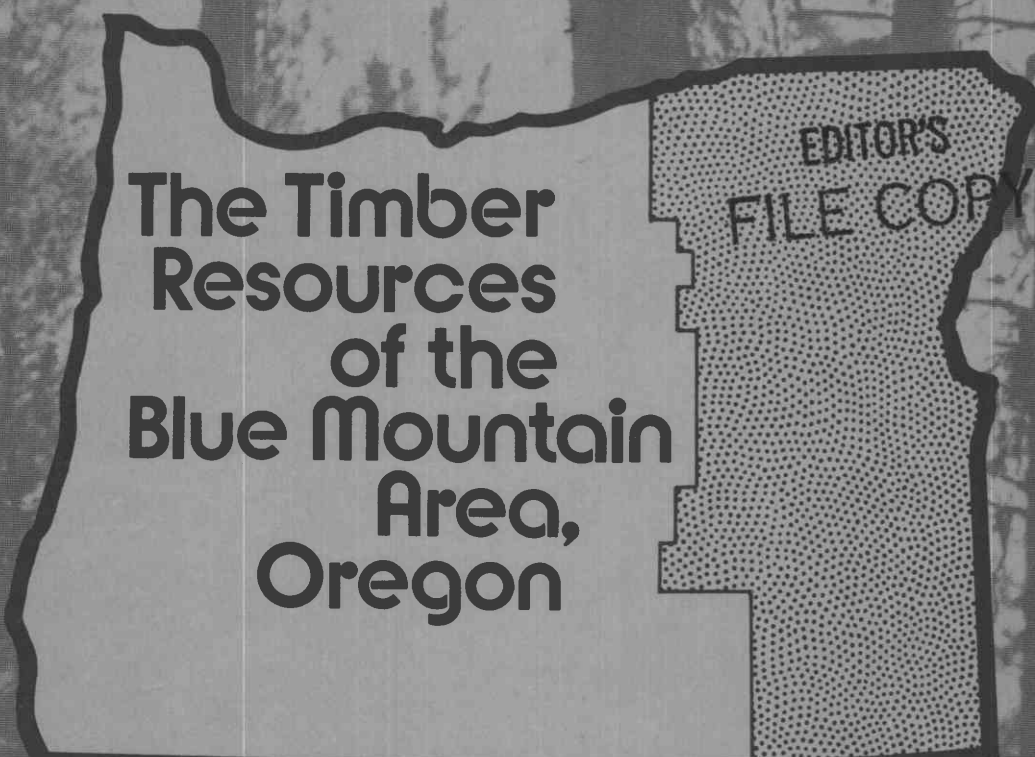




The Timber Resources of the Blue Mountain Area, Oregon

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Preface

This report summarizes the findings of the third inventory of the forests in Baker, Grant, Harney, Malheur, Morrow, Umatilla, Union, and Wallowa Counties in eastern Oregon. Fieldwork on lands outside the National Forests was completed during the summer of 1969. The Wallowa-Whitman National Forest was inventoried in 1966 and 1967, the Malheur National Forest in 1967 and 1968, and the Umatilla National Forest in 1968 and 1969. Inventory of the Snow Mountain Ranger District of the Ochoco National Forest in Grant and Harney Counties was completed in 1967, and that of the Crooked River Working Circle in Grant County was completed in 1962.

Previous inventories of these eight counties were completed as follows:

County	First inventory	Second inventory
Baker	1936-37	1956
Grant	1935-36	1958
Harney	1935	1953
Malheur	1936-37	1956
Morrow	1936	1954
Umatilla	1936	1958
Union	1936	1958
Wallowa	1935-36	1957

This report was prepared by the Forest Survey, a nationwide project of the Forest Service authorized by the McSweeney-McNary Forest Research Act of 1928 and subsequent amendments. The purposes of the Forest Survey are (1) to obtain comprehensive information on timber and other forest resources, including the extent and condition of forest lands, the amount and kind of timber growing on these lands, the rate of forest growth and depletion, the amount of timber cut, and probable future trends in timber requirements, and (2) to analyze and make available resource information needed to formulate forest policies and programs. Resurveys are made periodically to update basic information.

The Forest Survey is conducted throughout the 50 States by the U.S. Forest Service Experiment Stations. The Pacific Northwest Forest and Range Experiment Station at Portland, Oregon, is responsible for the States of Alaska, California, Hawaii, Oregon, and Washington.

Abstract

The latest inventory of the timber resources of the Blue Mountain Area of Oregon indicates that there are about 47 billion board feet of sawtimber on 4.6 million acres of commercial forest land. Public agencies administer about 76 percent of the area and hold 89 percent of the sawtimber volume; farmer and miscellaneous private ownerships account for 16 percent of the area but only 6 percent of the sawtimber volume; and forest industries 8 percent of the commercial forest area and 5 percent of the volume. Total volume of timber and area of commercial forest land have declined about 10 percent since the mid-1950's.

Ponderosa pine is the most abundant species, accounting for 44 percent of the sawtimber volume. Douglas-fir accounts for 20 percent of the volume, with true firs and larch occurring in significant amounts.

Most of the available timber volume is in public ownership. Private timberland is largely cut over, with resulting low inventory volumes. Although total timber cut has remained at about the same level, the harvest from public lands has increased from 56 percent in 1960 to 82 percent in 1972.

KEYWORDS: Forest Surveys (regional), statistics (forest), eastern Oregon.

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Forest Land

Only 19 Percent of the Blue Mountain Area Is Commercial Forest Land

Of the 24,399,000 acres of land in the eight counties of Baker, Grant, Harney, Malheur, Morrow, Umatilla, Union, and Wallowa 6,029,000 acres or 25 percent are forested. Of the total forest area, 4,565,000 acres or 76 percent is classified as commercial forest land, approximately 18 percent of the total in the State of Oregon. Unproductive forest land totals 1,344,000 acres. Productive forest land reserved by law from timber cutting is estimated to total 111,000 acres; another 9,000 acres of productive forest are being studied for possible wilderness classification.

Three-fourths of the Commercial Forest Land Is on National Forests

The four National Forests in the Blue Mountain Area—Malheur, Ochoco, Umatilla, and Wallowa-Whitman—contain 3,368,000 acres or about 74 percent of the total commercial forest land. The Malheur and Wallowa-Whitman National Forests lie completely within the eight-county inventory area; three-fourths of the Umatilla National Forest and one-third of the Ochoco National Forest lie within the area.

Located in the higher elevations where heavier annual precipitation promotes better tree growth, the National Forests contain 75 percent of the forest land capable of growing 85 or more cubic feet of wood per acre per year but only 41 percent of the forest land incapable of growing 50 cubic feet.

Private Owners Hold 24 Percent of Commercial Forest Area

Commercial forest area in ranches, farms, and miscellaneous private holdings totals 733,000 acres. These are generally the poorer forest lands due to their location in the lower elevations where insufficient moisture limits tree growth. Only 11 percent of these lands are capable of growing 85 or more cubic feet of wood per acre per year, and 54 percent are incapable of growing 50 cubic feet.

Timber companies, numbering at least 10, own 380,000 acres. Three corporations own 70 percent of this area. About one-fourth of the 380,000 acres are capable of growing 85 or more cubic feet of wood per acre per year. Timber companies have the highest proportion of land capable of growing 120 or more cubic feet per acre per year.

Other Public Holding Totals Less Than 2 Percent

The Umatilla Indian Reservation,¹ Bureau of Land Management (BLM), State of Oregon, and counties own an estimated 84,000 acres of commercial forest land, of which only 11 percent is capable of growing 85 or more cubic feet of wood per acre per year. The BLM lands, which amount to about 65 percent of the total "other public" holdings, occur in scattered tracts mostly in the arid forest fringe. The Umatilla Indian Reservation

¹Indian lands were included in the sample of "other public" lands, though strictly speaking they are private.

forest lands lie in one block on the west slope of the Blue Mountains near Pendleton.

Condition of the Forest Is Changing

Since the previous inventory, the forests of the Blue Mountain Area have been heavily logged. In the mid-1950's, the acreage in sawtimber trees 21.0-inch d.b.h. and larger was 2.5 million acres; the present inventory shows 1.4 million acres—a reduction of 44 percent. Small sawtimber stands decreased from 1.7 million acres to 1.5 million. On the other hand, poletimber stands increased by 96,000 acres, and seedling and sapling stands showed an increase from 102,000 to 583,000 acres.

The current inventory shows 121,000 acres of nonstocked commercial forest land, compared with 50,000 in the previous inventory. Since there were few major fires during the remeasurement period, and many formerly sparsely stocked areas are now classified as nonforest, it appears that the increase in nonstocked acreage is primarily the result of logging. About 57 percent of the nonstocked land is on National Forests, 2 percent on other public, and 41 percent on private lands. The nonstocked acreage amounts to about 2 percent of public lands and 4 percent of private lands.

Private and Other Public Lands Are in Poor Condition for Timber Production

Most of the private and public lands outside National Forests have been cut over or burned in the past few decades, so that only 5 percent of the area now supports old-growth sawtimber. These lands are in generally poor condition for efficient timber production. Only 189,000 acres, or 16 percent, is 70 percent or better stocked with desirable trees; and 601,000 acres, or 50 percent, is less than 40 percent stocked with desirable trees. Not only are there many poorly stocked cut over areas, but many trees that are restocking these lands, or have been left in cut over stands, are very poor trees for timber production. Common defects include:

1. Mistletoe, gall rust, and other diseases.
2. Top- and bole-damaged trees—often damaged during logging operations.
3. Top kill by animals and weather.
4. Deformed, suppressed, and excessively limby trees. These trees make up a small part of all stands but tend to make up a large part of stands left after logging.
5. Unknown damaging agents causing discoloration and sparse foliage.
6. Rot in tree boles caused by *Fomes pini*, *Echinodontium tinctorium*, and other fungi.

Timber Volume

Blue Mountains Contain 10 Percent of the State's Sawtimber

Total volume of sawtimber on all commercial forest land in the Blue Mountain Area is estimated at 46,550 million board feet (International ¼-inch rule), roughly 10 percent of the total for the State of Oregon. Cubic-foot volume in trees 5.0-inch d.b.h. and larger totals 10,376 million cubic feet.

National Forests Have Most of the Sawtimber

The National Forests hold 40,817 million board feet or 88 percent of the standing sawtimber. Farmer and miscellaneous private owners hold 2,960 million or 6 percent, and forest industries hold 2,155 million or about 5 percent. Other public owners have 618 million or about 1 percent.

Ponderosa Pine Is the Most Abundant Species

Ponderosa pine is the most abundant species, accounting for 44 percent of the sawtimber volume. Douglas-fir accounts for 20 percent, true firs 19 percent, and larch 9 percent. The remaining volume consists of Engelmann spruce, lodgepole pine, and a relatively small volume of other species, including hardwoods.

Timber Volume Is Declining

The current inventory shows about 7.7 percent less cubic-foot volume and 10.1 percent less Scribner board-foot volume than the previous inventory. International ¼-inch board-foot comparisons were not made because of the different utilization standards for the two inventories. Comparisons for National Forests and all other ownerships follow:

	<u>Previous inventory</u>	<u>Current inventory</u>	<u>Difference</u>
	Growing stock volume (Million cubic feet)		(Percent)
National Forests	8,869	8,726	-1.6
All other ownerships	<u>2,376</u>	<u>1,650</u>	<u>- 30.6</u>
Total	11,245	10,376	-7.7
	Sawtimber volume (Million board feet, Scribner)		
National Forests	36,067	34,693	-3.8
All other ownerships	<u>7,856</u>	<u>4,815</u>	<u>- 38.7</u>
Total	43,923	39,508	- 10.1

Ponderosa Pine Is Declining Rapidly

The cubic-foot volume of ponderosa pine, the most important species in the Blue Mountains in terms of total standing volume and use by forest industries, has declined 21 percent. Cutting in this species has greatly exceeded the growth rate. Prospects for increased growth of ponderosa pine in the near future are poor, especially on private lands where cutting has removed a large percentage of the trees on which growth could be occurring; the remaining stands are often poorly stocked, made up of inferior trees left after logging, or consist of other species such as Douglas-fir or true firs.

Douglas-fir, True Firs, and Lodgepole Pine Are Increasing, Other Conifers Declining

Total cubic-foot volume of Douglas-fir, white, grand, and subalpine firs, and lodgepole pine is 5 percent greater than shown in the previous inventory. In many stands the cutting of ponderosa pine has released Douglas-fir and true fir trees, accelerating their growth. The true firs and lodgepole pine also occur in some of the remote areas not yet opened up to timber cutting.

Total cubic-foot volume of western larch, Engelmann spruce, and whitebark and western white pines has declined by 14 percent, principally due to low growth and high mortality rates in these species.

Timber Cut and Growth

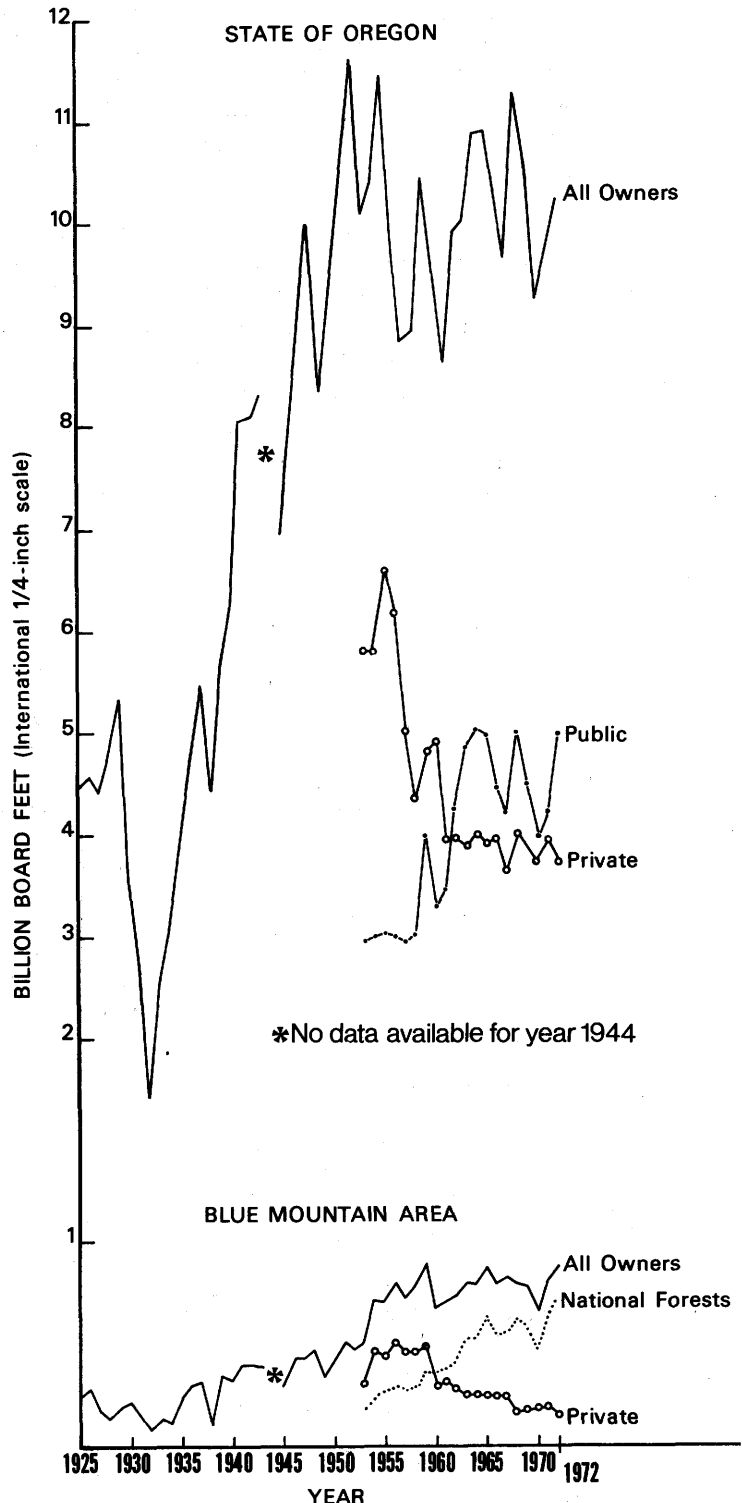
Blue Mountains Contribute About 7 Percent of Oregon Timber Harvest

In 1970, 657.8 billion board feet of timber were cut in the eight-county area, or 7.3 percent of the total cut in Oregon. The average annual timber cut in the Blue Mountains for the period 1960-70 was 777.1 million board feet. Grant County has consistently produced the greatest cut, averaging over one-third of the total in the Blue Mountains and exceeded only by Klamath and Lake Counties in all of eastern Oregon.

Forest Industries Are Becoming Dependent on National Forest Timber

Since the previous inventory (mid-1950's), the total timber cut on all owner-ships has remained about the same, but the cut on private lands has decreased from over 400 million to less than 200 million, and the cut on National Forest lands has increased from less than 300 million to over 500 million (fig. 1). In 1953, 63 percent of the timber harvest in the Blue Mountain Area came from private lands; in 1972, only 17 percent.

Figure 1.—Timber harvest in Oregon and in the Blue Mountains of Oregon, 1925-72.



Timber Growth Is Slightly Less Than Cut for All Ownerships

Net annual growth of sawtimber on all ownerships in 1969 was estimated to be 727.5 million board feet (International 1/4-inch rule) or 1.56 percent of the inventory volume. Cubic-foot growth was 159.1 million, or 1.53 percent of the inventory volume. The average annual timber harvest for 1970-72—780.7 million board feet—was 7.3 percent more than growth.

Table 1 shows growth, cut, and annual change in inventory by broad ownership classes. The figures indicate that the National Forest and other public inventories are either almost static or decreasing slowly compared with the more rapid decrease on private lands.

Net board-foot growth per acre (International 1/4-inch rule) by ownership is shown

in the following tabulation:

National Forest	171
Other public	143
Forest industry	89
Farmer and miscellaneous private	143
Average, all owners	159

National Forests have the highest growth rates, yet 54 percent of these lands are stocked with old-growth timber. Forest industries, on the other hand, have the lowest growth rates, but only 8 percent of their holdings are in old growth, and their lands are slightly more productive. Current growth in young stands is less than normal yield tables indicate they should be, and growth in old stands is greater. This situation occurs primarily because of the present stocking condition and the manner in which the present stands seem to have developed.

Table 1.--Net annual growth, cut, and change in inventory for National Forest, other public, and private lands in the Blue Mountain Area, 1970-72

Owner	Net annual growth	Average annual cut ^{1/}	Growth as a percent of cut	Cut as a percent of 1970 inventory	Annual change as a percent of 1970 inventory
- - - Million board feet - - - (International 1/4-inch rule)					
National Forest	576	594	97	1.5	-0.04
Other public	12	13	92	2.1	-.16
Private	139	174	80	3.4	-.68
Total	727	781	93	1.7	-.12

^{1/} Average annual cut is that reported by the various agencies; it has not been adjusted to account for total depletion of the standing timber.

Many present old-growth stands appear to have developed from a sparse stocking condition over large areas, with widely scattered pockets of overly dense trees. The growth rate in these stands was relatively low when they were young; but as they grew older, the overall stocking improved in the open areas and possibly held steady in the clumps so that growth increased, rather than dropping sharply as shown in normal yield tables. Thus, many stands 150 years and older are still not so dense that growth has declined. Current young-growth stands in many cases are like the precursors of the present old-growth stands—poorly stocked with dense clumps scattered throughout. The low growth rates in young stands has also been promoted by logging practices—especially on private lands, where not only is stocking low, but the trees remaining are often damaged, diseased, and of poor vigor.

This is a point-in-time phenomenon. Though the immediate effect of logging the old growth will apparently be to reduce the growth, intensive management could result in better stocking conditions in young stands and increased growth rates.

Mortality

Mortality Is Nearly a Quarter Billion Board Feet Per Year

Average annual mortality² of sawtimber as measured during a 5-year period just preceding the Douglas-fir tussock moth epidemic is estimated to be 244.9 million board feet (International 1/4-inch rule) or about 0.53 percent of the inventory volume. For all ownerships, weather, insects, and disease (in that order) were the leading known causes of mortality, accounting for 64 percent of the total board-foot loss. Most insect and disease mortality occurred on National Forests. While weather-caused mortality occurred on all lands, it was proportionately greatest on private lands, amounting to about one-fourth of the total mortality, and heaviest in cutover and young-growth stands. Logging damage caused about 2 percent of the board-foot mortality, but over 6 percent of the cubic-foot mortality, and was greatest on private lands because of heavier past cutting there. Losses from fire, animals, suppression, and miscellaneous agents such as landslides, erosion, fluctuating water tables, various activities by man including damage by vehicles (other than logging), fence building, camping, and others accounted for 6 percent of the mortality. About 28 percent of the mortality was due to undetermined causes.

² As developed from forest inventory plots. See procedures, page 56., for period of time over which mortality was measured.

Mortality Heaviest in True Firs

Mortality in white, grand, and subalpine firs amounted to 34 percent of the total mortality, yet these species account for only 19 percent of the total volume. Several factors combined caused this high mortality rate. (1) Large areas of true fir stands are "overstocked." Such stands include many trees that are under stress and are susceptible to insect (especially *Scolytis*) and disease attack, particularly during very dry years. This kind of mortality is normal in the development of unmanaged true fir stands; forest management minimizes such losses. (2) Large areas of old-growth stands with many weakened and defective trees, invite insect attack and make trees vulnerable to windthrow. (3) *Phellinus weirii* (*Poria weirii*) occurs in true firs in the Blue Mountains. This disease is now thought to be more serious in the Blue Mountains than formerly believed. Unlike *P. weirii* infections in the Cascade Range, which tend to be small in size, these in the Blue Mountains may sometimes encompass several hundred acres.

In spite of the high mortality rate in true firs, the volume of these species has been increasing due to a high gross growth rate—3.0 percent of inventory volume compared with 1.9 percent for all other species—and a relatively low rate of cutting.

Western Larch Mortality Is High Due to Dwarf Mistletoe

Mortality cancels out over 50 percent of

the gross growth of western larch. Dwarf mistletoe is the primary agent, either killing trees outright or making them susceptible to other mortality agents.

Dwarf mistletoe in western larch has increased over the years to the point where it is difficult to find stands that are not infected. This disease has increased apparently due to (1) fire control which has prevented the kind of fires that historically removed mistletoe from large areas, and (2) timber cutting practices which open up stands allowing light to enter but do not remove all the mistletoe-infected trees. With increased light the mistletoe spreads rapidly to other trees.

Since the inventory was completed, another pest has attacked western larch in the Blue Mountains—the larch casebearer. The extent of damage is not known.

Engelmann Spruce Mortality Is High

The Engelmann spruce bark beetle has caused heavy mortality locally, resulting in a percentage loss of spruce almost as great as larch. Since this species accounts for only 4 percent of the total volume, the mortality is of little importance as far as timber production is concerned; but because this species generally grows along streambanks and high mountain lakes, the mortality may be a significant loss in terms of watershed and scenic values.

Ponderosa Pine Mortality Is Low

Mortality in ponderosa pine accounted for about 24 percent of the total mortality, though this species makes up 44 percent of the total volume. The actual mortality rate of this species may be somewhat higher than indicated by the inventory. Because of the extensive road system in the lower elevations where ponderosa pine stands predominate, a large proportion of the trees are cut shortly after they die, or even as they begin to show signs of weakening. No attempt was made to determine the loss of ponderosa pine—or any other species—in stands where the mortality

was salvaged before inventory remeasurements were made. This probably has more effect on ponderosa pine mortality estimates than for the more inaccessible species.

Mortality in Other Species Is Low

Mortality in other species, including Douglas-fir and lodgepole pine, was not particularly serious during the remeasurement period. Since the inventory, the tussock moth has attacked Douglas-fir; and the mountain pine beetle has invaded several thousand acres of lodgepole pine in the headwaters of the Grande Ronde and North Fork of the John Day Rivers.

Tussock Moth Epidemic

During the period 1971 through 1973, after the Blue Mountains' forest inventory had been completed, an outbreak of the Douglas-fir tussock moth killed an estimated 548.7 million board feet (Scribner) of timber.³

Ownership	Area affected (Acres)	Volume killed (Million fbm, Scribner)	Salvable volume
National Forest	297,390	411.8	250.8
Other public and private	<u>141,060</u>	<u>136.9</u>	<u>116.3</u>
Total	438,450	548.7	367.1

This is equivalent to 1.4 percent of the 1970 inventory and about seven-tenths of the average annual timber harvest in the Blue Mountain Area. About two-thirds of the mortality is considered salvable.

³ Environmental Statement Cooperative Douglas-fir Tussock Moth Pest Management Plan, March 1974. Prepared by U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, P.O. Box 3623, Portland, Oregon 97208.

The volume, growth, and mortality figures shown elsewhere in this report have not been adjusted to account for the tussock moth epidemic.

Salvable Dead Volume Totals 655 Million Board Feet

Dead sawtimber trees with more than 25 percent sound wood are estimated to contain a total of 655.1 million board feet in the eight-county area. This does not include the salvable volume of trees killed in the tussock moth epidemic. True firs, which have the

greatest mortality rate, contain only 11 percent of the salvable dead volume because the wood of these species deteriorates rapidly when dead. Western larch makes up one-third of the salvable dead volume, and ponderosa pine and Douglas-fir, each roughly one-fourth.

Only 15 percent of the salvable dead volume is in concentrations of 2,500 or more board feet per acre. Over two-fifths is in concentrations of less than 1,000 board feet per acre. The amount of dead volume that is currently accessible and economic to log is unknown.

Timber Industry

In 1972 there were 30 forest industry mills in the Blue Mountain Area, including 23 lumber mills, 4 veneer and plywood plants, 2 pulp and board mills and 1 shake and shingle mill. Since the 1968 survey, there has been a loss of four lumber mills and one veneer and plywood mill. The shake and shingle mill is new.

The number of sawmills in the Blue Mountain Area has fluctuated over the years; but the trend since 1948, as throughout Oregon and Washington, is toward fewer and larger mills. The following tabulation shows the number of sawmills in the eight-county area for selected years during the period 1925 to 1972.

Year	Number of sawmills
1925	40
1940	46
1948	76
1968	27
1972	23

Total reported roundwood consumption in the Blue Mountain Area in 1972 was 741

million board feet, about 7 percent of the total in Oregon, and nearly identical to the total consumption in 1968. Over 75 percent of the consumption was by the lumber industry in both 1968 and 1972.

About 99 percent of the 1972 consumption in the Blue Mountain Area was from logs originating in the area. Roughly, 5 percent of the total timber harvest in the area was consumed outside the area, mostly in Crook and Wheeler Counties to the west.

Old-growth timber made up 75 percent of total timber consumption by all industries in 1972, a decrease of 4 percent since 1968.

Over the years there has been a change in the mix of species used by the industries (Wall 1972). Ponderosa pine was used almost exclusively in 1925 but now accounts for about 50 percent of the log consumption in the Blue Mountains. Douglas-fir, true firs, larch, and spruce, in that order, are now consumed by mills in the area. This has come about as the lower elevation pine forests have been logged, higher elevation forests of associated species opened up, and as market conditions have changed.

Changes in Forest Land Area

Commercial Forest Area Declining

The current inventory shows less commercial forest and more noncommercial forest

than previous inventories conducted in the 1950's (1953-58):

	Previous inventory	Current inventory	Difference
<i>(Thousand acres)</i>			
Commercial forest:			
National Forest	3,693	3,368	- 325
All other owners	1,519	1,197	- 322
Total	5,212	4,565	- 647
Unproductive unreserved:			
National Forest	221	298	+ 77
All other owners	522	909	+ 387
Total	743	1,207	+ 464
Productive reserved:			
National Forest ⁴	106	106	0
All other owners	5	5	0
Total	111	111	0
Unproductive reserved:			
National Forest	136	136	0
All other owners	1	1	0
Total	137	137	0
Deferred:			
National Forest	0	9	+ 9
Total forest	6,203	6,029	-174

⁴The estimate of productive reserved area in National Forest ownership is based on an appraisal made during the previous inventories. It is believed that these estimates are high based on current definitions and procedures.

The difference in estimates of forest area between the previous and current inventories reflects (1) physical changes on the land, (2) ownership changes, (3) changes in definitions and procedures, and (4) administrative decisions.

Physical Changes in Forest Area

About 20,000 acres of National Forest commercial forest land were converted to nonforest by construction of roads, reservoirs, powerlines, pipelines, ski areas, campgrounds, and other developments since the mid-1950's. On all other ownerships, losses of commercial forest due to road construction were estimated to be about 5,000 acres.

Of the 387,000-acre increase in unproductive forest land outside National Forests since the previous inventory, an estimated 90,000 acres are due to the encroachment of juniper on nonforest rangelands. Juniper has invaded extensive areas of overgrazed rangeland, mostly on calcareous soils in Grant and northern Harney Counties.

Ownership Changes

About 6,000 acres, mostly commercial forest, were acquired by the National Forests, thus reducing the total of all other ownerships.

Changes in Definitions and Procedures

Of the total reduction of 325,000 acres of commercial forest land on National Forest lands, approximately 302,000 acres is due to change in definitions and procedures. About 77,000 acres formerly called commercial forest were reclassified as noncommercial forest because of more precise techniques for estimating forest productivity or because they are now considered physically impossible to manage or have been set aside in critical watershed areas.

Most of the remaining reduction of commercial forest land on National Forests is due to land being reclassified as nonforest. In the Blue Mountains, narrow fingerlike strips of

timber bounded by nonforest grassland are common in the lower elevations and on south slopes in the higher elevations. The trees in these stringers are often growing in pockets of soil between the rocks or along fractures in the bedrock, frequently in very steep terrain. These stringers were classified as nonforest.

On all lands other than National Forests, the reduction in commercial forest area due to changes in definitions and procedure amounted to 311,000 acres. A new method of determining the stocking capacity of marginal forest land resulted in the reclassification of 237,000 acres that were formerly called commercial forest. These lands are now carried as noncommercial "low site," incapable of growing 20 cubic feet per acre per year. Most of these lands are in the lower forest fringe in the ponderosa pine-wheatgrass habitat type. They can be characterized as very open woodland—the pines short, limby, and slow-growing. Juniper and mountain-mahogany and several arid land shrubs are often present. The timber productivity of these areas is estimated to be only 20 percent of the yields shown in Walter Meyer's (1961) yield table for a given site index (MacLean and Bolsinger 1973). The volume of standing timber in such areas is very low. Though these marginal forest lands represent about 16 percent of the total land outside National Forests previously classified as commercial forest, they contain less than 7 percent of the total sawtimber volume outside National Forests. Much timber volume on these lands is poor in quality and scattered in occurrence.

The remaining 74,000-acre reduction in commercial forest land outside National Forest lands is due to their reclassification as nonforest.

Administrative Decisions

About 9,000 acres of productive forest land on the Wallowa-Whitman National Forest in the Minam River drainage have been classified as deferred, pending study for possible wilderness classification. These lands

may later be reclassified as commercial forest or may become productive reserved.

Change in Commercial Forest Ownership

In addition to the 6,000 acres acquired by National Forest, considerable shifting of

ownership occurred among private land-owners. In the four counties in which permanent plots on commercial forest land were remeasured (Grant, Umatilla, Union, and Wallowa), these changes were noted in ownership of the land on which the plots occurred:

Previous owner and approximate acres in the 1950's in four-county area	Current owner			
	Other public	Forest industry	Farmer	Miscellaneous private
	(Percent)			
Other public (80,000 acres)	91	9	0	0
Forest industry (200,000 acres)	0	97	3	0
Farmer (550,000 acres)	3	15	79	3
Miscellaneous private (96,000 acres)	0	61	23	16

The figures in the tabulation indicate that other public owners have acquired or sold very little commercial forest land and that forest industries have sold little, but acquired a lot, mostly from farmer and miscellaneous private owners. Many plots that remained in the same owner class changed owners during

the remeasurement period. Included were transactions between timber companies as well as transfers of farms and miscellaneous private lands. In Grant County, for example, over 25 percent of the plots outside National Forests changed owners between 1958 and 1969.

TABLES

METRIC CONVERSIONS

1,000 acres	= 404.69 hectares
1,000 cubic feet	= 28.3 cubic meters
1 cubic foot per acre	= 0.0700 cubic meter per hectare
1 square foot basal area per acre	= 0.2296 square meter per hectare
1 foot	= 30.48 centimeters

Table 2.--Area by land class and county, Blue Mountain Area, Oregon, January 1, 1970

(In thousand acres)

Land class	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Forest land:									
Commercial	4,565	578	1,538	411	8	199	460	658	713
Deferred	9	--	--	--	--	--	--	4	5
Productive reserved	111	5	20	--	--	--	4	10	72
Unproductive	1,344	141	399	364	90	8	56	88	198
Total	6,029	724	1,957	775	98	207	520	760	988
Nonforest land ^{1/}	18,370	1,240	943	5,731	6,213	1,111	1,545	541	1,046
Total area ^{2/}	24,399	1,964	2,900	6,506	6,311	1,318	2,065	1,301	2,034

^{1/} Includes swampland, industrial and urban areas, other nonforest land, and 6,173 acres, classed as water by Forest Survey standards, but defined by the Bureau of the Census as land.

^{2/} Source: U.S. Bureau of the Census, Land and Water Area of the United States, 1960.

Table 3.--Area of commercial forest land, by ownership class and county, Blue Mountain Area, Oregon, January 1, 1970

(In thousand acres)

Ownership class	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
National Forest	3,368	445	1,282	391	3	111	283	435	418
Other public: ^{1/}									
Bureau of Land Management	54	15	18	--	4	1	7	5	4
Bureau of Indian Affairs	16	--	--	--	--	--	15	1	--
Miscellaneous Federal	--	--	--	--	--	--	--	--	--
State	11	1	2	(2/)	--	--	3	--	5
County and municipal	3	1	--	--	--	--	2	--	--
Total other public	84	17	20	(2/)	4	1	27	6	9
Private:									
Forest industry	380	9	96	4	1	49	49	67	105
Farmer-owned	672	102	112	5	--	33	101	140	179
Miscellaneous private--									
corporate	16	--	--	11	--	5	--	--	--
Miscellaneous private--									
noncorporate	36	5	19	--	--	--	--	10	2
Miscellaneous private--									
leased to forest industry	9	--	9	--	--	--	--	--	--
Total private	1,113	116	236	20	1	87	150	217	286
All classes	4,565	578	1,538	411	8	199	460	658	713

^{1/} Estimates of commercial forest land in specific ownerships are derived by sampling methods. Consequently, they may not agree with the official estimates of the individual agencies.

^{2/} Less than 500 acres.

Table 4.--Area of commercial forest land, by stand-size, age, and ownership classes, Blue Mountain Area, Oregon, January 1, 1970

(In thousand acres)

Stand-size class	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Sawtimber stands:					
Old-growth ^{1/}	1,900	1,835	7	29	29
Young-growth ^{2/}	989	533	36	145	275
Total	2,889	2,368	43	174	304
Poletimber stands	972	640	13	102	217
Sapling and seedling stands	583	291	25	90	177
Nonstocked areas	121	69	3	14	35
All classes	4,565	3,368	84	380	733

^{1/} Stands 140 years and older.

^{2/} Stands less than 140 years old.

Table 5.--Area of commercial forest land, by stand-size and ownership classes, Blue Mountain Area, Oregon, January 1, 1970

(In thousand acres)

Stand-size class	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Sawtimber stands:					
21.0 inches and larger	1,407	1,321	15	43	28
11.0-20.9 inches	1,482	1,047	28	131	276
Total	2,889	2,368	43	174	304
Poletimber stands	972	640	13	102	217
Sapling and seedling stands	583	291	25	90	177
Nonstocked areas	121	69	3	14	35
All classes	4,565	3,368	84	380	733

Table 6.--Area of commercial forest land, by stand volume and ownership classes, Blue Mountain Area, Oregon, January 1, 1970

(In thousand acres)

Stand volume (board feet per acre ^{1/})	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Less than 1,500	571	237	22	63	249
1,500 to 4,999	984	540	18	146	280
5,000 to 9,999	1,126	854	21	105	146
10,000 to 19,999	1,257	1,138	17	55	47
20,000 to 29,999	481	453	6	11	11
30,000 to 39,999	121	121	--	--	--
40,000 to 49,999	22	22	--	--	--
50,000 or more	3	3	--	--	--
All classes	4,565	3,368	84	380	733

^{1/} Net volume, International 1/4-inch rule.

Table 7.--Area of commercial forest land, by cubic-foot site and ownership classes, Blue Mountain Area, Oregon, January 1, 1970

(In thousand acres)

Site class ^{1/} (cubic feet per acre)	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
225 or more	2	2	--	--	--
165 to 224	1	1	--	--	--
120 to 164	117	27	--	55	35
85 to 119	613	523	8	34	48
50 to 84	2,895	2,428	51	165	251
20 to 49	937	387	25	126	399
All classes	4,565	3,368	84	380	733

^{1/} A classification in terms of capacity for cubic-foot annual growth per acre at culmination of mean annual growth.

Table 8.--Area of commercial forest land, by forest type and ownership classes, Blue Mountain Area, Oregon, January 1, 1970

(In thousand acres)

Forest type	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Ponderosa pine	1,783	1,386	31	106	260
Lodgepole pine	525	450	1	17	57
Douglas-fir	846	464	27	94	261
White fir	660	531	16	63	50
Grand fir	290	209	--	34	47
Subalpine fir	133	118	3	12	--
Western larch	88	58	3	20	7
Engelmann spruce	81	61	--	20	--
Mountain hemlock	7	7	--	--	--
Commercial hardwoods ^{1/}	8	2	--	--	6
Noncommercial hardwood	23	13	--	--	10
Nonstocked	121	69	3	14	35
All types	4,565	3,368	84	380	733

^{1/} Includes quaking aspen and black cottonwood forest types.

Table 9.--Area of commercial forest land and volume of growing stock and

Stand age (years)	All ownerships			National Forest		
	Thousand acres	Growing stock	Sawtimber	Thousand acres	Growing stock	Sawtimber
		<i>Million cubic feet</i>	<i>Million board feet^{1/}</i>		<i>Million cubic feet</i>	<i>Million board^{1/} feet</i>
Nonstocked ^{2/}	121	26	143	69	15	87
0 - 9	108	76	307	28	13	63
10 - 19	62	34	99	14	11	48
20 - 29	54	54	152	32	25	94
30 - 39	155	148	550	77	87	338
40 - 49	128	155	394	77	107	364
50 - 59	243	394	1,091	120	204	635
60 - 69	392	666	2,118	195	395	1,296
70 - 79	218	554	1,801	150	411	1,252
80 - 89	95	286	881	77	241	686
90 - 99	51	161	546	44	142	501
100 - 109	35	123	494	35	123	494
110 - 119	42	117	426	33	86	248
120 - 129	13	44	199	13	44	199
130 - 139	26	51	222	15	34	144
140 - 149	27	99	558	27	99	558
150 - 159	19	75	366	19	75	366
160 - 169	7	18	106	7	18	106
170 - 179	7	26	148	7	26	148
180 - 189	4	11	66	4	11	66
190 - 199	12	43	255	12	43	255
200 - 299	149	450	2,840	140	438	2,769
300+	47	137	916	47	137	916
Uneven-aged under rotation age ^{2/}	1,617	3,492	15,104	1,249	2,985	13,328
Uneven-aged over rotation age ^{2/}	933	3,136	16,768	877	2,956	15,856
All classes	4,565	10,376	46,550	3,368	8,726	40,817

^{1/} International 1/4-inch rule.^{2/} See "Definition of Terms."^{3/} Less than 500,000 cubic feet.

sawtimber, by stand-age and ownership classes, Blue Mountain Area, Oregon, January 1, 1970

Other public			Forest industry			Farmer and miscellaneous private		
Thousand acres	Growing stock	Sawtimber	Thousand acres	Growing stock	Sawtimber	Thousand acres	Growing stock	Sawtimber
	Million cubic feet	Million board feet ^{1/}		Million cubic feet	Million board feet ^{1/}		Million cubic feet	Million board feet ^{1/}
3	(3/)	2	14	3	16	35	8	38
8	2	6	24	18	60	48	43	178
1	(3/)	1	13	9	41	34	14	9
--	--	--	11	18	50	11	11	8
6	11	39	21	12	38	51	38	135
10	2	--	8	15	16	33	31	14
13	22	49	38	58	143	72	110	264
6	12	41	24	38	136	167	221	645
9	20	90	27	58	213	32	65	246
4	18	92	2	8	29	12	19	74
--	--	--	4	12	21	3	7	24
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	9	31	178
--	--	--	--	--	--	--	--	--
--	--	--	4	9	39	7	8	39
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	9	12	71
--	--	--	--	--	--	--	--	--
17	36	170	161	242	912	190	229	694
7	22	128	29	90	441	20	68	343
84	145	618	380	590	2,155	733	915	2,960

**Table 10.--Area of noncommercial forest land, by ownership class, land use and forest type,
Blue Mountain Area, Oregon, January 1, 1970**

(In thousand acres)

Land use and forest type	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
RESERVED					
Productive: ^{1/}					
Ponderosa pine	23	19	4	--	--
Lodgepole pine	13	13	(2/)	--	--
Douglas-fir	32	31	1	--	--
Western larch	16	16	--	--	--
White fir	6	6	(2/)	--	--
Subalpine fir	15	15	--	--	--
Engelmann spruce	6	6	(2/)	--	--
Hardwoods	(2/)	--	(2/)	--	--
Total	111	106	5	--	--
Unproductive: ^{3/}					
Rocky ^{4/}	70	70	(2/)	--	--
Low site ^{5/}	66	66	--	--	--
Noncommercial conifers	1	(2/)	1	--	--
Total	137	136	1	--	--
Total reserved	248	242	6	--	--
UNRESERVED					
Unproductive:					
Low site					
Ponderosa pine	197	--	54	48	95
Lodgepole pine	2	2	--	--	--
Douglas-fir	40	--	12	12	16
Hardwoods	35	--	11	--	24
Unclassified	24	24	--	--	--
Total low site	298	26	77	60	135
Noncommercial rocky ^{4/}	102	66	25	1	10
Adverse location ^{6/}	79	79	--	--	--
Critical watershed ^{6/}	31	31	--	--	--
Chaparral	10	--	7	--	3
Willow	10	1	--	--	9
Junipers	677	95	287	9	286
Total unreserved	1,207	298	396	70	443
Total noncommercial forest	1,455	540	402	70	443

^{1/} Includes forest land estimated in the previous inventory to be capable of growing 20 cubic feet or more per acre in the Anthony Lakes and Snake River Limited Areas, Eagle Cap and Strawberry Mountain Wildernesses, Canyon Creek Natural Area, and several State parks.

^{2/} Less than 500 acres.

^{3/} Forest types not determined.

^{4/} Includes areas that are capable of growing merchantable trees but are too steep or rocky for timber management. Forest types not determined.

^{5/} Areas stocked with commercial tree species but incapable of growing 20 cubic feet per acre because of soil and climatic factors. Forest types not determined.

^{6/} Includes unstable areas that cannot be logged without seriously affecting the watershed and small isolated patches of commercial forest land on steep mountainsides. Forest types not determined.

Table 11.--Average number of growing-stock trees per acre on commercial forest land, by diameter and ownership classes, Blue Mountain Area, Oregon, January 1, 1970

Diameter class (inches at breast height)	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
5.0 - 6.9	53.9	58.5	45.8	44.7	38.2
7.0 - 8.9	32.3	33.9	24.6	28.9	27.7
9.0 - 10.9	18.6	18.8	16.5	15.8	19.5
11.0 - 12.9	10.6	10.6	11.5	12.0	9.9
13.0 - 14.9	6.4	6.3	4.9	7.6	6.4
15.0 - 16.9	4.1	4.5	3.9	2.6	3.3
17.0 - 18.9	2.9	3.2	3.5	1.6	1.8
19.0 - 20.9	2.1	2.4	1.4	1.3	1.1
21.0 - 28.9	4.4	5.2	3.6	2.3	1.4
29.0 - 38.9	1.3	1.7	.8	.7	.2
39.0 and larger	.1	.2	.1	.1	.1
All classes	136.7	145.3	116.6	117.6	109.6

Table 12.--Number of growing-stock trees on commercial forest land, by species and diameter class, Blue Mountain Area, Oregon,
January 1, 1970

(Thousand trees)

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- 38.9	39.0 and larger
Softwoods:												
Ponderosa pine	153,911	57,508	32,673	19,002	10,889	7,964	5,435	3,887	3,606	9,064	3,510	373
Lodgepole pine	152,284	77,601	43,558	19,674	7,720	2,303	915	294	116	101	2	--
Western white pine	169	--	75	33	9	9	5	4	4	22	8	--
Whitebark pine	128	42	--	76	--	--	--	--	10	--	--	--
Douglas-fir	111,533	34,443	26,074	17,586	10,599	6,993	4,621	3,337	2,179	4,512	1,070	119
White fir	76,572	30,280	16,899	10,093	6,579	4,193	2,508	1,795	1,266	2,263	610	86
Grand fir	38,628	14,597	8,499	5,213	3,120	2,300	1,527	1,015	780	1,184	344	49
Subalpine fir	27,846	11,052	7,028	4,210	2,529	1,206	761	473	240	326	20	1
Western larch	40,448	13,070	8,619	5,647	4,453	2,570	1,856	1,429	904	1,555	310	35
Engelmann spruce	19,485	6,177	3,418	2,998	2,123	1,442	1,178	778	452	753	157	9
Mountain hemlock	1,434	524	368	113	169	121	58	44	13	20	4	--
Total	622,438	245,294	147,211	84,645	48,190	29,101	18,864	13,056	9,570	19,800	6,035	672
Hardwoods^{1/}												
Hardwoods^{1/}	1,740	705	395	286	188	70	21	44	--	23	5	3
All species	624,178	245,999	147,606	84,931	48,378	29,171	18,885	13,100	9,570	19,823	6,040	675

^{1/} Primarily quaking aspen, white alder, black cottonwood, and western paper birch.

Table 13.--Volume of growing stock and sawtimber on commercial forest land, by ownership class and by softwoods and hardwoods, Blue Mountain Area, Oregon, January 1, 1970

Ownership class	Average volume per acre	Total volume		
		All species	Softwoods	Hardwoods
	<i>Cubic feet</i>	<i>- - - - - Million cubic feet - - - - -</i>		
All growing stock:				
National Forest	2,591	8,726	8,723	3
Other public	1,726	145	144	1
Forest industry	1,553	590	590	--
Farmer and miscellaneous private	1,248	915	904	11
All ownerships	2,273	10,376	10,361	15
	<i>Board feet</i>	<i>- - - - - Million board feet - - - - -</i>		
Sawtimber (International 1/4-inch rule):				
National Forest	12,119	40,817	40,808	9
Other public	7,357	618	616	2
Forest industry	5,671	2,155	2,155	--
Farmer and miscellaneous private	4,038	2,960	2,918	42
All ownerships	10,197	46,550	46,497	53
Sawtimber (Scribner rule):				
National Forest	10,301	34,693	34,685	8
Other public	6,309	530	528	2
Forest industry	4,763	1,810	1,810	--
Farmer and miscellaneous private	3,376	2,475	2,434	41
All ownerships	8,655	39,508	39,457	51

Table 14.--Volume of growing stock and sawtimber on commercial forest land, by county and ownership class, Blue Mountain Area, Oregon, January 1,1970

County	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
<i>----- Million cubic feet -----</i>					
Growing stock:					
Baker	1,217	1,048	19	8	142
Grant	3,476	3,159	41	106	170
Harney	801	784	(1/)	4	13
Malheur	10	2	8	(1/)	--
Morrow	434	306	2	75	51
Umatilla	1,112	842	50	92	128
Union	1,696	1,328	11	143	214
Wallowa	1,630	1,257	14	162	197
Total	10,376	8,726	145	590	915
<i>----- Million board feet -----</i>					
Sawtimber (International 1/4-inch rule):					
Baker	5,673	5,102	78	35	458
Grant	15,721	14,652	159	349	561
Harney	4,562	4,484	--	16	62
Malheur	50	10	38	2	--
Morrow	1,774	1,261	7	316	190
Umatilla	4,809	3,698	234	356	521
Union	6,653	5,539	40	448	626
Wallowa	7,308	6,071	62	633	542
Total	46,550	40,817	618	2,155	2,960
Sawtimber (Scribner rule):					
Baker	4,822	4,337	66	29	390
Grant	13,456	12,553	138	301	464
Harney	3,960	3,889	--	15	56
Malheur	41	8	32	1	--
Morrow	1,485	1,061	6	255	163
Umatilla	4,034	3,091	199	299	445
Union	5,546	4,625	35	370	516
Wallowa	6,164	5,129	54	540	441
Total	39,508	34,693	530	1,810	2,475

^{1/} Less than 500,000 cubic feet.

Table 15.--Volume of timber on commercial forest land, by class of timber and by softwoods and hardwoods, Blue Mountain Area, Oregon, January 1, 1970

(In million cubic feet)

Class of timber	All species	Softwoods	Hardwoods
Sawtimber trees:			
Saw-log portion	7,356	7,348	8
Upper-stem portion	151	150	1
Total	7,507	7,498	9
Poletimber trees	2,869	2,863	6
All growing-stock trees	10,376	10,361	15
Sound cull trees	126	90	36
Rotten cull trees	355	354	1
Salvable dead sawtimber trees	135	135	--
Total, all timber	10,992	10,940	52

Table 16.--Volume of growing stock and sawtimber on commercial forest land, by stand-size class and by softwoods and hardwoods, Blue Mountain Area, Oregon, January 1, 1970

Stand-size class	Volume per acre	Total volume		
		All species	Softwoods	Hardwoods
	<i>Cubic feet</i>	<i>----- Million cubic feet -----</i>		
All growing stock:				
Sawtimber stands	2,746	7,753	7,740	13
Poletimber stands	2,039	1,917	1,917	(1/)
Sapling and seedling stands	966	538	537	1
Nonstocked areas	686	168	167	1
All classes	2,273	10,376	10,361	15
	<i>Board feet</i>	<i>----- Million board feet -----</i>		
Sawtimber (International 1/4-inch rule):				
Sawtimber stands	14,123	40,011	39,966	45
Poletimber stands	4,120	3,873	3,873	--
Sapling and seedling stands	3,451	1,922	1,919	3
Nonstocked areas	3,037	744	739	5
All classes	10,197	46,550	46,497	53
Sawtimber (Scribner rule):				
Sawtimber stands	12,086	34,119	34,076	43
Poletimber stands	3,340	3,140	3,140	--
Sapling and seedling stands	2,912	1,622	1,619	3
Nonstocked areas	2,559	627	622	5
All classes	8,655	39,508	39,457	51

^{1/} Less than 500,000 cubic feet.

Table 17.--Volume of growing stock on commercial forest land, by species and county, Blue Mountain Area, Oregon, January 1, 1970

(In million cubic feet)

Species	Total	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	3,544	447	1,368	713	1	133	197	284	401
Lodgepole pine	1,246	73	519	3	--	59	150	306	136
Western white pine	6	--	4	--	--	--	--	2	--
Whitebark pine	1	--	1	--	--	--	--	(1/)	--
Douglas-fir	1,996	235	541	41	8	110	282	313	466
White fir	1,230	249	559	41	1	10	41	180	149
Grand fir	714	2	96	--	--	70	231	172	143
Subalpine fir	330	56	58	--	--	2	25	85	104
Western larch	852	101	224	(1/)	(1/)	45	129	220	133
Engelmann spruce	423	53	105	--	--	5	56	117	87
Mountain hemlock	19	--	--	--	--	--	--	16	3
Total	10,361	1,216	3,475	798	10	434	1,111	1,695	1,622
Hardwoods ^{2/}	15	1	1	3	--	--	1	1	8
All species	10,376	1,217	3,476	801	10	434	1,112	1,696	1,630

^{1/} Less than 500,000 cubic feet.^{2/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of red alder, white alder, and western paper birch.

Table 18.--Volume of sawtimber on commercial forest land, by species and county,
Blue Mountain Area, Oregon, January 1, 1970 (International 1/4-inch rule)

(In million board feet)

Species	Total	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	20,533	2,386	8,146	4,249	7	791	1,160	1,409	2,385
Lodgepole pine	1,545	116	602	--	--	40	144	395	248
Western white pine	34	--	25	--	--	--	--	9	--
Whitebark pine	2	--	2	--	--	--	--	--	--
Douglas-fir	9,162	1,103	2,498	175	38	439	1,321	1,481	2,107
White fir	4,794	1,045	2,214	132	--	35	146	680	542
Grand fir	3,103	8	441	--	--	264	995	796	599
Subalpine fir	1,067	196	144	--	--	5	109	300	313
Western larch	4,194	554	1,153	1	5	188	652	948	693
Engelmann spruce	1,987	264	495	--	--	12	277	569	370
Mountain hemlock	76	--	--	--	--	--	--	66	10
Total	46,497	5,672	15,720	4,557	50	1,774	4,804	6,653	7,267
Hardwoods ^{1/}	53	1	1	5	--	--	5	--	41
All species	46,550	5,673	15,721	4,562	50	1,774	4,809	6,653	7,308

^{1/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 19.--Volume of sawtimber on commercial forest land by species and county, Blue Mountain Area, Oregon, January 1, 1970 (Scribner rule)

(In million board feet)

Species	Total	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	17,868	2,062	7,114	3,694	6	692	1,017	1,201	2,082
Lodgepole pine	1,199	93	467	--	--	32	113	303	191
Western white pine	27	--	20	--	--	--	--	7	--
Whitebark pine	1	--	1	--	--	--	--	--	--
Douglas-fir	7,659	929	2,108	148	32	358	1,090	1,234	1,760
White fir	4,022	876	1,869	112	--	30	121	569	445
Grand fir	2,573	7	358	--	--	213	824	675	496
Subalpine fir	888	167	117	--	--	4	92	251	257
Western larch	3,451	460	979	2	3	146	532	759	570
Engelmann spruce	1,706	227	422	--	--	10	240	492	315
Mountain hemlock	63	--	--	--	--	--	--	55	8
Total	39,457	4,821	13,455	3,956	41	1,485	4,029	5,546	6,124
Hardwoods ^{1/}	51	1	1	4	--	--	5	--	40
All species	39,508	4,822	13,456	3,960	41	1,485	4,034	5,546	6,164

^{1/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 20.--Volume of growing stock on commercial forest land, by species and ownership class, Blue Mountain Area, Oregon, January 1, 1970

(In million cubic feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	3,544	2,981	53	148	362
Lodgepole pine	1,246	1,139	3	31	73
Western white pine	6	6	--	--	--
Whitebark pine	1	(1/)	--	1	--
Douglas-fir	1,996	1,496	61	160	279
White fir	1,230	1,053	10	102	65
Grand fir	714	591	3	64	56
Subalpine fir	330	317	1	8	4
Western larch	852	719	12	65	56
Engelmann spruce	423	402	1	11	9
Mountain hemlock	19	19	--	--	--
Total	10,361	8,723	144	590	904
Hardwoods ^{2/}	15	3	1	--	11
All species	10,376	8,726	145	590	915

Less than 500,000 cubic feet.

Consists primarily of black cottonwood and quaking aspen; also includes small of white alder and western paper birch.

Table 21.--Volume of sawtimber on commercial forest land, by species and ownership class,
Blue Mountain Area, Oregon, January 1, 1970 (International 1/4-inch rule)

(In million board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	20,533	18,357	253	655	1,268
Lodgepole pine	1,545	1,402	9	12	122
Western white pine	34	34	--	--	--
Whitebark pine	2	--	--	2	--
Douglas-fir	9,162	7,362	256	648	896
White fir	4,794	4,175	34	341	244
Grand fir	3,103	2,662	9	228	204
Subalpine fir	1,067	1,034	--	33	--
Western larch	4,194	3,809	52	186	147
Engelmann spruce	1,987	1,897	3	50	37
Mountain hemlock	76	76	--	--	--
Total	46,497	40,808	616	2,155	2,918
Hardwoods ^{1/}	53	9	2	--	42
All species	46,550	40,817	618	2,155	2,960

^{1/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 22.--Volume of sawtimber on commercial forest land, by species and ownership class,
Blue Mountain Area, Oregon, January 1, 1970 (Scribner rule)

(In million board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	17,868	16,001	222	573	1,072
Lodgepole pine	1,199	1,089	7	9	94
Western white pine	27	27	--	--	--
Whitebark pine	1	--	--	1	--
Douglas-fir	7,659	6,161	217	539	742
White fir	4,022	3,494	29	288	211
Grand fir	2,573	2,199	8	193	173
Subalpine fir	888	859	--	29	--
Western larch	3,451	3,161	42	137	111
Engelmann spruce	1,706	1,631	3	41	31
Mountain hemlock	63	63	--	--	--
Total	39,457	34,685	528	1,810	2,434
Hardwoods ^{1/}	51	8	2	--	41
All species	39,508	34,693	530	1,810	2,475

^{1/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 23.--Volume of growing stock on commercial forest land, by species and diameter class, Blue Mountain Area, Oregon, January 1, 1970

(In million cubic feet)

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- 38.9	39.0 and larger
Softwoods:												
Ponderosa pine	3,544	180	174	178	173	193	192	196	238	1,062	806	152
Lodgepole pine	1,246	322	356	271	163	66	36	15	8	9	(1/)	--
Western white pine	6	--	(1/)	(1/)	(1/)	1	(1/)	(1/)	(1/)	3	2	--
Whitebark pine	1	(1/)	--	1	--	--	--	--	(1/)	--	--	--
Douglas-fir	1,996	118	161	191	184	181	169	163	138	443	204	44
White fir	1,230	100	108	117	123	119	98	93	85	237	123	27
Grand fir	714	52	59	65	66	69	64	58	56	135	71	19
Subalpine fir	330	37	49	51	50	35	31	25	16	31	4	1
Western larch	852	51	66	75	92	81	81	82	67	175	68	14
Engelmann spruce	423	22	25	38	44	44	50	45	34	85	33	3
Mountain hemlock	19	1	2	2	3	3	2	2	1	2	1	--
Total	10,361	883	1,000	989	898	792	723	679	643	2,182	1,312	260
Hardwoods^{2/}												
	15	1	2	2	3	1	1	2	--	2	1	(1/)
All species	10,376	884	1,002	991	901	793	724	681	643	2,184	1,313	260

^{1/} Less than 500,000 cubic feet.^{2/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder and western paper birch.

Table 24.--Volume of sawtimber on commercial forest land, by species and diameter class, Blue Mountain Area, Oregon, January 1, 1970 (International 1/4-inch rule)

(In million board feet)

Species	Diameter class (inches at breast height)								
	All classes	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0-38.9	39.0 and larger
Softwoods:									
Ponderosa pine	20,533	805	1,010	1,067	1,161	1,503	7,460	6,264	1,263
Lodgepole pine	1,545	821	354	198	82	41	47	2	--
Western white pine	34	1	1	1	2	2	17	10	--
Whitebark pine	2	--	--	--	--	2	--	--	--
Douglas-fir	9,162	920	964	951	959	838	2,822	1,395	313
White fir	4,794	557	569	486	485	455	1,340	724	178
Grand fir	3,103	356	399	380	337	330	795	403	103
Subalpine fir	1,067	244	188	172	144	93	195	27	4
Western larch	4,194	533	483	498	519	425	1,158	478	100
Engelmann spruce	1,987	224	233	271	259	198	549	230	23
Mountain hemlock	76	14	18	13	12	4	12	3	--
Total	46,497	4,475	4,219	4,037	3,960	3,891	14,395	9,536	1,984
Hardwoods ^{1/}	53	12	7	4	11	--	11	5	3
All species	46,550	4,487	4,226	4,041	3,971	3,891	14,406	9,541	1,987

^{1/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 25.--Volume of sawtimber on commercial forest land, by species and diameter class,
Blue Mountain Area, Oregon, January 1, 1970 (Scribner rule)
(In million board feet)

Species	Diameter class (inches at breast height)								
	All classes	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- 38.9	39.0 and larger
Softwoods:									
Ponderosa pine	17,868	598	793	870	971	1,273	6,547	5,651	1,165
Lodgepole pine	1,199	585	286	169	74	38	45	2	--
Western white pine	27	1	1	1	1	1	13	9	--
Whitebark pine	1	--	--	--	--	1	--	--	--
Douglas-fir	7,659	625	743	780	806	718	2,472	1,236	279
White fir	4,022	393	443	403	409	394	1,177	656	147
Grand fir	2,573	254	310	308	281	279	690	358	93
Subalpine fir	888	178	151	147	127	83	174	25	3
Western larch	3,451	333	369	414	448	372	1,018	413	84
Engelmann spruce	1,706	151	186	235	232	180	497	206	19
Mountain hemlock	63	10	14	11	10	4	11	3	--
Total	39,457	3,128	3,296	3,338	3,359	3,343	12,644	8,559	1,790
Hardwoods^{1/}									
	51	10	7	4	11	--	11	5	3
All species	39,508	3,138	3,303	3,342	3,370	3,343	12,655	8,564	1,793

^{1/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 26.--Net annual growth of growing stock on commercial forest land, by species and ownership class, Blue Mountain Area, Oregon, January 1, 1970

(In thousand cubic feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	41,600	28,900	700	2,700	9,300
Lodgepole pine	29,300	26,700	200	^{1/} -300	2,700
Western white pine	100	100	--	--	--
Whitebark pine	(2/)	--	--	(2/)	--
Douglas-fir	34,800	21,500	1,000	3,700	8,600
White fir	25,600	22,000	400	1,200	2,000
Grand fir	10,500	9,700	300	^{1/} -1,300	1,800
Subalpine fir	5,300	5,000	200	100	(2/)
Western larch	5,900	3,000	^{1/} -300	900	2,300
Engelmann spruce	5,700	5,400	(2/)	100	200
Mountain hemlock	400	400	--	--	--
Total	159,200	122,700	2,500	7,100	26,900
Hardwoods ^{3/}	^{1/} -100	(2/)	(2/)	--	^{1/} -100
All species	159,100	122,700	2,500	7,100	26,800

^{1/} Negative growth is the result of annual mortality exceeding gross annual growth.

^{2/} Less than 50,000 cubic feet.

^{3/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder and western paper birch.

Table 27.--Net annual growth of sawtimber on commercial forest land, by species and ownership class, Blue Mountain Area, Oregon, January 1, 1970 (International 1/4-inch rule)

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	217,500	157,300	3,900	10,700	45,600
Lodgepole pine	74,300	68,800	800	300	4,400
Western white pine	400	400	--	--	--
Whitebark pine	(1/)	--	--	(1/)	--
Douglas-fir	179,600	116,200	6,400	19,200	37,800
White fir	108,500	99,700	400	3,000	5,400
Grand fir	45,300	46,600	200	^{2/} -3,000	1,500
Subalpine fir	28,500	28,000	--	500	--
Western larch	32,300	20,200	200	2,900	9,000
Engelmann spruce	37,500	36,100	100	400	900
Mountain hemlock	3,100	3,100	--	--	--
Total	727,000	576,400	12,000	34,000	104,600
Hardwoods ^{3/}					
	500	100	(1/)	--	400
All species	727,500	576,500	12,000	34,000	105,000

^{1/} Less than 50,000 board feet.

^{2/} Negative growth is the result of annual mortality exceeding gross annual growth.

^{3/} Consists of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 28.--*Net annual growth of sawtimber on commercial forest land, by species and ownership class, Blue Mountain Area, Oregon, January 1, 1970 (Scribner rule)*

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	184,000	132,400	3,400	9,500	38,700
Lodgepole pine	54,800	50,000	600	400	3,800
Western white pine	400	400	--	--	--
Whitebark pine	(1/)	--	--	(1/)	--
Douglas-fir	143,900	91,400	5,000	16,400	31,100
White fir	89,100	80,500	400	3,400	4,800
Grand fir	33,300	35,800	200	<u>2/</u> -4,500	1,800
Subalpine fir	22,500	22,000	--	500	--
Western larch	24,200	14,600	300	2,800	6,500
Engelmann spruce	30,100	28,600	100	500	900
Mountain hemlock	2,300	2,300	--	--	--
Total	584,600	458,000	10,000	29,000	87,600
Hardwoods ^{3/}	500	100	(1/)	--	400
All species	585,100	458,100	10,000	29,000	88,000

^{1/} Less than 50,000 board feet.

^{2/} Negative growth is the result of annual mortality exceeding gross annual growth.

^{3/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 29.--Net annual growth of growing stock on commercial forest land, by species and county, Blue Mountain Area, Oregon, January 1, 1970

(In thousand cubic feet)

Species	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	41,600	7,600	13,100	7,800	(1/)	1,300	1,700	4,400	5,700
Lodgepole pine	29,300	3,400	12,100	(1/)	--	1,500	2,400	7,000	2,900
Western white pine	100	--	100	--	--	--	--	(1/)	--
Whitebark pine	(1/)	--	(1/)	--	--	--	--	--	--
Douglas-fir	34,800	1,400	9,400	500	200	2,100	4,100	6,800	10,300
White fir	25,600	5,700	11,400	900	(1/)	200	400	4,100	2,900
Grand fir	10,500	(1/)	1,800	--	--	1,100	4,000	1,600	2,000
Subalpine fir	5,300	200	1,200	--	--	(1/)	100	1,700	2,100
Western larch	5,900	(1/)	600	(1/)	(1/)	700	200	3,100	1,300
Engelmann spruce	5,700	600	1,200	--	--	100	700	1,500	1,600
Mountain hemlock	400	--	--	--	--	--	--	200	200
Total	159,200	18,900	50,900	9,200	200	7,000	13,600	30,400	29,000
Hardwoods ^{2/}	<u>3/-100</u>	(1/)	(1/)	(1/)	--	--	(1/)	(1/)	<u>3/-100</u>
All species	159,100	18,900	50,900	9,200	200	7,000	13,600	30,400	28,900

^{1/} Less than 50,000 cubic feet.^{2/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder and western paper birch.^{3/} Negative growth is the result of annual mortality exceeding gross annual growth.

Table 30.--Net annual growth of sawtimber on commercial forest land, by species and county, Blue Mountain Area, Oregon, January 1, 1970 (International 1/4-inch rule)

(In thousand board feet)

Species	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	217,500	28,600	62,200	39,700	100	9,600	11,100	24,500	41,700
Lodgepole pine	74,300	1,100	35,700	--	--	1,500	9,600	20,900	5,500
Western white pine	400	--	200	--	--	--	--	200	--
Whitebark pine	(1/)	--	(1/)	--	--	--	--	--	--
Douglas-fir	179,600	5,400	40,000	4,300	1,700	13,000	32,300	33,400	49,500
White fir	108,500	24,900	52,600	3,500	--	1,800	2,900	15,600	7,200
Grand fir	45,300	100	7,700	--	--	6,900	16,500	7,400	6,700
Subalpine fir	28,500	2,200	3,300	--	--	(1/)	3,200	6,500	13,300
Western larch	32,300	1,300	2,700	(1/)	(1/)	5,200	3,800	12,900	6,400
Engelmann spruce	37,500	5,600	7,400	--	--	100	3,300	13,600	7,500
Mountain hemlock	3,100	--	--	--	--	--	--	2,900	200
Total	727,000	69,200	211,800	47,500	1,800	38,100	82,700	137,900	138,000
Hardwoods ^{2/}	500	(1/)	(1/)	(1/)	--	--	(1/)	--	500
All species	727,500	69,200	211,800	47,500	1,800	38,100	82,700	137,900	138,500

^{1/} Less than 50,000 board feet.

^{2/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 31.--Net annual growth of sawtimber on commercial forest land, by species and county, Blue Mountain Area, Oregon, January 1, 1970 (Scribner rule)

Species	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	184,000	24,900	52,000	34,200	(1/)	8,000	9,200	21,300	34,400
Lodgepole pine	54,800	800	26,000	--	--	1,200	7,100	14,900	4,800
Western white pine	400	--	200	--	--	--	--	200	--
Whitebark pine	(1/)	--	(1/)	--	--	--	--	--	--
Douglas-fir	143,900	5,100	32,200	2,900	1,400	9,300	25,500	26,800	40,700
White fir	89,100	20,400	42,800	3,000	--	1,500	2,800	13,100	5,500
Grand fir	33,300	100	6,000	--	--	5,100	13,400	4,600	4,100
Subalpine fir	22,500	2,200	2,800	--	--	(1/)	2,400	5,100	10,000
Western larch	24,200	800	2,500	(1/)	100	4,100	2,700	9,000	5,000
Engelmann spruce	30,100	4,000	6,600	--	--	100	3,000	9,700	6,700
Mountain hemlock	2,300	--	--	--	--	--	--	2,200	100
Total	584,600	58,300	171,100	40,100	1,500	29,300	66,100	106,900	111,300
Hardwoods ^{2/}	500	(1/)	(1/)	(1/)	--	--	(1/)	--	500
All species	585,100	58,300	171,100	40,100	1,500	29,300	66,100	106,900	111,800

^{1/} Less than 50,000 board feet.

^{2/} Consists primarily of black cottonwood and quaking aspen; also includes small amounts of white alder.

Table 32.--Average annual mortality of growing stock on commercial forest land, by species and ownership class, Blue Mountain Area, Oregon, January 1, 1970

(In thousand cubic feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	11,800	8,300	400	1,400	1,700
Lodgepole pine	9,700	7,800	(1/)	1,200	700
Douglas-fir	11,200	8,300	900	900	1,100
White fir	6,900	3,900	--	2,400	600
Grand fir	9,400	4,900	--	3,400	1,100
Subalpine fir	2,400	2,300	--	(1/)	100
Western larch	6,800	5,500	500	600	200
Engelmann spruce	2,600	2,600	--	--	--
Mountain hemlock	(1/)	(1/)	--	--	--
Total	60,800	43,600	1,800	9,900	5,500
Hardwoods ^{2/}	200	(1/)	--	--	200
All species	61,000	43,600	1,800	9,900	5,700

^{1/} Less than 50,000 cubic feet.

^{2/} Consists primarily of black cottonwood and red alder; also includes a small amount of quaking aspen.

Table 33.--Average annual mortality of sawtimber on commercial forest land, by species and ownership class, Blue Mountain Area, Oregon, January 1, 1970 (International 1/4-inch rule)

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	58,700	45,400	2,400	6,200	4,700
Lodgepole pine	6,400	6,300	100	--	--
Douglas-fir	50,700	41,000	4,700	3,000	2,000
White fir	26,400	14,400	--	7,000	5,000
Grand fir	50,800	27,800	--	17,400	5,600
Subalpine fir	6,700	6,700	--	--	--
Western larch	31,200	27,300	800	2,400	700
Engelmann spruce	13,700	13,700	--	--	--
Mountain hemlock	200	200	--	--	--
Total	244,800	182,800	8,000	36,000	18,000
Hardwoods ^{1/}	100	100	--	--	--
All species	244,900	182,900	8,000	36,000	18,000

^{1/} Consists of quaking aspen.

Table 34.--Average annual mortality of sawtimber on commercial forest land, by species and ownership class, Blue Mountain Area, Oregon, January 1, 1970 (Scribner rule)

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Ponderosa pine	53,200	41,900	2,200	5,300	3,800
Lodgepole pine	5,300	5,200	100	--	--
Douglas-fir	45,000	36,700	4,100	2,600	1,600
White fir	23,400	13,200	--	5,800	4,400
Grand fir	44,100	24,900	--	14,600	4,600
Subalpine fir	5,700	5,700	--	--	--
Western larch	26,200	23,300	600	1,700	600
Engelmann spruce	11,900	11,900	--	--	--
Mountain hemlock	200	200	--	--	--
Total	215,000	163,000	7,000	30,000	15,000
Hardwoods ^{1/}	100	100	--	--	--
All species	215,100	163,100	7,000	30,000	15,000

^{1/} Consists of quaking aspen.

Table 35.--Average annual mortality of growing stock on commercial forest land by species and county,
Blue Mountain Area, Oregon, January 1, 1970

(In thousand cubic feet)

Species	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	11,800	1,900	5,100	1,200	--	500	1,200	1,000	900
Lodgepole pine	9,700	800	4,500	200	--	600	1,700	1,700	200
Douglas-fir	11,200	3,600	2,700	200	--	800	2,200	1,100	600
White fir	6,900	1,000	2,500	100	--	100	600	800	1,800
Grand fir	9,400	--	800	--	--	600	1,700	2,700	3,600
Subalpine fir	2,400	900	400	--	--	(1/)	200	500	400
Western larch	6,800	1,200	1,900	--	--	300	1,200	1,700	500
Engelmann spruce	2,600	600	600	--	--	(1/)	400	800	200
Western hemlock	(1/)	--	--	--	--	--	--	(1/)	--
Total	60,800	10,000	18,500	1,700	--	2,900	9,200	10,300	8,200
Hardwoods ^{2/}	200	--	(1/)	(1/)	--	--	--	--	200
All species	61,000	10,000	18,500	1,700	--	2,900	9,200	10,300	8,400

^{1/} Less than 50,000 cubic feet.

^{2/} Consists primarily of black cottonwood; also includes small amounts of quaking aspen.

Table 36.---Average annual mortality of sawtimber on commercial forest land by species and county, Blue Mountain Area, Oregon, January 1, 1970 (International 1/4-inch rule)

(In thousand board feet)

Species	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Walla
Softwoods:									
Ponderosa pine	58,700	6,200	27,900	6,900	--	3,300	7,100	4,000	3,300
Lodgepole pine	6,400	1,400	2,700	--	--	200	700	1,000	400
Douglas-fir	50,700	17,200	12,500	900	--	3,900	9,800	5,000	1,400
White fir	26,400	3,200	9,400	400	--	900	--	2,800	9,700
Grand fir	50,800	--	4,600	--	--	2,700	9,200	16,200	18,100
Subalpine fir	6,700	1,200	1,100	--	--	100	1,000	1,600	1,700
Western larch	31,200	5,700	8,100	--	--	1,300	6,100	8,000	2,000
Engelmann spruce	13,700	2,400	3,200	--	--	100	2,200	4,600	1,200
Mountain hemlock	200	--	--	--	--	--	--	200	--
Total	244,800	37,300	69,500	8,200	--	12,500	36,100	43,400	37,800
Hardwoods^{1/}									
All species	244,900	37,300	69,600	8,200	--	12,500	36,100	43,400	37,800

^{1/} Consists of quaking aspen.

Table 37.--Average annual mortality of sawtimber on commercial forest land by species and county, Blue Mountain Area, Oregon, January 1, 1970 (Scribner rule)

(In thousand board feet)

Species	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
Softwoods:									
Ponderosa pine	53,200	5,900	25,100	6,300	--	3,100	6,400	3,500	2,900
Lodgepole pine	5,300	1,300	2,100	--	--	200	600	800	300
Douglas-fir	45,000	16,000	11,000	900	--	3,400	8,500	4,000	1,200
White fir	23,400	3,000	8,700	300	--	700	--	2,300	8,400
Grand fir	44,100	--	4,000	--	--	2,400	8,300	14,100	15,300
Subalpine fir	5,700	900	900	--	--	100	800	1,500	1,500
Western larch	26,200	4,500	7,100	--	--	1,000	5,100	6,700	1,800
Engelmann spruce	11,900	2,000	2,800	--	--	100	1,900	4,100	1,000
Mountain hemlock	200	--	--	--	--	--	--	200	--
Total	215,000	33,600	61,700	7,500	--	11,000	31,600	37,200	32,400
Hardwoods^{1/}									
All species	215,100	33,600	61,800	7,500	--	11,000	31,600	37,200	32,400

^{1/} Consists of quaking aspen.

Table 38.--Average annual mortality of growing stock and sawtimber on commercial forest land, by cause of death and by softwoods and hardwoods, Blue Mountain Area, Oregon, January 1, 1970

Cause of death	Growing stock			Sawtimber (International 1/4-inch rule)			Sawtimber (Scribner rule)		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
----- Thousand cubic feet ----- ----- Thousand board feet -----									
Fire	400	400	--	2,200	2,200	--	1,800	1,800	--
Insect	11,700	11,700	--	52,600	52,600	--	46,400	46,400	--
Disease	10,600	10,600	--	52,400	52,400	--	46,900	46,900	--
Animal	100	100	--	--	--	--	--	--	--
Weather	11,200	11,200	--	52,700	52,700	--	46,900	46,900	--
Suppression	2,400	2,400	--	3,800	3,800	--	3,500	3,500	--
Logging	3,700	3,700	--	5,700	5,700	--	4,600	4,600	--
Other	800	600	200	7,400	7,400	--	6,500	6,500	--
Unknown	20,100	20,100	(1/)	68,100	68,000	100	58,500	58,400	100
All causes	61,000	60,800	200	244,900	244,800	100	215,100	215,000	100

^{1/} Less than 50,000 cubic feet.

Table 39.--Net volume of salvable dead sawtimber on commercial forest land, by volume per acre class and county, Blue Mountain Area, Oregon, January 1, 1970

Volume per acre	All counties	Baker	Grant	Harney	Malheur	Morrow	Umatilla	Union	Wallowa
----- Thousand cubic feet -----									
Cubic feet:									
1-199	58,000	6,000	18,200	2,400	--	3,700	6,300	10,100	11,300
200-499	57,800	9,200	15,900	600	--	500	9,900	8,200	13,500
500-999	19,700	3,400	8,200	--	--	--	900	2,400	4,800
1,000-1,999	--	--	--	--	--	--	--	--	--
2,000 or more	--	--	--	--	--	--	--	--	--
All classes	135,500	18,600	42,300	3,000	--	4,200	17,100	20,700	29,600
----- Thousand board feet, International 1/4-inch rule -----									
Board feet:									
1-499	74,300	7,000	18,300	1,100	--	3,500	14,000	18,800	11,600
500-999	204,400	23,500	66,200	9,300	--	15,300	17,700	27,000	45,400
1,000-2,499	274,400	38,600	92,600	3,700	--	4,900	46,500	34,400	53,700
2,500-4,999	92,400	19,100	26,100	--	--	--	10,800	17,100	19,300
5,000-9,999	9,600	--	9,600	--	--	--	--	--	--
10,000 or more	--	--	--	--	--	--	--	--	--
All classes	655,100	88,200	212,800	14,100	--	23,700	89,000	97,300	130,000
----- Thousand board feet, Scribner rule -----									
Board feet:									
1-499	98,000	8,900	21,800	2,700	--	3,100	19,900	19,700	21,900
500-999	184,800	21,800	63,000	6,700	--	15,400	11,600	23,500	42,800
1,000-2,499	225,700	33,300	78,800	3,300	--	2,700	43,700	28,400	35,500
2,500-4,999	56,400	12,400	21,900	--	--	--	--	10,300	11,800
5,000-9,999	--	--	--	--	--	--	--	--	--
10,000 or more	--	--	--	--	--	--	--	--	--
All classes	564,900	76,400	185,500	12,700	--	21,200	75,200	81,900	112,000

Table 40.--Net volume of salvable dead sawtimber on commercial forest land, by volume per tree class and species,
Blue Mountain Area, Oregon, January 1, 1970

Volume per tree	All species	Ponderosa pine	Lodgepole pine	Douglas-fir	White fir	Grand fir	Subalpine fir	Western larch	Engelmann spruce	Mountain hemlock
<i>Thousand cubic feet</i>										
Cubic feet:										
1-49	16,300	2,200	600	7,600	1,700	700	--	1,900	1,600	--
50-99	21,000	4,500	2,300	5,600	1,700	1,000	800	4,700	100	300
100-499	98,200	25,600	3,700	17,300	3,100	3,300	2,800	36,000	6,400	--
500 or more	--	--	--	--	--	--	--	--	--	--
All classes	135,500	32,300	6,600	30,500	6,500	5,000	3,600	42,600	8,100	300
<i>Thousand board feet, International 1/4-inch rule</i>										
Board feet:										
1-149	38,500	4,100	2,500	23,100	2,700	2,900	--	3,200	--	--
150-499	169,500	34,600	3,900	54,000	16,900	8,800	4,700	36,300	9,500	800
500-2,499	447,100	113,400	13,000	67,500	9,500	13,100	12,100	179,700	38,800	--
2,500 or more	--	--	--	--	--	--	--	--	--	--
All classes	655,100	152,100	19,400	144,600	29,100	24,800	16,800	219,200	48,300	800
<i>Thousand board feet, Scribner rule</i>										
Board feet:										
1-149	47,400	3,700	2,400	27,300	2,400	2,100	--	2,800	6,700	--
150-499	196,600	45,300	8,800	50,400	14,200	11,300	4,400	55,500	6,100	600
500-2,499	320,900	87,800	4,400	47,900	8,500	6,800	9,700	128,900	26,900	--
2,500 or more	--	--	--	--	--	--	--	--	--	--
All classes	564,900	136,800	15,600	125,600	25,100	20,200	14,100	187,200	39,700	600

Table 41.--*Timber harvest by ownership class, Blue Mountain Area, Oregon, 1950-72 (International 1/4-inch scale)*

(In thousand board feet)

Year	All ownerships	Private	State	National Forest	Other public
1950	431,289	--	253,562	176,657	1,070
1951	506,932	--	331,133	174,729	1,070
1952	487,544	--	296,542	185,752	5,250
1953	503,249	315,116	--	174,838	13,295
1954	716,573	459,679	--	245,137	11,757
1955	703,202	442,011	--	261,182	9
1956	799,616	502,537	--	289,117	7,962
1957	732,516	455,241	--	263,434	13,841
1958	775,959	455,325	1,703	296,723	22,208
1959	891,218	493,105	2,006	379,233	16,874
1960	676,273	297,047	3,202	356,122	19,902
1961	708,438	313,362	545	375,718	18,813
1962	729,233	288,205	--	419,761	21,267
1963	797,162	243,768	4,467	536,605	12,322
1964	788,981	247,865	105	537,461	3,550
1965	871,768	244,967	910	623,703	2,188
1966	798,659	241,780	--	541,206	15,673
1967	827,988	246,804	--	563,890	17,294
1968	794,392	161,112	--	619,407	13,873
1969	777,690	171,982	870	594,497	10,341
1970	657,799	183,745	1,650	464,681	7,723
1971	809,819	187,017	2,691	607,007	13,104
1972	874,482	151,444	5,827	710,057	7,154

Reliability of Forest Resource Estimates

Forest Land Area and Timber Volume

The estimates of forest land area and timber volume in the Blue Mountain Area were derived by sampling and thus have sampling errors. Sampling errors have been computed for the estimates of commercial forest land area, noncommercial forest land area, net cubic-foot volume of growing stock, and net board-foot volume (International ¼-inch rule) of sawtimber. These sampling errors are presented in table 42 as a percent of the estimated total at the 68-percent and 95-percent probability levels. They may be interpreted as meaning that the odds are two out of three for 68-percent probability, or 19 out of 20 for 95-percent probability, that the ranges shown include the true value (i.e., the results of a 100-percent inventory). For example, we can expect, with 95-percent confidence, that the estimate of total commercial forest land area—4,565,000 acres $\pm$ 2.47 percent (112,756 acres)—includes the true value.

The sampling error of any breakdown of these totals will be substantially greater than for the total. The smaller the breakdown, the larger the sampling error. An approximation of the increasing sampling error can be obtained from table 43, which shows the sampling error associated with smaller estimates.

In addition to measurable sampling errors, there may be nonsampling errors due to mistakes in judgment, measurement, and compilation. The magnitude of errors of this nature cannot be determined. However, such errors are kept to a minimum through training, supervision, field checking, and complete editing and machine verification in compiling the data.

Table 42.--*Sampling errors of estimate of forest area and timber volume,
Blue Mountain Area, Oregon, 1969*

Item	Estimated total	Sampling error in percent	
		68-percent probability	95-percent probability
Commercial forest land	4,565,000 acres	± 1.26	± 2.47
Noncommercial forest land ^{1/}	1,207,000 acres	± 3.77	± 7.39
Volume:			
Growing stock	10,376 million cubic feet	± 2.31	± 4.53
Sawtimber (International 1/4-inch rule)	46,550 million board feet	± 2.75	± 5.40

^{1/} In addition to the estimated 1,207,000 acres of noncommercial forest land derived by sampling methods, 111,000 acres of productive reserved forest land and 137,000 acres of unproductive reserved forest land were determined by type-mapping procedures and have no sampling error.

Table 43.--*Approximate sampling error by size of estimate, Blue Mountain
Area, Oregon, 1969*

Commercial forest land		Growing stock		Sawtimber	
Area	Sampling error ^{1/}	Volume	Sampling error ^{1/}	Volume	Sampling error ^{1/}
<i>Thousand acres</i>	<i>Percent</i>	<i>Million cubic feet</i>	<i>Percent</i>	<i>Million board feet, International 1/4-inch rule</i>	<i>Percent</i>
4,565	1.26	10,376	2.31	46,550	2.75
1,812	2.0	6,152	3.0	39,115	3.0
805	3.0	3,460	4.0	22,002	4.0
452	4.0	2,215	5.0	14,081	5.0
290	5.0	554	10.0	3,520	10.0
72	10.0	246	15.0	1,565	15.0
32	15.0	138	20.0	880	20.0
18	20.0	89	25.0	563	25.0
12	25.0	61	30.0	391	30.0
8	30.0				

^{1/} By random sampling formula; 68-percent probability.

Inventory Procedures

This report on the forests of the Blue Mountain Area includes information gathered in the 1966-69 inventories of the Malheur, Umatilla, Wallowa-Whitman National Forests, and the Snow Mountain Ranger District and Crooked River Working Circle of the Ochoco National Forest conducted by Region 6 of the U.S. Forest Service; and the 1969 inventory of lands outside the National Forests conducted by the Forest Survey project to the Pacific Northwest Forest and Range Experiment Station. No updating was done to bring the data to a common date. Information on forest land in wildernesses and other National Forest reserved areas was carried forward from the previous inventory (in the mid-1950's). Information on forest land in reserved areas outside National Forests was gathered by the Forest Survey project in 1969.

National Forest Lands

Field plots were distributed on a systematic grid at 1.7-mile intervals on all National Forest lands.

There were 749 field plots established on the Umatilla National Forest, 639 on the Wallowa-Whitman, 766 on the Malheur National Forest, 126 plots on the Snow Mountain Ranger District of the Ochoco National Forest in Grant and Harney Counties, and 27 plots on the Crooked River Working Circle of the Ochoco National Forest in Grant County. Plots on all areas except the Crooked River Working Circle consisted of 10 sample points distributed systematically over

an acre. The variable-radius plot sampling principle was used at each point to select the trees to be tallied. Where no trees were tallied, a ground cover class was recorded. Circular 1/5-acre plots were measured on the Crooked River Working Circle. Summations of the plot tally expressed the timber resources and conditions for each stand sampled. Data from all plots were summarized to provide total area, volume, growth, and mortality estimates.

Gross annual growth estimates on National Forest lands were for 1967-72 as estimated from increment core readings of a sample of trees on each 10-point plot. Multiple regression equations were used to estimate tree diameter 1 year ago, and net volume was computed for both present and past diameters. Gross annual growth was obtained by subtracting past from present net volume. Annual mortality is for 1957-72 and was obtained either from remeasurement of the 1/5-acre subplot used for the previous inventory or from the newly established 10-point plot. On the newly established 10-point plot, mortality was based on tally trees which were estimated to have died within the past 5 years.

Outside National Forests

A double sampling design was used for lands outside the National Forests. First 38,148 aerial photo sample plots were distributed systematically across the area. Photo plots were classified into one of three major land classes—commercial and noncommercial

forests and nonforest—and the commercial forest plots were further classified into stand volume classes. All photo plots were classified by kind of owner from public records.

The second stage consisted of a basic systematic grid of field plots 3.4 miles apart with supplemental plots added. A total of 789 field plots were established at photo plot locations. Each consisted of 10 sample points distributed systematically over an acre. Where no trees were tallied, a ground cover class was recorded. Summations of the 10-point tally expressed the resources and conditions for that acre and were used with the photo sample to provide area and volume estimates.

Annual growth estimates were developed from the diameter increment and mortality data measured on field plots, using a stand projection model (USDA Forest Service 1970). In Grant, Umatilla, Union, and Wallowa Counties, diameter increments came

from remeasured trees on 1/5-acre plots originally established in the 1950's or from increment core readings from the 10-point tally when the 1/5-acre plot could not be relocated. In Baker, Harney, Malheur, and Morrow Counties, all growth estimates came from increment core readings on the 10-point tally. In Grant, Umatilla, Union, and Wallowa Counties, mortality estimates came from either the remeasured 1/5-acre plots or the 10-point plots in the event the remeasured plot was not located. In Baker, Harney, Malheur, and Morrow Counties, mortality was based on a sample of trees from the 10-point tally which were estimated to have died within the past 5 years.

Timber Harvest

The timber harvest figures for public lands have been compiled by the various agencies; information on timber harvest on private lands has been compiled by the State Forester.

Definition of Terms

Land Area

Total land area is that reported by the Bureau of the Census and 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 1/8-mile wide, and lakes, reservoirs, and ponds less than 40 acres in area.

Forest land is at least 16.7 percent stocked by trees of any size, or formerly having such tree cover, and not currently developed for nonforest use. Minimum area of forest land recognized is 1 acre.

Nonforest land has never supported forests or was formerly forested and is currently developed for nonforest uses. Included are areas used for agricultural crops, improved pasture, residential areas, city parks, improved roads of any width and their right-of-way clearings, powerline clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of Census as land. If intermingled in forest areas, unimproved roads and other nonforest strips must be more than 120 feet wide, and clearings, etc., more than 1 acre in size, to qualify as nonforest land.

Forest-land Classes

Adverse location areas are productive forest land, often having merchantable stands of timber, but which, because of physical location, are impossible or difficult to harvest.

Commercial forest land is capable of producing 20 cubic feet per acre per year of industrial wood and not withdrawn from timber utilization.

Critical watersheds are areas well within the forest zone and sites above the 20 cubic feet per acre per year productivity level; but because of unstable soil and other conditions, cannot be logged without seriously affecting the watershed.

Deferred forest land is productive and has been administratively identified for study as possible additions to the Wilderness System or other withdrawal from timber utilization.

Noncommercial forest land is incapable of yielding crops of industrial wood because of adverse site conditions, and productive public forest land is withdrawn from commercial timber use through statute or administrative regulation.

Productive-reserved public forest land is withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualified as commercial forest land. Also included are forest areas managed exclusively for Christmas tree production.

Unproductive forest land is incapable of yielding crops of industrial wood products because of adverse site conditions such as sterile soil, poor drainage, high elevation, steepness, and rockiness.

Forest Types

Forest types are determined on the basis of species plurality of all live trees that contribute to stocking, considering both size and spacing.

Tree Classes

Growing Stock

Sawtimber trees, poletimber trees, saplings, and seedlings are included; that is, all live trees except cull trees.

Acceptable growing-stock trees are of commercial species and meet specified standards of size and quality, but do not qualify as desirable trees.

Desirable growing-stock trees are of commercial species, have no serious defects in quality limiting present or prospective use for timber products, are of relatively high vigor, and contain no pathogens that may result in death or serious deterioration before rotation age.

Sawtimber trees are 11.0-inch d.b.h. and larger, live, and of commercial species. Softwood trees must contain at least one 12-foot saw log with a top diameter not less than 6 inches inside bark; hardwood trees must contain at least one 8-foot saw log with a top diameter not less than 8 inches inside bark. At least 25 percent of the board-foot volume in a tree must be free of defect for either softwoods or hardwoods.

Poletimber trees are 5.0- to 10.9-inch d.b.h., live, and of commercial species, not less than 50 percent sound on a cubic-foot basis, and with no disease, defects, or deformities which are likely to prevent them from becoming growing-stock sawtimber trees.

Sapling and seedling trees are less than 5.0-inch d.b.h., live, of commercial species, and have no disease, defects, or deformities which are likely to prevent them from becoming growing-stock poletimber trees.

Nongrowing Stock

Cull trees are noncommercial species or commercial species which are too defective or which are unlikely to become growing-stock trees due to deformity, disease, low vigor, etc.

Sound cull trees are noncommercial species or commercial species with excessive

defect due to form, roughness, etc.

Rotten cull trees have excessive defect due primarily to rot.

Mortality trees are commercial species which have died from natural causes within a specified period and which were not cull trees at the time of death.

Salvable dead trees are standing or down, of commercial species, 11.0 inches or more in diameter, containing 25 percent or more of sound volume and at least one merchantable 16-foot log if a softwood or one merchantable 8-foot log if a hardwood.

Stand-Size Classes

Sawtimber stands are at least 16.7 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber and poletimber trees and with sawtimber stocking equal to or greater than poletimber stocking. In *large sawtimber stands*, the majority of the sawtimber stocking is in trees 21.0 inches and larger at breast height. In *small sawtimber stands*, the majority of the sawtimber stocking is in trees from 11.0 to 20.9 inches at breast height.

Poletimber stands are at least 16.7 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber and poletimber trees, and with poletimber stocking exceeding sawtimber stocking.

Sapling and seedling stands are at least 16.7 percent stocked with growing-stock trees, with more than half of this stocking in saplings, seedlings, or both.

Nonstocked areas of commercial forest land are less than 16.7 percent stocked with growing-stocked trees.

Stocking

Stocking is an expression of the extent to which growing space is effectively utilized by present or potential growing-stock trees of commercial species. "Percent of stocking" is

synonymous with “percentage of growing space occupied” and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

Age

Stand age is based upon growing-stock stocking. In order for a stand to be even-aged, a majority of the growing-stock stocking must be in two adjacent age classes. Stands that do not meet this criterion are classified as uneven-aged, under or over rotation age.

Rotation age is the period of years between establishment of a stand of timber and the time when it is considered ready for cutting—in lodgepole pine, 80 years; in all other softwoods, 120 years; in hardwood stands, 50 years.

In *old-growth sawtimber stands*, 50 percent or more of the growing stock is in trees at least 140 years old.

In *young-growth sawtimber stands*, more than 50 percent of the growing stock is in trees less than 140 years old.

Timber Volume

Live Sawtimber

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

Scribner rule is the common board-foot log rule used locally in determining volume of sawtimber. Scribner volume is measured in terms of 16-foot logs.

International 1/4-inch rule is the standard board-foot log rule adopted nationally by the Forest Service for the presentation of Forest Survey volume statistics.

Saw-log portion is the bole of sawtimber trees between the stump and the saw-log top.

Upper-stem portion includes the bole of sawtimber trees above the saw-log top of 7.0 inches outside bark for softwoods and 8.0 inches outside for hardwoods to a minimum top diameter of 4.0 inches outside bark; or to the point where the central stem breaks into limbs.

Growing Stock

Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark is measured. Net volume equals gross volume less deduction for rot and missing bole sections.

All Timber

Net volume in cubic feet of live and salvable dead sawtimber trees and poletimber trees of commercial species, also cull trees of all species from stump to a minimum 4.0-inch top outside bark is measured.

Industrial Wood

All roundwood products, except fuelwood are included.

Net Annual Growth

The net increase in volume of trees during a specified year is included. (Components of net annual growth include: (a) the increment in net volume of trees at the beginning of the specified year surviving to the year's end, plus (b) the net volume of trees reaching the size class during the year, minus (c) the net volume of trees that died during the year, minus (d) the net volume of trees that became culls during the year.)

Ownership Classes

National Forest lands are Federal lands which have been designated by Executive Order or statute as National Forests or purchase units and other lands under the adminis-

Tree Species

tration of the Forest Service, including experimental areas and Bankhead-Jones title III lands.

Other public lands are Federal lands other than National Forests, including lands administered by the Bureau of Land Management, Bureau of Indian Affairs, and miscellaneous Federal agencies, and lands owned by States, counties, and local public agencies or lands leased by these governmental units for more than 50 years.

Forest industry lands are owned by companies or individuals operating wood-using plants.

Farmer lands are lands owned by operators of farms.

Miscellaneous private—corporate lands are owned by companies or corporations that do not operate wood-using plants. Included are corporate farms, some railroad lands, oil company lands, real estate and land-holding company lands, and lands held by banks and other financial institutions and various other companies and corporations.

Miscellaneous private—noncorporate lands are privately owned lands other than forest industry, farmer-owned, or corporate lands.

Principal tree species found on the commercial forest land in the Blue Mountain Area include:

Softwoods:

Douglas-fir (*Pseudotsuga menziesii*)
Engelmann spruce (*Picea engelmannii*)
Grand fir (*Abies grandis*)
Lodgepole pine (*Pinus contorta*)
Mountain hemlock (*Tsuga mertensiana*)
Pacific yew (*Taxus brevifolia*)¹
Ponderosa pine (*Pinus ponderosa*)
Subalpine fir (*Abies lasiocarpa*)
Western juniper (*Juniperus occidentalis*)
Western larch (*Larix occidentalis*)
Western white pine (*Pinus monticola*)
Whitebark pine (*Pinus albicaulis*)
White fir (*Abies concolor*)

Hardwoods:

Black cottonwood (*Populus trichocarpa*)
Hawthorn (*Crataegus* spp.)¹
Quaking aspen (*Populus tremuloides*)
Red alder (*Alnus rubra*)
White alder (*Alnus rhombifolia*)
Willow (*Salix* spp.)¹

¹ Noncommercial species.

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