 19E and fig. 31). The remaining 12 percent includes mountain hemlock, western hemlock, western redcedar, western white pine, Engelmann spruce, and several hardwood species. Quaking aspen and black cottonwood account for 74 percent of the 278 million cubic feet of hardwood growing-stock volume.

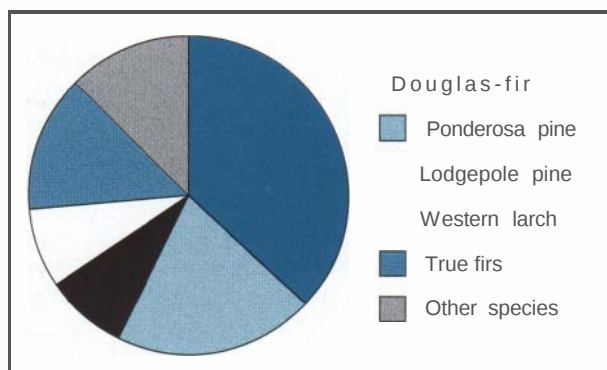


Figure 31-Growing-stock volume by species, eastern Washington, 1992.

Stand age- In western Washington, 89 percent of the area and 84 percent of the growing-stock volume are in even-aged stands (proportions exclude unclassified and no manageable stand present; table 26W).

The preferred tree species-and the most abundant conifer-in western Washington is Douglas-fir. Although able to regenerate under partial forest overstories in eastern Washington and the sunny forests of southern Oregon and California, Douglas-fir needs full exposure to sunlight in most of western Washington, where cloudy days are common during much of the growing season. The shade-tolerant species that are grown and harvested-western hemlock, Pacific silver fir, and western redcedar-also regenerate well under full exposure to the sky in western Washington. Even-age management, which has economic advantages over

uneven-age management, is usually chosen for these species as well. The common practice has been to plant nursery-grown seedlings within a short time after harvesting by clearcutting (fig. 32).



Figure 32-Most logged areas in western Washington are quickly restocked with nursery-grown seedlings.

About 86 percent of the timberland area and 82 percent of the growing-stock volume in National Forest ownership in western Washington are in even-aged stands (excluding unclassified and no manageable stand present; table 26W). Thirty-eight percent of the even-aged stands in National Forest ownership are younger than 70 years old, and 54 percent are 100 years old or older. The stands 100 years old and older with their high volumes per acre contain 73 percent of National Forest growing-stock volume in even-aged stands. National Forests contain 97 percent of all timberland area in western Washington over 200 years old. Age class distribution of area and volume are shown in figures 33 and 34 and table 26W.

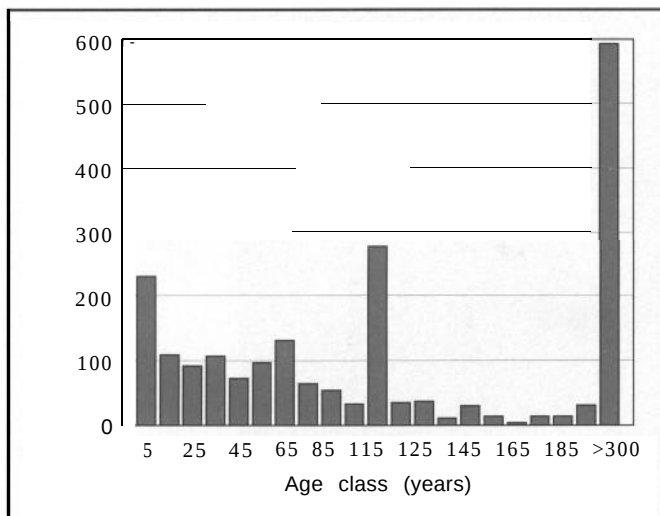


Figure 33-Area of timberland in National Forests, by age class, western Washington, 1992.

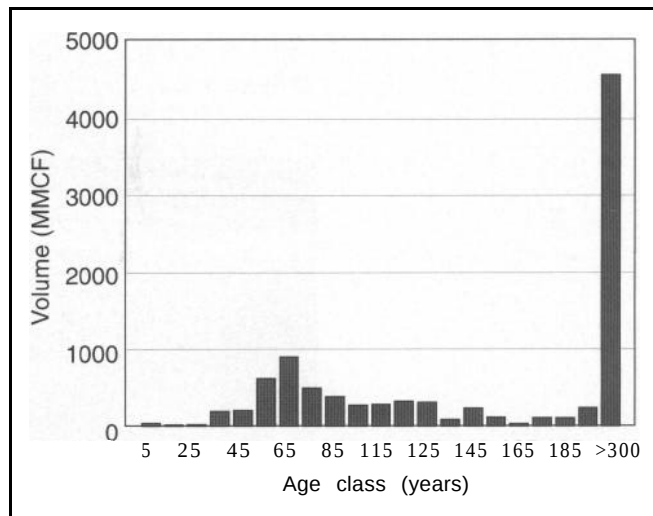


Figure 34-Growing-stock volume on timberland in National Forests, by age class, western Washington, 1992.

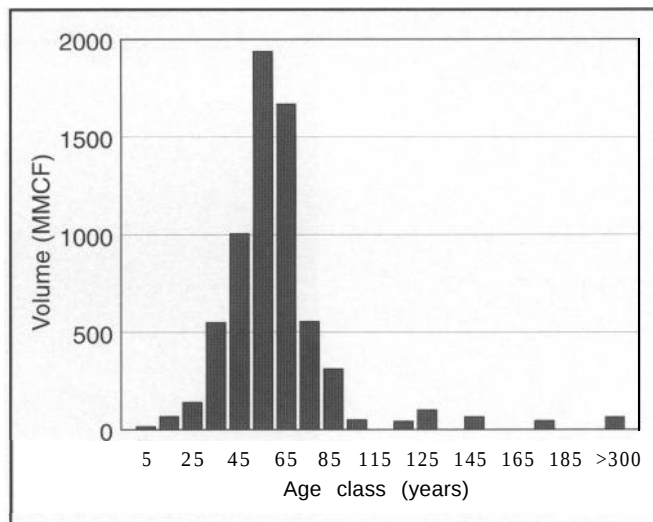
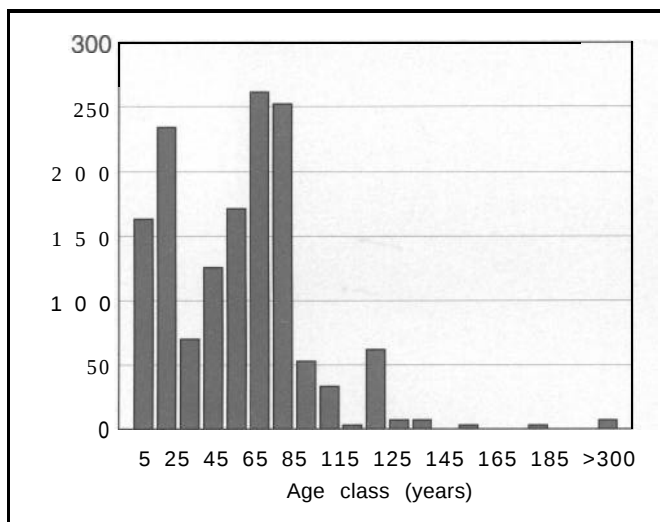


Figure 36-Growing-stock volume on timberland, by age class, other public owners, western Washington, 1992.

In western Washington, 90 percent of the timberland area and 84 percent of the growing-stock volume in other public ownership are in even-aged stands (excluding unclassified and no manageable stand present). Of this area, 61 percent is in stands 30 to 79 years old and contains 78 percent of the total even-aged growing-stock volume (figs. 35 and 36, and table 26W).

On forest industry lands in western Washington, 94 percent of the area and 88 percent of the growing-stock volume are in even-aged stands (fig. 37). The area in older stands in forest industry ownership has steadily diminished while rotation lengths have shortened. Currently, 68 percent of all even-aged stands in forest industry ownership are under 40 years old. Because of the

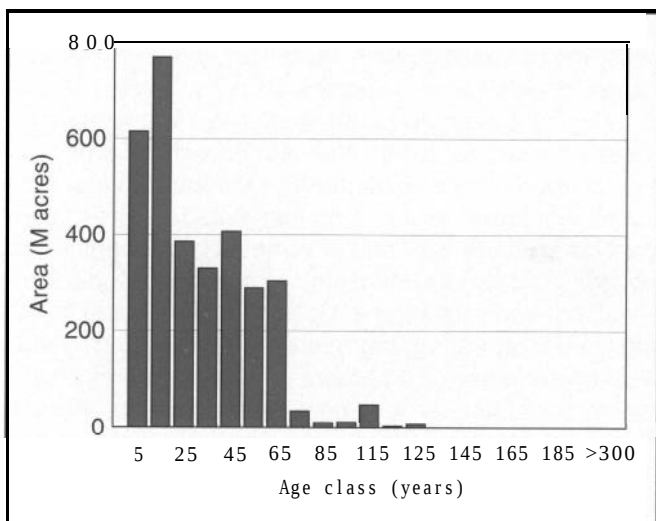


Figure 37-Area of timberland by age class, forest industry, western Washington, 1992.



Figure 38-Growing-stock volume on timberland, by age class, forest industry, western Washington, 1992.

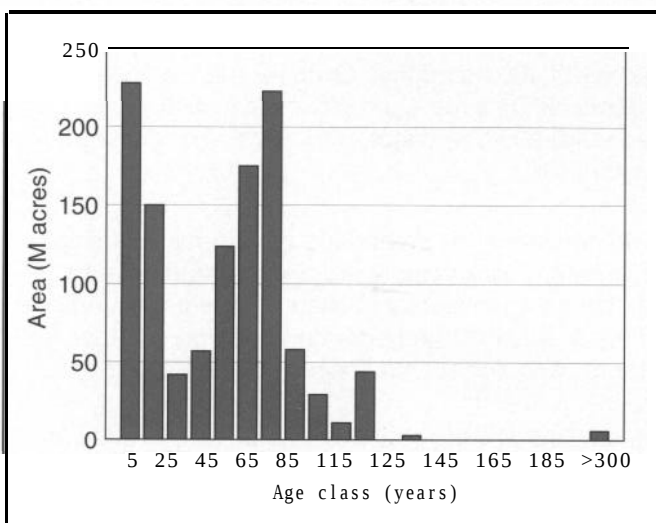


Figure 39-Area of timberland by age class, other private owners, western Washington, 1992.

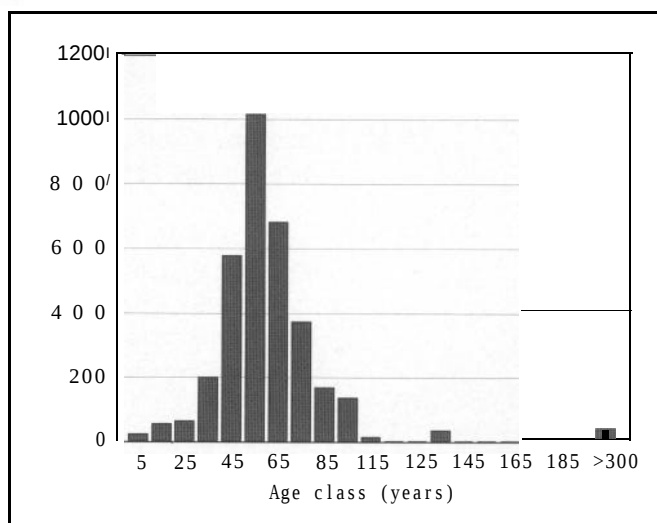


Figure 40-Growing-stock volume on timberland, by age class, other private owners, western Washington, 1992.

preponderance of area in lower age classes, the average volume per acre on forest industry lands is the lowest of any of the ownership groups (fig. 38).

On other private lands in western Washington, 81 percent of the area and 75 percent of the growing-stock volume are in even-aged stands. The bulk of the area is in two major age groups, under 20 years and 40 to 69 years (fig. 39). The stands under 20 years were regenerated after harvest during the last two to three decades when several billion cubic feet were harvested for domestic use and log exports. Stands 40 to 69 years old are, in part, the result of timber harvesting to meet World War II needs and post-War demand. These stands contain 32 percent of the total volume and 81 percent of the even-aged volume on other private lands (fig. 40).

Uneven-aged stands originate in many ways. Under natural conditions, insects and diseases can selectively kill trees, root diseases cause openings, and windthrown trees make room for younger trees. Shade-tolerant species also play a role but only where stands are allowed to live long enough for these species to develop in forest understories. Many of these conditions exist on National Forests where 14 percent of the area is in uneven-aged stands (table 26W). On other private timberland, maintenance of a continual forest structure having a pleasing aesthetic appearance is important to some landowners, and timber removal is frequently based on tree selection. High prices paid for individual high-quality trees appeal to other private owners with less well defined management goals. In some situations, selective cutting and a dependency on natural regeneration has resulted in ragged uneven-aged stands. Because of these factors, 19 percent of the timberland area in other private ownership in western Washington is in uneven-aged stands. Forest industry and other public lands have negligible amounts of uneven-aged stands—6 and 10 percent, respectively.

Uneven-aged stands in western Washington are hard to characterize. No two stands are alike in species composition, stocking, or stand structure. On the non-industrial private ownerships (other private), the uneven-aged stands, which cover a substantial area and contain a significant portion of the timber volume, can be generalized in terms of volume per acre: uneven-aged stands under 100 years average 6,550 cubic feet per acre (27,400 board feet, Scribner rule), comparable to even-aged stands 50 to 59 years old; uneven-aged stands over 100 years average 7,960 cubic feet per acre (40,000 board feet, Scribner rule), comparable to even-aged stands 70 to 79 years old.

In eastern Washington, about 66 percent of the timberland area (outside National Forests) and 46 percent of the growing-stock volume are in even-aged stands (table 26E). The larger area of uneven-aged stands in eastern Washington reflects owner objectives, the ability of many species to regenerate under forest canopies, and the long history of fires, storms, and insect and disease epidemics.

Recent change in volume-Softwood growing-stock volume on all ownerships combined (outside National Forests) has remained stable, decreasing by less than 1 percent during the 11 years between successive inventories (table 1). This overall stability, however, masks changes that have occurred within specific owner groups (tables 36, 36W, and 36E).

In western Washington, softwood growing-stock volume on forest industry lands decreased 16 percent. This decrease resulted from a net loss of 2 billion cubic feet, mostly from timber harvesting. Other sources of the volume decline are mortality and changes in ownership (sales to nonindustrial owners).

In western Washington, softwood growing-stock volume increased by 15 percent on other public timberland and 17 percent on other private timberland. These increases resulted from gross growth exceeding losses from both mortality and timber harvesting.

Table 1-Volume of growing-stock volume on timberland outside National Forests by owner class, western and eastern Washington, 1980 and 1991

Ownership and species group	Western Washington			Eastern Washington		
	1980	1991	Percent change	1980	1992	Percent change
<i>Million cubic feet</i>						
Forest industry:						
Softwoods	13,179	11,117	-16	2,415	2,005	-17
Hardwoods	2,797	2,417	-14	20	27	+35
Other Public:						
Softwoods	6,789	7,825	+15	1,966	2,115	+10
Hardwoods	1,034	1,295	+25	60	68	+13
Other Private:						
Softwoods	3,919	4,579	+17	4,688	4,858	+4
Hardwoods	2,330	2,594	+11	134	182	+36
All Owners:						
Softwoods	23,887	23,521	-2	9,069	9,018	-1
Hardwoods	6,160	6,307	+2	214	277	+29

Although the total volume of hardwood growing stock in western Washington has changed little over the last decade, hardwood volume has increased 25 percent on other public lands and 11 percent on other private timberlands. These increases, however, were matched by the 14-percent decrease in hardwood volume on forest industry lands.

In eastern Washington, softwood growing stock on forest industry timberland decreased 17 percent between successive inventories. Although gross growth and removals were almost equal, mortality and loss of timberland to other owners has accounted for most of the decrease. Softwood growing stock increased 10 percent on other public and 4 percent on other private timberland. These increases were the primary result of gross growth exceeding losses due to mortality, removals, and conversion of timberland to other land uses.

Recent change in species- A comparison of data collected in a 1967 inventory (Bolsinger 1969, 1971) with data collected in the current inventory shows changes in species distribution that have occurred over the quarter of a century between inventories (table 2). The inventories are for the Puget Sound and the Olympic Peninsula inventory units of western Washington, together representing about two-thirds of western Washington. Species distribution is based on growing-stock volume. Similar data were not available for southwest Washington.



Table 2-Percent of growing-stock volume on timberland, by species and owner class, Olympic Peninsula and Puget Sound areas of western Washington, 1967 and 1991

Species	National Forests		Other public		Forest industry		Other private	
	1967	1991	1967	1991	1967	1991	1967	1991
<i>Percent</i>								
Sitka spruce	0.5	0.7	2.2	1.9	1.9	2.3	1.6	1.4
Western hemlock	38.4	32.9	40.4	30.0	45.0	37.3	23.4	13.4
Western redcedar	9.2	7.5	12.0	5.9	6.6	6.7	9.9	13.3
Douglas-fir	25.5	28.6	20.7	44.4	24.3	33.3	35.1	34.1
Pacific silver fir	20.8	21.8	14.1	3.5	6.5	2.2	1.8	.4
Other conifers	4.7	6.6	2.3	.7	3.0	.8	.7	2.8
Hardwoods	.9	1.9	8.3	13.6	12.7	17.4	27.5	34.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Over extensive areas, Douglas-fir is the most highly desired commercial species, and in intensively managed areas, the proportion in this species has increased significantly, whereas other species have decreased (fig. 41). The proportion of stand volume in Douglas-fir increased from 20.7 to 44.4 percent on other public timberland, and from 24.3 to 33.3 percent on forest industry lands.



Figure 41—Sitka spruce and western redcedar were logged from this area before the end of World War II (decay-resistant cedar stumps with springboard notches are still present). Small western hemlock trees that were in the understory when the large cedars and spruces were cut grew several inches in diameter. In 1991, the hemlocks were cut (stumps in foreground). Douglas-fir seedlings were planted in 1992, thus establishing the third forest and third forest type to occupy the site this century.

On other private lands, which are less intensively managed for timber production, the proportion of Douglas-fir has remained relatively constant. On National Forests Douglas-fir increased by only 3 percent. Western hemlock, the species most common in most ownerships in 1967 has decreased across all ownerships. Pacific silver fir decreased markedly on other public and forest industry lands and has disappeared entirely in some areas with the conversion of natural mixed-species stands to managed stands of Douglas-fir. For example, a rather isolated enclave of Pacific silver fir occurs in the southern Coast Range in western Washington. Permanent inventory plots indicated that, in 1963, the area of Pacific silver fir occurrence in Pacific County, which contains most of the silver fir enclave, was 67,000 acres (Hazard 1965). On 70 percent of these plots, silver fir was a major component in the sawtimber overstory. In the current inventory, based on remeasurement of these same plots, Pacific silver fir was present on 22,000 acres, mostly as isolated seedlings and saplings in stands of Douglas-fir planted after the silver fir was logged.

In general, the more intensive the management, the less diverse the forests. The proportion of the stand volume in "other conifers," which includes many of the less common species such as grand fir, Alaska-cedar, Engelmann spruce, mountain hemlock, lodgepole, and western white pine, has decreased on both other public and forest industry lands but increased on National Forests and other private holdings.

Under the short rotations common to much of the forest management practiced in western Washington, hardwoods can be invasive and dominate areas formerly occupied by softwoods. On other public lands, the proportion of the stand volume in hardwoods increased from 8.3 to 13.6 percent, on forest industry lands from 12.7 to 17.4 percent, and on other private lands from 27.5 to 34.6 percent. National Forests have minimal hardwood stocking and showed an increase of from 0.9 to 1.9 percent.

The relative changes in the distribution of growing-stock volume by species by owner for all of western Washington but over a more recent and shorter period are shown in table 3.

Many of the trends that were evident between 1967 and 1991 still hold for the shorter period, although the rates of change may be slightly different. Most of the stands that existed in 1967 had regenerated naturally after fires, windstorms, and earlier logging; but by 1980, much of the forest was under management and had been reforested artificially. Natural reforestation was less dependable than planting; with intensive management came better overall forest stocking, along with some loss in diversity. Across all ownerships, the proportion of western hemlock continued to decrease, but at a slower rate. Similarly, the proportion of Douglas-fir increased but at a slower rate on all ownerships, except National Forests where the effect of heavy cutting and increased timber management activity resulted in a substantial increase in the proportion of Douglas-fir. Other conifers continued to decrease across all ownerships. Hardwoods increased moderately on all ownerships.

Table 3-Percent of growing-stock volume on timberland, by species and owner class, western Washington, 1980 and 1991

Species	National Forests		Other public		Forest industry		Other private	
	1980	1991	1980	1991	1980	1991	1980	1991
<i>Percent</i>								
Sitka spruce	.4	.4	.9	1.5	2.9	2.0	1.3	1.7
Western hemlock	28.2	25.2	31.1	27.9	38.8	35.1	15.0	12.3
Western redcedar	5.4	5.9	5.5	4.8	4.0	5.2	8.7	11.7
Douglas-fir	34.2	42.9	42.8	47.8	31.9	37.9	38.7	36.9
Pacific silver fir	22.6	18.1	6.1	3.2	3.8	1.9	.9	.4
Other conifers	8.4	6.3	1.1	.7	2.9	.8	1.9	2.5
Hardwoods	.9	1.3	12.5	14.1	15.6	17.1	33.5	34.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The proportional change in species mix between 1981 and 1992 in eastern Washington is shown in table 4.

Table 4-Percent of growing-stock volume on timberland outside National Forests, by species and owner class, eastern Washington, 1981 and 1992

Species	Forest industry		Other public and other private	
	1981	1992	1981	1992
<i>Percent</i>				
True firs	20.6	16.5	11.1	8.7
Western larch	7.4	6.6	8.0	7.3
Engelmann spruce	5.4	1.5	2.6	2.8
Lodgepole pine	4.6	3.1	9.9	8.9
Ponderosa pine	18.4	18.6	27.2	28.7
Douglas-fir	34.4	46.3	36.1	37.5
Other conifers	8.8	6.1	3.0	2.7
Hardwoods	.3	1.3	2.2	3.4
Total	100.0	100.0	100.0	100.0



The owner classes in table 4, which show species distribution at two points in time, differ from those used in western Washington. In 1981, Native American timberlands were reported as part of the "other public" owner class. In 1992, they were included with "other private." Because of the large area in Native American ownership in eastern Washington, it was necessary to combine these two ownership groups for valid comparison. The same grouping was not necessary for species comparisons in western Washington as the area in Native American ownership is relatively small.

Forest industry lands, most of which are located at higher elevations, as on the east slope of the Cascade Range, show trends similar to industry lands in western Washington. The proportion of Douglas-fir increased from 36.4 to 46.3 percent and, with the exception of ponderosa pine which increased slightly, the proportion of all other species decreased. On other public and other private ownerships, the mix of species has changed relatively little. The largest change was in the proportion of true firs which decreased from 11.1 to 8.7 percent. Douglas-fir and ponderosa pine, the two principal species on these lands, increased slightly from 63.3 to 66.2 percent of the total volume.

Recent change in size of trees- The size of trees in Washington, for all ownerships outside National Forests, has changed relatively little in the past 10 years. There has been a moderate decrease in the proportion of growing-stock volume in trees 29.0 inches and larger in diameter and an increase in the proportion of mid-range diameter classes (tables 38, 38W, and 38E). Not evident in table 5 is the change in diameter distribution by species or by owner.

Table 5-Percent of growing-stock volume on timberland outside National Forests, by diameter breast height (in inches), western Washington, 1980 and 1991, and eastern Washington, 1981 and 1992

Diameter breast height	Western Washington		Eastern Washington	
	1980	1991	1981	1992
<i>Inches</i>	<i>Percent</i>			
5.0-8.9	9	9	15	14
9.0-12.9	17	17	20	20
13.0-16.9	17	19	20	19
17.0-20.9	15	16	15	16
21.0-28.9	19	20	18	18
29.0+	23	19	12	13
Total	100	100	100	100

Long-Term Changes in Washington's Forests

This report shows that across all ownerships there has been little change in total volume of timber in Washington's forests in recent years, though some changes in tree size and species mix have occurred. On some ownerships, timber volume actually increased in the past 10 to 11 years (tables 28, 37, and 39). Many people are interested in how Washington's forests today compare with those of the more distant past, say 50 or 100 years ago, or longer. Questions include, Has total forest area changed? Do we have more or less timber volume? Has the mix of species changed? And is there less old growth?

Comparisons of historical data with current forest statistics do not allow detailed quantification of changes because of differences in definitions and procedures. Detailed data for shorter periods of time (tables 33, 36, and 38 in this report; Bolsinger 1973), however, corroborate the direction and general magnitude of changes indicated by comparing current statistics with the results of the first forest inventory in Washington.

The first comprehensive forest inventory, authorized by the McSweeney-McNary Forest Research Act of 1928, was completed in 1933 in western Washington (Andrews and Cowlin 1940), and in 1936 in eastern Washington (Cowlin and others 1942). The eastern Washington inventory excluded Pend Oreille, Spokane, and Stevens Counties. Following is a discussion of changes in forest area and volume that have occurred since the 1933-36 inventory.

Forest area amounted to 13.4 million acres in western Washington and 8.0 million acres in eastern Washington, giving a total of 21.4 million acres statewide (exclusive of Pend Oreille, Spokane, and Stevens Counties) in 1933-36. In 1992, forest area totaled 19.3 million acres (table 6; less forest area in Pend Oreille, Spokane, and Stevens Counties shown in table 7), indicating a loss of 2.1 million acres of forest, or 9.8 percent, over the 56- to 59-year period. Forest loss in western Washington was about 1.5 million acres, or 11.2 percent between 1933 and 1992. In eastern Washington, forest loss was about 0.6 million acres, 7.5 percent between 1936 and 1992.

In 1933, in western Washington, sawtimber volume was estimated for trees 16 inches in d.b.h. and larger. In eastern Washington, in 1936 sawtimber volume was estimated for trees 12 inches and larger. Volumes were calculated according to the utilization standards of that period, which resulted in about 30 percent less volume per tree than current standards in western Washington, and 20 percent less per tree in eastern Washington.

Major differences in volume calculations:

1. Top diameter was 40 percent of d.b.h. in 1933-36, versus 7 inches in 1992; for a 50-inch tree, for example, the volume between a 40-percent-of-d.b.h. top (20 inches) and 7 inches amounts to 13 to 20 percent of total tree volume. The exact amount depends on tree height and taper.
2. Stump height was variable in 1933-36, based on woods practice, which ranged from 2 to 12 feet or higher in flare-buttressed trees, versus 1-foot stumps in 1992. In a tree with three 32-foot logs, for example, the lower 12-foot section contains 16 to 25 percent of the volume above a 1-foot stump, depending on taper.
3. Culling procedures in the 1933-36 inventory deducted more heavily than current procedures for defect and breakage.

Estimated volume of softwood sawtimber in western Washington in 1933 was 244 billion board feet compared to 80 billion in 1992 (in trees 16 inches and larger; volume adjusted to 1933 utilization standards), a 67-percent decrease. The volume

in trees less than 16 inches in d.b.h. in 1933 is not known. On the basis of what is known about the proportion of old growth, forest condition, and growth and removals in 1933 (discussed below), it is safe to assume there was less volume in trees smaller than 16 inches in diameter than there is now (table 18W). If there had been no volume in trees less than 16 inches in diameter in 1933, and the total volume in 1992 including these smaller trees were used for comparison, the change in volume in western Washington would be from 244 to 104 billion, a 57-percent falldown.

In the 1936 inventory in eastern Washington, which excluded Pend Oreille, Spokane, and Stevens Counties, sawtimber volume in trees 12 inches in d.b.h. and larger totaled 39.4 billion board feet. In 1992, the approximate volume of sawtimber in trees 12 inches and larger in eastern Washington, exclusive of Pend Oreille, Spokane, and Stevens Counties (prorated from Arbogast 1974, who included National Forest estimates by county) was 42.2 billion. The 7-percent increase in volume in eastern Washington contrasts with the 67-percent decrease in western Washington over about the same period. The difference in trends in eastern Washington compared with those in western Washington is thought to be caused by a combination of these factors:

- Lower existing volumes in the 1930s in eastern Washington.

- Less land converted to nonforest after cutting (in western Washington extensive areas of high-volume timber were converted to urban areas, agriculture, and “stump-pastures” after being logged, especially near Puget Sound [Holbrook 1945, Washington State Historical Society 1941]).

- Lower overall cutting rates in eastern Washington.

- Timber harvest and forestry practices, including fire control, that promoted the increase of species other than ponderosa pine (Burns and Honkala 1990, Steer 1948). While ponderosa pine decreased from 41 percent of sawtimber volume in 1933 to 22 percent in 1992, Douglas-fir increased from 27 to 42 percent, and true firs increased from 10 percent to 15 percent (these long-term trends for all ownerships differ somewhat from changes for some ownerships over the past 10 years).

As in eastern Washington, the proportional volume of Douglas-fir in western Washington increased, from 41 percent (in trees 16 inches d.b.h. and larger) in 1933 to 51 percent in 1992. The proportional volumes in western hemlock, or Sitka spruce, western redcedar, and true firs decreased. Hardwoods made up 0.4 percent of the reported volume in trees 16 inches d.b.h. and larger in 1933 versus 8.5 percent in 1992. Whether hardwoods have increased as much as these estimates suggest or, as suspected, they were heavily discounted in the 1933-36 inventory, is not known. A moderate increase in hardwoods over the past decade has been documented (table 37W), which would suggest that the large increase over the longer period is partly real and partly a function of changing standards, procedures, and attitudes toward hardwoods.



Old-growth forests occupied 9.1 million acres in 1933-36, 7.2 million acres in western Washington, and 1.9 million acres in eastern Washington (exclusive of Pend Oreille, Spokane, and Stevens Counties). In 1992, old-growth forests occupied 2.6 million acres, 2.0 million acres in western Washington, and 0.6 million acres in eastern Washington, exclusive of Pend Oreille, Spokane, and Stevens Counties (Bolsinger and Waddell 1993).

In 1933, about 62 percent of the sawtimber volume in western Washington was old growth by 1933 definitions. Stands as old as 160 years were classified as "second growth," and old-growth Douglas-fir-called yellow fir-consisted of trees 250 years and older. Fifty-four percent of the volume of old-growth Douglas-fir was in private ownership. In 1992, 26 percent of the sawtimber volume in western Washington was in even-aged stands 200 years and older and uneven-aged stands 100 years and older. Of this "old growth," 5 percent was in private ownership, including that on Native American lands, and 95 percent was on Federal and State lands. Excluding Native American lands, in 1992, 2 percent of the old-growth area was privately owned, and 96 percent was in Federal and State ownership (Bolsinger and Waddell 1993).

In eastern Washington in 1936, exclusive of Pend Oreille, Spokane, and Stevens Counties, old growth made up 52 percent of total sawtimber volume, and 92 percent of the ponderosa pine sawtimber. In 1992, in eastern Washington including Pend Oreille, Spokane, and Stevens Counties, sawtimber trees 21 inches in d.b.h. and larger (roughly equivalent to old growth as reported in 1936) contained 43 percent of total sawtimber volume and 52 percent of ponderosa pine sawtimber volume. Except for 0.2 million acres on the Colville National Forest, there was no old-growth acreage in Pend Oreille, Spokane, or Stevens Counties in 1992. The remaining area of old-growth forest in eastern Washington-0.6 million acre-was in the other counties, on Federal, State, and Native American lands. The tables in this report (for example, table 18E) include the volume in scattered old-growth trees found in younger stands throughout eastern Washington on all ownerships.

Steer (1948) reported the production of 13 billion board feet of lumber in Washington from 1869 to 1899, and 156 billion board feet from 1899 to 1934. Adding this volume to the inventory volume reported in 1933-36 (156 + 284) gives a total of 440 billion board feet of sawtimber in Washington's forests at the turn of the century. In 1869, nearly one and a quarter centuries ago, there was roughly 458 billion board feet, about 3.8 times the present volume (120 billion board feet, excluding Pend Oreille, Spokane, and Stevens Counties) of sawtimber in trees 16 inches and larger in western Washington and 12 inches and larger in eastern Washington.

The above approximations ignore the effects of forest growth, fires and other negative forest impacts, changes in utilization standards before 1934, volume in smaller trees at both points in time, and timber harvested for products other than lumber. A considerable but unquantifiable volume of timber was harvested from areas now within Seattle, Tacoma, Olympia, Everett, and other urban areas near Puget Sound. In addition to these areas that were not available for growing new timber crops were extensive areas that were cleared for pasture and agriculture,

and burned and reburned, both deliberately and accidentally (Anon. 1938, Holbrook 1945, Meany 1924, Washington State Historical Society 1941).

Andrews and Cowlin (1940) addressed the subject of forest depletion before the 1933-36 inventory, stating:

No one now knows, or will ever know, what the volume of timber in the Douglas-fir region was before the coming of the white man. It is therefore quite impossible to compare the volume of the present stand with that of prehistoric times and thus compute the depletion that has resulted from the activities of civilization. It is certain that the primeval forest was far from carrying on every acre the maximum volume.... Fires, windstorms, insects, and diseases have always taken their toll and kept certain areas understocked or temporarily stripped of large living timber. But it must be assumed that before the interference of man the forests of the region maintained from decade to decade and century to century a generally constant volume; that the natural agencies of depletion were constantly at work but were substantially in equilibrium with growth.

Since the region has been settled and industrial activity begun there has been great acceleration of depletion.... It appears that the sawtimber volume of the Douglas-fir region is being depleted about four times as fast as it is being replaced by growth.

Whether the depletion rate was really four times the growth rate, or the volume in the original forest was 3.8 times the current volume, as was approximated above, there is no doubt that Washington's forests were heavily exploited in the 1800s and the early part of the 1900s. More recent trends shown in this report indicate that growth and removals are close to being in equilibrium now (table 36), a decided change from the past.

Annual Growth and Mortality

Total growth of growing-stock volume on all ownerships in the State was estimated at 1.9 billion cubic feet (roughly 8.4 billion board feet) in 1991. This "gross growth" (see "Terminology") represents total wood production for the year, including that on trees that were dead at the end of the year. Estimated mortality-the volume in trees that died during the year-amounted to 374 million cubic feet (about 1.2 billion board feet). Some mortality agents typically kill trees that have been growing slowly before death-long-term diseases such as dwarf mistletoe and root diseases, and insects that attack weakened trees, for example. Reduced growth caused by such agents is, in some forests, thought to have a greater impact than mortality, though it is virtually impossible to quantify. A common goal of most forest managers is to maintain healthy forests so that mortality will be low and growth rates high; but some agents-windstorms, lightning, and wildfire, for example-are sometimes impossible to control, and they kill healthy, rapidly growing trees as well as slow-growing trees.



Net annual growth-gross growth minus mortality from all causes-amounted to 1.5 billion cubic feet (6.1 billion board feet) roughly equal to the average harvest of live trees from all ownerships over the past several years (table 39). Growth and mortality differed considerably by ownership in western and eastern Washington, as discussed in the following section.

In western Washington, notable differences in growth rates by ownership reflect species mix, stand age, stocking, the presence of growth impactors such as insects and disease, and the innate productivity of the land. As shown in the following tabulation, National Forests have both the lowest innate productivity and also the lowest growth rate. National Forests are managed for many purposes and on some sites, achieving high rates of growth is secondary to other objectives. Forest industry lands are the highest in innate productivity and in growth as a percentage of inventory but second in terms of absolute growth rates. Extensive areas of forest industry lands are stocked with trees that are too young for growth to be measured. Growth in these areas is expected to increase in the future, though the continual harvesting of young stands will tend to keep growth lower than potential. Growth potential by ownership in western Washington, and growth as a percentage of inventory and per acre are shown in the following tabulation:

Ownership	Growth potential	Softwood growth	Softwood growth
	<i>Cubic feet per acre</i>	<i>Percent of inventory</i>	<i>Per acre</i>
National Forest	119	0.8	46
Other public	165	3.1	142
Forest industry	174	4.5	129
Other private	150	3.6	84

Mortality in western Washington forests differed relatively little by ownership. Despite the widespread occurrences of many insect and disease pests, storms, fires, and a drought, mortality rates for the 10-year period between inventories were close to the average trend-level value of one-half of one percent of inventory volume as shown in the following tabulation:

Ownership	Annual mortality of softwood growing-stock volume
	<i>Percent</i>
National Forest	0.3
Other public	.6
Forest industry	.6
Other private	.5

The following tabulation shows that in eastern Washington, forest productivity is relatively low and tends to differ little on the average across ownerships. Also, contrasts in management style do not occur here to the degree they do in western Washington. For these reasons, growth rates in eastern Washington were much

lower than in western Washington, with negligible differences among ownerships (data not available for National Forests):

Ownership	Growth potential	Softwood growth	Softwood growth
	<i>Cubic feet per acre</i>	<i>Percent of inventory</i>	<i>Per acre</i>
Other public	69	1.8	50
Forest industry	72	2.3	52
Other private	70	2.4	48

Mortality rates in eastern Washington were higher than in western Washington, as was expected. Unlike western Washington where the effects of drought were moderate, in eastern Washington where much of the forest is in or adjacent to the low-rainfall "tension zone," the drought was injurious. Several factors combined to kill trees over extensive areas, resulting in mortality rates 1.6 to 1.8 times the average long-term trend-level rates: Trees that in years of normal rainfall were able to resist forest pests such as bark beetles were vulnerable in the drought. Trees that had been hosts to dwarf mistletoe for years were no longer able to support themselves and the parasitic plants. In many stands, cutting practices had left dwarf-mistletoe-infected trees in the overstory and opened the stand to light, thus favoring the growth and spread of the light-demanding disease. Over several decades of fire prevention, dense "doghair" stands of pine, fir, and larch developed. Trees in these stands, already under stress from overcrowding, were vulnerable to drought either directly or indirectly through various agents such as spruce budworm, bark beetles, root diseases, and dwarf mistletoe. Spreading budworm infestations left extensive areas of dead trees susceptible to fire.

Softwood mortality rates by ownership in eastern Washington are shown in the following tabulation (data not available for National Forests):

Ownership	Annual mortality of growing-stock volume
	<i>Percent</i>
Other public	0.9
Forest industry	.8
Other private	.8

Discussion

Washington's forests have provided products and amenities for many centuries and continue to do so. In western Washington, the impressive old-growth forests of the low hills and valleys that awed the early European settlers have in most places been replaced by young forests, or housing tracts, roads, and industrial complexes. Remaining old-growth forests are in the mountains on steep ground and poorer sites, and mostly in Federal ownership. Intensive management of the highly productive Coast Range and Cascade Range foothills has resulted in extensive areas of well-stocked forests of young nursery-grown Douglas-fir trees. To some extent, this has occurred on all ownerships, with the overall effect of increasing expected future timber growth rates, while reducing biological diversity, including the genetic makeup of the major forest tree species. The long-term trend of increasing forest

industry ownership has changed, and some industry lands are being sold to non-industrial owners, who in turn are developing the lands for nonforest uses. Non-industrial private forest lands are extremely diverse in character, productivity, and owner intent. Hardwood stands are common on these lands, and because of the low rates of past timber harvest, these lands have been supplying an increasing amount of softwood timber in recent years. Because of the rapid urbanization in the area where the nonindustrial private lands are located, the future of these forests is questionable.

In eastern Washington where soils and climate are less favorable for tree growth than those west of the Cascade Range, and pressures from expanding populations have so far been slight, forests seem to be relatively static. Despite recently high mortality rates, the overall character of the forest has changed little in the past 10 years. Over a longer period, tree size has declined, ponderosa pine have decreased, whereas shade-tolerant species have increased. As in western Washington, Federal ownerships contain much of the larger, older forests. Most of the old growth that does occur outside Federal lands in eastern Washington is in three areas owned by Native Americans.

Many of the problems of forest management have been solved, or the knowledge to solve them exists if the resources can be made available to apply the knowledge. Some unproven include the long-term effects of artificial regeneration and the narrowing of biological diversity in intensively managed areas. These may not be irreversible problems, so long as genetic material and species are preserved somewhere in the ecosystems. In the meantime, society is enjoying the results of highly productive forests. A greater problem, one that currently seems irreversible, is the increasing loss of forest land, the subtle and not-so-subtle encroachment of urbanization into remote forest areas. In the long run, this problem could greatly overshadow currently perceived problems related to forest fire policy, insect and disease epidemics, drought, floods, and Federal timber supply issues.

Inventory Procedures on Lands Other Than National Forests

For lands other than National Forest, the sampling design was double sampling with stratification (Cochran 1977). Inventoried area did not include Adams, Benton, Franklin, and Grant Counties, which had virtually no forest land. The primary sample was a grid of 42,068 photo plots established in the 1978-80 inventory and reexamined in 1988-89 in western Washington (22,107 photo plots) and 1990-91 in eastern Washington (19,961 photo plots). At each photo plot, owner group was identified, and land class (timberland, other forest, or nonforest), degree of urbanization, and for forested plots, stage of development, major type and broad stocking class were photointerpreted.

The secondary sample in the 1988-91 inventory was a grid of 4,035 field plots that subsampled the primary grid at about every eighth photo plot in western Washington and about every 16th photo plot in eastern Washington. During the 1963-68 inventory of Washington, permanent plots were established at every timberland location on the grid. Each plot was a cluster of 10 variable-radius subplots distributed over 1 acre. In the 1978-79 inventory, the timberland plots in western Washington were replaced with plots consisting of five variable-radius subplots that sampled about 8 acres; in eastern Washington in 1980, the 10-subplot, 1-acre timberland plots were revisited, but only 5 subplots were remeasured.

In 1988-89, the five-subplot, 8-acre plots in western Washington were remeasured, and the data were combined with new classifications on the 22,107 photo plots to provide current estimates of timber volume, growth, mortality, removals, and area attributes such as forest type, stand size, stand age, and site class. In 1990, in cooperation with the Washington Department of Natural Resources, the field plot grid in western Washington was doubled, the new field plots were established, and the inventory was recompiled from the data collected on the combined doubled grid of field plots.

In the 1990-91 inventory, the five-subplot, 1-acre plots in eastern Washington were remeasured. As in western Washington, these data were combined with current classifications on the 19,961 photo plots to provide current estimates. Additionally, permanent field plots were established at other forest (nontimberland) sites on the field grid. The field plot grid was not doubled in eastern Washington.

Estimates of changes between 1978 to 1980 and 1988 to 1991 are based on changes observed and measured on remeasured plots. Because the plots established in 1990 in western Washington were new, estimates of area and timber volume change are based solely on plots remeasured in western Washington from 1988 to 1989 and in eastern Washington from 1990 to 1991. For this reason, current estimates of area and volume that appear in tables 33 through 38E differ slightly from comparable estimates in other tables.

National Forest Data

National Forest statistics in this report are for lands within western Washington administrated by the Gifford Pinchot, Olympic, and Mount Baker-Snoqualmie National Forests and for lands within eastern Washington proclaimed to the Colville, Idaho Panhandle, Okanogan, Wenatchee, and Umatilla National Forests. These data do not include National Forest land proclaimed to the Mount Baker-Snoqualmie National Forest in Skagit and Whatcom Counties but administrated by the Okanogan National Forest (197,000 acres) or National Forest land proclaimed to the Mount Baker-Snoqualmie National Forest but administrated by the Wenatchee National Forest in Kittitas and Yakima Counties (523,000 acres); these lands, reported in the previous inventory (Bassett and Oswald 1983), are excluded because data are not available. Lands within the Gifford Pinchot National Forest in Klickitat and Yakima Counties (47,000 acres) are tabled and analyzed as part of western Washington. Statistics for area and timber-volume change between current and previous inventories are not available for National Forests.

Olympic and Mount Baker-Snoqualmie National Forests- Inventories on these Forests were conducted in 1975. The areas of timberland, other forest land, and nonforest land in the Olympic and Mount Baker-Snoqualmie National Forests were determined from maps prepared from aerial photographs. The inventories were restricted to timberland area, where a 1.7-mile grid of 10-point field plot clusters was established. Recent clearcuts and young plantations were excluded from the inventory.

The inventory statistics used in this report were updated by National Forest personnel to reflect the effects of harvesting activities between 1975 and 1989. Statistics for unsampled areas and areas harvested since 1976 were based on stand-examination records and other ancillary data.



Gifford Pinchot National Forest- The design for the 1981 inventory of the Gifford Pinchot National Forest was a stratified random sample with optimum allocation of field plots (Cochran 1977).⁴ Strata, based on management criteria, were delineated on aerial photographs, and a total of 355 field plots were delineated to the various strata in proportion to their estimated stratum variance in Scribner board-foot volume. Recent clearcuts, young plantations, and areas not qualifying as timberland were not sampled in the inventory. Data for these excluded areas are derived from stand examinations and other ancillary sources.

All area statistics have been updated to reflect conditions as of January 1, 1989, but volume statistics are as of 1981 less harvest volumes removed after that date. Tables 21 through 24 and 27 through 30E require that growing-stock volume, saw-timber volume, net, and mortality be reported by forest type. Because the Gifford Pinchot National Forest was unable to provide these data, they were approximated by using volumes per acre as obtained from the RPA (Resource Planning Act, Forest and Rangeland Renewable Resources Planning Act 1974) assessment data.⁵

Colville, Idaho Panhandle, Okanogan, Wenatchee, and Umatilla National Forests-Statistics for these National Forests were based on inventory data submitted by the National Forest System for the 1989 Resource Planning Act assessment (Haynes 1990, Waddell and others 1989). The inventories were conducted in 1973 for the Colville National Forest, in 1976 for the Idaho Panhandle National Forest, in 1977 for the Okanogan and Wenatchee National Forests, and in 1981 for the Umatilla National Forest. National Forest personnel updated the data submitted from these inventories for the 1989 RPA assessment; the data were updated to 1987.

Further information about National Forest inventories and updating procedures for RPA data submissions may be obtained, except for the Idaho Panhandle National Forest, by contacting USDA Forest Service, Pacific Northwest Region, Division of Timber Management, P.O. Box 3623, Portland, OR 97208-3623. For the Idaho Panhandle National Forest, contact USDA Forest Service, Northern Region, Division of Timber, Cooperative Forestry and Pest Management, P.O. Box 7669, Missoula, MT 59807-7669.

Changes Since the Previous Inventory on Lands Outside National Forests

Comparisons of statistics from this report with those presented by Bassett and Oswald (1981a, 1981b, 1982, 1983) are unreliable estimators of change for the following reasons:

1. The accuracy of current (1988-91) inventory statistics was improved by photo-interpreting the latest available aerial photographs. With this information, new stratum weights were calculated to expand the field plots. Even though the same photo plots and field plots were used for the current and previous inventory, any given field plot in the current inventory represented a slightly different number of acres than it did in the 1978-80 inventory, a difference that is not real change.



⁴ Teply, John. 1981. Gifford Pinchot National Forest summary tables for timber resource inventory. Unpublished report. On file with: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, P.O. Box 3623, Portland, OR 97208-3623.

⁵ On file with: Pacific Northwest Research Station, Pacific Resource Inventory, Monitoring and Evaluation Program, P.O. Box 3890, Portland, OR 97208-3890.

2. We improved our database during the current inventory. On some plots, better site trees were obtained in 1988-91 inventory, thereby improving our estimate of site capability. For hemlock sites in western Washington and Douglas-fir sites in eastern Washington, we adopted site curves (Curtis and others 1974, Wiley 1978) that improved estimates of potential productivity and forest land class. Additionally, after careful examination, the classification of ownership was revised for some plots at the time of previous inventory (1978-80). These improvements reflect new information or reevaluation, not resource change.

3. Ownership definitions have been revised since the previous inventory. In the 1978-80 inventory, forest industry lands were defined as lands belonging to companies or individuals operating wood-using plants. Because this definition no longer identified all industrial timber growers, we broadened the definition to include all companies holding land for timber production whether or not they operated a wood-processing facility. Also, Native American lands are now classified as "other private" at the request of the owners; these lands were included in "other public" ownership in the 1978-80 inventory.

Tables 33 through 38E provide reliable estimates because statistics for the 1978-80 inventory were recompiled by using the same procedures and definitions applied in the current inventory. For both current and previous inventories, each field plot represented the same (current) number of acres, site capability was based only on the latest information, and only current definitions for classifying owner group were used.

Reliability of Inventory Data

Estimates of sampling errors for National Forest statistics are not available, and confidence intervals cannot be calculated for estimates that include National Forest data. All area and volume statistics for ownerships other than National Forest are based on sampling and are subject to sampling error. Confidence intervals (68-percent probability) for the estimated timberland area, cubic-foot volume, and net annual cubic-foot growth outside National Forests are shown in the following tabulation:

Region and owner	Timberland area	Net volume	Net annual growth
	<i>Thousand acres</i>	<i>- - - Million cubic feet - - -</i>	
Western Washington:			
Other public	1,663±29	8,812±304	270±9
Forest industry	3,732±39	12,840±368	545±13
Other private	1,978±40	7,089±249	247±8
Total, all owners	7,373±49	28,741±516	1,062±17
Eastern Washington:			
Other public	764±35	2,223±178	39±3
Forest industry	878±34	2,032±135	47±5
Other private	2,366±57	5,039±199	119±5
Total, all owners	4,008±72	9,294±295	205±8
Washington:			
Other public	2,427±45	11,035±352	309±10
Forest industry	4,610±52	14,872±392	592±14
Other private	4,344±70	12,128±319	366±9
Total, all owners	11,381±87	38,035±594	1,267±19

Confidence intervals are quantitative expressions of the reliability of statistics. The above tabulation indicates, for example, a two-in-three (68-percent) chance that the timberland area for all owners other than National Forests is within the range of 11,294,000 to 11,468,000 acres.

Confidence intervals differ by both size of the estimate and variance of the statistic being estimated. Confidence intervals for subsets of data usually are broader (less precise) than those for totals. Confidence intervals for individual tabular estimates in this publication may be as high as 100 percent. This is demonstrated in the following tabulation showing examples of timberland area and volume estimates for western Washington taken from tables 11W and 19W:

Item	Area	Confidence interval	
	Thousand		
	-----acres-----	Percent	
Timberland area outside National Forests, all forest types	7,373	49	0.6
Timberland area, forest industry, all forest types	3,732	39	1.0
Timberland area, other private, all forest types	1,978	40	2.0
Timberland area, forest industry, hemlock-Sitka spruce type	1,052	53	5.0
Timberland area, other public, Douglas-fir types	705	40	5.7
Timberland area, other public, hemlock-Sitka spruce types	440	34	7.7
Timberland area, other public, all hardwood types	269	27	10.0
Timberland area, forest industry, other softwood types	111	20	18.0
Timberland area, other public, other softwood types	40	13	32.5
Timberland area, other private, fir-spruce types	19	9	47.3
Timberland area, other public, mountain hemlock type	4	4	100.0

Item	Volume	Confidence interval	
	Million cubic		
	-----feet-----	Percent	
Net growing-stock volume outside National Forest, all species	28,741	516	1.8
Net growing-stock volume, forest industry, all species	12,840	369	2.9
Net growing-stock volume, other private, all species	7,089	249	3.5
Net growing-stock volume, forest industry, Douglas-fir	4,864	243	4.9
Net growing-stock volume, forest industry, red alder	1,714	112	6.5
Net growing-stock volume, other public, red alder	962	87	9.0
Net growing-stock volume, other public, western redcedar	427	49	11.5
Net growing-stock volume, other public, bigleaf maple	190	31	16.3
Net growing-stock volume, other private, grand fir	109	26	23.9
Net growing-stock volume, other private, lodgepole pine	54	17	31.4
Net growing-stock volume, forest industry, lodgepole pine	23	17	74.9
Net growing-stock volume, other public, Oregon ash	4	4	100.0

Confidence intervals have been calculated by region for non-National Forest tabular data and are available on request from the Pacific Resources, Inventory, Monitoring, and Evaluation (PRIME) Research, Development and Application Program, Forestry Sciences Laboratory, P.O. Box 3890, Portland, OR 97208-3890.

Terminology

Available timberland-Timberland that is not withdrawn from timber by statute, ordinance, or administrative order.

Class of timber- A classification of trees as growing-stock, cull, and salvable dead. Growing-stock trees are divided into pole timber and saw-timber trees.

County and municipal lands- Lands owned by county and other local public agencies.

Cull trees- Live trees of noncommercial species, and live trees of commercial species that are more than 75-percent defective. Noncommercial species are western juniper, Pacific yew, white alder, Pacific dogwood, apple, and willow.

Cull trees, rotten- Cull trees with defect caused primarily by rot.

Cull trees, sound- Trees of noncommercial species or cull trees of commercial species with defect caused primarily by poor form and roughness.

Diameter class- A classification of trees based on diameter outside the bark measured at breast height, 4-1/2 feet above ground. D.b.h. is the common abbreviation for diameter at breast height.

Even-aged stands- Stands where 70 percent or more of the stocking falls within three adjacent 10-year age classes.

Farmer-owned lands- Lands owned by the operators of farms.

Forest industry lands- Lands owned by companies that grow timber for industrial use. Includes companies with or without wood processing plants.

Forest land- Land at least 10 percent stocked by live trees or land formerly having such tree cover and not currently developed for nonforest use. The minimum area recognized is 1 acre.

Forest types- Stands with 70 percent or more of the stocking in live conifer trees are classed as pure softwood types; stands with 50 to 69 percent of the stocking in live conifer trees are classed as softwood-hardwood types. Stands with 70 percent or more of the stocking in live hardwood trees are classed as pure hardwood types; stands with 50 to 69 percent of the stocking in live hardwood trees are classed as hardwood-softwood types. The specific forest type reflects the individual species of live softwood or hardwood tree with the greatest total stocking.

Forest zones- All land outside National Forests and parks was classified into three zones, as defined below:

1. **Primary forest zone** is characterized by continuous tracts of forest with a maximum of one development per 640 acres. Nonforest inclusions are confined to unimproved range. Roads are more than 1/4 mile apart and are for resource extraction rather than access to residential or commercial developments. Primary uses of this zone include timber production, grazing, watershed, and wildlife protection.

2. Low-density suburban-farm zone is characterized by a pattern of intermingled forests, farms, pastures, and housing or industrial developments with more than one development per 640 acres. Roads are 1/4 mile apart or more, and can be for any purpose including access to developments.

3. Urban-residential-developed zone includes land within legal boundaries of cities or towns, and tracts of forest or other undeveloped land intermingled with residential and industrial areas. Roads are closer together than 1/4 mile. The primary use is for residential, business, or industrial purposes, although this zone may contain recreational forests, preserved tracts of greenspace, wildlife habitat, and undeveloped inclusions.

Growing-stock trees- All live trees except cull trees.

Growing-stock volume- Net volume in cubic feet of live sawtimber and pole-timber growing-stock trees from the top of a stump 12 inches tall to a minimum 4-inch top (of central stem) outside the bark. Net volume is gross volume less deductions for rot and missing bole sections.

Growth, current net annual, growing-stock- The increase in growing-stock volume during the last year in the period between the previous and current inventories. Components of current net annual growth for growing-stock volume include (a) the increment in net volume of poletimber and sawtimber growing-stock trees alive at the beginning of the year and surviving to year end; plus (b) ingrowth, the net volume of growing-stock trees reaching poletimber or sawtimber size during the year; minus (c) mortality, the net volume of poletimber and sawtimber growing-stock trees that died during the year.

Growth, current net annual, sawtimber- The increase in sawtimber volume during the last year in the period between the previous and current inventories. Components of current net annual growth for sawtimber volume include (a) the increment in net volume of sawtimber trees alive at the beginning of the year and surviving to year end; plus (b) ingrowth, the net volume of trees reaching sawtimber size during the year; minus (c) mortality, the net volume of sawtimber trees that died during the year.

Growth, periodic gross, growing stock- The increase in growing-stock volume between the previous and current inventories that is attributable to increasing tree size. Periodic gross growth includes (a) the increment in net volume of poletimber and sawtimber growing-stock trees alive at both the previous and current inventories; (b) the increment in net volume of poletimber and sawtimber growing-stock trees alive at the previous inventory and harvested between inventories; and (c) ingrowth, the net volume of growing-stock trees reaching poletimber or sawtimber size between inventories.

Growth, periodic gross, sawtimber- The increase in sawtimber volume between the previous and current inventories that is attributable to increasing tree size. Periodic gross growth includes (a) the increment in net volume of sawtimber trees alive at both the previous and current inventories; (b) the increment in net volume of sawtimber trees alive at the previous inventory and harvested between inventories; and (c) ingrowth, the net volume of trees reaching sawtimber size between inventories.

Hardwoods- Nonconiferous trees, usually broad-leaved and deciduous.

Industrial wood- All commercial roundwood products except fuelwood.

Land area- Area reported as land by the Bureau of the Census (U.S. Department of Commerce 1983). Total land area includes dry land and land temporarily or partially covered by water such as marshes, swamps, and river flood plains; streams, sloughs, and canals less than one-eighth of a mile wide; and lakes, reservoirs, and ponds less than 40 acres in area.

Land class- A classification of land by major use. The minimum area for classification is 1 acre.

Mean annual increment- A measure of the productivity of forest land expressed as the average increase in cubic-foot volume per acre per year. For a given species and site index, the average is based on the age at which the mean annual increment culminates for fully stocked natural stands. Productivity for conifer stands is based on conifer yields even when the current stand is hardwood. When productivity is calculated for forest land in western Washington outside National Forests, and forest inclusions of less than 1 acre are excluded.

Miscellaneous Federal lands- Federal lands other than lands administered by the Forest Service.

Miscellaneous private lands- Lands of all private owners not otherwise classified.

Mortality, average annual, growing stock- The average annual net volume of pole timber and sawtimber growing-stock trees that died between the previous and current inventories.

Mortality, average annual, sawtimber- The annual net volume of sawtimber trees that died between the previous and current inventories.

Mortality, periodic, growing stock- The net volume of pole timber and sawtimber growing-stock trees that died between the previous and current inventories.

Mortality, periodic, sawtimber- The net volume of sawtimber trees that died between the previous and current inventories.

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 Forest Service, U.S. Department of Agriculture, including experimental areas and Bankhead-Jones Title III lands.

Native American lands- Tribal and allotted lands held in trust by the Federal Government. Native American lands are grouped with farmer and miscellaneous private lands as other private lands.



Net volume- Gross wood volume less deductions for sound and rotten defects. Growing-stock net volume is gross cubic-foot volume less deductions for rot and missing bole sections on poletimber and sawtimber growing-stock trees. Sawtimber net volume is gross board-foot volume less deductions for rot, sweep, crook, missing bole sections and other defects that affect the use of sawtimber trees for lumber.

Noncommercial species- A tree species not suitable for industrial wood products: western juniper, Pacific yew, white alder, Pacific dogwood, apple, and willow.

Nonforest land- Land that has never supported forests or formerly was forested and currently is developed for nonforest uses. Included are lands used for agricultural crops, Christmas tree farms, improved pasture, residential areas, city parks, constructed roads, operating railroads and their right-of-way clearings, powerline and pipeline clearings, streams more than 30 feet wide, and 1- to 40-acre areas of water classified by the Bureau of the Census, U.S. Department of Commerce, as land. If intermingled in forest areas, unimproved roads and other nonforest strips must be more than 120 feet wide, and clearings or other areas must be 1 acre or larger to qualify as nonforest land.

Nonstocked areas- Timberland less than 10 percent stocked with live trees. Recent clearcuts are classified as nonstocked area.

Other forest land- Forest land incapable of growing 20 cubic feet per acre per year (mean annual increment at culmination in fully stocked, natural stands) of industrial wood because of adverse conditions such as sterile soils, dry climate, poor drainage, subalpine sites, steepness, or rockiness.

Other private lands- Private lands not owned by forest industry. Native American lands, farmer-owned lands, and miscellaneous private lands are included.

Other public lands- Lands administered by public agencies other than the U.S. Department of Agriculture, Forest Service. Other public lands do not include Native American lands, which are included with other private lands.

Poletimber stands- Stands with a mean diameter (weighted by basal area) from 5.0 to 8.9 inches at breast height if a stand of softwood forest type and from 5.0 to 10.9 inches at breast height if a stand of hardwood forest type.

Poletimber trees- Live growing-stock trees that are 5.0 inches in d.b.h. or larger but smaller than sawtimber size.

Removals, average annual, growing stock- The annual net volume of poletimber and sawtimber growing-stock trees removed by cutting, bulldozing, girdling, or poisoning between the previous and current inventories. Includes timber removed by harvesting, silvicultural activities, and land clearing.

Removals, average annual, sawtimber- The annual net volume of sawtimber trees removed by cutting, bulldozing, girdling, or poisoning between the previous and current inventories. Includes timber removed by harvesting, silvicultural activities, and land clearing.

Removals, periodic, growing stock- The net volume of poletimber and sawtimber growing-stock trees removed by cutting, bulldozing, girdling, or poisoning between the previous and current inventories. Includes timber removed by harvesting, silvicultural activities, and land clearing.

Removals, periodic, sawtimber- The net volume of sawtimber trees removed by cutting, bulldozing, girdling, or poisoning between the previous and current inventories. Includes timber removed by harvesting, silvicultural activities, and land clearing.

Reserved other forest- Forest land incapable of growing 20 cubic feet per acre per year (mean annual increment at culmination in fully stocked, natural stands) of industrial wood and withdrawn from timber utilization through statute, ordinance, or administrative order.

Reserved timberland- Forest land capable of growing 20 cubic feet or more per acre per year (mean annual increment at culmination in fully stocked, natural stands) of industrial wood and withdrawn from timber utilization through statute, ordinance, or administrative order.

Roundwood- Logs, bolts, or other round sections cut from trees

Sapling and seedling stands- Stands with a mean diameter (weighted by basal area) less than 5.0 inches at breast height.

Sapling and seedling trees- Live trees of commercial species that are less than 5.0 inches in d.b.h. and have no diseases, defects, or deformities likely to prevent their becoming poletimber trees.

Saw-log portion- The bole of sawtimber trees between the stump and the saw-log top. Saw-log top is 7.0 inches in diameter outside bark on conifers and 9.0 inches in diameter outside bark on hardwoods.

Sawtimber stands- Stands with a mean diameter (weighted by basal area) 9.0 inches or larger at breast height if a stand of softwood forest type and 11.0 inches or larger at breast height if a stand of hardwood forest type.

Sawtimber trees- Live growing-stock softwood trees at least 9.0 inches in d.b.h. and live growing-stock hardwood trees 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.

Sawtimber volume- Net volume of sawtimber trees measured in board feet. Net sawtimber volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Scribner rule- The board-foot log rule used commonly in Washington to determine volume of sawtimber. Scribner conifer volume is estimated by 32-foot logs in western Washington. Scribner conifer volume in eastern Washington and Scribner hardwood volume throughout the State is estimated by 16-foot logs.

Site class- A classification of the potential productivity of forest land expressed as mean annual increment at culmination in fully stocked, natural stands.

Site index- A measure of the productivity of forest land expressed as the average height of dominant and codominant trees at a specified age.

Softwoods- Coniferous trees, usually evergreen, with needles or scalelike leaves.

Stand age- The 10-year age class that best characterizes the stand. See “even-aged stand” and “uneven-aged stand” for more details.

Stand-size class- A classification of stands based on tree size. Stand-size classes are sawtimber, poletimber, and sapling-seedling stands.

State lands- Lands owned by States or administered by State agencies.

Timber harvest- Volume of roundwood removed from forest land for products. Timber harvest statistics reported in table 39 were collected by the State of Washington, Department of Natural Resources. Periodic removals shown in tables 36 through 37E are based on trees sampled as live on timberland during the previous inventory but harvested or killed in a cultural operation before the current inventory.

Timber volume- Includes the net volume in cubic feet of poletimber and sawtimber trees and salvable dead sawtimber trees, the net volume in cubic feet of cull trees of commercial species, and gross volume of noncommercial species. Volume is measured from the top of a stump 12 inches tall to a minimum 4-inch top outside bark.

Timberland- Forest land capable of growing 20 cubic feet or more per acre per year (mean increment at culmination) of industrial wood and not withdrawn from timber utilization by statute, ordinance, or administrative order.

Uneven- aged stands-Stands where less than 70 percent of the tree stocking falls in three adjacent 10-year age classes.

Upper stem portion- The bole of sawtimber trees above the saw-log top-7.0 inches outside bark for softwoods and 9.0 inches outside bark for hardwoods-to a minimum top diameter of 4.0 inches outside bark, or to the point where the central stem divides into limbs.

Names of Trees

Common name	Scientific name ⁶
Softwoods:	
Alaska-cedar	<i>Chamaecyparis nootkatensis</i> (D. Don) Spach
California redwood	<i>Sequoia sempervirens</i> (D. Don) Endl.
Douglas-fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco
Engelmann spruce	<i>Picea engelmannii</i> Parry ex Engelm.
Giant sequoia	<i>Sequoiadendron giganteum</i> (Lindl.) Buchholz
Grand fir	<i>Abies grandis</i> (Dougl. ex D. Don) Lindl.
Lodgepole pine	<i>Pinus contorta</i> Dougl. ex Loud. var. <i>latifolia</i> Engelm.
Mountain hemlock	<i>Tsuga mertensiana</i> (Bong.) Carr.
Noble fir	<i>Abies procera</i> Rehd.
Pacific silver fir	<i>Abies amabilis</i> Dougl. ex Forbes
Pacific yew	<i>Taxus brevifolia</i> Nutt.
Ponderosa pine	<i>Pinus ponderosa</i> Dougl. ex Laws.
Sitka spruce	<i>Picea sitchensis</i> (Bong.) Carr.
Subalpine fir	<i>Abies lasiocarpa</i> (Hook.) Nutt.
Western hemlock	<i>Tsuga heterophylla</i> (Raf.) Sarg.
Western juniper	<i>Juniperus occidentalis</i> Hook.
Western larch	<i>Larix occidentalis</i> Nutt.
Western redcedar	<i>Thuja plicata</i> Donn ex D. Don
Western white pine	<i>Pinus monticola</i> Dougl. ex D. Don
Whitebark pine	<i>Pinus albicaulis</i> Engelm.
Hardwoods:	
Apple	<i>Malus</i> spp.
Bigleaf maple	<i>Acer macrophyllum</i> Pursh
Bitter cherry	<i>Prunus emarginata</i> Dougl. ex Eaton
Black cottonwood	<i>Populus trichocarpa</i> Torr. & Gray
Golden chinkapin	<i>Castanopsis chrysophylla</i> (Dougl.) A. DC.
Oregon ash	<i>Fraxinus latifolia</i> Benth.
Oregon white oak	<i>Quercus garryana</i> Dougl. ex Hook.
Pacific dogwood	<i>Cornus nuttallii</i> Audubon
Pacific madrone	<i>Arbutus menziesii</i> Pursh
Quaking aspen	<i>Populus tremuloides</i> Michx.
Red alder	<i>Alnus rubra</i> Bong.
Western paper birch	<i>Betula papyrifera</i> var. <i>commutata</i> (Regel) Fern.
White alder	<i>Alnus rhombifolia</i> Nutt.
Willow	<i>Salix</i> spp.

Metric Equivalents

1 acre = 0.405 hectare
 1,000 acres = 404.7 hectares
 1,000 cubic feet = 28.3 cubic meters
 1 cubic foot per acre = 0.07 cubic meter per hectare
 1 foot = 0.3048 meter
 1 inch = 2.54 centimeters
 1 mile = 1.609 kilometers

⁶Per Little 1979.

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Appendix 1

Table 6-Area by region and land class, Washington, 1992a

Region	Forest type					Nonforest land ^c	All land ^d
	Timberland ^b	Reserved timberland	Other forest	Reserved other forest	Total		
Thousand acres							
Western Washington ^e	9,581	1,330	255	708	11,874	3,786	15,660
Eastern Washington	6,502	891	1,616	9	9,018	17,889 ^{f g}	26,907
Total	16,083	2,221	1,871	717	20,892	21,675	42,567

^a Totals may be off because of rounding; data subject to sampling error.

Includes 18,000 acres of forest land in National Forests incapable of growing 20 cubic feet of wood per acre per year (mean annual increment at culmination in fully stocked, natural stands).

^b Includes cropland, pasture and range, swampland, industrial and urban areas, powerline and pipeline clearings, railroad rights-of-way, and constructed roads and highways; and water as classified by Forest Inventory and Analysis standards but defined by the Bureau of the Census as land.

^d Source: U.S. Department of Commerce 1983.

^e Includes 47,000 acres of Gifford Pinchot National Forest land in Klickitat and Yakima Counties.

^f Includes 197,000 acres of National Forest land in Skagit and Whatcom Counties that is administered by the Okanogan National Forest. These acres include forest and nonforest land. 107,000 of these acres are in the Paysten Wilderness Area.

^g Includes 523,000 acres of the Mount Baker-Snoqualmie National Forest located in Kittitas and Yakima Counties and administered by the Wenatchee National Forest. These acres include forest and nonforest land. 224,000 of these acres are in wilderness areas.

Table 7-Area of forest land by county and land class, Washington, 1992 ^a

County	Timberland	Reserved timberland ^b	Other forest	Reserved other forest	Total
<i>Thousand acres</i>					
Western Washington:					
Clallam	658	182	9	103	952
Clark	200	2	4	—	206
Cowlitz	592	14	7	—	613
Grays Harbor	1,062	23	13	2	1,100
Island	75	1	5	1	82
Jefferson	494	343	8	152	998
King	679	60	37	45	821
Kitsap	158	1	5	—	164
Lewis	1,131	93	16	26	1,267
Mason	471	30	9	17	526
Pacific	515	2	6	—	523
Pierce	572	110	18	74	774
San Juan	67	3	—	3	73
Skagit ^c	584	82	22	56	743
Skamania	812	81	15	19	927
Snohomish	658	139	48	59	904
Thurston	283	1	5	—	289
Wahkiakum	129	—	2	—	131
Whatcom ^c	410	158	24	146	737
Other ^d	31	5	2	5	43
Total	9,581	1,330	255	708	11,874
Eastern Washington: ^a					
Adams	—	—	—	—	—
Asotin	26	—	—	—	26
Benton	—	—	—	—	—
Chelan	102	30	81	—	213
Columbia	49	—	2	—	51
Douglas	—	—	—	—	—
Ferry	582	14	168	—	763
Franklin	—	—	—	—	—
Garfield	9	—	—	—	9
Grant	—	—	—	—	—
Kittitas	315	—	43	—	358
Klickitat	353	14	127	1	495
Lincoln	37	2	28	—	67
Okanogan	554	10	190	—	754
Pend Oreille	279	1	9	—	289
Spokane	281	22	67	—	369
Stevens	926	5	44	—	975
Walla Walla	18	—	—	—	18
Whitman	9	—	5	—	15
Yakima	469	94	41	8	611
National Forests ^e	2,494	698	811	1	4,004
Total	6,502	891	1,616	9	9,018
All counties	16,083	2,221	1,871	717	20,892

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b May include forest land incapable of growing 20 cubic feet of wood per acre per year (mean annual increment at culmination in fully stocked, natural stands).

^c Excludes land administered by the Okanogan National Forest.

^d Includes Gifford Pinchot National Forest land in Klickitat, Yakima, Pierce, and Thurston Counties.

^e National Forest area statistics are not available by county in eastern Washington.

Table 8-Area of reserved timberland and other forest land by forest type, Washington, 1992 ^a

Forest type	Reserved timberland ^b	Other forest	Reserved other forest	Total
<i>Thousand acres</i>				
Softwood types:				
Douglas-fir	953	416	40	1,409
Ponderosa pine	226	721	—	947
Fir-spruce	460	61	81	602
Hemlock-Sitka spruce ^c	430	30	60	520
Lodgepole pine	29	309	—	338
Other softwoods	16	7	11	34
Total	2,114	1,544	192	3,850
Hardwood types	20	70	17	107
Unclassified ^d	81	258	509	848
All types	2,221	1,871	717	4,809

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b May include forest land incapable of growing 20 cubic feet of wood per acre per year (mean annual increment at culmination in fully stocked, natural stands).

^c Includes western redcedar type in National Forests in eastern Washington.

^d Information on forest type is not available.

Table 8W-Area of reserved timberland and other forest land by forest type, western Washington, 1992 ^a

Forest type	Reserved timberland ^b	Other forest	Reserved other forest	Total
<i>Thousand acres</i>				
Softwood types:				
Douglas-fir	430	20	40	490
Fir-spruce	392	38	81	511
Hemlock-Sitka spruce	423	30	60	513
Lodgepole pine	3	—	—	3
Other softwoods	16	2	4	22
Total	1,264	91	185	1,540
Hardwood types	19	2	15	36
Unclassified ^c	42	164	508	714
All types	1,330	255	708	2,293

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b May include forest land incapable of growing 20 cubic feet of wood per acre per year (mean annual increment at culmination in fully stocked, natural stands).

^c Information on forest type is not available.

Table 8E-Area of reserved timberland and other forest land by forest type, eastern Washington, 1992 ^a

Forest type	Reserved timberland ^b	Other forest	Reserved other forest	Total
<i>Thousand acres</i>				
Softwood types:				
Douglas-fir	524	396	—	920
Ponderosa pine	226	721	—	947
Fir-spruce	68	23	—	91
Western hemlock ^c	7	—	—	7
Lodgepole pine	27	309	—	336
Other softwoods	—	5	7	11
Total	852	1,454	7	2,312
Hardwood types	1	68	2	70
Unclassified ^d	39	94	1	134
All types	891	1,616	9	2,516

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b May include forest land incapable of growing 20 cubic feet of wood per acre per year (mean annual increment at culmination in fully stocked stand).

^c Western hemlock or western redcedar.

^d Information on forest type is not available.

Table 9-Area of reserved timberland and other forest land by land class, forest type and owner, Washington, 1992^a

Land class and forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>					
Reserved timberland: ^b					
Douglas-fir	634	306	--	13	953
Ponderosa pine	188	8	--	30	226
Fir-spruce	196	248	--	16	460
Hemlock-Sitka spruce ^c	129	301	--	--	430
Lodgepole pine	2	26	--	1	29
Other softwoods	8	8	--	--	16
Hardwoods	5	15	--	--	20
Unclassified ^d	42	34	--	5	81
Total	1,207	948	--	65	2,221
Reserved other forest:					
Douglas-fir	40	--	--	--	40
Ponderosa pine	--	--	--	--	--
Fir-spruce	68	13	--	--	81
Hemlock-Sitka spruce ^c	80	--	--	--	60
Lodgepole pine	--	--	--	--	--
Other softwoods	4	--	--	7	7
Hardwoods	2	13	--	2	17
Unclassified ^d	35	474	--	--	509
Total	208	501	--	8	717
All reserved	1,416	1,451	--	74	2,938
Unreserved other forest:					
Douglas-fir	206	54	38	118	418
Ponderosa pine	313	89	76	243	721
Fir-spruce	38	--	14	9	61
Hemlock-Sitka spruce ^c	30	--	--	--	30
Lodgepole pine	309	--	--	--	309
Other softwoods	2	5	--	--	7
Hardwoods	2	7	--	62	70
Unclassified ^d	23	75	68	92	258
Total	923	230	196	524	1,871

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b May include forest land incapable of growing 20 cubic feet per acre per year (mean annual increment at culmination in fully stocked, natural stands).

^c Includes western redcedar type in National Forests in eastern Washington.

^d Information on forest type is not available.

Table SW-Area of reserved timberland and other forest land by land class, forest type and owner, western Washington, 1992 ^a

Land class and forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>					
Reserved timberland: ^b					
Douglas-fir	132	298	--	—	430
Fir-spruce	188	204	--	—	392
Hemlock-Sitka spruce	129	294	--	—	423
Lodgepole pine	2	1	--	—	3
Other softwoods	8	8	--	—	16
Hardwoods	5	14	—	—	19
Unclassified ^c	42	--	--	--	42
Total	509	822	--	--	1,330
Reserved other forest:					
Douglas-fir	40	--	--	--	40
Fir-spruce	68	13	--	--	81
Hemlock-Sitka spruce	60	--	--	--	60
Other softwoods	4	--	--	--	4
Hardwoods	2	13	—	--	15
Unclassified ^c	34	474	--	—	508
Total	207	501	--	--	708
All reserved	716	1,324	--	--	2,039
Unreserved other forest:					
Douglas-fir	20	--	--	--	20
Fir-spruce	38	--	--	--	38
Hemlock-Sitka spruce	30	--	--	--	30
Other softwoods	2	--	--	--	2
Hardwoods	2	--	--	--	2
Unclassified ^c	20	43	53	47	164
Total	113	43	53	47	255

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b May include forest land incapable of growing 20 cubic feet of wood per acre per year (mean annual increment at culmination in fully stocked, natural stands).

^c Information on forest type is not available.

Table SE-Area of reserved timberland and other forest land by land class, forest type and owner, eastern Washington, 1992 ^a

Land class and forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>					
Reserved timberland: ^b					
Douglas-fir	502	8	--	13	524
Ponderosa pine	188	8		30	226
Fir-spruce	8	44		16	68
Western hemlock ^c	--	7		--	7
Lodgepole pine	--	25	--	1	27
Hardwoods	--	1	--	--	1
Unclassified ^d	--	34	--	5	39
Total	888	127		88	891
Reserved forest:					
Other softwoods	--	--	--	7	7
Hardwoods	--	--	--	2	2
Unclassified ^d	1	--	--	--	1
Total	1			0	9
All Reserved	888	127		74	888
Unreserved other forest:					
Douglas-fir	186	54	38	118	396
Ponderosa pine	313	89	76	243	721
Fir-spruce			14	9	23
Lodgepole pine	309	--	--	--	309
Other softwoods	--	5	--	--	5
Hardwoods	--	7	--	62	68
Unclassified ^d	3	32	15	45	94
Total	811	108	142	478	1,610

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b May include forest land incapable of growing 20 cubic feet of wood per acre per year (mean annual increment at culmination in fully stocked, natural stands).

^c Western hemlock or western redcedar type.

^d Information on forest type is not available.

Table 10--Area of timberland by county and owner, Washington, 1992 ^{ab}

County	Public						Private					
	National Forest	Other public				Forest industry	Native American	Other private			All other private owners	
		Miscellaneous Federal	State	County and municipal	All other public			Farmer	Miscellaneous			
Thousand acres												
Western Washington:												
Cllallam	69	—	139	—	139	254	24	4	68	96	658	
Clark	1	--	56	--	56	41	—	4	98	102	200	
Cowlitz	8	—	68	—	68	414	—	8	94	102	592	
Grays Harbor	116	—	81	53	134	556	139	7	110	256	1,062	
Island	—	2	10	1	13	2	—	3	57	60	75	
Jefferson	115	3	170	1	174	149	6	—	50	56	494	
King	114	4	61	90	155	272	—	—	138	138	679	
Kitsap	—	8	21	13	42	29	8	—	79	87	158	
Lewis	288	—	116	10	126	548	—	54	115	169	1,131	
Mason	100	—	72	—	72	207	5	—	87	92	471	
Pacific	—	6	67	3	76	377	—	27	35	62	515	
Pierce	94	37	35	7	79	243	—	9	147	156	572	
San Juan	—	1	3	—	4	—	—	—	63	63	67	
Skagit	172	1	128	3	132	180	2	6	92	100	584	
Skamania	611	1	75	3	79	75	—	—	47	47	812	
Snohomish	248	4	108	7	119	134	5	9	143	157	658	
Thurston	—	11	58	1	70	93	3	10	107	124	283	
Wahkiakum	—	—	36	—	36	81	—	3	9	12	129	
Whatcom	142	--	85	2	87	77	2	13	89	104	410	
Other ^d	31	na	na	na	na	na	na	na	na	na	31	
Total	2,208	78	1,390	194	1,663	3,732	194	157	1,627	1,978	9,581	

Table 10- (continued)

County	National Forest	Public				Private					All owners
		Other public			County and All other public	Forest industry	Other private				
		Miscellaneous Federal	State	County municipal			Native American	Farmer	Miscellaneous	All other private	
Thousand acres											
Eastern Washington: ^{be}											
Asotin	nc	—	—	—	—	—	—	26	—	26	nc
Chelan	nc	—	13	—	13	30	—	33	26	59	nc
Columbia	nc	—	9	—	9	16	—	24	—	24	nc
Douglas	nc	—	—	—	—	—	—	—	—	—	nc
Ferry	nc	4	21	—	25	54	407	50	46	503	nc
Garfield	nc	—	—	—	—	—	—	9	—	9	nc
Kittitas	nc	—	82	—	82	193	—	39	—	39	nc
Klickitat	nc	13	64	7	85	169	24	55	21	100	nc
Lincoln	nc	—	—	—	—	—	—	22	15	37	nc
Okanogan	nc	10	163	—	174	39	224	72	46	342	nc
Pend Oreille	nc	—	34	—	34	97	—	15	133	148	nc
Spokane	nc	13	19	—	32	26	—	38	185	223	nc
Stevens	nc	69	162	—	231	206	78	171	240	489	nc
Walla Walla	nc	—	—	—	—	—	—	18	—	18	nc
Whitman	nc	—	—	—	—	—	—	9	—	9	nc
Yakima	nc	—	81	—	81	46	342	—	—	342	nc
National Forests	2,294	na	na	na	na	na	na	na	na	na	2,494
Total	2,494	110	647	7	764	878	1,074	582	710	2,366	6,502
All counties	4,702 ^b	187	2,037	201	2,427	4,610	1,269	738	2,340	4,344	16,083

-- = none found or less than 500 acres.

na = not applicable.

nc = not available by county.

^a Totals may be off because of rounding; data subject to sampling error.

^b Does not include timberland in the Mount Baker-Snoqualmie National Forest in Kittitas and Yakima Counties that is administered by the Wenatchee National Forest.

^c Includes timberland in the Gifford Pinchot National Forest in Klickitat and Yakima Counties. Does not include timberland in the Mount Baker-Snoqualmie National Forest that is administered by the Okanogan National Forest in Skagit and Whatcom Counties.

^d Timberland in the Gifford Pinchot National Forest in Klickitat, Yakima, Pierce, and Thurston Counties.

^e Includes timberland in the Mount Baker-Snoqualmie National Forest in Skagit and Whatcom Counties that is administered by the Okanogan National Forest. Does not include timberland in the Gifford Pinchot National Forest in Klickitat and Yakima Counties.

Table 11-Area of timberland by forest type and owner, Washington, 1992 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>					
Softwood types:					
Douglas-fir	2,142	1,148	2,140	1,852	7,082
Ponderosa pine	354	205	217	884	1,880
Fir-spruce	748	148	272	185	1,331
Hemlock-Sitka spruce ^b	1,062	440	1,058	170	2,730
Western larch	--	31	18	47	98
Lodgepole pine	132	81	23	209	425
Other softwood types	39	53	123	147	382
Total	4,478	2,083	3,851	3,275	13,685
Hardwood types	31	294	634	962	1,921
Nonstocked	129	50	125	107	412
Unclassified ^c	85	—	—	--	85
All types	4,702	2,427	4,810	4,344	18,083

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 11W-Area of timberland by forest type and owner, western Washington, 1992a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
Softwood types:					
<i>Thousand acres</i>					
Douglas-fir-					
Douglas-fir	892	683	1,411	527	3,513
Douglas-fir/red alder	--	96	246	117	460
Douglas-fir/other hardwood	--	17	49	60	126
Total	892	796	1,705	705	4,099
Fir-spruce-					
Grand fir	14	6	10	8	38
Noble fir	21	6	50	--	76
Noble fir/red alder	--	4	--	--	4
Pacific silver fir	421	74	87	12	593
Pacific silver fir/red alder	--	2	--	--	2
Subalpine fir	12	--	--	--	12
Engelmann spruce	2	--	--	--	2
Mountain hemlock	30	4	10	--	44
Total	500	95	156	19	770
Hemlock-Sitka spruce-					
Western hemlock	583	386	953	128	2,050
Western hemlock/red alder	--	50	64	21	134
Western hemlock/other hardwood	--	4	8	--	11
Sitka spruce	1	--	23	15	39
Sitka spruce/red alder	--	--	4	--	4
Total	584	440	1,052	164	2,239
Other softwood types-					
Western redcedar	24	29	56	100	209
Western redcedar/red alder	--	10	16	24	50
Western redcedar/other hardwood	--	--	4	10	15
Alaska-cedar	5	--	--	--	5
Western white pine	2	--	--	--	2
Unclassified softwood types ^b	4	--	--	--	4
Total	35	40	76	134	285
Ponderosa pine	3	--	--	--	3
Lodgepole pine	8	2	4	20	34
Total, softwood types	2,022	3,373	2,994	1,042	7,429
Hardwood types:					
Western hardwoods-					
Red alder	15	115	252	407	789
Red alder/conifer	--	118	257	170	545
Bigleaf maple	12	10	29	124	175
Bigleaf maple/conifer	--	11	39	57	107
Black cottonwood	--	7	27	31	65
Black cottonwood/conifer	--	7	--	12	19
Pacific madrone	--	--	--	7	7
Pacific madrone/conifer	--	--	--	8	8
Oregon white oak/conifer	--	--	--	3	3
Oregon ash	--	--	8	30	38
Bitter cherry	--	--	--	3	3
Bitter cherry/conifer	--	--	4	3	7
Other hardwood types	4	--	8	21	33
Other hardwood types/conifer	--	--	4	11	15
Total, hardwood types ⁱ	31	269	627	886	1,813
Nonstocked	91	21	111	50	274
Unclassified ^b	65	--	--	--	65
All types	2,208	1,663	3,732	1,978	9,581

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Information on forest type is not available.

Table 11 E-Area of timberland by forest type and owner, eastern Washington, 1992 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>					
Softwood types:					
Douglas-fir	1,250	352	434	947	2,983
Ponderosa pine	351	205	217	884	1,657
Fir-spruce	248	51	116	146	561
Western hemlock ^b	479	—	6	7	491
Western larch	--	31	18	47	96
Lodgepole pine	124	59	19	189	391
Other softwood types	4	13	47	13	77
Total	2,456	710	857	2,233	6,256
Hardwood types		26	6	76	100
Nonstocked	38	29	14	57	138
All types	2,494	764	878	2,366	6,502

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Western hemlock or western redcedar.

Table 12-Area of timberland by owner and stand-size class, Washington, 1992 ^a

Owner	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Thousand acres</i>					
National Forest	2,857 ^b	981	735	129	4,702
Other public	1,648	267	462	50	2,427
Forest industry	2,350	698	1,437	125	4,610
Other private	2,939	629	669	107	4,344
Total	9,794	2,575	3,303	412	16,083

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes 65,000 acres of timberland unclassified by stand size in National Forests in western Washington.

Table 12W-Area of timberland by owner and stand-size class, western Washington, 1992 ^a

Owner	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Thousand acres</i>					
National Forest	1,486 ^b	179	451	91	2,208
Other public	1,068	177	397	21	1,663
Forest industry	1,765	579	1,277	111	3,732
Other private	1,229	274	425	50	1,978
Total	5,548	1,210	2,550	274	9,581

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes 65,000 acres of timberland unclassified by stand size in National Forests.

Table 12E-Area of timberland by owner and stand-size class, eastern Washington, 1992 ^a

Owner	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Thousand acres</i>					
National Forest	1,371	801	284	38	2,494
Other public	581	90	65	29	764
Forest industry	585	119	160	14	878
Other private	1,710	355	244	57	2,366
Total	4,247	1,365	752	138	6,502

^a Totals may be off because of rounding; data subject to sampling error.

Table 13-Area of timberland by owner and site class, Washington, 1992 ^a

Owner	Site class ^b						All classes
	≥ 225	165-224	120-164	85-119	50-84	20-49 ^c	
<i>Thousand acres</i>							
National Forest	31	321	663	662	1,132	1,881	4,690
Other public	207	646	590	365	281	325	2,414
Forest industry	681	1,590	1,129	423	438	322	4,583
Other private	144	541	1,011	822	971	842	4,331
Total	1,063	3,098	3,393	2,272	2,822	3,370	16,018

^a Totals may be off because of rounding; data subject to sampling error.

^b Mean annual cubic-foot growth per acre at culmination in fully stocked, natural stands. Excludes 68,000 acres of nonforest land inclusions, each less than 1 acre.

^c Includes 18,000 acres of National Forest land in site class 0-19 in western Washington.

Table 13W-Area of timberland by owner and site class, western Washington, 1992^a

Owner	Site class ^b						All classes
	≥ 225	165-224	120-164	85-119	50-84	20-49 ^c	
<i>Thousand acres</i>							
National Forest	31	321	663	562	544	75	2,194
Other public	207	646	539	170	69	19	1,650
Forest industry	681	1,590	1,038	235	121	40	3,706
Other private	144	525	814	324	124	32	1,963
Total	1,063	3,082	3,055	1,291	857	165	9,513

^a Totals may be off because of rounding; data subject to sampling error.

^b Mean annual cubic-foot growth per acre at culmination in fully stocked, natural stands. Excludes 68,000 acres of nonforest land inclusions, each less than 1 acre.

^c Includes 18,000 acres of National Forest land in site class 0-19.

Table 13E-Area of timberland by owner and site class, eastern Washington, 1992^a

Owner	Site class ^b						All classes
	≥ 225	165-224	120-164	85-119	50-84	20-49 ^c	
<i>Thousand acres</i>							
National Forest	--	--	-	100	588	1,806	2,494
Other public	—	—	51	195	212	306	764
Forest industry	—	—	91	188	317	282	878
Other private	—	16	197	498	847	810	2,366
Total	—	16	338	981	1,963	3,204	6,502

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Mean annual cubic-foot growth per acre at culmination in fully stocked, natural stands.

**Table 14-Area of timberland by forest type and stand-size class,
Washington, 1992^a**

Forest type	Sawtimber	Poletimber	Seedling- sapling	Nonstocked	All classes
<i>Thousand acres</i>					
Softwood Types:					
Douglas-fir	4,389	1,069	1,622	--	7,082
Ponderosa pine	1,215	256	189	--	1,660
Fir-spruce	833	124	375	--	1,331
Hemlock-Sitka spruce ^b	1,629	488	613	--	2,730
Western larch	58	38	--	--	96
Lodgepole pine	274	118	34	--	425
Other softwood types	232	38	91	--	362
Total	8,630	2,130	2,926	--	13,687
Hardwood types	1,099	446	377		1,921
Nonstocked	--	--	--	412	412
Unclassified ^c	65	--	--	--	65
All types	9,794	2,575	3,303	412	16,083

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 14W-Area of timberland by forest type and stand-size class, western Washington, 1992 ^a

Forest type	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Thousand acres</i>					
Softwood types:					
Douglas-fir—					
Douglas-fir	2,099	397	1,015	--	3,513
Douglas-fir/red alder	284	30	146	--	460
Douglas-fir/other hardwood	79	24	24	--	126
Total	2,461	451	1,185	--	4,099
Fir-spruce-					
Grand fir	26	1	10	--	38
Noble fir	3	--	72	--	76
Noble fir/red alder	--	--	4	--	4
Pacific silver fir	329	43	222	--	593
Pacific silver fir/red alder	--	--	2	--	2
Subalpine fir	7	5	1	--	12
Engelmann spruce	1	--	1	--	2
Mountain hemlock	29	4	11	--	44
Total	395	53	322	--	770
Hemlock-Sitka spruce-					
Western hemlock	1,242	240	568	--	2,050
Western hemlock/red alder	97	20	18	--	134
Western hemlock/other hardwood	8	4	--	--	11
Sitka spruce	17	3	19	--	39
Sitka spruce/red alder	--	--	--	--	4
Total	1,364	271	604	--	2,239
Other softwood types-					
Western redcedar	134	14	60	--	209
Western redcedared alder	47	--	3	--	50
Western redcedar/other hardwood	15	--	--	--	15
Alaska-cedar	4	--	1	--	5
Western white pine	1	1	1	--	2
Unclassified softwood types ^b	--	--	3	--	4
Total	201	16	68	--	285
Ponderosa pine	2	--	1	--	3
Lodgepole pine	14	8	12	--	34
Total Softwood types	4,436	700	5103	--	7,429
Hardwood types					
Western hardwoods-					
Red alder	437	226	126	--	789
Red alder/conifer	310	91	145	--	545
Bigleaf maple	130	27	19	--	175
Bigleaf maple/conifer	73	23	11	--	107
Black cottonwood	34	--	31	--	65
Black cottonwood/conifer	--	8	11	--	19
Pacific madrone	3	3	--	--	7
Pacific madrone/conifer	8	--	--	--	8
Oregon white oak/conifer	3	--	--	--	3
Oregon ash	26	8	4	--	38
Bitter cherry	3	--	--	--	3
Bitter cherry/conifer	--	7	--	--	7
Other hardwood type	7	15	11	--	33
Other hardwood type/conifer	12	3	--	--	15
Total, hardwood types	1,046	410	367		1,813
Nonstocked	--	--	--	274	274
Unclassified ^b	65	--	--	--	65
All types	5,548	1,210	2,550	274	9,581

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Information on forest type is not available.

**Table 14E-Area of timberland by forest type and stand-size class,
eastern Washington, 1992 ^a**

Forest type	Sawtimber	Poletimber	Seedling- sapling	Nonstocked	All classes
<i>Thousand acres</i>					
Softwood types:					
Douglas-fir	1,928	618	437	--	2,983
Ponderosa pine	1,213	256	188	—	1,657
Fir-spruce	438	71	53	—	561
Western hemlock ^b	265	217	9	—	491
Western larch	58	38	—	--	96
Lodgepole pine	260	110	22	—	391
Other softwood types	31	22	24	--	77
Total	4,194	1,330	732	--	6,256
Hardwood types	53	35	20	--	108
Nonstocked	—	—	—	138	138
All types	4,247	1,365	752	138	6,502

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 15-Net volume of growing stock on timberland, by county, owner, and species group, Washington, 1992 ^{ab}

County	National Forest			Other public			Forest industry			Other private			Owners other than National Forest			All owners	
	All species	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	All Species			
Western Washington: ^c																	
Cllallam	907	772	101	873	594	153	747	273	28	301	1,639	282	1,921	2,828			
Clark	7	207	53	260	184	7	191	205	78	282	596	137	733	740			
Cowlitz	52	250	49	299	902	184	1,086	206	168	374	1,358	401	1,759	1,811			
Grays Harbor	491	693	123	816	2,072	361	2,433	644	183	827	3,410	666	4,076	4,567			
Island	—	51	11	62	—	—	—	168	42	210	219	53	272	272			
Jefferson	574	630	57	687	406	92	498	167	29	196	1,203	178	1,381	1,955			
King	571	675	99	774	804	131	935	287	282	569	1,766	512	2,278	2,849			
Kitsap	—	178	23	201	81	20	101	225	106	331	485	148	633	633			
Lewis	1,784	514	120	634	1,245	333	1,578	397	241	638	2,156	694	2,850	4,634			
Mason	410	290	2	292	772	131	905	220	72	292	1,284	205	1,489	1,899			
Pacific	—	302	64	366	1,105	195	1,300	92	14	108	1,498	274	1,772	1,772			
Pierce	405	408	41	449	666	124	790	323	163	486	1,397	328	1,725	2,130			
San Juan	—	28	--	28	—	—	—	284	37	321	312	37	349	349			
Skagit	993	632	137	769	501	137	638	241	171	412	1,374	445	1,819	2,812			
Skamania	3,780	390	26	416	170	4	174	166	33	199	726	63	789	4,569			
Snohomish	1,471	531	146	677	477	99	576	317	327	644	1,325	572	1,897	3,368			
Thurston	—	422	65	487	226	84	310	226	171	397	875	319	1,194	1,194			
Wahkiakum	--	165	40	205	246	24	270	10	11	21	420	76	496	496			
Whatcom	947	429	89	518	213	96	309	212	271	483	854	456	1,310	2,257			
Other ^d	190	na	na	na	na	na	na	na	na	na	na	na	na	190			
Total	12,580	7,567	1,246	8,812	10,665	2,176	12,840	4,662	2,427	7,089	22,895	5,848	28,743	41,321			

Table 15-(continued)

County	National Forest			Other public			Forest industry			Other private			Owners other than National Forest			All owners
	All species	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	All species		
Million cubic feet																
Eastern Washington: ^e																
Chelan and Douglas	nc	43	--	43	111	--	111	210	24	234	364	24	366		nc	
Ferry	nc	59	3	62	96	--	96	1,074	4	1,076	1,229	7	1,236		nc	
Kittitas	nc	216	6	222	467	--	467	76	6	64	760	13	773		nc	
Klickitat	nc	335	6	343	415	12	427	156	6	164	906	26	934		nc	
Lincoln	nc	--	--	--	--	--	--	45	--	45	45	--	45		nc	
Okanogan	nc	436	8	444	24	--	24	507	44	551	967	52	1,019		nc	
Pend Oreille	nc	174	--	174	289	6	295	279	28	307	742	34	776		nc	
Southeastern counties ^f	nc	22	--	22	46	--	46	120	7	127	188	7	195		nc	
Spokane and Whitman	nc	62	--	62	86	--	86	385	2	387	533	2	535		nc	
Stevens	nc	589	39	628	397	9	406	886	15	901	1,871	64	1,935		nc	
Yakima	6,648	223	--	223	75	--	75	1,126	34	1,160	1,424	34	1,458		nc	
National Forests		na	na	na	na	na	na	na	na	na	na	na	na		nc	
Total	6,648	2,160	63	2,223	2,005	27	2,032	4,866	172	5,039	9,031	264	9,294		15,943	
All counties ^b	19,227	9,727	1,309	11,035	12,670	2,204	14,872	9,528	2,599	12,128	31,925	6,112	38,037		57,263	

-- = none found or less than 500,000 cubic feet.

na = not applicable.

nc = not available by county.

^a Totals may be off because of rounding; data subject to sampling error.

^b Does not include volume on timberland in the Mount Baker-Snoqualmie National Forest in Kittitas and Yakima Counties that is administered by the Wenatchee National Forest.

^c Includes volume on timberland in the Gifford Pinchot National Forest in Klickitat and Yakima Counties. Does not include volume on timberland in the Mount Baker-Snoqualmie National Forest that is administered by the Okanogan National Forest in Skagit and Whatcom Counties.

^d Volume on timberland in the Gifford Pinchot National Forest in Klickitat, Yakima, Pierce, and Thurston Counties.

^e Includes volume on timberland in the Mount Baker-Snoqualmie National Forest in Skagit and Whatcom Counties that is administered by the Okanogan National Forest. Does not include volume on timberland in the Gifford Pinchot National Forest in Klickitat and Yakima Counties.

^f Asotin, Columbia, Garfield, and Walla Walla Counties.

Table 16—Net volume of sawtimber on timberland, by county and owner, Washington, 1992 ^{a b}

County	National Forest			Other public			Forest industry			Other private			Owners other than National Forest			All owners	
	All species	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	All Species
Western Washington: ^c																	
Clallam	4,124	3,297	215	3,512	2,020	447	2,467	1,000	84	1,084	6,317	746	7,063	11,187			
Clark	34	880	218	1,098	845	9	854	948	275	1,223	2,673	502	3,175	3,209			
Cowlitz	262	977	178	1,155	3,565	542	4,107	898	568	1,466	5,439	1,289	6,728	6,990			
Grays Harbor	2,368	3,151	410	3,561	8,606	1,204	9,810	2,318	545	2,863	14,074	2,159	16,233	18,601			
Island		198	51	249	--	--	--	550	135	685	749	185	934	934			
Jefferson	2,686	2,844	219	3,063	1,559	352	1,911	585	93	678	4,988	664	5,652	8,338			
King	2,420	2,492	351	2,843	2,853	488	3,341	1,053	1,032	2,085	6,397	1,871	8,269	10,689			
Kitsap		639	79	718	323	43	366	823	399	1,222	1,785	521	2,306	2,306			
Lewis	8,995	2,082	403	2,485	4,480	936	5,417	1,703	810	2,513	8,268	2,148	10,416	19,411			
Mason	1,865	957	4	961	3,185	430	3,615	786	265	1,051	4,928	699	5,627	7,492			
Pacific	--	1,146	316	1,462	3,751	760	4,511	415	60	475	5,312	1,136	6,448	6,448			
Pierce	1,600	1,731	134	1,865	2,215	430	2,645	1,150	624	1,774	5,096	1,188	6,284	7,884			
San Juan	--	127	--	127	--	--	--	1,032	136	1,168	1,159	136	1,295	1,295			
Skagit	4,543	2,508	543	3,051	1,617	477	2,094	859	582	1,441	4,984	1,602	6,586	11,129			
Skamania	19,058	1,548	40	1,588	659	9	668	604	69	673	2,811	118	2,929	21,987			
Snohomish	6,355	2,169	633	2,802	1,705	365	2,070	1,266	1,168	2,434	5,140	2,165	7,306	13,660			
Thurston	--	1,847	215	2,062	1,033	231	1,264	888	529	1,417	3,768	975	4,743	4,743			
Wahkiakum	--	736	193	929	1,013	83	1,096	45	32	77	1,793	309	2,102	2,102			
Whatcom	4,401	1,650	302	1,952	707	244	951	924	1,024	1,948	3,281	1,570	4,851	9,252			
Other ^d	945	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	945
Total	59,655	30,979	4,504	35,483	40,137	7,050	47,187	17,847	8,430	26,277	88,963	19,984	108,947	168,601			

Table 16-(continued)

County	National Forest	Other public			Forest industry			Other private			Owners other than National Forest			All owners
	All species	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	All Species
Million board feet, Scribner rule														
Eastern Washington: ^e														
Chelan and Douglas	nc	135	--	135	461	--	461	1,073	59	1,132	1,669	59	1,728	nc
Ferry	nc	167	--	167	409	--	409	4,564	--	4,564	5,140	--	5,140	nc
Kittitas	nc	1,010	24	1,034	2,144	--	2,144	256	21	277	3,410	45	3,455	nc
Klickitat	nc	1,703	3	1,706	1,879	24	1,903	638	9	647	4,220	36	4,256	nc
Lincoln	nc	--	--	--	--	--	--	162	--	162	162	--	162	nc
Okanogan	nc	1,713	24	1,737	85	--	85	1,937	170	2,107	3,735	194	3,929	nc
Pend Oreille	nc	806	--	806	1,079	3	1,081	903	90	993	2,788	93	2,880	nc
Southeastern counties ^f	nc	7	5	12	225	--	225	459	30	489	759	30	784	nc
Spokane and Whitman	nc	261	--	261	361	--	361	1,541	--	1,541	2,163	--	2,163	nc
Stevens	nc	2,430	160	2,590	1,520	26	1,547	3,136	20	3,156	7,086	206	7,293	nc
Yakima	nc	993	--	993	319	--	319	5,159	71	5,230	6,471	71	6,542	nc
National Forests	35,521	na	na	na	na	na	na	na	na	na	na	na	na	35,521
Total	35,521	9,293	211	9,504	8,482	53	8,535	19,828	470	20,298	37,603	734	38,337	73,858
All counties ^b	95,175	40,272	4,715	44,987	48,619	7,103	55,722	37,675	8,900	46,575	126,565	20,718	147,284	242,459

-- = none found or less than 500,000 board feet.

na = not applicable.

nc = not available by county.

^a Totals may be off because of rounding; data subject to sampling error.

^b Does not include volume on timberland in the Mount Baker-Snoqualmie National Forest in Kittitas and Yakima Counties that is administered by the Wenatchee National Forest.

^c Includes volume on timberland in the Gifford Pinchot National Forest in Klickitat and Yakima Counties. Does not include volume on timberland in the Mount Baker-Snoqualmie National Forest that is administered by the Okanogan National Forest in Skagit and Whatcom Counties.

^d Volume on timberland in the Gifford Pinchot National Forest in Klickitat, Yakima, Pierce, and Thurston Counties.

^e Includes volume on timberland in the Mount Baker-Snoqualmie National Forest in Skagit and Whatcom Counties that is administered by the Okanogan National Forest. Does not include volume on timberland in the Gifford Pinchot National Forest in Klickitat and Yakima Counties.

^f Asotin, Columbia, Garfield, and Walla Walla Counties.

Table 17-Net volume of growing stock on timberland by species and diameter class, Washington, 1992 ^a

Species	Diameter class (inches at breast height)										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+	
Million cubic feet											
Softwoods:											
Alaska-cedar	2	--	--	6	4	6	6	4	14	32	80
True firs	238	375	430	470	439	429	450	400	1,152	1,165	5,548
Western larch	66	117	139	141	127	109	119	94	241	108	1,264
Engelmann spruce	23	36	57	74	60	67	61	57	140	68	644
Sitka spruce	12	19	30	28	38	32	30	27	96	242	555
Lodgepole pine	233	356	314	197	146	84	52	29	13	3	1,430
Western white pine	8	16	29	36	28	25	26	20	42	25	255
Ponderosa pine	73	137	217	261	306	318	289	307	605	520	3,233
Douglas-fir	534	1,067	1,465	1,866	2,097	2,152	2,064	1,962	5,474	4,322	23,023
Western redcedar	100	169	174	194	200	200	194	192	610	944	2,976
Western hemlock	431	788	1,027	1,207	1,217	1,138	948	789	1,962	1,911	11,419
Mountain hemlock	2	9	11	14	23	23	33	34	107	129	386
Other softwoods ^b	4	3	6	6	6	6	8	4	35	38	122
Total	1,726	3,097	3,906	4,503	4,695	4,588	4,260	3,936	10,694	9,508	50,934
Hardwoods:											
Bigleaf maple	41	94	130	133	117	120	113	65	198	114	1,144
Red alder	165	411	703	635	725	567	361	211	231	26	4,236
Pacific madrone	4	5	10	10	8	8	4	5	6	--	60
Western paper birch	14	22	28	16	11	3	--	1	--	--	96
Oregon ash	5	10	11	13	15	12	15	7	13	3	103
Quaking aspen	3	14	30	20	14	21	7	2	2	--	110
Black cottonwood	7	11	24	35	24	31	52	61	161	71	496
Cherry	11	17	14	5	2	1	--	1	1	--	51
Oregon white oak	7	6	8	3	--	1	1	2	3	--	28
Other hardwoods ^b	1	--	--	--	--	--	--	--	--	--	1
Total	269	669	967	1,071	914	763	552	374	634	216	6,328
All species	1,965	3,665	4,662	5,574	5,610	5,352	4,631	4,312	11,329	9,724	57,263

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes some species in National Forests in eastern Washington that are listed separately for other ownerships.

Table 17W-Net volume of growing stock on timberland by species and diameter class, western Washington, 1992^a

Species	Diameter class (inches at breast height)										All classes
	5.0-6.9	7.0-6.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-16.9	19.0-20.9	21.0-28.9	29.0+	
Million cubic feet											
Softwoods											
Alaska-cedar	2	3	2	6	4	6	6	4	14	32	80
True firs	101	149	192	210	221	218	234	243	768	969	3,304
Western larch	--	--	--	--	--	--	1	--	--	1	3
Engelmann spruce	--	1	2	1	3	5	4	4	22	6	49
Sitka spruce	12	19	30	28	38	32	30	27	98	242	555
Lodgepole pine	5	11	18	18	18	14	9	1	2	--	97
Western white pine	3	3	4	4	6	2	--	1	4	4	33
Ponderosa pine	--	--	--	--	--	--	--	--	2	8	10
Douglas-fir	329	661	964	1,271	1,458	1,537	1,563	1,516	4,391	3,403	17,093
Western redcedar	82	138	139	173	180	169	175	167	557	885	2,665
Western hemlock	418	764	1,002	1,177	1,178	1,106	909	759	1,851	1,833	10,997
Mountain hemlock	2	9	10	14	22	23	33	34	107	129	384
Other softwoods	--	--	--	--	--	--	--	--	--	--	--
Total	954	1,759	2,363	2,903	3,128	3,109	2,964	2,755	7,820	7,513	35,271
Hardwoods:											
Bigleaf maple	41	94	125	131	117	120	113	85	198	114	1,138
Red alder	164	410	703	835	723	565	359	210	229	27	4,226
Pacific madrone	4	5	10	10	8	8	4	5	6	--	60
Western paper birch	4	14	21	13	7	3	--	1	--	--	62
Oregon ash	5	10	11	13	15	12	15	7	13	3	103
Quaking aspen	--	2	2	1	--	1	--	--	--	--	4
Black cottonwood	4	6	17	20	19	21	49	39	156	65	395
Cherry	9	16	14	5	2	1	--	1	1	--	48
Oregon white oak	1	3	4	2	--	--	--	2	2	--	13
Other hardwoods	--	--	--	--	--	--	--	--	--	--	--
Total	224	560	906	1,028	890	731	539	349	604	209	6,051
All species	1,188	2,319	3,270	3,931	4,018	3,841	3,503	3,104	8,425	7,722	41,321

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

Table 17E-Net volume of growing stock on timberland by species and diameter class, eastern Washington, 1992 ^a

Species	Diameter class (inches at breast height)										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+	
Million cubic feet											
Softwoods:											
True firs	137	226	239	260	218	212	216	157	383	196	2,244
Western larch	66	117	139	141	127	109	118	94	241	107	1,261
Engelmann spruce	23	35	55	73	57	62	57	53	118	62	595
Lodgepole pine	228	345	296	179	130	70	43	28	11	3	1,334
Western white pine	5	13	25	32	22	23	26	19	38	21	223
Ponderosa pine	73	137	217	261	306	318	289	307	803	512	3,222
Douglas-fir	205	406	501	595	639	615	501	466	1,083	919	5,930
Western redcedar	18	31	35	21	20	31	19	25	53	59	311
Western hemlock	13	24	25	30	40	32	39	30	111	78	422
Mountain hemlock	—	--	1	—	1	—	—	—	--	--	2
Other softwoods ^b	4	3	8	8	8	6	8	4	35	38	122
Total	772	1,339	1,541	1,600	1,568	1,477	1,316	1,163	2,874	1,995	15,665
Hardwoods:											
Bigleaf maple	—	--	5	2	—	--	—	--	—	—	7
Red alder	1	1	—	—	2	2	2	1	2	1	11
Western paper birch	10	8	7	5	4	--	—	—	—	—	34
Quaking aspen	3	12	28	19	14	20	7	2	2	—	106
Black cottonwood	3	5	7	15	5	10	3	22	25	6	101
Cherry	2	1	—	--	—	—	—	—	—	—	3
Oregon white oak	6	3	4	1	—	1	1	—	1	—	16
Other hardwoods ^b	1	--	—	--	—	--	—	--	—	—	1
Total	26	29	50	42	24	32	13	25	30	7	278
All species	798	1,367	1,592	1,642	1,593	1,509	1,329	1,207	2,903	2,003	15,943

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes some species in National Forests in eastern Washington that are listed separately for other ownerships.

Table 18-Net volume of sawtimber on timberland by species and diameter class, Washington, 1992 ^a

Species	Diameter class (inches at breast height)								All classes
	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+	
Million board feet, Scribner rule									
Softwoods:									
True fir	1,423	1,898	1,962	2,054	2,307	2,094	6,467	7,152	25,354
Alaska-cedar	4	17	14	18	21	17	63	173	327
Western larch	493	632	646	590	657	549	1,486	684	5,737
Engelmann spruce	231	352	311	373	362	339	883	459	3,309
Sitka spruce	74	82	132	124	120	115	469	1,356	2,472
Lodgepole pine	1,183	857	696	422	265	165	75	14	3,676
Western white pine	115	178	145	139	153	119	265	191	1,306
Ponderosa pine	664	1,016	1,365	1,547	1,499	1,672	4,868	3,641	16,271
Douglas-fir	4,258	6,737	8,592	9,484	9,578	9,630	28,665	25,754	102,698
Western redcedar	438	576	662	719	738	763	2,527	4,585	11,007
Western hemlock	2,860	4,196	4,767	4,797	4,257	3,734	10,139	11,849	46,600
Mountain hemlock	27	43	78	87	137	146	521	725	1,766
Other softwoods ^b	34	39	41	33	46	22	205	234	654
Total	11,804	16,623	19,412	20,388	29,140	19,363	56,631	56,814	221,177
Hardwoods:									
Bigleaf maple		488	530	583	561	430	1,025	573	4,189
Red alder		3,152	3,315	2,809	1,851	1,106	1,225	149	13,606
Pacific madrone	--	35	35	38	17	26	27	--	179
Western paper birch	--	63	44	14	--	4	1	--	125
Oregon ash	--	48	67	60	72	36	64	14	360
Quaking aspen		69	62	96	31	8	9	--	275
Black cottonwood		131	111	155	283	318	1,053	420	2,470
Cherry	--	18	6	3	--	4	4	--	35
Oregon white oak	--	8	--	7	2	8	10	--	35
Other hardwoods ^b	--	2	1	1	1	1	1	1	7
Total	--	4,013	4,171	3,765	2,818	1,941	3,418	1,156	21,283
All species	11,804	20,637	23,583	24,152	22,958	21,304	60,049	57,971	242,459

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes some species in National Forests in eastern Washington that are listed separately for other ownerships.

Table 18W--Net volume of sawtimber on timberland by species and diameter class, western Washington, 1992 ^a

Species	Diameter class (inches at breast height)							All classes	
	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+
Million board feet, Scribner rule									
Softwoods:									
True firs	492	709	845	902	1,070	1,169	4,045	5,772	15,000
Alaska-cedar	4	17	14	18	21	17	63	173	327
Western larch	—	—	1	—	3	--	3	8	16
Engelmann spruce	5	4	10	20	21	21	115	34	229
Sitka spruce	74	82	132	124	120	115	469	1,356	2,472
Lodgepole pine	47	57	60	53	35	4	9	1	265
Western white pine	11	15	22	10	1	4	26	23	113
Ponderosa pine	—	--	1	1	—	—	9	48	59
Douglas-fir	2,526	4,245	5,598	6,407	6,922	7,027	22,030	19,173	73,927
Western redcedar	321	492	575	579	647	639	2,267	4,266	9,784
Western hemlock	2,749	4,046	4,541	4,603	4,030	3,544	9,382	11,250	44,145
Mountain hemlock	24	43	73	87	137	146	521	725	1,758
Other softwoods	--	--	—	—	--	—	—	--	—
Total	6,254	9,710	11,872	12,804	13,007	12,684	38,937	42,827	148,097
Hardwoods:									
Bigleaf maple	--	483	530	583	561	430	1,025	573	4,184
Red alder	—	3,152	3,307	2,802	1,842	1,104	1,218	143	13,567
Pacific madrone	--	35	35	38	17	26	27	—	179
Western paper birch	—	44	30	14	--	4	1	—	92
Oregon ash	—	48	67	60	72	36	64	14	360
Quaking aspen	—	2	--	4	—	—	—	--	6
Black cottonwood	—	77	92	107	270	212	916	385	2,057
Cherry	—	18	6	3	--	4	4	—	35
Oregon white oak	—	6	—	3	—	8	6	—	23
Other hardwoods	—	--	—	—	--	—	—	--	—
Total		3,864	4,067	3,613	2,762	1,824	3,260	1,115	20,505
All species	6,254	13,575	15,939	16,416	15,769	14,508	42,197	43,943	168,601

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

Table 18E—Net volume of sawtimber on timberland by species and diameter class, eastern Washington, 1992 ^a

Species	Diameter class (inches at breast height)								All classes
	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+	
Million board feet. Scribner rule									
Softwoods:									
True firs	931	1,189	1,117	1,152	1,237	925	2,422	1,380	10,353
Western larch	493	632	645	590	654	549	1,483	676	5,720
Engelmann spruce	226	348	301	353	341	318	768	425	3,080
Lodgepole pine	1,136	800	636	369	230	161	66	13	3,411
Western white pine	104	163	123	129	152	115	239	168	1,194
Ponderosa pine	664	1,016	1,364	1,546	1,499	1,672	4,859	3,593	16,213
Douglas-fir	1,732	2,492	2,994	3,077	2,656	2,603	6,635	6,581	28,770
Western redcedar	117	84	87	140	91	124	260	319	1,221
Western hemlock	111	150	226	194	227	190	757	599	2,455
Mountain hemlock	3	--	5	--	--	--	--	--	8
Other softwoods ^b	34	39	41	33	46	22	205	234	654
Total	5,550	6,913	7,540	7,584	7,159	6,679	17,694	13,987	73,080
Hardwoods:									
Bigleaf maple	--	5	--	--	--	--	--	--	5
Red alder	--	--	8	7	9	2	7	6	39
Western paper birch	--	19	14	--	--	--	--	--	33
Quaking aspen	--	67	62	92	31	8	9	--	269
Black cottonwood	--	54	19	48	13	106	137	35	413
Cherry	--	--	--	--	--	--	--	--	--
Oregon white oak	--	2	--	4	2	--	4	--	12
Other hardwoods ^b	--	2	1	1	1	1	1	1	7
TOW		149	104	152	56	147	158	41	778
All species	5,550	7,062	7,644	7,736	7,189	6,796	17,852	14,028	73,858

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes some species in National Forests in eastern Washington that are listed separately for other ownerships.

Table 19-Net volume of growing stock on timberland by species and owner, Washington, 1992^a

Species	National Forest	Other public	Forest industry	Other private	All owners
<i>Million cubic feet</i>					
Softwoods:					
True fir	3,814	502	646	586	5,548
Alaska-cedar	73	4	2	1	80
Western larch	599	171	134	360	1,264
Engelmann spruce	403	150	35	55	644
Sitka spruce	46	133	257	119	555
Lodgepole pine	644	173	87	526	1,430
Western white pine	192	13	23	27	255
Ponderosa pine	771	414	378	1,670	3,233
Douglas-fir	7,666	5,167	5,804	4,386	23,023
Western redcedar	818	518	753	887	2,976
Western hemlock	3,553	2,462	4,524	879	11,419
Mountain hemlock	367	14	3	2	386
Other softwoods ^b	119	3	—	—	122
Total	19,064	9,724	12,647		50,934
Hardwoods:					
Bigleaf maple	38	197	286	623	1,144
Red alder	96	968	1,718	1,455	4,236
Pacific madrone	1	11	—	48	60
Western paper birch	—	14	30	52	96
Oregon ash	—	4	15	84	103
Quaking aspen	—	22	12	76	110
Black cottonwood	27	80	140	249	496
Cherry	--	13	19	20	51
Oregon white oak	—	1	6	22	28
Other hardwoods ^b	1	—	--	--	1
Total	163	1,311	2,225	2,629	6,328
All species	19,227	11,035	14,872	12,128	57,263

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes some species in National Forests in eastern Washington that are listed separately for other ownerships.

Table 19W-Net volume of growing stock on timberland by species and owner, western Washington, 1992^a

Species	National Forest	Other public	Forest industry	Other private	All owners
<i>Million cubic feet</i>					
Softwoods:					
Pacific silver fir	2,272	282	247	28	2,829
Grand fir	96	36	63	109	303
Noble fir	122	--	--	--	122
Subalpine fir	50	--	--	--	50
Alaska-cedar	73	4	2	1	80
Western larch	3	--	--	--	3
Engelmann spruce	44	--	5	--	49
Sitka spruce	46	133	257	119	555
Lodgepole pine	19	1	23	54	97
Western white pine	11	4	3	14	33
Ponderosa pine	10	--	--	--	10
Douglas-fir	5,399	4,211	4,864	2,619	17,093
Western redcedar	740	427	670	827	2,665
Western hemlock	3,165	2,456	4,505	871	10,997
Mountain hemlock	367	14	3	--	384
Other softwoods	--	--	--	--	--
Total	12,418	7,569	10,642	4,641	35,271
Hardwoods:					
Bigleaf maple	38	190	286	623	1,138
Red alder	96	962	1,714	1,455	4,226
Pacific madrone	1	11	--	48	60
Western paper birch	--	7	23	32	62
Oregon ash	--	4	15	84	103
Quaking aspen	--	--	--	4	4
Black cottonwood	27	58	140	170	395
Cherry	--	11	19	18	48
Oregon white oak	--	--	1	12	13
Other hardwoods	--	--	--	--	--
Total	163	1,243	2,198	2,448	6,051
All species	12,580	8,812	12,840	7,089	41,321

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

Table 19E-Net volume of growing stock on timberland by species and owner, eastern Washington, 1992^a

Species	National Forest	Other public	Forest industry	Other private	All owners
<i>Million cubic feet</i>					
Softwoods:					
Pacific silver fir	na	13	28	15	57
Grand fir	na	130	272	409	811
Subalpine fir	na	41	36	25	102
True firs	1,274	na	na	na	1,274
Western larch	596	171	134	360	1,261
Engelmann spruce	359	150	30	55	595
Lodgepole pine	625	172	64	472	1,334
Western white pine	181	9	20	13	223
Ponderosa pine	760	414	378	1,670	3,222
Douglas-fir	2,267	956	940	1,767	5,930
Western redcedar	78	90	83	60	311
Western hemlock	388	6	18	9	422
Mountain hemlock	—	—	—	2	2
Other softwoods ^b	119	3	—	2	122
Total	6,647	2,155	2,005	4,858	15,665
Hardwoods:					
Bigleaf maple	na	7	--		7
Red alder	na	7	4	—	11
Western paper birch	na	7	6	20	34
Quaking aspen	na	22	12	72	106
Black cottonwood	na	23	--	78	101
Cherry	na	2	—	2	3
Oregon white oak	na	1	5	10	16
Other hardwoods ^b	1	—	—	--	1
Total	1	68	27	182	278
All species	6,648	2,223	2,032	5,039	15,943

-- = none found or less than 500,000 cubic feet.

na = not available by species for National Forests in eastern Washington but available by species for other ownerships.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes some species in National Forests in eastern Washington that are listed separately for other ownerships.

Table 20-Net volume of sawtimber on timberland by species and owner, Washington, 1992 ^a

Species	National Forest	Other public	Forest industry	Other private	All owners
<i>Million board feet. Scribner rule</i>					
Softwoods:					
True firs	18,436	2,019	2,373	2,527	25,354
Alaska-cedar	300	16	9	3	327
Western larch	3,100	644	506	1,487	5,737
Engelmann spruce	2,203	676	186	245	3,309
Sitka spruce	283	607	1,030	553	2,472
Lodgepole pine	1,566	393	253	1,464	3,676
Western white pine	1,051	52	102	101	1,306
Ponderosa pine	5,191	1,915	1,680	7,485	16,271
Douglas-fir	9,134	22,501	23,643	17,420	102,698
Western redcedar	3,694	1,830	2,480	3,003	11,007
Western hemlock	7,428	9,652	16,234	3,287	46,600
Mountain hemlock	1,695	53	10	8	1,766
Other softwoods ^b	640	14	—	--	654
Total	94,720	40,369	48,505	37,582	221,177
Hardwoods:					
Bigleaf maple	92	718	900	2,500	4,209
Red alder	270	3,366	5,489	4,519	13,644
Pacific madrone	1	25	--	154	180
Western paper birch	—	19	28	79	125
Oregon ash	—	19	32	309	360
Quaking aspen	—	70	37	167	275
Black cottonwood	144	400	718	1,208	2,470
Cherry	--	1	6	28	35
Oregon white oak	—	--	7	29	35
Other hardwoods ^b	7	--	—	—	7
Total	514	4,618	7,217	8,993	21,342
All species	95,235	44,987	55,722	46,575	242,518

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes some species in National Forests in eastern Washington that are listed separately for other ownerships.

^c Includes hardwood trees 9.0 inches in diameter at breast height and larger in National Forests in western Washington.

Table 20W-Net volume of sawtimber on timberland by species and owner, western Washington, 1992 ^a

Species	National Forest ^b	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule</i>					
Softwoods:					
Pacific silver fir	10,904	1,168	827	116	13,015
Grand fir	438	136	235	451	1,259
Noble fir	600	--	--	--	600
Subalpine fir	126	--	--	--	126
Alaska-cedar	300	16	9	3	327
Western larch	16	--	--	--	16
Engelmann spruce	209	--	20	--	229
Sitka spruce	283	607	1,030	553	2,472
Lodgepole pine	65	4	63	133	265
Western white pine	48	13	11	41	113
Ponderosa pine	59	--	--	--	59
Douglas-fir	26,049	18,004	19,489	10,386	73,927
Western redcedar	3,331	1,462	2,172	2,821	9,784
Western hemlock	15,085	9,625	16,167	3,269	44,145
Mountain hemlock	1,695	53	10	--	1,758
Other softwoods	--	--	--	--	--
Total	59,207	31,085	40,032	17,772	148,097
Hardwoods:					
Bigleaf maple	92	713	900	2,500	4,204
Red alder	270	3,344	5,471	4,519	13,605
Pacific madrone	1	25	--	154	180
Western paper birch	--	7	25	61	92
Oregon ash	--	19	32	309	360
Black cottonwood	144	288	718	908	2,057
Quaking aspen	--	--	--	6	6
Oregon white oak	--	--	3	21	23
Other hardwoods	--	--	--	--	--
Total	507	4,397	7,155	8,505	20,564
All species	59,714	35,483	47,187	26,277	166,660

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b National Forest data include hardwood trees 9.0 inches in diameter at breast height and larger.

Table 20E-Net volume of sawtimber on timberland by species and owner, eastern Washington, 1992 ^a

Species	National Forest	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule</i>					
Softwoods:					
Pacific silver fir	na	25	141	63	229
Grand fir	na	537	1,025	1,832	3,394
Subalpine fir		153	145	65	363
True firs	6,368	—	—	—	6,368
Western larch	3,084	644	506	1,487	5,721
Engelmann spruce	1,994	676	166	245	3,080
Lodgepole pine	1,501	389	190	1,331	3,411
Western white pine	1,003	39	91	60	1,193
Ponderosa pine	5,132	1,915	1,680	7,485	16,212
Douglas-fir	13,085	4,497	4,154	7,034	28,771
Western redcedar	363	368	308	182	1,221
Western hemlock	2,343	27	67	18	2,455
Mountain hemlock	—	—	—	8	8
Other softwoods ^b	640	14	—	—	654
Total	35,513	9,284	8,473	19,810	73,080
Hardwoods:					
Bigleaf maple	na	5	—	—	5
Red alder	na	22	18	—	39
Western paper birch	na	12	3	18	33
Quaking aspen	na	70	37	161	269
Black cottonwood	na	112	—	300	413
Oregon white oak	—	--	4	8	12
Other hardwoods ^b	7	--	--	--	7
Total	7	221	82	488	778
All species	35,521	9,504	8,535	20,298	73,858

-- = none found or less than 500,000 board feet.

na = not available by species on National Forests in eastern Washington but available by species for other ownerships.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes species in National Forests in eastern Washington that are listed separately for other ownerships.

Table 21-Net volume of growing stock on timberland by forest type and stand-size class, Washington, 1992 ^a

Forest type	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Million cubic feet</i>					
Softwood types:					
Douglas-fir	23,131	2,398	228	--	25,756
Ponderosa pine	2,606	393	63	--	3,061
Fir-spruce	4,687	169	120	--	4,976
Hemlock-Sitka spruce ^b	11,219	1,335	174	--	12,728
Western larch	239	88	--	--	327
Lodgepole pine	715	316	20	--	1,051
Other softwood types	1,385	70	31	--	1,488
Total	43,982	4,769	636	--	49,387
Hardwood types	5,568	1,403	168	--	7,138
Nonstocked	--	--	--	80	80
Unclassified ^c	880	--	--	--	680
All types	50,230	6,172	804	60	57,263

--= none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 21W-Net volume of growing stock on timberland by forest type and stand-size class, western Washington, 1992 ^a

Forest type	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Million cubic feet</i>					
Softwood types:					
Douglas-Fir-					
Douglas-fir	14,897	717	93	—	15,707
Douglas-fir/red alder	1,768	62	23	—	1,853
Douglas-fir/other hardwood	418	37	8	—	463
Total	17,084	816	124	—	18,024
Fir-spruce-					
Grand fir	144	3	1	—	148
Noble fir	124	5	1	—	130
Noble fir/red alder	—	--	9	—	9
Pacific silver fir	2,616	87	91	--	2,794
Pacific silver fir/red alder	—	--	—	—	--
Subalpine fir	33	11	--	—	44
Engelmann spruce	12	—	--	—	12
Mountain hemlock	200	4	2	--	206
Total	3,129	112	105	—	3,345
Hemlock-Sitka spruce-					
Western hemlock	9,358	539	163	—	10,059
Western hemlock/red alder	632	44	5	--	680
Western hemlock/other hardwood	62	1	—	—	63
Sitka spruce	111	10	—	—	121
Sitka spruce/red alder	--	5	—	—	5
Total	10,163	598	167	—	10,928
Other softwood types-					
Western redcedar	873	23	20	—	916
Western redcedar/red alder	279	—	1	—	281
Western redcedar/other hardwood	77	--	—	—	77
Alaska-cedar	26	—	—	—	26
Western white pine	4	3	--	—	7
Unclassified softwood types ^b	--	3	—	—	3
Total	1,259	29	22	—	1,310
Ponderosa pine	6	1	--	—	7
Lodgepole pine	53	20	17	—	90
Total, softwood types	31,693	1,575	435	—	33,704
Hardwood types:					
Western hardwoods-					
Red alder	2,233	748	82	—	3,062
Red alder/conifer	1,860	292	39	—	2,192
Bigleaf maple	581	87	2	—	670
Bigleaf maple/conifer	374	71	7	--	452
Black cottonwood	179	—	4	—	182
Black cottonwood/conifer	--	10	3	—	12
Pacific madrone	15	6	—	—	21
Pacific madrone/conifer	22	—	—	--	22
Oregon white oak/conifer	5	—	—	—	5
Oregon ash	99	24	2	—	125
Bitter cherry	9	--	—	—	9
Bitter cherry/conifer	--	17	—	—	17
Other hardwood types	28	52	7	—	88
Other hardwood types/conifer	38	3	—	--	42
Total, hardwood types	5,443	1,311	146	—	6,899
Nonstocked	—	—	--	37	37
Unclassified ^b	680	—	—	—	680
All types	37,816	2,886	581	37	41,321

-- = none found or less than 500,000 cubic feet

^a Totals may be off because of rounding; data subject to sampling error.

^b Information on forest type is not available.

Table 21E-Net volume of growing stock on timberland by forest type and stand-size class, eastern Washington, 1992 ^a

Forest type	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Million cubic feet</i>					
Softwood types:					
Douglas-fir	6,047	1,582	104		7,732
Ponderosa pine	2,600	392	63		3,054
Fir-spruce	1,558	57	15		1,631
Western hemlock ^b	1,056	732	7		1,800
Western larch	239	88	--		327
Lodgepole pine	662	296	3		961
Other softwood types	126	41	9	—	176
Total	12,288	3,193	201		15,682
Hardwood types	125	93	22		238
Nonstocked	--	--	—	22	22
All types	12,413	3,285	223	22	15,943

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

Table 22-Net volume of sawtimber on timberland by forest type and stand-size class, Washington, 1992^a

Forest type	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Million board feet, Scribner rule</i>					
Softwood types:					
Douglas-fir	102,151	8,173	641	--	110,964
Ponderosa pine	11,827	1,673	247	--	13,747
Fir-spruce	23,410	442	569	—	24,422
Hemlock-Sitka spruce ^b	48,347	4,496	537	—	53,380
Western larch	944	140	--	--	1,085
Lodgepole pine	3,095	505	58	--	3,659
Other softwood types	5,352	123	59	—	5,534
Total	195,126	15,552	2,111	--	212,790
Hardwood types	21,939	3,479	480	--	25,899
Nonstocked	—	--	—	238	238
Unclassified ^c	3,534	56	—	—	3,590
All types	220,599	19,087	2,591	238	242,518

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c information on forest type is not available.

Table 22W—Net volume of sawtimber on timberland by forest type and stand-size class, western Washington, 1992 ^{a b}

Forest type	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
Softwood types:					
<i>Million board feet, Scribner rule</i>					
Douglas-fir—					
Douglas-fir	63,884	1,211	198	--	65,293
Douglas-fir/red alder	7,083	106	57	--	7,246
Douglas-fir/other hardwood	1,599	61	17	--	1,677
Total	72,566	1,379	272	--	74,216
Fir-spruce—					
Grand fir	676	8	--	--	684
Noble fir	657	13	1	--	671
Noble fir/red alder	--	--	35	--	35
Pacific silver fir	13,460	139	475	--	14,073
Pacific silver fir/red alder	--	--	--	--	--
Subalpine fir	135	17	--	--	153
Engelmann spruce	61	1	--	--	62
Mountain hemlock	816	6	8	--	830
Total	15,805	185	519	--	16,510
Hemlock-Sitka spruce—					
Western hemlock	39,281	751	520	--	40,550
Western hemlock/red alder	2,554	76	1	--	2,630
Western hemlock/other hardwood	211	--	--	--	211
Sitka spruce	487	16	--	--	503
Sitka spruce/red alder	--	3	--	--	3
Total	42,532	845	520	--	43,897
Other softwood types—					
Western redcedar	3,308	42	44	--	3,394
Western redcedar/red alder	1,106	--	4	--	1,111
Western redcedar/other hardwood	290	--	--	--	290
Alaska-cedar	104	--	--	--	104
Western white pine	28	8	--	--	36
Unclassified softwood types ^c	--	--	--	--	--
Total	4,837	50	48	--	4,935
Ponderosa pine	33	3	--	--	36
Lodgepole pine	151	52	49	--	252
Total, softwood types	135,925	2,514	1,409	--	139,847
Hardwood types:					
Western hardwoods—					
Red alder	8,819	1,799	227	--	10,844
Red alder/conifer	7,304	769	85	--	8,158
Bigleaf maple	2,345	242	5	--	2,592
Bigleaf maple/conifer	1,342	220	26	--	1,588
Black cottonwood	777	--	7	--	783
Black cottonwood/conifer	--	10	--	--	10
Pacific madrone	50	15	--	--	65
Pacific madrone/conifer	86	--	--	--	86
Oregon white oak/conifer	13	--	--	--	13
Oregon ash	397	65	8	--	470
Bitter cherry	25	--	--	--	25
Bitter cherry/conifer	--	37	--	--	37
Other hardwood types	100	118	23	--	241
Other hardwood types/conifer	155	10	--	--	165
Total, hardwood types	21,413	3,285	380	--	25,079
Nonstocked	--	--	--	144	144
Unclassified ^c	3,534	56	--	--	3,590
All types	160,872	5,854	1,789	144	168,660

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes hardwood trees 9.0 inches diameter breast height and larger in National Forests.

^c Information on forest type is not available.

Table 22E-Net volume of sawtimber on timberland by forest type and stand-size class, eastern Washington, 1992^a

Forest type	Sawtimber	Poletimber	Seedling-sapling	Nonstocked	All classes
<i>Million board feet, Scribner rule</i>					
Softwood types:					
Douglas-fir	29,585	6,794	369	--	36,748
Ponderosa pine	11,794	1,670	247	--	13,711
Fir-spruce	7,605	257	50	--	7,912
Western hemlock ^b	5,815	3,651	17	--	9,483
Western larch	944	140	--	--	1,085
Lodgepole pine	2,944	453	9	--	3,407
Other softwood types	515	73	11	--	599
Total	59,202	13,038	704	--	72,944
Hardwood types	526	194	100	--	820
Nonstocked	--	--	--	94	94
All types	59,728	13,231	804	94	73,858

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

Table 23-Net volume of growing stock on timberland by forest type and owner, Washington, 1992 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Million cubic feet</i>					
Softwood types:					
Douglas-fir	9,035	5,787	6,261	4,674	25,756
Ponderosa pine	613	404	383	1,661	3,061
Fir-spruce	3,580	453	436	507	4,976
Hemlock-Sitka spruce ^b	4,819	2,501	4,712	696	12,728
Western larch	—	109	62	155	327
Lodgepole pine	230	174	78	569	1,051
Other softwood types	175	252	488	572	1,488
Total	18,452	9,680	12,420	8,834	49,387
Hardwood types	95	1,351	2,435	3,237	7,138
Nonstocked	1	4	17	37	60
Unclassified ^c	680	—	—	--	680
All types	19,228	11,035	14,872	12,128	57,263

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 23W-Net volume of growing stock on timberland by forest type and owner, western Washington, 1992 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Million cubic feet</i>					
Softwood types:					
Douglas-fir-					
Douglas-fir	5,537	3,917	4,196	2,058	15,707
Douglas-fir/red alder	—	567	892	394	1,853
Douglas-fir/other hardwood	—	96	149	218	463
Total	5,537	4,580	5,238	2,669	18,024
Fir-spruce-					
Grand fir	86	11	6	45	148
Noble fir	129	—	1	—	130
Noble fir/red alder	—	9	—	—	9
Pacific silver fir	2,539	198	49	8	2,794
Pacific silver fir/red alder	—	—	—	—	—
Subalpine fir	44	—	—	—	44
Engelmann spruce	12	—	—	—	12
Mountain hemlock	183	18	5	—	206
Total	2,994	236	61	53	3,345
Hemlock-Sitka spruce-					
Western hemlock	3,052	2,210	4,269	529	10,059
Western hemlock/red alder	—	256	337	87	680
Western hemlock/other hardwood	—	35	28	—	63
Sitka spruce	17	—	43	60	121
Sitka spruce/red alder	—	—	5	—	5
Total	3,069	2,501	4,681	677	10,928
Other softwood types-					
Western redcedar	136	142	278	361	916
Western redcedar/red alder	—	60	99	121	281
Western redcedar/other hardwood	—	—	27	50	77
Alaska-cedar	26	—	—	—	26
Western white pine	7	—	—	—	7
Unclassified softwood types ^b	3	—	—	—	3
Total	172	202	404	532	1,310
Ponderosa pine	7	—	—	—	7
Lodgepole pine	26	1	21	42	90
Total, softwood types	11,805	7,520	10,405	3,974	33,704
Hardwood types:					
Western hardwoods-					
Red alder	61	598	1,070	1,333	3,062
Red alder/conifer	—	565	990	637	2,192
Bigleaf maple	31	48	55	536	670
Bigleaf maple/conifer	—	33	182	236	452
Black cottonwood	—	47	47	88	182
Black cottonwood/conifer	—	—	—	12	12
Pacific madrone	—	—	—	21	21
Pacific madrone/conifer	—	—	—	22	22
Oregon white oak/conifer	—	—	—	5	5
Oregon ash	—	—	21	104	125
Bitter cherry	—	—	—	9	9
Bitter cherry/conifer	—	—	6	10	17
Other hardwood types	3	—	34	51	88
Other hardwood types/conifer	—	—	10	31	42
Total, hardwood types	95	1,291	2,417	3,096	6,899
Nonstocked ^b	—	1	17	19	37
Unclassified ^b	680	—	—	—	680
All types	12,580	8,812	12,840	7,089	41,321

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Information on forest type is not available.

Table 23E-Net volume of growing stock on timberland by forest type and owner, eastern Washington, 1992 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Million cubic feet</i>					
Softwood types:					
Douglas-fir	3,498	1,206	1,023	2,005	7,732
Ponderosa pine	606	404	383	1,661	3,054
Fir-spruce	586	217	375	453	1,631
Western hemlock ^b	1,750	--	30	19	1,800
Western larch	--	109	62	155	327
Lodgepole pine	204	173	57	527	961
Other softwood types	3	50	84	40	176
Total	6,647	2,160	2,015	4,861	15,682
Hardwood types	--	60	18	160	238
Nonstocked	1	3	--	18	22
All types	6,648	2,223	2,032	5,039	15,943

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

Table 24-Net volume of sawtimber on timberland by forest type and owner, Washington, 1992^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule</i>					
Softwood types:					
Douglas-fir	43,978	24,276	24,534	18,176	110,964
Ponderosa pine	3,147	1,745	1,629	7,225	13,747
Fir-spruce	18,522	1,895	1,870	2,135	24,422
Hemlock-Sitka spruce ^b	23,700	10,074	16,891	2,715	53,380
Western larch	—	305	120	659	1,085
Lodgepole pine	1,213	468	189	1,788	3,659
Other softwood types	752	947	1,789	2,046	5,534
Total	91,312	39,710	47,022	34,745	212,790
Hardwood types	328	5,261	8,634	11,676	25,899
Nonstocked	3	15	66	154	238
Unclassified ^c	3,590	--	—	—	3,590
All types	95,235	44,987	55,722	46,575	242,518

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 24W-Net volume of sawtimber on timberland by forest type and owner, western Washington, 1992^{ab}

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule</i>					
Softwood types:					
Douglas-fir-					
Douglas-fir	25,291	16,026	16,080	7,897	65,293
Douglas-fir/red alder	--	2,284	3,551	1,411	7,246
Douglas-fir/other hardwood	--	399	465	813	1,677
Total	25,291	18,709	20,096	10,120	74,216
Fir-spruce-					
Grand fir	446	36	18	184	684
Noble fir	670	--	1	--	671
Noble fir/red alder	--	35	--	--	35
Pacific silver fir	13,145	806	103	20	14,073
Pacific silver fir/red alder	--	--	--	--	--
Subalpine fir	153	--	--	--	153
Engelmann spruce	62	--	--	--	62
Mountain hemlock	752	66	12	--	830
Total	15,228	943	135	204	16,510
Hemlock-Sitka spruce-					
Western hemlock	14,293	8,923	15,244	2,090	40,550
Western hemlock/red alder	--	1,031	1,278	322	2,630
Western hemlock/other hardwood	--	120	90	--	211
Sitka spruce	114	--	138	251	503
Sitka spruce/red alder	--	--	3	--	3
Total	14,407	10,074	16,753	2,663	43,897
Other softwood types-					
Western redcedar	604	532	1,004	1,254	3,394
Western redcedar/red alder	--	240	408	462	1,111
Western redcedar/other hardwood	--	--	105	185	290
Alaska-cedar	104	--	--	--	104
Western white pine	36	--	--	--	36
Unclassified softwood types ^c	--	--	--	--	--
Total	744	772	1,518	1,901	4,935
Ponderosa pine	36	--	--	--	36
Lodgepole pine	88	1	54	109	252
Total, Softwood types	55,795	30,499	38,556	14,997	139,847
Hardwood types:					
Western hardwoods-					
Red alder	224	2,142	3,864	4,615	10,844
Red alder/conifer	--	2,336	3,494	2,328	8,158
Bigleaf maple	105	205	21	2,072	2,592
Bigleaf maple/conifer	--	115	601	872	1,588
Black cottonwood	--	182	173	428	783
Black cottonwood/conifer	--	--	--	10	10
Pacific madrone	--	--	--	65	65
Pacific madrone/conifer	--	--	--	86	86
Oregon white oak/conifer	--	--	--	13	13
Oregon ash	--	--	72	397	470
Bitter cherry	--	--	--	25	25
Bitter cherry/conifer	--	--	10	27	37
Other hardwood types	--	--	93	148	241
Other hardwood types/conifer	--	--	47	118	165
Total, Hardwood types	328	4,981	8,565	11,205	25,079
Nonstocked	--	3	66	75	144
Unclassified ^c	3,590	--	--	--	3,590
All types	59,714	35,483	47,187	26,277	168,660

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes hardwood trees 9.0 inches in diameter at breast height and larger in National Forests.

^c Information on forest type is not available.

Table 24E-Net volume of sawtimber on timberland by forest type and owner, eastern Washington, 1992 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule</i>					
Softwood types:					
Douglas-fir	18,687	5,567	4,438	8,056	36,748
Ponderosa pine	3,111	1,745	1,629	7,225	13,711
Fir-spruce	3,294	952	1,735	1,931	7,912
Western hemlock ^b	9,293	--	138	52	9,483
Western larch	--	305	120	659	1,085
Lodgepole pine	1,125	467	135	1,679	3,407
Other softwood types	8	175	271	145	599
Total	35,518	9,212	8,466	19,748	72,944
Hardwood types	--	280	69	471	820
Nonstocked	3	12	—	79	94
All types	35,521	9,504	8,535	20,298	73,858

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

Table 25-Net volume of timber on timberland outside National Forests by class of timber and species group, Washington, 1992 ^a

Class of timber	Softwoods	Hardwoods	All species
<i>Million cubic feet</i>			
Growing-stock trees:			
Sawtimber trees-			
Saw-log portion	27,683	3,922	31,605
Upper stem portion	1,009	489	1,499
Total	28,692	4,411	33,103
Poletimber trees	3,178	1,764	4,932
Total, growing-stock trees	31,871	6,165	38,035
Cull trees			
Sound cull	11	91	102
Rotten cull	66	62	128
Total, cull trees	77	153	230
All timber	31,948	6,318	38,266

^a Totals may be off because of rounding; data subject to sampling error.

Table 25W-Net volume of timber on timberland outside National Forests by class of timber and species group, western Washington, 1992^a

Class of timber	Softwoods	Hardwoods	All species
<i>Million cubic feet</i>			
Growing-stock trees:			
Sawtimber trees-			
Saw-log portion	20,116	3,768	23,884
Upper stem portion	690	470	1,161
Total	20,806	4,238	25,044
Poletimber trees	2,046	1,650	3,696
Total, growing-stock trees	33,852	5,889	28,741
Cull trees:			
Sound cull	8	73	82
Rotten cull	50	57	108
Total cull trees	59	131	190
All timber	22,912	6,019	28,931

^a Totals may be off because of rounding; data subject to sampling error.

Table 25E-Net volume of timber on timberland outside National Forests by class of timber and species group, eastern Washington, 1992 ^a

1992 ^a

Class of timber	Softwoods	Hardwoods	All species
Million cubic feet			
Growing-stock trees			
Sawtimber trees-			
Saw-log portion	7,567	154	7,721
Upper stem portion	319	19	336
Total	7,666	173	6,059
Poletimber trees	1,132	104	1,236
All growing-stock trees	9,018	277	9,294
Cull trees:			
Sound cull	3	18	20
Rotten cull	16	5	20
Total, cull trees	48	22	40
All timber	9,036	299	9,335

^a Totals may be off because of rounding; data subject to sampling error.

Table 26W-Area, net volume of growing stock, and net volume of sawtimber on timberland by stand age and owner, western Washington, 1992^a

Stand age	National Forest			Other public			Forest industry			Other private			All owners		
	National Forest			Other public			Forest industry			Other private			All owners		
	Area	Growing-stock volume	Sawtimber volume, Scribner rule ^b	Area	Growing-stock volume	Sawtimber volume, Scribner rule	Area	Growing-stock volume	Sawtimber volume, Scribner rule	Area	Growing-stock volume	Sawtimber volume, Scribner rule	Area	Growing-stock volume	Sawtimber volume, Scribner rule
	Thousand acres	Thousand cubic feet	Thousand board feet	Thousand acres	Thousand cubic feet	Thousand board feet	Thousand acres	Thousand cubic feet	Thousand board feet	Thousand acres	Thousand cubic feet	Thousand board feet	Thousand acres	Thousand cubic feet	Thousand board feet
Even-aged:															
0-9	102	37,526	198,665	113	14,590	39,974	490	23,085	69,845	121	21,513	72,993	827	96,714	381,477
10-19	109	16,694	86,724	234	67,416	107,743	766	252,034	380,601	150	54,186	100,473	1,260	390,330	675,540
20-29	92	21,286	40,917	70	139,093	299,408	386	767,771	1,516,397	42	63,480	100,616	590	991,630	1,957,338
30-39	107	192,321	324,452	126	548,764	1,434,871	331	1,492,065	4,410,189	57	199,843	542,872	621	2,433,012	6,712,385
40-49	73	204,871	561,203	171	1,003,654	3,567,618	407	2,687,986	9,411,255	124	577,528	2,081,209	776	4,474,039	15,621,285
50-59	97	621,020	841,728	261	1,933,408	7,742,949	289	2,297,450	9,649,931	175	1,014,730	3,827,315	622	5,866,608	22,061,924
60-69	67	555,374	2,439,299	170	1,665,755	7,324,220	162	1,418,720	6,148,614	96	682,408	2,865,598	515	4,322,257	18,777,731
70-79	65	501,951	2,317,185	53	553,883	2,569,625	35	360,064	1,726,834	58	374,102	1,615,653	211	1,790,020	8,229,297
80-89	54	380,596	1,870,957	33	312,710	1,371,154	11	156,369	800,091	29	167,963	645,074	127	1,019,639	4,887,276
90-99	33	272,024	1,328,456	3	49,715	247,574	12	130,723	619,278	11	137,133	706,022	60	589,595	2,901,330
100-109	36	282,694	1,324,787	--	--	--	12	109,256	551,798	3	13,026	54,388	51	405,176	1,854,073
110-119	35	323,008	1,390,604	7	41,656	186,735	3	16,196	31,194	--	--	--	46	380,860	1,608,533
120-129	37	309,676	1,591,186	7	100,099	494,665	7	78,890	362,683	--	--	--	51	486,664	2,448,535
130-139	11	85,759	460,082	--	--	--	--	--	--	3	34,134	177,455	14	119,893	637,537
140-149	30	234,100	1,255,899	3	64,856	382,843	--	--	--	--	--	--	33	298,956	1,638,742
150-159	14	116,479	567,991	--	--	--	--	--	--	--	--	--	14	116,479	567,991
160-169	4	32,450	174,085	--	--	--	--	--	--	--	--	--	4	32,450	174,085
170-179	14	107,796	568,977	3	45,294	225,900	--	--	--	--	--	--	17	153,090	794,877
180-189	14	105,647	567,849	--	--	--	--	--	--	--	--	--	14	105,847	567,849
190-199	31	238,557	1,275,566	--	--	--	--	--	--	--	--	--	31	236,557	1,275,566
200-299	131	1,160,016	5,581,017	9	102,743	490,662	--	--	--	3	15,991	36,367	143	1,276,750	6,108,046
300+	593	4,575,351	23,197,651	7	54,439	248,403	--	--	--	6	29,596	93,619	606	4,659,365	23,539,672
Uneven-aged:															
?/100	44	343,038	1,840,328	62	597,450	2,559,528	143	1,033,563	4,281,924	165	868,440	3,208,161	434	2,842,510	11,889,941
100+	241	1,861,212	9,985,020	62	650,955	2,998,323	36	247,916	1,054,558	41	265,330	994,507	380	3,025,413	15,032,408
No manageable stand ^c	--	--	--	246	865,466	3,190,426	639	1,765,827	6,171,929	693	2,569,650	9,154,473	1,778	5,200,943	18,516,829
Unclassified ^d	155	--	--	--	--	--	--	--	--	--	--	--	155	--	--
All ages	2,208	12,579,844	59,713,733	1,663	8,811,964	35,482,619	3,732	12,839,956	47,187,124	1,978	7,089,053	26,276,798	9,581	41,320,816	168,660,272

^a -- = none found or less than 500 acres, 500 cubic feet, or 500 board feet.^b Totals may be off because of rounding; data subject to sampling error.^c Includes hardwood trees 9.0 inches in diameter at breast height and larger in National Forests^d Lacks 25 percent conifer stocking on 3/5ths of sample points.^e Stand age is not available.

Table 26E-Area, net volume of growing stock, and net volume of sawtimber on timberland outside National Forests, by stand age and owner, eastern Washington, 1992^{ab}

Stand age	Other public			Forest industry			Other private			All owners ^b		
	Other public			Forest industry			Other private			All owners ^b		
	Area	Growing-stock volume	Sawtimber volume, Scribner rule	Area	Growing-stock volume	Sawtimber volume, Scribner rule	Area	Growing-stock volume	Sawtimber volume, Scribner rule	Area	Growing-stock volume	Sawtimber volume, Scribner rule
	Thousand acres	Thousand cubic feet	Thousand board feet	Thousand acres	Thousand cubic feet	Thousand board feet	Thousand acres	Thousand cubic feet	Thousand board feet	Thousand acres	Thousand cubic feet	Thousand board feet
Even-aged:												
0-9	--	--	--	76	11,597	33,697	62	21,282	90,611	138	32,879	124,307
10-19	9	3,790	14,708	30	8,134	31,474	69	29,680	117,836	108	41,605	164,018
20-29	26	19,157	66,275	6	6,430	3,043	28	13,309	43,902	60	38,896	113,221
30-39	15	23,133	37,696	9	16,481	64,567	23	25,500	62,922	46	65,114	165,186
40-49	20	40,173	130,768	35	75,898	217,938	111	182,347	555,018	166	298,418	903,724
50-59	48	87,061	260,663	53	76,674	300,177	218	444,927	1,442,765	316	608,662	2,003,605
60-69	62	180,617	504,484	108	276,724	926,643	158	373,361	1,208,262	326	830,702	2,639,388
70-79	10	16,997	81,085	57	180,184	752,663	183	480,817	1,871,890	250	677,998	2,705,638
80-89	81	322,393	1,356,623	7	27,973	143,164	153	428,539	1,514,789	242	778,905	3,014,576
90-99	38	169,655	725,610	25	104,865	392,032	83	227,452	986,972	146	501,972	2,104,614
100-109	--	--	--	--	--	--	19	68,786	296,741	19	68,786	296,741
110-119	14	51,337	123,284	--	--	--	--	--	--	14	51,337	123,284
120-129	--	--	--	--	--	--	9	5,355	11,690	9	5,355	11,690
130-139	--	--	--	6	31,475	171,433	7	11,960	54,623	12	43,435	226,066
140-149	--	--	--	--	--	--	--	--	--	--	--	--
150-159	--	--	--	--	--	--	--	--	--	--	--	--
160-169	--	--	--	8	43,108	215,814	7	42,898	213,565	15	86,006	429,379
170-179	6	26,437	122,594	6	12,330	63,827	--	--	--	12	38,767	186,421
180-189	--	--	--	--	--	--	6	10,698	48,769	6	10,698	48,769
190-199	--	--	--	--	--	--	--	--	--	--	--	--
200-299	6	16,654	82,996	--	--	--	7	16,560	77,562	13	35,214	160,558
300+	--	--	--	--	--	--	9	52,389	274,819	9	52,389	274,819
Uneven-aged:												
???	140	450,666	2,081,993	160	517,143	2,152,930	504	1,121,575	4,606,376	824	2,089,586	8,841,299
100+	132	638,932	3,178,416	103	504,788	2,548,007	258	924,009	4,470,933	492	2,067,728	10,197,357
Nonmanageable stand ^c	158	173,747	737,262	170	138,365	517,127	455	557,680	2,347,588	784	869,992	3,601,978
All ages	764	2,222,950	9,504,455	678	2,032,170	8,534,546	2,366	5,039,323	20,297,635	4,008	9,294,443	38,336,636

-- = none found or less than 500 acres, 500 cubic feet, or 500 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates by stand age are not available for National Forests in eastern Washington.

^c Lacks 25 percent conifer stocking on 3/5ths of sample points.

Table 27--Current net annual growth of growing stock on timberland by forest type and owner, Washington, 1991 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand cubic feet</i>					
Softwood types:					
Douglas-fir	127,582	164,687	258,548	149,090	699,906
Ponderosa pine	9,261	8,634	10,462	36,117	64,474
Fir-spruce	22,544	6,679	9,132	11,218	49,572
Hemlock-Sitka spruce ^b	54,544	78,254	214,965	24,787	372,548
Western larch	--	1,921	1,124	2,087	5,132
Lodgepole pine	3,363	3,321	1,298	8,273	16,274
Other softwood types	1,524	6,362	16,153	18,453	42,492
Total	218,838	269,850	511,691	250,004	1,250,400
Hardwood types	1,633	38,952	79,185	114,988	234,758
Nonstocked	49	244	362	1,223	1,878
Unclassified ^c	6,494	na	na	na	6,494
All types	227,014	309,052	591,229	366,236	1,493,528

-- = none found or less than 500,000 board feet.

na = not applicable.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 27W—Current net annual growth of growing stock on timberland by forest type and owner, western Washington, 1991 ^{a b}

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand cubic feet</i>					
<i>Softwood types:</i>					
Douglas-fir	61,019	119,849	192,413	67,809	441,090
Douglas-fir/red alder	--	19,626	31,900	15,766	67,293
Douglas-fir/other hardwood	--	3,024	7,763	8,445	19,232
Total	61,019	142,500	232,076	92,020	527,615
Fir-spruce-					
Grand fir	791	347	567	1,551	3,256
Noble fir	1,185	--	210	--	1,395
Noble fir/red alder	--	689	--	--	689
Pacific silver fir	10,926	5,289	3,090	530	19,835
Pacific silver fir/red alder	--	--	--	--	--
Subalpine fir	398	--	--	--	398
Engelmann spruce	110	--	--	--	110
Mountain hemlock	1,071	24	506	--	1,602
Total	14,481	6,350	4,374	2,080	27,285
Hemlock-Sitka spruce-					
Western hemlock	18,508	68,249	196,912	17,727	301,395
Western hemlock/red alder	--	8,637	13,533	4,147	26,317
Western hemlock/other hardwood	--	1,368	1,617	--	2,985
Sitka spruce	85	--	2,203	2,003	4,291
Sitka spruce/red alder	--	--	729	--	729
Total	18,593	78,254	214,994	23,877	335,717
Other softwood types-					
Western redcedar	828	3,967	9,343	11,005	25,144
Western redcedar/red alder	--	1,729	3,868	4,159	9,756
Western redcedar/other hardwood	--	--	828	1,743	2,571
Alaska-cedar	366	--	--	--	366
Western white pine	75	--	--	--	75
Unclassified softwood types ^c	1	--	--	--	1
Total	1,270	5,696	14,039	16,908	37,913
Ponderosa pine	75	--	--	--	75
Lodgepole pine	279	107	-83	919	1,221
Total, softwood types	95,717	232,906	465,400	135,803	929,827
Hardwood types:					
Western hardwoods-					
Red alder	1,090	16,846	30,683	49,499	98,118
Red alder/conifer	--	15,862	34,670	22,990	73,522
Bigleaf maple	541	1,212	1,955	16,018	19,726
Bigleaf maple/conifer	--	1,071	6,719	7,656	15,446
Black cottonwood	--	2,146	1,957	3,736	7,839
Black cottonwood/conifer	--	--	--	1,015	1,015
Pacific madrone	--	--	--	735	735
Pacific madrone/conifer	--	--	--	698	698
Oregon white oak/conifer	--	--	--	172	172
Oregon ash	--	--	388	3,054	3,442
Bitter cherry	--	--	--	246	246
Bitter cherry/conifer	--	--	568	778	1,346
Other hardwood types	1	--	1,545	2,494	4,040
Other hardwood types/conifer	--	--	388	1,413	1,801
Total, hardwood types	1,633	37,138	78,872	110,503	228,146
Nonstocked	--	11	362	670	1,042
Unclassified ^c	6,494	--	--	--	6,494
All types	103,843	270,054	544,634	246,976	1,165,508

-- = none found or less than 500 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Negative net annual growth is the result of annual mortality exceeding gross annual growth

^c Information on forest type is not available.

Table 27E-Current net annual growth of growing stock on timberland by forest type and owner, eastern Washington, 1991^{ab}

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand cubic feet</i>					
Softwood types:					
Douglas-fir	66,563	22,187	26,472	57,070	172,291
Ponderosa pine	9,186	8,634	10,462	36,117	64,399
Fir-spruce	8,063	329	4,758	9,138	22,287
Western hemlock ^c	35,951	--	-29	910	36,831
Western larch	—	1,921	1,124	2,087	5,132
Lodgepole pine	3,104	3,214	1,381	7,354	15,053
Other softwood types	254	666	2,114	1,545	4,579
Total	123,121	36,950	46,281	114,221	320,573
Hardwood types	--	1,814	313	4,485	6,612
Nonstocked	49	233	—	553	836
All types	123,170	38,998	46,594	119,260	328,021

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Negative net annual growth is the result of annual mortality exceeding gross annual growth.

^c Includes western redcedar type in National Forests in eastern Washington.

Table 28-Current net annual growth of sawtimber on timberland outside National Forests by forest type and owner, Washington, 1991^{ab}



Forest type	Other public	Forest industry	Other private	All owners
<i>Thousand board feet. Scribner rule</i>				
Softwood types:				
Douglas-fir	857,410	1,196,848	736,584	2,790,842
Ponderosa pine	44,129	60,526	202,420	307,076
Fir-spruce	28,636	33,415	54,989	117,040
Hemlock-Sitka spruce	368,141	944,962	110,064	1,423,167
Western larch	10,524	7,224	10,201	27,949
Lodgepole pine	12,556	5,759	38,229	56,544
Other softwood types	31,770	71,010	79,086	181,867
Total	1,353,166	2,319,744	1,231,574	4,904,484
Hardwood types	239.871	427,259	565.879	1,233.010
Nonstocked	1,296	1,420	6,302	9,019
All types	1,594,334	2,748,423	1,803,756	6,146,512

- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error

^b Estimates for National Forests are not available.

Table 28W-Current net annual growth of sawtimber on timberland by forest type and owner, western Washington, 1991^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand board feet. Scribner rule</i>					
Softwood types:					
Douglas-fir-					
Douglas-fir	298,324	625,478	854,836	344,711	2,123,350
Douglas-fir/red alder	--	94,127	174,756	69,349	338,232
Douglas-fir/other hardwood	--	14,836	32,492	41,499	88,828
Total	298,324	734,441	1,062,084	455,560	2,550,410
Fir-spruce-					
Grand fir	4,103	1,250	1,711	8,044	15,108
Noble fir	6,146	--	98	--	6,244
Noble fir/red alder	--	2,150	--	--	2,150
Pacific silver fir	62,578	17,023	4,251	2,291	86,143
Pacific silver fir/red alder	--	--	--	--	--
Subalpine fir	778	--	--	--	778
Engelmann spruce	570	--	--	--	570
Mountain hemlock	8,155	200	392	--	8,747
Total	82,331	20,622	6,452	10,335	119,739
Hemlock-Sitka spruce-					
Western hemlock	98,419	323,463	870,461	81,218	1,373,561
Western hemlock/red alder	--	39,321	58,168	17,126	114,615
Western hemlock/other hardwood	--	5,357	5,469	--	10,826
Sitka spruce	575	--	10,166	8,828	19,569
Sitka spruce/red alder	--	--	470	--	470
Total	98,994	368,141	944,735	107,172	1,519,042
Other softwood types-					
Western redcedar	5,804	18,739	39,527	46,070	110,140
Western redcedar/red alder	--	10,297	20,197	18,600	49,094
Western redcedar/other hardwood	--	--	3,642	7,914	11,557
Alaska-cedar	1,234	--	--	--	1,234
Western white pine	389	--	--	--	389
Unclassified softwood types ^b	--	--	--	--	--
Total	7,427	29,036	63,366	72,584	172,413
Ponderosa pine	389	--	--	--	389
Lodgepole pine	944	145	54	2,891	4,033
Total, softwood types	488,409	1,152,385	2,076,690	648,541	4,366,026
Hardwood types:					
Western hardwood s -					
Red alder	3,351	114,066	195,030	222,569	535,016
Red alder/conifer	--	89,358	169,430	112,095	370,883
Bigleaf maple	2,053	12,522	10,087	102,726	127,388
Bigleaf maple/conifer	--	4,512	29,312	38,755	72,579
Black cottonwood	--	9,315	9,773	21,411	40,498
Black cottonwood/conifer	--	--	--	2,108	2,108
Pacific madrone	--	--	--	4,841	4,841
Pacific madrone/conifer	--	--	--	3,422	3,422
Oregon white oak/conifer	--	--	--	604	604
Oregon ash	--	--	1,331	12,625	13,956
Bitter cherry	--	--	--	984	984
Bitter cherry/conifer	--	--	1,304	2,975	4,279
Other hardwood types	--	--	7,250	9,772	17,021
Other hardwood types/conifer	--	--	2,210	6,278	8,488
Total, Hardwood types	5,405	229,774	425,727	541,163	1,202,068
Nonstocked	--	74	1,420	3,240	4,735
Unclassified ^b	30,930	--	--	--	30,930
All types	524,744	1,382,234	2,503,837	1,192,945	5,603,759

-- = none found or less than 500 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Information on forest type is not available.

Table 28E-Current net annual growth of sawtimber on timberland outside National Forests by forest type and owner, eastern Washington, 1991^{ab}

Forest type	Other public	Forest industry	Other private	All owners
<i>Thousand board feet, Scribner rule</i>				
<i>Softwood types:</i>				
Douglas-fir	122,969	134,764	281,024	538,757
Ponderosa pine	44,129	60,526	202,420	307,076
Fir-spruce	8,014	26,963	44,654	79,631
Western hemlock ^c	—	227	2,892	3,119
Western larch	10,524	7,224	10,201	27,949
Lodgepole pine	12,411	5,705	35,338	53,454
Other softwood types	2,734	7,644	6,502	16,881
Total	200,781	243,053	583,031	1,026,866
Hardwood types	10,197	1,532	24,716	36,346
Nonstocked	1,222	—	3,062	4,285
All types	212,101	244,585	610,811	1,067,496

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates for National Forests are not available.

^c Includes western redcedar type in National Forests in eastern Washington.

Table 29-Average annual mortality of growing stock on timberland by forest type and owner, Washington, 1991^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand cubic feet</i>					
Softwood types:					
Douglas-fir	29,729	35,291	36,420	29,318	130,758
Ponderosa pine	21,294	3,192	2,832	12,938	40,257
Fir-spruce	14,506	5,201	5,192	5,806	30,706
Hemlock-Sitka spruce ^b	21,637	19,439	34,257	5,284	80,616
Western larch	—	1,120	724	1,551	3,395
Lodgepole pine	916	2,814	1,175	8,073	12,978
Other softwood types	564	1,633	3,117	2,691	8,005
Total	88,646	88,691	83,718	65,662	308,716
Hardwood types	288	13,081	24,754	27,433	65,564
Nonstocked	--	13	167	179	359
Unclassified ^c	983	na	na	na	983
All types	89,926	81,784	108,639	93,274	373,622

-- = none found or less than 500,000 board feet.

na = not applicable.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

^c Information on forest type is not available.

Table 29W-Average annual mortality of growing stock on timberland by forest type and owner, western Washington, 1991 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand cubic feet</i>					
Softwood types:					
Douglas-fir-					
Douglas-fir	12,282	22,978	22,580	13,704	71,544
Douglas-fir/red alder	--	4,528	6,388	2,590	13,505
Douglas-fir/other hardwood	--	598	1,557	1,258	3,413
Total	12,282	28,104	30,524	17,552	88,462
Fir-spruce-					
Grand fir	124	61	17	242	444
Noble fir	186	--	6	--	192
Noble fir/red alder	--	12	--	--	12
Pacific silver fir	11,632	976	220	31	12,859
Pacific silver fir/red alder	--	--	--	--	--
Subalpine fir	310	--	--	--	310
Engelmann spruce	18	--	--	--	18
Mountain hemlock	532	75	30	--	637
Total	12,801	1,124	273	273	14,472
Hemlock-Sitka spruce-					
Western hemlock	13,517	17,152	30,220	3,874	64,763
Western hemlock/red alder	--	1,879	2,797	666	5,342
Western hemlock/other hardwood	--	408	177	--	585
Sitka spruce	--	--	448	513	961
Sitka spruce/red alder	--	--	37	--	37
Total	13,517	19,439	33,679	5,053	71,688
Other softwood types-					
Western redcedar	454	632	1,547	1,485	4,118
Western redcedar/red alder	--	377	576	546	1,499
Western redcedar/other hardwood	--	--	96	233	328
Alaska-cedar	66	--	--	--	66
Western white pine	10	--	--	--	10
Unclassified softwood types ^b	--	--	--	--	--
Total	531	1,009	2,218	2,264	6,022
Ponderosa pine	10	--	--	--	10
Lodgepole pine	38	3	311	497	849
Total, softwood types	39,179	49,680	67,005	25,640	181,503
Hardwood types:					
Western hardwoods-					
Red alder	210	6,215	12,146	12,173	30,745
Red alder/conifer	--	4,910	9,381	4,512	18,802
Bigleaf maple	86	585	582	4,345	5,597
Bigleaf maple/conifer	--	296	1,421	1,823	3,540
Black cottonwood	--	474	442	633	1,549
Black cottonwood/conifer	--	--	--	135	135
Pacific madrone	--	--	--	304	304
Pacific madrone/conifer	--	--	--	94	94
Oregon white oak/conifer	--	--	--	19	19
Oregon ash	--	--	248	771	1,019
Bitter cherry	--	--	--	44	44
Bitter cherry/conifer	--	--	24	99	123
Other hardwood types	--	--	353	486	839
Other hardwood types/conifer	--	--	42	285	327
Total, hardwood types	296	12,479	24,639	25,722	63,137
Nonstocked ^b	--	5	167	85	257
Unclassified ^b	983	--	--	--	983
All types	40,458	62,164	91,811	51,447	245,880

-- = none found or less than 500 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Information on forest type is not available.

Table 29E-Average annual mortality of growing stock on timberland by forest type and owner, eastern Washington, 1991 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand cubic feet</i>					
Softwood types:					
Douglas-fir	17,447	7,187	5,896	11,766	42,296
Ponderosa pine	21,284	3,192	2,832	12,938	40,247
Fir-spruce	1,705	4,077	4,919	5,533	14,234
Western hemlock ^b	8,120	—	578	231	8,928
Western larch	--	1,120	724	1,551	3,395
Lodgepole pine	878	2,811	864	7,578	12,129
Other softwood types	33	624	899	427	1,983
Total	49,467	19,011	16,713	40,022	125,212
Hardwood types	--	602	115	1,711	2,427
Nonstocked	--	8	—	94	102
All types	49,467	19,620	16,828	41,827	127,743

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding: data subject to sampling error.

^b Includes western redcedar type in National Forests in eastern Washington.

Table 30-Average annual mortality of sawtimber on timberland outside National Forests by forest type and owner, Washington, 1991^{ab}

Forest type	Other public	Forest industry	Other private	All owners
<i>Thousand board feet, Scribner rule</i>				
Softwood types:				
Douglas-fir	118,318	115,629	92,625	326,572
Ponderosa pine	13,367	11,684	54,675	79,726
Fir-spruce	21,976	22,833	23,642	68,451
Hemlock-Sitka spruce ^c	64,640	97,029	16,128	177,797
Western larch	2,985	1,430	6,400	10,814
Lodgepole pine	6,556	2,644	23,557	32,757
Other softwood types	5,304	9,195	8,218	22,717
Total	222,145	260,443	225,245	718,834
Hardwood types	39,486	64,258	72,322	176,065
Nonstocked	55	585	704	1,343
All types	272,686	325,286	298,270	896,243

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates for National Forests are not available.

^c Includes western redcedar type in National Forests in eastern Washington.

Table 30W-Average annual mortality of sawtimber on timberland by forest type and owner, western Washington, 1991 ^a

Forest type	National Forest	Other public	Forest industry	Other private	All owners
<i>Thousand board feet, Scribner rule</i>					
Softwood types:					
Douglas-fir-					
Douglas-fir	48,890	72,216	68,754	39,170	229,031
Douglas-fir/red alder	--	14,525	19,139	6,450	40,114
Douglas-fir/other hardwood	--	1,771	4,017	2,937	8,725
Total	48,890	88,512	91,910	48,556	277,869
Fir-spruce-					
Grand fir	574	202	39	786	1,601
Noble fir	862	--	2	--	864
Noble fir/red alder	--	26	--	--	26
Pacific silver fir	57,561	3,595	358	58	61,573
Pacific silver fir/red alder	--	--	--	--	--
Subalpine fir	889	--	--	--	889
Engelmann spruce	80	--	--	--	80
Mountain hemlock	2,012	280	110	--	2,401
Total	61,978	4,102	510	844	67,434
Hemlock-Sitka spruce-					
Western hemlock	68,505	57,719	85,531	12,287	224,042
Western hemlock/red alder	--	6,103	7,532	1,920	15,555
Western hemlock/other hardwood	--	818	185	--	1,003
Sitka spruce	--	--	1,211	1,579	2,790
Sitka spruce/red alder	--	--	16	--	16
Total	68,505	64,640	94,476	15,785	243,406
Other softwood types-					
Western redcedar	1,653	2,009	3,827	4,080	11,569
Western redcedar/red alder	--	1,108	2,337	1,680	5,126
Western redcedar/other hardwood	--	--	389	830	1,219
Alaska-cedar	289	--	--	--	289
Western white pine	46	--	--	--	46
Unclassified softwood types ^b	--	--	--	--	--
Total	1,988	3,117	6,554	6,591	18,249
Ponderosa pine	46	--	--	--	46
Lodgepole pine	113	3	788	1,206	2,109
Total, softwood types	181,521	160,373	194,238	72,982	609,114
Hardwood types:					
Western hardwoods-					
Red alder	778	15,874	33,840	30,360	80,852
Red alder/conifer	--	16,767	22,834	12,196	51,797
Bigleaf maple	219	2,065	1,752	13,399	17,435
Bigleaf maple/conifer	--	720	3,375	4,897	8,992
Black cottonwood	--	1,367	910	2,641	4,918
Black cottonwood/conifer	--	--	--	34	34
Pacific madrone	--	--	--	701	701
Pacific madrone/conifer	--	--	--	310	310
Oregon white oak/conifer	--	--	--	44	44
Oregon ash	--	--	451	2,244	2,696
Bitter cherry	--	--	--	119	119
Bitter cherry/conifer	--	--	12	59	70
Other hardwood types	--	--	438	787	1,225
Other hardwood types/conifer	--	--	189	921	1,110
Total, hardwood types	997	38,793	63,801	68,713	170,303
Nonstocked	--	21	585	302	908
Unclassified ^b	4,620	--	--	--	4,620
All types	187,137	197,187	258,623	141,997	784,945

-- = none found or less than 500 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Information on forest type is not available.

Table 30E-Average annual mortality of sawtimber on timberland outside National Forests by forest type and owner, eastern Washington, 1991^{ab}

Forest type	Other public	Forest industry	Other private	All owners
<i>Thousand board feet, Scribner rule</i>				
<i>softwood types:</i>				
Douglas-fir	29,806	23,719	44,069	97,594
Ponderosa pine	13,367	11,684	54,675	79,726
Fir-spruce	17,874	22,323	22,798	62,995
Western hemlock ^b	--	2,553	343	2,896
Western larch	2,985	1,430	6,400	10,814
Lodgepole pine	6,553	1,856	22,351	30,760
Other softwood types	2,187	2,641	1,627	6,455
Total	72,772	66,205	152,263	291,240
Hardwood types	2,693	457	3,609	6,758
Nonstocked	34	--	402	435
All types	75,498	66,665	156,273	298,434

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates for National Forests are not available.

^c Includes western redcedar type in National Forests in eastern Washington.

Table 31W-Current net annual growth, average annual mortality, and average annual removals of growing stock on timberland by species and owner, western Washington, 1991^a

Species	National Forest ^b			Other public			Forest industry			Other private			All owners		
	Current net annual growth	Average annual mortality	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	
Softwoods: ^d															
Pacific silver fir	13,636	11,184	8,737	1,570	10,014	13,070	1,284	29,071	858	148	2,870	36,301	14,186		
Grand fir	1,493	96	1,689	189	-	4,269	363	742	4,583	727	1,152	12,034	1,375		
Noble fir	1,316	120	-	-	-	-	-	-	-	-	-	1,316	120		
Subalpine fir	519	371	-	-	-	-	-	-	-	-	-	519	371		
Alaska-cedar	572	143	4	30	2,418	72	9	240	24	3	-	672	185		
Western larch	14	-	-	-	-	-	-	-	-	-	-	14	-		
Engelmann spruce	495	465	-	-	-	229	44	-	-	-	-	723	509		
Sitka spruce	273	129	3,819	849	781	11,761	1,777	31,182	3,834	783	876	19,686	3,538		
Lodgepole pine	186	99	107	8	-	143	319	-	746	675	80	1,182	1,101		
Western white pine	-93	529	8	246	-	-3	173	-	-81	784	-	-169	1,733		
Ponderosa pine	61	209	-	-	-	-	-	-	-	-	-	61	209		
Douglas-fir	51,095	12,290	131,761	21,813	48,253	221,691	23,333	214,336	95,131	14,442	73,508	499,678	71,878		
Western redcedar	5,855	1,850	13,336	1,086	11,836	25,752	1,679	25,639	30,599	1,132	9,946	75,542	5,747		
Western hemlock	23,578	11,992	76,969	20,247	67,478	202,503	33,799	304,648	29,998	6,207	61,734	333,048	72,245		
Mountain hemlock	1,774	361	46	48	257	200	24	18,067	-	-	-	2,020	433		
Other softwoods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	100,772	39,839	236,476	46,086	141,038	479,685	62,803	623,924	165,692	24,902	150,167	982,626	173,630		
Hardwoods:															
Bigleaf maple	645	52	5,318	2,058	2,330	8,670	3,211	11,113	19,367	5,583	5,811	34,000	10,904		
Red alder	2,221	496	25,484	12,826	9,366	48,812	23,607	88,700	48,614	17,327	47,529	125,131	54,257		
Pacific madrone	23	1	208	195	-	-	-	117	1,074	725	163	1,305	921		
Western paper birch	-	-	63	152	200	652	438	-	1,233	461	-	1,947	1,051		
Oregon ash	-	-	70	25	-	394	224	681	2,143	794	223	2,607	1,042		
Quaking aspen	-	-	-	-	-	-	-	-	169	43	-	169	43		
Black cottonwood	184	69	2,187	521	421	5,484	1,221	307	7,513	1,177	442	15,368	2,989		
Cherry	-	-	241	289	252	924	304	1,115	859	326	827	2,024	918		
Oregon white oak	-	-	7	12	-	13	4	-	312	110	-	332	126		
Other hardwoods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	3,073	619	33,578	16,078	12,569	64,949	29,009	102,035	81,284	26,545	54,996	182,884	72,251		
All species	103,843	40,458	270,054	62,164	153,607	544,634	91,811	725,959	246,976	51,447	205,163	1,165,508	245,880		

-- = none found or less than 500 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Removals not available for National Forest data.

^c Removals not available for all owners.

^d Negative net annual growth is the result of annual mortality exceeding gross annual growth.

Table 31E-Current net annual growth, average annual mortality, and average annual removals of growing stock on timberland outside National Forests by species and owner, eastern Washington, 1991^{a b}

Species	Other public			Forest industry			Other private			All owners ^b		
	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals
	Thousand cubic feet ^c											
Softwoods:												
Pacific silver fir	553	157		9	485	413	241	198		803	839	413
Grand fir	2,865	1,909	2,759	5,816	4,326	6,346	9,045	5,706	11,312	17,727	11,941	20,417
Subalpine fir	598	559	--	44	623	3,985	419	415	--	1,061	1,597	3,985
Noble fir	--	--	--	--	--	245	--	--	--	--	--	245
Western larch	1,253	1,803	374	1,246	1,405	7,566	4,287	3,526	2,487	6,786	6,735	10,427
Engelmann spruce	-24	3,494	902	-268	741	1,142	232	1,183	--	-61	5,418	2,044
Lodgepole pine	2,422	3,267	319	714	1,125	3,183	4,979	8,212	2,850	8,114	12,604	6,352
Western white pine	302	143	--	-119	327	241	252	203	--	435	673	241
Ponderosa pine	6,660	3,311	8,053	7,305	3,217	11,532	33,865	13,291	27,531	47,830	19,819	47,115
Douglas-fir	21,629	3,721	7,723	29,161	3,374	26,316	58,118	6,596	23,497	108,909	13,691	57,536
Western redcedar	1,848	562	--	1,996	575	2,368	2,561	423	--	6,405	1,560	2,326
Western hemlock	8	134	--	192	425	2,626	386	209	--	586	768	2,626
Mountain hemlock	--	--	--	--	--	--	19	39	--	19	39	--
Other softwoods	-35	38	--	--	--	--	--	--	--	-35	38	--
Total	38,080	29,099	20,130	46,096	16,623	65,964	114,404	40,001	67,676	198,579	75,722	153,769
Hardwoods:												
Bigleaf maple	22	52	--	--	--	--	--	--	--	22	52	--
Red alder	62	52	--	30	29	--	--	--	--	92	81	--
Western paper birch	150	54	135	164	49	--	521	154	85	835	257	220
Quaking aspen	309	170	--	163	90	--	1,268	549	--	1,740	808	--
Black cottonwood	263	175	--	--	--	--	2,799	1,037	330	3,062	1,212	330
Cherry	100	13	--	--	--	--	82	12	--	183	25	--
Oregon white oak	12	7	122	141	38	--	185	73	--	338	118	122
Total	918	521	257	498	206	--	4,856	1,826	415	6,272	2,553	672
All species	38,998	19,620	20,387	46,594	16,828	65,964	119,260	41,827	68,091	204,851	78,275	154,441

-- = none found or less than 500 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are not available for National Forests in eastern Washington.

^c Negative net annual growth is the result of annual mortality exceeding gross annual growth.

Table 32W-Current net annual growth, average annual mortality, and average annual removals of sawtimber on timberland by species and owner, western Washington, 1991 ^a

Species	National Forest ^b			Other public			Forest industry			Other private			All owners ^c		
	Current net annual growth	Average annual mortality	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals	
Thousand board feet, Scribner rule ^d															
Softwoods:															
Alaska-cedar	1,976	415	60	106	8,718	394	33	1,028	130	12	--	2,560	586	--	
Douglas-fir	266,693	49,564	699,821	74,108	244,270	1,012,737	74,566	1,016,528	474,378	41,926	311,717	2,453,629	240,163	--	
Grand fir	7,581	412	7,973	690	--	19,034	1,120	3,397	26,950	2,310	3,140	61,538	4,538	--	
Noble fir	5,833	646	--	--	--	--	--	--	--	--	--	5,833	646	--	
Pacific silver fir	75,105	56,359	34,386	5,947	50,218	46,664	3,652	140,897	4,667	565	13,966	160,822	66,523	--	
Subalpine fir	876	1,125	--	--	--	--	--	--	--	--	--	876	1,125	--	
Mountain hemlock	10,661	1,080	221	182	1,080	216	106	98,258	--	--	--	11,098	1,368	--	
Western hemlock	115,184	60,348	365,867	65,792	316,097	924,689	95,473	1,423,489	139,530	18,167	264,414	1,545,270	239,781	--	
Western larch	76	--	--	--	--	--	--	--	--	--	--	76	--	--	
Lodgepole pine	753	147	219	19	--	631	857	--	2,836	1,496	--	4,239	2,519	--	
Ponderosa pine	356	1,036	--	--	--	--	--	--	--	--	--	356	1,036	--	
Western white pine	-623	2,501	273	696	--	-190	638	--	-253	2,276	--	-794	6,110	--	
Western redcedar	29,878	8,107	54,693	2,363	45,828	103,682	3,321	86,023	126,773	2,816	30,634	315,026	16,606	--	
Engelmann spruce	2,414	2,441	--	--	--	1,080	207	--	--	--	--	3,494	2,648	--	
Sitka spruce	1,132	999	17,899	3,472	3,980	52,480	6,039	159,664	20,811	3,307	3,512	92,321	13,818	--	
Pacific yew	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Total	517,894	185,179	1,181,411	153,376	670,192	2,161,415	186,012	2,929,282	795,623	72,875	627,383	4,656,343	597,442	--	
Hardwoods:															
Red alder	3,831	1,536	157,374	35,512	30,109	264,442	58,527	332,693	218,133	39,570	145,655	643,780	135,144	--	
Oregon ash	--	--	489	114	--	963	210	1,722	8,412	2,399	659	9,864	2,723	--	
Quaking aspen	--	--	--	--	--	--	--	--	273	41	--	273	41	--	
Western paper birch	--	--	275	68	838	1,218	262	--	3,898	721	--	5,391	1,051	--	
Bitter cherry	--	--	22	10	--	331	46	424	2,619	280	2,748	2,972	335	--	
Black cottonwood	972	376	12,298	2,083	2,418	37,250	5,610	1,898	44,378	5,757	--	94,898	13,826	--	
Pacific dogwood	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Pacific madrone	35	1	518	253	--	--	--	549	9,365	1,866	841	9,918	2,120	--	
Bigleaf maple	2,011	45	29,848	5,773	11,403	38,146	7,941	40,410	109,632	18,346	22,845	179,637	32,105	--	
Oregon white oak	--	--	--	--	--	71	16	--	611	142	--	683	158	--	
Willow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Other trees	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Total	6,850	1,958	200,823	43,812	44,768	342,422	72,611	377,695	397,322	69,122	172,749	947,416	187,503	--	
All species	524,744	187,137	1,382,234	197,187	714,959	2,503,837	258,623	3,306,977	1,192,945	141,997	800,132	5,603,759	784,945	--	

-- = none found or less than 500 board feet.
^a Totals may be off because of rounding; data subject to sampling error.
^b Removals not available for National Forests.
^c Removals not available for all owners.
^d Negative net annual growth is the result of annual mortality exceeding gross annual growth.

Table 32E-Current net annual growth, average annual mortality, and average annual removals of sawtimber on timberland outside National Forests by species and owner, eastern Washington, 1991^a

Species	Other public			Forest industry				Other private			All owners		
	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	"Average" annual mortality	Average annual removals	Thousand board feet, Scribner rule ^b	Current net annual growth	Average annual mortality	Average annual removals	Current net annual growth	Average annual mortality	Average annual removals
Softwoods:													
Pacific silver fir	3,518	316	--	114	2,451	2,175	1,272	1,272	825	--	4,905	3,592	2,175
Grand fir	15,288	7,871	12,210	24,685	16,006	25,158	50,062	25,261	61,090	--	90,039	49,138	98,459
Subalpine fir	6,788	1,994	--	409	2,489	15,775	1,674	1,063	--	--	8,871	5,566	15,775
Noble fir	--	--	--	--	--	1,417	--	--	--	--	--	--	1,417
Western larch	5,046	6,602	1,589	7,038	5,214	36,717	22,485	14,302	11,442	--	34,569	26,116	49,748
Engelmann spruce	1,286	15,641	3,975	-1,112	4,052	6,044	1,418	5,115	--	--	1,592	24,808	10,019
Lodgepole pine	8,677	7,182	1,296	7,134	3,195	13,338	34,324	22,115	6,394	--	50,135	32,492	21,028
Western white pine	6,518	590	--	-245	1,450	1,202	1,327	912	--	--	7,600	2,952	1,202
Ponderosa pine	37,336	14,960	44,439	43,614	14,047	57,567	186,365	57,778	140,726	--	267,315	86,786	242,733
Douglas-fir	115,084	15,701	38,797	153,306	13,649	119,328	281,687	23,307	111,192	--	550,077	52,657	269,317
Western redcedar	9,038	2,184	--	7,765	2,137	9,098	6,020	1,308	--	--	22,824	5,629	9,098
Western hemlock	214	562	--	1,129	1,503	11,583	274	393	--	--	1,617	2,459	11,583
Mountain hemlock	-187	209	--	--	--	--	138	147	--	--	13	147	--
Other softwoods	208,606	73,813	102,307	243,837	66,194	299,402	587,051	152,545	330,844	--	1,039,494	292,553	732,554
Hardwoods:													
Bigleaf maple	29	36	--	--	--	--	--	--	--	--	29	36	--
Red alder	168	164	--	213	136	--	--	--	--	--	381	300	--
Western paper birch	191	93	426	27	22	--	348	140	--	--	566	255	426
Quaking aspen	1,334	536	--	485	286	--	14,944	1,231	--	--	16,763	2,053	776
Black cottonwood	1,773	856	--	--	--	--	8,388	2,295	776	--	10,161	3,151	518
Oregon white oak	--	--	518	23	28	--	79	62	--	--	102	90	--
Other hardwoods	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	3,495	1,685	944	747	471	--	23,759	3,728	776	--	28,001	5,885	1,719
All species	212,101	75,498	103,251	244,584	66,665	299,402	610,811	156,273	331,620	--	1,067,496	298,434	734,273

-- = none found or less than 500 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Negative net annual growth is the result of annual mortality exceeding gross annual growth.

Table 33-Changes in timberland area outside National Forests by owner, Washington, 1978-80 to 1988-91^{ab}

Description	Other public	Forest industry	Other private	All owners
<i>Thousand acres^c</i>				
Timberland area in 1978-80	2,416	4,982	4,450	11,939
Area change due to:				
Changes in land class-				
Timberland to rights-of-way ^d	-12	-95	48	-155
Timberland to urban	—	-7	-82	-89
Timberland to agricultural	—	--	-53	-53
Agricultural to timberland	--	--	12	12
Christmas tree farm to timberland	—	6	—	6
Net change	-12	-96	-171	-279
Changes in inventory area-				
To National Forest	-11	-164	--	-175
From National Forest	3	38	17	58
To reserved timberland	-5	—	-87	-92
Net change	-13	-126	-70	-209
Changes in ownership-				
From other public	-134	134	—	—
From forest industry	166	-325	159	—
From other private	11	63	-74	—
Net change	43	-128	85	--
Timberland area in 1988-91	2,433	4,633	4,386	11,452

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of timberland, and positive values are gains of timberland.

Losses are shown by the 1978-80 owner, and gains are shown by the 1988-91 owner.

^d Includes constructed roads, powerline and pipeline clearings, and operating railroad rights-of-way.

Table 33W-Changes in timberland area outside National Forests by owner, western Washington, 1978-79 to 1988-89 ^{ab}

Description	Other public	Forest industry	Other private	All owners
<i>Thousand acres ^c</i>				
	1,636	4,012	2,637	7,685
Area change due to:				
Changes in land class-				
Timberland to rights-of-way ^d	--	-75	-48	-123
Timberland to urban	--	-7	-56	-63
Timberland to agricultural	--	--	-38	-38
Agricultural to timberland	--	--	12	12
Christmas tree farm to timberland	--	6	--	6
Net change	--	-75	-130	-205
Changes in inventory area-				
To National Forest	--	-90	--	-90
From National Forest	3	38	17	58
To reserved timberland	-5	--	--	-5
Net change	-2	-52	17	-37
Changes in ownership-				
From other public	-111	111	--	--
From forest industry	146	-285	139	--
From other private	--	44	-44	--
Net change	35	-130	95	--
Timberland area in 1988-89	1,669	3,755	2,020	7,443

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of timberland, and positive values are gains of timberland.

Losses are shown by the 1978-79 owner, and gains are shown by the 1988-89 owner.

^d Includes constructed roads, powerline and pipeline clearings, and operating railroad rights-of-way.

Table 33E-Changes in timberland area outside National Forests by owner, eastern Washington, 1980 to 1990-91 ^{a b}

Description	Other public	Forest industry	Other private	All owners
<i>Thousand acres ^c</i>				
Timberland area in 1980	780	970	2,503	4,254
Area change due to:				
Changes in land class-				
Timberland to rights-of-way ^d	-12	-20	--	-33
Timberland to urban	--	--	-26	-26
Timberland to agricultural	--	--	-15	-15
Agricultural to timberland	--	--	--	--
Christmas tree farm to timberland	--	--	--	--
Net change	-12	-20	-41	-74
Changes in inventory area-				
To National Forest	-11	-74	--	-85
From National Forest	--	--	--	--
To reserved timberland	--	--	-87	-87
Net change	-11	-74	-87	-172
Changes in ownership-				
From other public	-23	23	--	--
From forest industry	20	-40	20	--
From other private	11	19	-30	--
Net change	7	2	-9	--
Timberland area in 1990-91	764	878	2,366	4,008

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of timberland, and positive values are gains of timberland. Losses are shown by the 1980 owner, and gains are shown by the 1990-91 owner.

^d Includes constructed roads, powerline and pipeline clearings, and operating railroad rights-of-way.

Table 34-Changes in timberland area outside National Forests by forest type and owner, Washington, 1978-80 to 1988-91^{abc}

Forest type	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>				
Softwood types:				
Douglas-fir	-25	276	81	333
Ponderosa pine	15	-13	-46	-43
Fir-spruce	13	-28	-51	-65
Hemlock-Sitka spruce	12	-220	-2	-211
Western larch	7	-58	-15	-66
Lodgepole pine	-5	-39	-31	-74
Other softwood types	5	-10	27	-23
Total	24	-91	-35	-102
Hardwood types				
	9	-238	-118	-346
Nonstocked	-16	-21	-2	-40
All types	17	-350	-155	-488

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Includes change in ownership and reserved status as well as real change in forest types.

Table 34W-Changes in timberland area outside National Forests by forest type and owner, western Washington, 1978-79 to 1988-89^{abc}

Forest type	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>				
Softwood types:				
Douglas-fir	7	226	41	274
Fir-spruce	22	2	--	24
Hemlock-Sitka spruce	12	-226	-9	-223
Lodgepole pine	--	--	7	7
Other softwood types	0	-16	32	27
Total	51	-14	72	109
Hardwood types				
	-2	-231	-109	-342
Nonstocked	-16	-13	20	-9
All types	33	-258	-17	-242

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Includes change in ownership and reserved status as well as real change in forest types.

Table 34E-Changes in timberland area outside National Forests by forest type and owner, eastern Washington, 1980 to 1990-91^{abc}

Forest type	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>				
Softwood types:				
Douglas-fir	-31	51	40	59
Ponderosa pine	15	-13	-46	-43
Fir-spruce	-9	-30	-51	-89
Western hemlock	--	6	7	12
Western larch	7	-58	-15	-66
Lodgepole pine	-5	-39	-38	-81
Other softwood types	-5	6	-5	-3
Total	-27	-78	-107	-211
Hardwood types	11	-6	-9	4
Nonstocked	--	-9	-22	-30
All types	-16	-92	-138	-246

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Includes change in ownership and reserved status as well as real change in forest types.

Table 35-Changes in timberland area outside National Forests by stand-size class and owner, Washington, 1978-80 to 1988-91^{a bc}

Stand-size	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>				
Sawtimber	98	-398	228	-72
Poletimber	-185	-292	-609	-1,086
Seedling-sapling	120	362	228	709
Nonstocked-	-16	-21	-2	-40
All classes	17	-350	-155	-488

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Includes change in ownership and reserved status as well as real change in stand sizes.

Table 35W-Changes in timberland area outside National Forests by stand-size class and owner, western Washington, 1978-79 to 1988-89^{abc}

Stand-size	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>				
Sawtimber	56	-302	117	-129
Poletimber	-153	-195	-331	-679
Seedling-sapling	146	251	177	575
Nonstocked	-16	-13	20	-9
All classes	33	-258	-17	243

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

Estimates are based on remeasured plots.

^c Includes change in ownership and reserved status as well as real change in stand sizes.

Table 35E-Changes in timberland area outside National Forests by stand-size class and owner, eastern Washington, 1980 to 1990-91^{abc}

Stand-size	Other public	Forest industry	Other private	All owners
<i>Thousand acres</i>				
Sawtimber	42	-97	111	57
Poletimber	-32	-97	-277	-407
Seedling-sapling	-26	110	51	134
Nonstocked	--	-9	-22	-30
All classes	-16	-92	-138	-246

-- = none found or less than 500 acres.

^a Totals may be off because of rounding; data subject to sampling error.

Estimates are based on remeasured plots.

^c Includes change in ownership and reserved status as well as real change in stand sizes.

Table 36-Changes in volume of growing stock on timberland outside National Forests by species group and owner, Washington, 1978-80 to 1988-91^{ab}

Description	Other public	Forest industry	Other private	All owners
<i>Million cubic feet^c</i>				
Softwoods:				
Total volume in 1978-80	8,755	15,594	8,607	32,956
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	-26	-506	-332	-864
Nonforest to timberland	--	--	33	33
Net change	-26	-506	-299	-831
Changes in inventory area-				
To National Forest	-53	-432	--	485
From National Forest	27	36	84	147
To reserved timberland	-18	--	-328	-346
Net change	-44	-396	-244	-684
Changes in ownership-				
From other public	-432	432	--	--
From forest industry	412	-989	577	--
From other private	12	127	-139	--
Net change	-8	-430	438	--
Growth, mortality, and harvest-				
Periodic gross growth	3,299	6,274	3,610	13,183
Periodic mortality	-367	-454	-428	-1,249
Periodic removals	-1,630	-6,963	-2,251	-10,844
Net change	1,302	-1,143	931	1,090
Total volume in 1988-91	9,980	13,122	9,437	32,539
Hardwoods:				
Total volume in 1978-80	1,094	2,817	2,464	6,375
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	--	-29	-173	-202
Nonforest to timberland	--	--	--	--
Net change	--	-29	-173	-202
Changes in inventory area-				
To National Forest	--	-22	--	-22
From National Forest	--	7	--	7
To reserved timberland	--	--	--	--
Net change	--	-15	--	-15
Changes in ownership-				
From other public	-110	110	--	--
From forest industry	160	-287	127	--
From other private	--	23	-23	--
Net change	50	-154	104	--
Growth, mortality, and harvest-				
Periodic gross growth	445	980	1,098	2,523
Periodic mortality	-98	-134	-161	-393
Periodic removals	-129	-1,020	-555	-1,704
Net change	218	-174	382	426
Total volume in 1988-91	1,363	2,444	2,776	6,583

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of volume and positive values are gains of volume. Losses are shown by the 1978-80 owner and gains are shown by the 1988-91 owner.

Table 36W-Changes in volume of growing stock on timberland outside National Forests by species group and owner, western Washington, 1976-79 to 1988-89^{ab}

Description	Other public	Forest industry	Other private	All owners
<i>Million cubic feet^c</i>				
Softwoods:				
Total volume in 1978-79	6,789	13,179	3,919	23,887
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	--	484	-275	-759
Nonforest to timberland	--	--	33	33
Net change	--	-484	-242	-726
Changes in inventory area-				
To National Forest	--	-177	--	-177
From National Forest	27	36	84	147
To reserved timberland	-18	--	--	-18
Net change	9	-141	84	-48
Changes in ownership-				
From other public	-408	408	--	--
From forest industry	386	-941	555	--
From other private	--	86	-86	--
Net change	-22	-447	469	--
Growth, mortality, and harvest-				
Periodic gross growth	2,710	5,552	1,983	10,245
Periodic mortality	-249	-306	-130	-686
Periodic removals	-1,410	-6,239	-1,507	-9,157
Net change	1,050	-993	345	402
Total volume in 1988-89	7,825	11,117	4,579	23,521
Hardwoods				
Total volume in 1978-79	1,034	2,797	2,330	6,160
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	--	-29	-173	-201
Nonforest to timberland	--	--	--	--
Net change	--	-29	-173	-201
Changes in inventory area-				
To National Forest	--	-22	--	-22
From National Forest	--	7	--	7
To reserved timberland	--	--	--	--
Net change	--	-16	--	-16
Changes in ownership-				
From other public	-110	110	--	--
From forest industry	159	-286	127	--
From other private	--	23	-23	--
Net change	50	-153	104	--
Growth, mortality, and harvest-				
Periodic gross growth	430	972	1,031	2,433
Periodic mortality	-93	-134	-147	-373
Periodic removals	-126	-1,020	-550	-1,696
Net change	212	-182	334	363
Total volume in 1988-89	1,295	2,417	2,594	6,307

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of volume and positive values are gains of volume. Losses are shown by the 1978-79 owner and gains are shown by the 1988-89 owner.

Table 36E-Changes in volume of growing stock on timberland outside National Forests by species group and owner, eastern Washington, 1980 to 1990-91 ^{a b}

Description	Other public	Forest industry	Other private	All owners
<i>Million cubic feet ^c</i>				
Softwoods:				
Total volume in 1980	1,966	2,415	4,688	9,069
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	-26	-22	-57	-105
Nonforest to timberland	--	--	--	--
Net change	-26	-22	-57	-105
Changes in inventory area-				
To National Forest	-53	-255	--	-306
From National Forest	--	--	--	--
To reserved timberland	--	--	-328	-328
Net change	-53	-255	-328	-637
Changes in ownership-				
From other public	-24	24	--	--
From forest industry	26	-48	22	--
From other private	12	41	-53	--
Net change	14	17	-31	--
Growth, mortality, and harvest-				
Periodic gross growth	589	722	1,627	2,938
Periodic mortality	-118	-148	-298	-565
Periodic removals	-220	-724	-744	-1,687
Net change	251	-150	585	686
Total volume in 1990-91	2,155	2,005	4,858	9,018
Hardwoods:				
Total volume in 1980	60	20	134	214
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	--	--	--	--
Nonforest to timberland	--	--	--	--
Net change	--	--	--	--
Changes in inventory area-				
To National Forest	--	--	--	--
From National Forest	--	--	--	--
To reserved timberland	--	--	--	--
Net change	--	--	--	--
Changes in ownership-				
From other public	--	--	--	--
From forest industry	1	-1	--	--
From other private	--	--	--	--
Net change	1	-1	--	--
Growth, mortality, and harvest-				
Periodic gross growth	15	8	67	90
Periodic mortality	-5	--	-14	-20
Periodic removals	-3	--	-5	-7
Net change	7	8	48	63
Total volume in 1990-91	68	27	182	277

-- = none found or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of volume and positive values are gains of volume. Losses are shown by the 1980 owner and gains are shown by the 1990-91 owner.

Table 37-Changes in volume of sawtimber on timberland outside National Forests by species group and owner, Washington, 1978-80 to 1988-91^{ab}

Description	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule^c</i>				
Softwoods:				
Total volume in 1978-80	35,072	61,577	32,305	128,953
Volume changes due to:				
Changes in land class—				
Timberland to nonforest	-124	-2,182	-1,111	-3,416
Nonforest to timberland	—	—	85	85
Net change	-124	-2,182	-1,026	-3,331
Changes in inventory area—				
To National Forest	-126	-1,714	—	-1,840
From National Forest	118	137	429	684
To reserved timberland	-64	—	-1,439	-1,439
Net change	-72	-1,577	-1,010	-2,659
Changes in ownership—				
From other public	-1,548	1,548	—	—
From forest industry	1,400	-3,564	2,164	—
From other private	34	409	-442	—
Net change	-113	-1,607	1,720	—
Growth, mortality, and harvest—				
Periodic gross growth	15,570	27,631	16,366	59,567
Periodic mortality	-1,171	-1,302	-1,480	-3,953
Periodic removals	-7,818	-32,531	-9,933	-50,327
Net change	6,581	-6,246	4,952	5,287
Total volume in 1988-91	41,342	49,964	36,940	128,245
Hardwoods:				
Total volume in 1978-80	3,153	8,226	7,080	18,459
Volume changes due to:				
Changes in land class—				
Timberland to nonforest	—	-88	-542	-630
Nonforest to timberland	—	—	—	—
Net change	—	-88	-542	-630
Changes in inventory area—				
To National Forest	—	-77	—	-77
From National Forest	—	13	—	13
To reserved timberland	—	—	—	—
Net change	—	-64	—	-64
Changes in ownership—				
From other public	-218	218	—	—
From forest industry	339	-748	409	—
From other private	—	56	-56	—
Net change	121	-474	353	—
Growth, mortality, and harvest—				
Periodic gross growth	2,011	4,297	4,655	10,964
Periodic mortality	-254	-215	-313	-782
Periodic removals	-458	-3,777	-1,737	-5,972
Net change	1,300	305	2,605	4,211
Total volume in 1988-91	7,909	9,490	21,974	

— = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of volume and positive values are gains of volume. Losses are shown by the 1978-80 owner and gains are shown by the 1988-91 owner.

Table 37W-Changes in volume of sawtimber outside National Forests by species group and owner, western Washington, 1978-79 to 1988-89^{ab}

Description	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule^c</i>				
Softwoods:				
Total volume in 1978-79	26,687	51,785	13,577	92,049
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	--	-2,085	-947	-3,032
Nonforest to timberland	--	--	85	85
Net change	--	-2,085	-862	-2,947
Changes in inventory area-				
To National Forest	--	-722	--	-722
From National Forest	118	137	429	684
To reserved timberland	-64	--	--	-64
Net change	54	-585	429	-102
Changes in ownership-				
From other public	-1,472	1,472	--	--
From forest industry	1,353	-3,464	2,111	--
From other private	--	282	-282	--
Net change	-119	-1,709	1,828	--
Growth, mortality, and harvest-				
Periodic gross growth	12,842	24,107	8,863	45,812
Periodic mortality	-703	-728	-409	-1,840
Periodic removals	6,702	-29,293	-6,296	-42,291
Net change	5,437	-5,913	2,157	1,681
Total volume in 1988-89	32,058	41,491	17,130	90,679
Hardwoods:				
Total volume in 1978-79	2,978	8,177	6,763	17,918
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	--	-88	-542	-630
Nonforest to timberland	--	--	--	--
Net change	--	-88	-542	-630
Changes in inventory area-				
To National Forest	--	-77	--	-77
From National Forest	--	13	--	13
To reserved timberland	--	--	--	--
Net change	--	-64	--	-64
Changes in ownership-				
From other public	-218	218	--	--
From forest industry	339	-748	409	--
From other private	--	56	-56	--
Net change	121	-474	353	--
Growth, mortality, and harvest-				
Periodic gross growth	1,948	4,284	4,447	10,680
Periodic mortality	-246	-215	-285	-746
Periodic removals	-448	-3,777	-1,728	-5,953
Net change	1,255	292	2,434	3,981
Total volume in 1988-89	4,354	7,847	9,002	21,204

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of volume and positive values are gains of volume. Losses are shown by the 1978-79 owner and gains are shown by the 1988-89 owner.

Table 37E-Changes in volume of sawtimber on timberland outside National Forests by species group and owner, eastern Washington, 1980 to 1990-91 ^{a b}

Description	Other public	Forest industry	Other private	All owners
<i>Million board feet, Scribner rule ^c</i>				
Softwoods:				
Total volume in 1980	8,385	9,792	18,728	36,904
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	-124	-97	-164	-384
Nonforest to timberland	--	--	--	--
Net change	-124	-97	-164	-384
Changes in inventory area-				
To National Forest	-126	-992	--	-1,118
From National Forest	--	--	--	--
To reserved timberland	--	--	-1,439	-1,439
Net change	-126	-992	-1,439	-2,557
Changes in ownership-				
From other public	-76	76	--	--
From forest industry	47	-100	53	--
From other private	34	127	-160	--
Net change	6	102	-108	--
Growth, mortality, and harvest-				
Periodic gross growth	2,728	3,524	7,503	13,755
Periodic mortality	-468	-574	-1,071	-2,113
Periodic removals	-1,116	-3,283	-3,637	-8,036
Net change	1,144	-333	2,795	3,606
Total volume in 1990-91	9,284	8,473	19,810	37,566
Hardwoods:				
Total volume in 1980	175	49	317	541
Volume changes due to:				
Changes in land class-				
Timberland to nonforest	--	--	--	--
Nonforest to timberland	--	--	--	--
Net change	--	--	--	--
Changes in inventory area-				
To National Forest	--	--	--	--
From National Forest	--	--	--	--
To reserved timberland	--	--	--	--
Net change	--	--	--	--
Changes in ownership-				
From other public	--	--	--	--
From forest industry	--	--	--	--
From other private	--	--	--	--
Net change	--	--	--	--
Growth, mortality, and harvest-				
Periodic gross growth	63	13	208	284
Periodic mortality	-8	--	-28	-36
Periodic removals	-10	--	-9	-18
Net change	45	13	171	230
Total volume in 1990-91	221	62	488	770

-- = none found or less than 500,000 board feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Estimates are based on remeasured plots.

^c Negative values are losses of volume and positive values are gains of volume. Losses are shown by the 1980 owner and gains are shown by the 1990-91 owner.

Table 38-Changes in net volume of growing stock on timberland outside National Forests by species and diameter class, Washington, 1978-80 to 1988-91 ^{a b}

	Diameter class (inches at breast height)						All classes
Species	5.0- 8.9	9.0- 12.9	13.0- 16.9	17.0- 20.9	21.0- 28.9	29.0+	
<i>Million cubic feet</i>							
Softwoods:							
True firs	-31	-5	-73	-13	-86	-177	-383
Alaska-cedar	—	—	-3	-6	-11	-11	-30
Western larch	-47	-15	-48	-17	-15	-8	-152
Engelmann spruce	-3	1	-3	-3	-16	-9	-32
Sitka spruce	13	5	5	-8	-11	-87	-83
Lodgepole pine	-65	-53	9	-6	-9	--	-121
Western white pine	2	8	12	--	-1	-6	15
Ponderosa pine	-9	35	68	60	-8	-85	61
Douglas-fir	-33	164	246	311	715	42	1,445
Western redcedar	--	26	20	23	118	44	231
Western hemlock	-71	129	46	-92	-352	-695	-1,034
Mountain hemlock	-2	-11	-43	-42	-67	-164	-327
Other softwoods	-1	-1	—	-3	1	—	-5
Total	-248	288	235	204	259	1,155	-417
Hardwoods:							
Bigleaf maple	-11	14	-5	73	26	38	134
Red alder	-229	-119	144	28	40	23	-115
Pacific madrone	-2	1	—	3	—	—	3
Western paper birch	5	12	6	—	—	--	22
Oregon ash	—	4	7	9	9	—	31
Quaking aspen	-4	11	8	3	2	—	21
Black cottonwood	-1	5	-41	33	86	38	120
Cherry	-9	-2	-3	-1	--	—	-14
Oregon white oak	-1	7	--	1	-1	—	8
Other hardwoods	—	—	--	--	—	--	—
Total	-249	-69	116	147	162	99	208
All species	-497	219	352	351	421	-1,056	-208

-- = no change or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^c Includes volume change due to shifts in ownership and reserved status.

Table 38W-Changes in net volume of growing stock on timberland outside National Forests by species and diameter class, western Washington, 1978-79 to 1988-89^{ab}

	Diameter class (inches at breast height)						All classes
Species	5.0- 8.9	9.0- 12.9	13.0- 16.9	17.0- 20.9	21.0- 28.9	29.0+	
<i>Million cubic feet</i>							
Softwoods:							
True firs	- 4	2	-16	- 3	-75	-145	-239
Alaska-cedar	—	—	- 3	- 4	- 8	-11	-25
Western larch		--	—	--	—	—	—
Engelmann spruce	—	-1	1	—	—	—	1
Sitka spruce	13	5	5	-8	-11	-87	-83
Lodgepole pine	- 2	-1	-14	1	-1	1	-16
Western white pine	2	8	16	-1	--	- 5	20
Ponderosa pine	--	--	—	--	—	--	—
Douglas-fir	-49	109	81	179	629	63	1,013
Western redcedar	- 8	-13	9	21	101	43	178
Western hemlock	-74	129	50	-85	-349	-691	-1,020
Mountain hemlock	1	- 5	-14	-18	-37	-153	-223
Other softwoods		—	—	--	—	—	—
Total	-180	264	143	81	250	- 8 8 4 4 8 8	
Hardwoods:							
Bigleaf maple	-11	13	- 5	73	26	38	133
Red alder	-230	-118	147	26	41	22	-114
Pacific madrone	- 2	1	—	3	--	—	3
Western paper birch	1	12	2	—	--	—	14
Oregon ash		4	7	9	9	—	31
Quaking aspen	—	—	—	—	--	—	—
Black cottonwood	- 7	1	-34	21	78	34	92
Cherry	-12	- 2	- 3	-1	--	--	-17
Oregon white oak	- 4	5	--	—	—	—	2
Other hardwoods		—	--	—	—	--	—
Total	261	- 86	114	129	154	94	145
All species	-382	178	258	210	404	-890	-220

-- = no change or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes volume change due to shifts in ownership and reserved status.

Table 38E-Changes in net volume of growing stock on timberland outside National Forests by species and diameter class, eastern Washington, 1980 to 1990-91^{ab}

Species	Diameter class (inches at breast height)						All classes
	5.0-8.9	9.0-12.9	13.0-16.9	17.0-20.9	21.0-28.9	29.0+	
Million cubic feet							
Softwoods:							
True firs	-27	-7	-57	-10	-11	-32	-144
Western larch	-47	-15	-49	-17	-15	-8	-152
Engelmann spruce	-3	2	-4	-3	-16	-9	-33
Lodgepole pine	-63	-52	-5	-7	-8	-1	-137
Western white pine	--	--	-4	1	-1	-1	-5
Ponderosa pine	-9	35	68	60	-8	-85	61
Douglas-fir	16	55	165	132	86	-21	432
Western redcedar	8	13	11	2	17	1	53
Western hemlock	3	--	-4	-7	-3	-4	-14
Mountain hemlock	-3	-6	-29	-24	-30	-11	-104
Other softwoods	-1	-1	--	-5	-2	--	-10
Total	-128	24	99	123	9	-171	-52
Hardwoods:							
Bigleaf maple	--	1	--	--	--	--	1
Red alder	1	-1	-3	2	-1	1	-1
Western paper birch	4	--	4	--	--	--	8
Quaking aspen	-4	11	8	3	2	--	21
Black cottonwood	6	4	-7	12	8	4	28
Cherry	3	--	--	--	--	--	3
Oregon white oak	3	2	--	1	-1	--	5
Total	12	17	2	16	9	6	92
All species	-115	41	94	141	17	-166	11

-- = no change or less than 500,000 cubic feet.

^a Totals may be off because of rounding; data subject to sampling error.

^b Includes volume change due to shifts in ownership and reserved status.

Table 39-Timber harvest by owner, Washington, 1955-92

Year	National Forest			Other public ^a			Private			All owners		
	Western Washington	Eastern Washington	Total	Western Washington	Eastern Washington	Total	Western Washington	Eastern Washington	Total	Western Washington	Eastern Washington	Total
<i>Thousand board feet, Scitbner rule</i>												
1955	669,672	172,714	862,386	424,744	47,673	472,417	2,777,915	537,955	3,315,870	3,892,331	758,342	4,650,673
1956	727,200	217,290	944,490	502,135	48,097	548,232	3,038,207	504,073	3,542,280	4,267,542	767,460	5,035,002
1957	672,190	227,845	900,035	387,006	37,657	424,663	2,237,635	485,045	2,722,680	3,296,831	750,547	4,047,378
1956	776,080	250,764	1,026,844	293,581	29,131	322,712	2,038,037	491,670	2,529,707	3,107,698	771,565	3,879,263
1959	1,107,261	330,307	1,437,568	273,932	35,716	309,648	2,585,248	536,507	3,121,755	3,966,441	902,530	4,868,971
1960	909,243	272,884	1,181,127	260,626	29,195	289,821	2,719,803	538,180	3,255,983	3,888,672	838,259	4,726,931
1961	891,646	288,501	1,180,147	289,318	27,229	316,547	2,457,226	481,854	2,939,080	3,638,190	797,584	4,435,774
1962	1,096,100	400,062	1,496,162	296,781	37,159	333,940	2,766,816	454,426	3,221,242	4,159,697	891,647	5,051,344
1963	1,171,400	411,925	1,583,325	529,806	41,419	571,225	2,782,133	491,028	3,273,161	4,483,339	944,372	5,427,711
1964	1,274,200	427,596	1,701,796	550,492	38,232	588,714	3,379,857	547,882	3,927,739	5,204,539	1,013,710	6,218,249
1965	1,287,000	433,090	1,720,090	675,081	75,941	751,022	3,520,101	530,562	4,050,663	5,482,182	1,039,593	6,521,775
1966	1,144,649	428,176	1,572,825	536,100	75,922	612,022	3,363,883	526,794	3,890,677	5,044,632	1,030,892	6,075,524
1967	1,151,400	448,802	1,600,202	475,640	84,539	560,179	3,244,896	531,740	3,776,636	4,871,936	1,065,081	5,937,017
1968	1,322,273	472,669	1,794,942	689,598	102,260	791,858	3,782,017	603,772	4,385,789	5,793,888	1,178,701	6,972,589
1969	1,092,414	426,409	1,518,823	716,294	118,017	834,311	4,127,107	523,715	4,650,822	5,935,815	1,068,141	7,003,956
1970	1,045,406	332,863	1,378,269	601,215	67,014	668,229	3,922,566	490,807	4,413,373	5,569,187	890,684	6,459,871
1971	875,470	385,967	1,261,437	716,634	110,434	827,068	3,788,314	573,711	4,362,025	5,380,418	1,070,112	6,450,530
1972	1,005,802	481,759	1,487,561	996,613	91,899	1,088,512	3,887,790	615,658	4,503,448	5,890,205	1,189,316	7,079,521
1973	1,173,961	439,170	1,613,131	909,711	113,300	1,023,011	4,506,856	668,398	5,173,254	6,590,528	1,218,868	7,809,396
1974	908,694	382,870	1,289,564	720,640	76,699	797,339	4,106,312	663,056	4,789,368	5,733,646	1,142,625	6,876,271
1975	758,498	339,847	1,098,345	539,034	66,583	605,617	3,874,626	606,463	4,481,089	5,172,158	1,012,893	6,185,051
1976	850,548	363,896	1,214,444	745,189	78,859	824,048	4,241,215	689,168	4,930,403	5,836,952	1,131,943	6,968,895
1977	848,754	321,884	1,170,638	759,894	116,758	875,652	3,814,114	730,581	4,544,695	5,421,762	1,169,223	6,590,985
1978	921,270	339,443	1,260,713	016,669	108,993	1,025,662	3,725,151	771,153	4,496,304	5,563,090	1,219,589	6,782,679
1979	984,246	291,369	1,275,615	1,104,197	89,186	1,193,383	3,753,066	747,201	4,500,267	5,541,500	1,127,756	6,969,265
1980	771,896	316,864	1,088,760	732,046	55,485	787,531	3,157,035	666,626	3,843,661	4,660,977	1,058,975	5,719,952
1981	577,876	297,105	874,981	436,361	51,486	489,847	2,940,940	585,130	3,526,070	3,957,177	933,721	4,890,898
1982	649,637	178,788	728,325	435,222	23,331	458,553	3,366,713	525,473	3,892,186	4,351,472	727,592	5,079,064
1983	840,858	399,356	1,240,214	401,990	92,725	584,715	3,629,260	634,084	4,263,344	4,962,108	1,126,165	6,088,273
1984	860,919	327,596	1,188,515	739,755	123,010	862,765	3,153,539	597,153	3,750,692	4,754,213	1,047,759	5,801,972
1985	803,518	324,138	1,127,656	964,710	96,516	1,061,226	3,091,271	683,390	3,774,661	4,859,499	1,104,044	5,963,543
1986	835,706	396,551	1,232,257	991,020	108,974	1,099,994	3,505,069	718,637	4,223,706	5,331,705	1,224,182	6,555,957
1987	960,512	462,312	1,422,824	863,687	146,022	1,009,709	3,873,048	729,928	4,602,976	5,697,247	1,336,262	7,035,509
1988	1,059,327	426,280	1,485,607	781,460	121,557	883,017	3,928,027	748,721	4,676,748	5,748,814	1,296,558	7,045,372
1989	707,974	433,511	1,141,485	745,019	119,929	864,948	3,981,886	805,671	4,787,557	5,434,879	1,359,111	6,793,990
1990	503,952	313,259	817,211	599,267	102,628	701,895	3,586,460	759,905	4,346,365	4,689,679	1,175,792	5,865,471
1991	419,446	284,304	703,750	509,706	68,673	578,379	3,084,358	737,433	3,821,791	4,013,510	1,090,410	5,103,920
1992	255,866	205,206	461,072	505,963	207,135	713,098	3,192,872	650,634	3,843,506	3,954,701	1,062,975	5,017,676

^a Includes volume harvested from land owned by Native Americans.
Source: State of Washington, Department of Natural Resources.

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This report summarizes and analyzes 1988-91 timber inventories of western and eastern Washington. These inventories were conducted on all private and public lands except National Forests. Timber resource statistics from National Forest inventories also are presented. Detailed tables provide estimates of forest area, timber volume, growth, mortality, and harvest. Data on change are presented by using comparable statistics from previous inventories, and historical records.

Keywords: Forest surveys, forest inventory, statistics (forest), timber resources, resources (forest), western Washington, eastern Washington, Washington.

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