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Forest Statistics for Land Outside National Forests in West-Central Montana, 1989

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RESEARCH SUMMARY

There are about 1.3 million acres of forest land outside the National Forests in west-central Montana, almost all of it timberland. Three-fourths of the forest land is privately owned. The estimated volume of wood on these lands is around 1.5 billion cubic feet. Net annual growth in 1988 was about 36 million cubic feet. This report highlights additional information on total land area, timberland area, volume, growth, and mortality.

PREFACE

The primary objective of Forest Survey—a continuing, nationwide undertaking of the Forest Service,

U.S. Department of Agriculture—is to provide an assessment of the renewable resources for the forest lands of the Nation. Fundamental to the accomplishment of the objective are the periodic State-by-State resource inventories. Originally, Forest Survey was authorized by the McSweeney-McNary Act of 1928. The current authorization is through the Renewable Resources Research Act of 1978.

The Intermountain Research Station with headquarters in Ogden, UT, conducts the forest resource inventories for the Rocky Mountain States of Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, and Wyoming. These inventories provide information on the extent and condition of the forests—their volume of wood and stand dynamics as expressed by growth, removals, and mortality for State, privately owned, and most other forest lands not in the National Forest System. These data, when combined with similar information on National Forest lands, provide a basis for forming forest policies and programs and for the orderly development and use of the resources.

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INTRODUCTION

This report presents the principal findings of the most recent Forest Survey of the timberland resources outside the National Forests in west-central Montana (fig. 1). Phase I of the survey began in 1987 with the collection and reconciliation of area information and aerial photo interpretation. The field phase began in 1988 and was completed in 1989.

Figure 1—West-central Montana Counties.

The resource statistics in this report include estimates for those lands in private ownership and those public lands administered by the Bureau of Land Management (BLM), U.S. Department of the Interior (USDI), other Federal agencies, the State of Montana, and county and municipal governments. Reserved areas, such as those lands administered by the National Park Service, USDI, are not field sampled but are included in the total area summaries (table 1). Area estimates for those lands administered by the National Forest System, Forest Service, U.S. Department of Agriculture, are also included in table 1. However, associated resource estimates are not included in this report but will be combined with the estimates presented

here and in other Survey Unit reports to form the basis for a comprehensive statewide analysis of Montana's forest resource situation.

HIGHLIGHTS

Area

The eight counties that compose west-central Montana contain nearly 11.0 million acres. The majority of the land—60 percent—is owned by private individuals and firms. Of the 4.3 million acres of public land, the National Forests administer 3.3 million acres, which is 30 percent of the total land area (fig. 2).

Figure 2—Distribution of land by ownership in west-central Montana, 1989.

Of the 7.6 million acres of land outside National Forests in west-central Montana, only 17 percent (fig. 3) meet minimum stocking requirements to be classified as forest land.

All of the 977,369 acres of forest land in private holdings are nonreserved, which means they are potentially available for harvesting. Of the 316,230 acres administered by public agencies, only 1,092 acres are reserved.

Stands in which Douglas-fir (*Pseudotsuga menziesii*) predominates constitute three-fifths of the timberland area, and stands in which ponderosa pine (*Pinus ponderosa*) predominates constitute one-fifth (fig. 4). Other forest types occurring include lodgepole pine, aspen, limber pine, cottonwood, spruce-fir, western larch, and Engelmann spruce.

Sawtimber stands occupy 63 percent of the timberland area (fig. 5). Nearly 22 percent of the timberland area is in poletimber, while 13 percent is in sapling/seedlings. Only 2 percent of the timberland area is nonstocked.

Most of the timberland acres are capable of producing 20 cubic feet or more of wood fiber on an annual basis. Only 3 percent of the area is capable of producing 85 cubic feet or more per acre per year (table 5).

Figure 3—Distribution of land outside National Forests by type of land in west-central Montana, 1989.

Figure 4—Distribution of timberland outside National Forests by forest type in west-central Montana, 1989.

Figure 5—Distribution of timberland outside National Forests by stand-size class in west-central Montana, 1989.

About 72 percent of the timberland acres supports stands containing less than 5,000 board feet per acre (fig. 6). Another 31 percent of the timberland area contains less than 1,500 board feet per acre, while only 13 percent supports stands containing 10,000 or more board feet per acre.

Stand Composition and Volume

The timberlands of west-central Montana support 437 million growing-stock trees. Most are coniferous species, with only 4 percent aspen (*Populus tremuloides*) and cottonwood (*Populus* spp.). Almost 57 percent are less than 5.0 inches diameter at breast height (d.b.h.), and 15 percent are sawtimber sized trees (fig. 7). In addition to the growing-stock trees, timberland stands contain more than 7 million cull trees. There are another 7.5 million trees that are dead but still sufficiently sound to meet minimum merchantability standards.

Approximately 14 percent of the timberland area, some 182,000 acres, are fully stocked with growing-stock trees (fig. 8), as are the nearly 44,000 acres in the overstocked condition. These latter acres, however, have a sufficient number of rough and rotten cull trees present to create the overstocking. About one-quarter of the timberland area is poorly stocked, and another 2 percent is nonstocked.

Timberland supports 1.5 billion cubic feet of growing stock, including 5.4 billion board feet (International 1/4-inch rule) of sawtimber. The volume in cull and salvable dead trees adds an additional 63 million cubic feet to the timberland "woodpile."

Sawtimber stands contain 87 percent of the board-foot volume on timberland. Poletimber and sapling/seedling stands account for 10 percent and

Figure 6—Distribution of timberland outside National Forests by stand-volume class in west-central Montana, 1989.

Figure 7—Distribution of growing-stock trees on timberland outside National Forests by tree-size class in west-central Montana, 1989.

Figure 8—Distribution of timberland outside National Forests by stocking condition in west-central Montana, 1989.

2 percent, respectively. The average net volume per acre of growing stock on timberland is 1,189 cubic feet.

Over 70 percent of the growing-stock and sawtimber volume is found on forest industry and nonindustrial private land.

Growing-stock volume is well distributed. About 30 percent is in pole-timber trees, 51 percent is in sawtimber trees under 17.0 inches d.b.h., and trees 17.0 inches d.b.h. and larger account for the remaining 19 percent (fig. 9).

Douglas-fir, lodgepole pine (*Pinus contorta*), and ponderosa pine species account for about 90 percent of the growing-stock and sawtimber volume (fig. 10). Douglas-fir alone accounts for 728.5 million cubic feet or 48 percent of the inventory.

Components of Change

Total volume on timberlands in west-central Montana increased at a rate of nearly 42 million cubic feet in 1988. At the same time, mortality was taking over 6.5 million cubic feet, reducing the gain in inventory volume to a net of just over 35 million cubic feet. Lodgepole pine accounted for about 39 percent of the mortality (fig. 11) and suffered losses to wildfire of more than 1.4 million cubic feet of volume. Insects and disease combined caused roughly 46 percent of the total timberland mortality.

On the average, the productive potential of a typical timberland acre is about 48 cubic feet per year. In 1988, gross growth averaged only 33 cubic feet per acre. After deducting for mortality, net production averaged almost 28 cubic feet per acre, or 58 percent of potential.

Figure 9—Distribution of growing-stock volume on timberland outside National Forests by tree-size class in west-central Montana, 1989.

Figure 10—Distribution of growing-stock volume on timberland outside National Forests by species in west-central Montana, 1989.

Figure 11—Annual mortality of growing stock on timberland outside National Forests by species in west-central Montana, 1988.

HOW THE INVENTORY WAS CONDUCTED

The inventory was designed to provide reliable statistics primarily at the State and Survey Unit levels.

Prefield

Initial area estimates were based on the classification of 31,181 sample points systematically placed on the latest aerial photographs available. The sample points were summarized and grouped into strata for subsequent field sampling. The photo points, adjusted to meet known land areas, were used to compute area expansion factors for the sampling strata means.

Field

Land classification and estimates for timberland and woodland characteristics and volume were based on observations and measurements recorded at 1,231 field sample locations, of which 229 were forested (fig. 12).

Sample trees for timberland were selected using a 10-point cluster. Trees less than 5.0 inches d.b.h. were measured on a $\frac{1}{300}$ -acre fixed radius plot. Trees 5.0 inches d.b.h. or larger were selected using a variable radius plot. Locations were measured using a 40-basal-area-factor angle gauge. Sample trees for woodland were selected using one $\frac{1}{10}$ -acre or one $\frac{1}{5}$ -acre fixed radius plot for trees 3.0 inches diameter at root collar (d.r.c.) and larger. Trees less than 3.0 inches d.r.c. were tallied on $\frac{1}{300}$ -acre subplots.

Compilation

The photo and field data are encoded for subsequent computer manipulation to assure accuracy and consistency of codes and to produce quality control summaries. Final estimates from these data were based on statistical summaries, a portion of which is included in this bulletin. Volume and defect were computed using the most appropriate equations, including those developed by Kemp (1958) and Moisen (1990).

Figure 12—Distribution of forest land field locations outside National Forests in west-central Montana, 1989.

DATA RELIABILITY

Individual cells within tables should be used with caution. Some are based on small sample sizes, which may result in high sampling errors. The standard error percentages shown in tables 2 and 3 were calculated at the 67 percent confidence level.

STANDARD FOREST SURVEY TERMINOLOGY

- Basal area*—The cross-sectional area of a tree expressed in square feet. For timber species the calculation is based on diameter at breast height (d.b.h.); for woodland species it is based on diameter at root collar (d.r.c.).
- Christmas tree grade*—Pinyon species are classified as Christmas trees using the following guidelines:
- Premium—Excellent conical form with no gaps in branches and a straight bole.
 - Standard—Good conical form with small gaps in branches and bole slightly malformed.
 - Utility—Conical in form with branches missing and bole bent or malformed.
 - Cull—Not meeting one of the above classifications or over 12 feet in height.
- Cord*—A pile of stacked wood equivalent to 128 cubic feet of wood and air space having standard dimensions of 4 by 4 by 8 feet.
- Cull trees*—Live trees that are unmerchantable now or prospectively (see Rough trees and Rotten trees).

Cull volume—Portions of a tree's volume that are not usable for wood products because of rot, missing or dead material, or other cubic-foot defect.

Deferred forest land—Forest lands within the National Forest System that are under study for possible inclusion in the Wilderness System.

Diameter at breast height (d.b.h.)—Diameter of the stem measured at 4.5 feet above the ground.

Diameter at root collar (d.r.c.)—Diameter equivalent at the point nearest the ground line that represents the basal area of the tree stem or stems.

Diameter classes—Tree diameters, either d.b.h. or d.r.c., grouped into 2-inch classes.

Farmer /rancher-owned lands—Lands owned by a person who operates a farm or a ranch and who either does the work or directly supervises the work.

Fenceposts—Juniper and oak species are evaluated for post potential using the following criteria:

Line post—A 7-foot minimum length with 5 to 7 inches diameter at the butt, 2.5 inches minimum small end diameter, and reasonably straight and solid.

Corner post—An 8-foot minimum length with 7 to 9 inches diameter at the butt, 2.5 inches minimum small end diameter, and reasonably straight and solid.

Forest industry lands—Lands owned by companies or individuals operating a primary wood-processing plant.

Forest lands—Lands at least 10 percent stocked by forest trees of any size, including lands that formerly had such tree cover and that will be naturally or artificially regenerated. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest if less than 120 feet wide.

Forest trees—Woody plants having a well-developed stem or stems, usually more than 12 feet in height at maturity, with a generally well-defined crown.

Forest type—A classification of forest land based upon and named for the tree species presently forming a plurality of live-tree stocking.

Gross annual growth—The average annual increase in the net volume of trees during a specified period.

Growing-stock trees—Live sawtimber trees, poletimber trees, saplings, and seedlings of timber species meeting specified standards of quality and vigor; excludes cull trees.

Growing-stock volume—Net cubic-foot volume in live poletimber-size and sawtimber-size growing-stock trees from a 1-foot stump to a minimum 4-inch top (of central stem) outside bark or to the point where the central stem breaks into limbs.

Growth—See definition for Net annual growth.

Hardwood trees—Dicotyledonous trees, usually broad-leaved and deciduous.

Indian lands—Indian lands held in trust by the Federal Government.

Industrial wood—All commercial roundwood products except fuelwood.

Land area—The area of dry land and land temporarily or partially covered by water such as marshes, swamps, and river flood plains, streams, sloughs, estuaries, and canals less than 120 feet wide; and lakes, reservoirs, and ponds less than 1 acre in size.

Logging residue—The unused portions of growing-stock trees cut or killed by logging.

Miscellaneous Federal lands—Lands administered by Federal agencies other than the Forest Service, U.S. Department of Agriculture, or Bureau of Land Management, U.S. Department of the Interior.

Mortality—The net volume of growing-stock trees that have died from natural causes during a specified period.

National Forest lands—Public lands administered by the Forest Service, U.S. Department of Agriculture.

National Resource lands—Public lands administered by the Bureau of Land Management, U.S. Department of the Interior.

Net annual growth—Gross annual growth minus average annual mortality.

Net dead volume—Total net volume of dead trees plus the net volume of dead material in live trees.

Net volume in board feet—The gross board-foot volume in the sawlog portion of growing-stock trees, less deductions for cull volume.

Net volume in cubic feet—Gross cubic-foot volume in the merchantable portion of trees less deductions for cull volume. For timber species, volume is computed for the merchantable stem from a 1-foot stump to a minimum 4-inch top diameter outside bark (d.o.b.), or to the point where the central stem breaks into limbs. For woodland species, volume is computed outside bark (o.b.) for all woody material above d.r.c. that is larger than 1.5 inches d.o.b.

Nonforest lands—Lands that do not currently qualify as forest land.

Nonindustrial private—All private ownerships except forest industry.

Nonstocked areas—Forest land less than 10 percent stocked with live trees.

Other private lands—Privately owned lands other than forest industry or Indian Trust.

Other public lands—Public lands administered by agencies other than the Forest Service, U.S. Department of Agriculture.

Other removals—The net volume of growing-stock trees removed from the inventory by cultural operations such as timber-stand improvement, by land clearing, and by changes in land use, such as a shift to wilderness.

Poletimber stands—Stands at least 10 percent stocked with growing-stock trees, in which half or more of the stocking is sawtimber or poletimber trees or both, with poletimber stocking exceeding that of sawtimber (see definition for Stocking).

Poletimber trees—Live trees of timber species at least 5 inches d.b.h. but smaller than sawtimber size.

Potential growth—The average net annual cubic-foot growth per acre at culmination of mean annual growth attainable in fully stocked natural stands.

Primary wood-processing plants—Plants using roundwood products such as sawlogs, pulpwood bolts, veneer logs, and so forth.

Productivity class—A classification of forest land that reflects biological potential. For timberlands the index used is the potential net annual growth at culmination of mean annual increment in fully stocked natural stands. For woodland, characteristics that affect the land's ability to produce wood, such as soil depth and aspect, are used. Furthermore, woodland is classified as high site where sustained wood production is likely, or low site where the continuous production of wood is unlikely.

Removals—The net volume of growing-stock trees removed from the inventory by harvesting, cultural operations, land clearings, or changes in land use.

Reserved forest land—Forest land withdrawn from tree utilization through statute or administrative designation.

Residues:

Coarse residues—Plant residues suitable for chipping, such as slabs, edgings, and ends.

Fine residues—Plant residues not suitable for chipping, such as sawdust, shavings, and veneer clippings.

Plant residues—Wood materials from primary manufacturing plants that are not used for any product.

Rotten trees—Live poletimber or sawtimber trees with more than 67 percent of their total volume cull (cubic-foot) and with more than half of the cull volume attributable to rotten or missing material.

Rough trees—Live poletimber or sawtimber trees with more than 67 percent of their total volume cull (cubic-foot) and with less than half of the cull volume attributable to rotten or missing material.

Roundwood—Logs, bolts, or other round sections cut from trees.

Salvable dead trees—Standing dead trees that are currently merchantable by regional standards.

Saplings—Live trees of timber species 1 to 4.9 inches d.b.h. or woodland species 1 to 2.9 inches d.r.c.

Sapling and seedling stands—Timberland stands at least 10 percent stocked on which more than half of the stocking is saplings or seedlings or both.

Sawlog portion—That part of the bole of sawtimber trees between a 1-foot stump and the sawlog top.

Sawlog top—The point on the bole of sawtimber trees above which a sawlog cannot be produced. The minimum sawlog top is 7 inches d.o.b. for softwoods and 9 inches d.o.b. for hardwoods.

- Sawtimber stands*—Stands at least 10 percent stocked with growing-stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.
- Sawtimber trees*—Live trees of timber species meeting regional size and defect specifications. Softwood trees must be at least 9 inches d.b.h. and hardwood trees 11 inches d.b.h.
- Sawtimber volume*—Net volume in board feet of the sawlog portion of live sawtimber trees.
- Seedlings*—Established live trees of timber species less than 1 inch d.b.h. or woodland species less than 1 inch d.r.c.
- Softwood trees*—Monocotyledonous trees, usually evergreen, having needle or scalelike leaves.
- Standard error*—An expression of the degree of confidence that can be placed on an estimated total or average obtained by statistical sampling methods. Standard errors do not include technique errors that could occur in photo classification of areas, field measurements, or compilation of data.
- Stand-size classes*—A classification of forest land based on the predominant size of trees present (see Sawtimber stands, Poletimber stands, and Sapling and seedling stands).
- State, county, and municipal lands*—Lands administered by States, counties, and local public agencies, or lands leased by these governmental units for more than 50 years.
- Stocking*—An expression of the extent to which growing space is effectively utilized by present or potential growing-stock trees of timber species.
- Stocking condition*—A categorization of timberland reflecting the degree to which the site is being utilized by growing-stock trees and other conditions affecting current and prospective timber growth (see Stocking):
- Overstocked—Areas at least 60 percent stocked with growing-stock trees, but overstocked with all live trees.
 - Fully stocked—Areas at least 60 percent stocked with growing-stock trees and not overstocked.
 - Medium to fully stocked—Areas 35 percent to 60 percent stocked with growing-stock trees. Includes areas where other trees or inhibiting vegetation or surface conditions prevent occupancy by growing-stock trees.
 - Poorly stocked—Areas less than 35 percent stocked with growing-stock trees.
 - Nonstocked—Forest land less than 10 percent stocked with growing-stock trees.
 - Mature—Stands of timber species over 100 years old.
- Timberland*—Forest land where timber species make up at least 10 percent stocking.
- Timber species*—Tree species traditionally used for industrial wood products. In the Rocky Mountain States, these include aspen and cottonwood hardwood species and all softwood species except pinyon and juniper.

Timber stand improvement—Treatments such as thinning, pruning, release cutting, girdling, weeding, or poisoning of unwanted trees aimed at improving growing conditions for the remaining trees.

Upper-stem portion—That part of the main stem or fork of sawtimber trees above the sawlog top to a minimum top diameter of 4 inches outside bark or to the point where the main stem or fork breaks into limbs.

Water—Streams, sloughs, estuaries, and canals more than 120 feet wide, and lakes, reservoirs, and ponds more than 1 acre in size at mean high water level.

Wilderness—An area of undeveloped land currently included in the Wilderness System, managed so as to preserve its natural conditions and retain its primeval character and influence.

Woodland—Forest land where timber species make up less than 10 percent stocking.

Woodland species—Tree species not usually converted into industrial wood products. Common uses are fuelwood, fenceposts, and Christmas trees.

REFERENCES

- Kemp, Paul D. 1958. Volume tables. Unpublished report on file at: U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Forest Survey Research Work Unit, Ogden, UT.
- Moisen, Gretchen G. 1990. Volume equations for timber species in western Montana and northern Idaho. Unpublished report on file at: U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Forest Survey Research Work Unit, Ogden, UT.

FOREST SURVEY TABLES

Table 1—Total area by ownership class and land class in west-central Montana, 1989

Ownership class	Land class						Total		
	Nonreserved			Reserved			Timberland	Woodland	Nonforest
	Timberland	Woodland	Nonforest	Total	Timberland	Woodland	Nonforest	Total	Total
----- Acres -----									
Land:									
Public:									
National Forest	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other public:									
Bureau of Land Management	196,768	145	171,803	368,716	—	—	—	196,768	145
National Parks ²	—	—	—	—	—	—	1,499	1,499	171,803
Miscellaneous Federal	2,633	32	31,605	34,270	—	—	—	—	1,499
State	114,987	573	549,109	664,669	819	273	1,637	2,633	31,605
County and municipal	—	—	—	—	—	—	—	115,806	846
Total other public	314,388	750	752,517	1,067,655	819	273	3,136	4,228	315,207
Total public	314,388	750	752,517	1,067,655	819	273	3,136	4,228	315,207
Private:									
Indian Trust	—	—	—	—	—	—	—	—	—
Forest Industry	100,392	32	18,419	118,843	—	—	—	100,392	32
Other private	866,208	10,737	5,566,443	6,443,388	—	—	—	866,208	10,737
Total private	966,600	10,769	5,584,862	6,562,231	—	—	—	966,600	10,769
Total land area	1,280,988	11,519	6,337,379	7,629,886	819	273	3,136	4,228	1,281,807
Total land and water ³	1,280,988	11,519	6,337,379	7,629,886	819	273	3,136	4,228	1,281,807
									11,792
									6,340,515
									10,906,207
									57,057

¹ Data not available for this report.

² Not included with miscellaneous Federal, a component of other public, for purpose of clarity. These lands are reserved and are included in tables 1, 2, and 4 only.

³ U.S. Department of Commerce, Bureau of Census 1980.

Table 2—Area of forest land outside National Forests with percent standard error in west-central Montana, 1989

Item	Acres	Percent standard error
Timberland	1,280,988	±3.1
Woodland	11,519	±71.2
Reserved forest land: ¹		
Timberland	819	
Woodland	273	
Total forest land ²	1,293,599	

¹Reserved land areas are estimated from aerial photos without field verification; therefore, standard errors are not calculated.

²On this and all following tables, totals may vary due to rounding.

Table 3—Net volume, net annual growth, and annual mortality of growing stock and sawtimber on timberland outside National Forests with percent standard error in west-central Montana

Item	All species	
	Volume	Percent standard error
Net volume, 1989:		
Growing stock (M cubic feet)	1,522,963	±6.3
Sawtimber ¹ (M board feet)	5,432,591	±7.5
Sawtimber ² (M board feet)	4,428,862	±7.7
Net annual growth, 1988:		
Growing stock (M cubic feet)	35,457	±9.3
Sawtimber ¹ (M board feet)	152,429	±9.3
Sawtimber ² (M board feet)	128,250	±9.1
Annual mortality, 1988:		
Growing stock (M cubic feet)	6,547	±23.7
Sawtimber ¹ (M board feet)	17,993	±26.9
Sawtimber ² (M board feet)	14,803	±26.5

¹International ¼-inch rule.

²Scribner rule.

Table 4—Total land area outside National Forests by major land class and owner group in west-central Montana, 1989

Land class	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
	----- Acres -----					
Timberland:						
Reserved	819	—	819	—	—	819
Nonreserved	114,987	199,401	314,388	100,392	866,208	1,280,988
Total	115,806	199,401	315,207	100,392	866,208	1,281,807
Woodland:						
Reserved	273	—	273	—	—	273
Nonreserved	573	177	750	32	10,737	11,519
Total	846	177	1,023	32	10,737	11,792
Total forest land:						
Reserved	1,092	—	1,092	—	—	1,092
Nonreserved	115,560	199,578	315,138	100,424	876,945	1,292,507
Total	116,652	199,578	316,230	100,424	876,945	1,293,599
Nonforest land	550,746	204,907	755,653	18,419	5,566,443	6,340,515
Total land area	667,398	404,485	1,071,883	118,843	6,443,388	7,634,114

TIMBERLAND TABLES

Area

Table 5—Area of timberland outside National Forests by forest type, stand-size class, and productivity class in west-central Montana, 1989

Forest type and stand-size class	Productivity class					Total acres
	120-164	85-119	50-84	20-49	0-19	
----- Acres -----						
Douglas-fir:						
Sawtimber	—	11,294	228,202	285,726	—	525,222
Poletimber	—	—	17,239	85,690	—	102,929
Sapling and seedling	—	—	16,531	93,780	—	110,311
Nonstocked	—	—	—	11,323	—	11,323
Total	—	11,294	261,972	476,519	—	749,785
Ponderosa pine:						
Sawtimber	8,513	—	44,712	121,077	—	174,302
Poletimber	—	—	—	39,157	—	39,157
Sapling and seedling	—	—	5,670	25,433	—	31,103
Nonstocked	—	—	5,624	—	—	5,624
Total	8,513	—	56,006	185,667	—	250,186
Lodgepole pine:						
Sawtimber	—	5,499	15,226	30,649	—	51,374
Poletimber	—	—	45,539	31,282	—	76,821
Sapling and seedling	—	—	5,086	12,211	—	17,297
Nonstocked	—	—	—	—	4,320	4,320
Total	—	5,499	65,851	74,142	4,320	149,812
Western larch:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	5,362	—	5,362
Nonstocked	—	—	—	—	—	—
Total	—	—	—	5,362	—	5,362
Limber pine:						
Sawtimber	—	—	—	10,997	—	10,997
Poletimber	—	—	—	14,750	3,479	18,229
Sapling and seedling	—	—	—	—	1,687	1,687
Nonstocked	—	—	—	—	—	—
Total	—	—	—	25,747	5,166	30,913
Spruce-fir:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	6,713	—	11,169	—	17,882
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	6,713	—	11,169	—	17,882
Engelmann spruce:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	5,362	—	—	5,362
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	5,362	—	—	5,362
Aspen:						
Sawtimber	—	5,362	16,633	—	—	21,995
Poletimber	—	—	12,057	11,123	—	23,180
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	5,362	28,690	11,123	—	45,175
Cottonwood ¹ :						
Sawtimber	—	—	12,584	13,927	—	26,511
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	12,584	13,927	—	26,511
All types:						
Sawtimber	8,513	22,155	317,357	462,376	—	810,401
Poletimber	—	6,713	80,197	193,171	3,479	283,560
Sapling and seedling	—	—	27,287	136,786	1,687	165,760
Nonstocked	—	—	5,624	11,323	4,320	21,267
Total	8,513	28,868	430,465	803,656	9,486	1,280,988

¹Includes paper birch.

Table 6—Area of other publicly owned timberland by forest type, stand-size class, and productivity class in west-central Montana, 1989

Forest type and stand-size class	Productivity class					Total acres
	120-164	85-119	50-84	20-49	0-19	
	----- Acres -----					
Douglas-fir:						
Sawtimber	—	—	59,052	56,149	—	115,201
Poletimber	—	—	11,556	16,806	—	28,362
Sapling and seedling	—	—	—	19,465	—	19,465
Nonstocked	—	—	—	6,237	—	6,237
Total	—	—	70,608	98,657	—	169,265
Ponderosa pine:						
Sawtimber	—	—	13,920	31,053	—	44,973
Poletimber	—	—	—	8,021	—	8,021
Sapling and seedling	—	—	—	8,640	—	8,640
Nonstocked	—	—	—	—	—	—
Total	—	—	13,920	47,714	—	61,634
Lodgepole pine:						
Sawtimber	—	—	6,713	19,663	—	26,376
Poletimber	—	—	13,426	17,270	—	30,696
Sapling and seedling	—	—	—	6,713	—	6,713
Nonstocked	—	—	—	—	4,320	4,320
Total	—	—	20,139	43,646	4,320	68,105
Western larch:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Limber pine:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	6,237	338	6,575
Sapling and seedling	—	—	—	—	331	331
Nonstocked	—	—	—	—	—	—
Total	—	—	—	6,237	669	6,906
Spruce-fir:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	6,713	—	—	—	6,713
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	6,713	—	—	—	6,713
Engelmann spruce:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Aspen:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	750	—	—	750
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	750	—	—	750
Cottonwood ¹ :						
Sawtimber	—	—	677	338	—	1,015
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	677	338	—	1,015
All types:						
Sawtimber	—	—	80,362	107,203	—	187,565
Poletimber	—	6,713	25,732	48,334	338	81,117
Sapling and seedling	—	—	—	34,818	331	35,149
Nonstocked	—	—	—	6,237	4,320	10,557
Total	—	6,713	106,094	196,592	4,989	314,388

¹Includes paper birch.

Table 7—Area of forest industry owned timberland by forest type, stand-size class, and productivity class in west-central Montana, 1989

Forest type and stand-size class	Productivity class					Total acres
	120-164	85-119	50-84	20-49	0-19	
----- Acres -----						
Douglas-fir:						
Sawtimber	—	5,670	16,366	11,247	—	33,283
Poletimber	—	—	18	5,865	—	5,883
Sapling and seedling	—	—	5,685	27,367	—	33,052
Nonstocked	—	—	—	14	—	14
Total	—	5,670	22,069	44,493	—	72,232
Ponderosa pine:						
Sawtimber	68	—	263	180	—	511
Poletimber	—	—	—	15	—	15
Sapling and seedling	—	—	5,670	5,685	—	11,355
Nonstocked	—	—	—	—	—	—
Total	68	—	5,933	5,880	—	11,881
Lodgepole pine:						
Sawtimber	—	15	68	—	—	83
Poletimber	—	—	10,159	82	—	10,241
Sapling and seedling	—	—	14	14	—	28
Nonstocked	—	—	—	—	—	—
Total	—	15	10,241	96	—	10,352
Western larch:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Limber pine:						
Sawtimber	—	—	—	29	—	29
Poletimber	—	—	—	68	—	68
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	97	—	97
Spruce-fir:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	5,685	—	5,685
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	5,685	—	5,685
Engelmann spruce:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Aspen:						
Sawtimber	—	—	98	—	—	98
Poletimber	—	—	18	15	—	33
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	116	15	—	131
Cottonwood ¹ :						
Sawtimber	—	—	—	14	—	14
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	14	—	14
All types:						
Sawtimber	68	5,685	16,795	11,470	—	34,018
Poletimber	—	—	10,195	11,730	—	21,925
Sapling and seedling	—	—	11,369	33,066	—	44,435
Nonstocked	—	—	—	14	—	14
Total	68	5,685	38,359	56,280	—	100,392

¹Includes paper birch.

Table 8—Area of nonindustrial private timberland by forest type, stand-size class, and productivity class in west-central Montana, 1989

Forest type and stand-size class	Productivity class					Total acres
	120-164	85-119	50-84	20-49	0-19	
	----- Acres -----					
Douglas-fir:						
Sawtimber	—	5,624	152,784	218,330	—	376,738
Poletimber	—	—	5,665	63,019	—	68,684
Sapling and seedling	—	—	10,846	46,948	—	57,794
Nonstocked	—	—	—	5,072	—	5,072
Total	—	5,624	169,295	333,369	—	508,288
Ponderosa pine:						
Sawtimber	8,445	—	30,529	89,844	—	128,818
Poletimber	—	—	—	31,121	—	31,121
Sapling and seedling	—	—	—	11,108	—	11,108
Nonstocked	—	—	5,624	—	—	5,624
Total	8,445	—	36,153	132,073	—	176,671
Lodgepole pine:						
Sawtimber	—	5,484	8,445	10,986	—	24,915
Poletimber	—	—	21,954	13,930	—	35,884
Sapling and seedling	—	—	5,072	5,484	—	10,556
Nonstocked	—	—	—	—	—	—
Total	—	5,484	35,471	30,400	—	71,355
Western larch:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	5,362	—	5,362
Nonstocked	—	—	—	—	—	—
Total	—	—	—	5,362	—	5,362
Limber pine:						
Sawtimber	—	—	—	10,968	—	10,968
Poletimber	—	—	—	8,445	3,141	11,586
Sapling and seedling	—	—	—	—	1,356	1,356
Nonstocked	—	—	—	—	—	—
Total	—	—	—	19,413	4,497	23,910
Spruce-fir:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	5,484	—	5,484
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	5,484	—	5,484
Engelmann spruce:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	5,362	—	—	5,362
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	5,362	—	—	5,362
Aspen:						
Sawtimber	—	5,362	16,535	—	—	21,897
Poletimber	—	—	11,289	11,108	—	22,397
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	5,362	27,824	11,108	—	44,294
Cottonwood ¹ :						
Sawtimber	—	—	11,907	13,575	—	25,482
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	11,907	13,575	—	25,482
All types:						
Sawtimber	8,445	16,470	220,200	343,703	—	588,818
Poletimber	—	—	44,270	133,107	3,141	180,518
Sapling and seedling	—	—	15,918	68,902	1,356	86,176
Nonstocked	—	—	5,624	5,072	—	10,696
Total	8,445	16,470	286,012	550,784	4,497	866,208

¹Includes paper birch.

Table 9—Area of timberland outside National Forests by stand volume and owner group in west-central Montana, 1989

Stand volume per acre ¹	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial private	
	State	Other				
	----- Acres -----					
Less than 1,500 board feet	24,774	67,851	92,625	50,791	256,648	400,064
1,500 to 4,999 board feet	51,144	72,862	124,006	22,624	369,266	515,896
5,000 to 9,999 board feet	14,054	20,742	34,796	15,186	150,936	200,918
10,000 board feet or more	25,015	37,946	62,961	11,791	89,358	164,110
All classes	114,987	199,401	314,388	100,392	866,208	1,280,988

¹International 1/4-inch rule.**Table 10**—Area of timberland outside National Forests by forest type and stocking condition in west-central Montana, 1989

Forest type	Stocking condition					Nonstocked	All classes
	Overstocked	Fully stocked	Medium to fully stocked	Poorly stocked	Mature		
	----- Acres -----						
Douglas-fir	8,640	89,059	229,351	203,165	208,247	11,323	749,785
Ponderosa pine	—	24,315	99,744	75,100	45,402	5,624	250,185
Lodgepole pine	29,055	47,904	37,885	—	30,649	4,320	149,813
Western larch	—	—	5,362	—	—	—	5,362
Limber pine	—	6,237	8,513	10,666	5,499	—	30,915
Spruce-fir	6,713	—	11,169	—	—	—	17,882
Engelmann spruce	—	—	5,362	—	—	—	5,362
Aspen	—	11,123	12,080	16,610	5,362	—	45,175
Cottonwood ¹	—	3,479	5,624	13,927	3,479	—	26,509
All types	44,408	182,117	415,090	319,468	298,638	21,267	1,280,988

¹Includes paper birch.

Table 11—Number of growing-stock trees on timberland outside National Forests by species and diameter class in west-central Montana, 1989

Species	Diameter class (Inches at breast height)															29.0+ classes
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9		
----- Thousand trees -----																
Douglas-fir	61,511	54,893	36,380	21,939	15,105	9,692	5,076	2,515	1,477	947	416	270	130	92	160	210,603
Ponderosa pine	11,571	19,681	6,647	6,776	4,129	2,729	1,746	1,162	757	409	129	201	79	87	61	56,164
Lodgepole pine	33,701	21,078	20,869	14,041	6,145	2,429	781	525	205	63	20	7	6	5	4	99,879
Whitebark pine	624	—	355	813	132	32	—	—	—	—	—	—	—	—	—	1,956
Limber pine	5,158	4,592	3,001	1,197	532	240	179	17	26	—	8	—	—	—	—	14,950
Western larch	—	567	110	—	217	27	—	8	13	33	5	—	16	—	—	996
Subalpine fir	12,432	2,564	2,381	927	319	109	73	34	—	12	—	—	—	—	—	18,851
Engelmann spruce	8,392	4,991	1,148	543	128	188	21	116	125	32	9	11	15	—	—	15,719
Total softwoods	133,389	108,366	70,891	46,236	26,707	15,446	7,876	4,377	2,603	1,496	587	489	246	184	225	419,118
Aspen	7,234	2,226	2,974	2,365	1,243	858	230	66	14	—	—	—	—	—	—	17,210
Cottonwood ¹	—	—	—	32	49	158	267	107	171	82	63	117	53	39	19	1,157
Total hardwoods	7,234	2,226	2,974	2,397	1,292	1,016	497	173	185	82	63	117	53	39	19	18,367
All species	140,623	110,592	73,865	48,633	27,999	16,462	8,373	4,550	2,788	1,578	650	606	299	223	244	437,485

¹Includes paper birch.

Table 12—Number of cull and salvable dead trees on timberland outside National Forests by owner group, and softwoods and hardwoods in west-central Montana, 1989

Owner group	Species group	Cull trees			Salvable dead trees	Total
		Rough	Rotten	Total		
----- Thousand trees -----						
Other public:						
State:	Softwoods	181	44	225	200	425
	Hardwoods	9	—	9	34	43
	Total	190	44	234	234	468
Other:	Softwoods	618	242	860	2,402	3,262
	Hardwoods	2	—	2	10	12
	Total	620	242	862	2,412	3,274
Total other public:	Softwoods	799	286	1,085	2,602	3,687
	Hardwoods	11	—	11	44	55
	Total	810	286	1,096	2,646	3,742
Forest industry:						
	Softwoods	354	8	362	349	711
	Hardwoods	(¹)	1	1	6	7
	Total	354	9	363	355	718
Nonindustrial private:						
	Softwoods	3,248	240	3,488	3,595	7,083
	Hardwoods	534	1,656	2,190	988	3,178
	Total	3,782	1,896	5,678	4,583	10,261
Total:						
	Softwoods	4,401	534	4,935	6,546	11,481
	Hardwoods	545	1,657	2,202	1,038	3,240
	Total	4,946	2,191	7,137	7,584	14,721

¹Less than 500 trees.

Volume

Table 13—Net volume of growing stock on timberland outside National Forests by forest type and stand-size class in west-central Montana, 1989

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
----- Thousand cubic feet -----					
Douglas-fir	685,756	116,212	16,840	204	819,012
Ponderosa pine	183,710	33,077	6,574	263	223,624
Lodgepole pine	149,044	184,774	9,533	—	343,351
Western larch	—	—	871	—	871
Limber pine	2,507	6,819	—	—	9,326
Spruce-fir	—	24,916	—	—	24,916
Engelmann spruce	—	5,480	—	—	5,480
Aspen	45,524	20,669	—	—	66,193
Cottonwood ¹	30,190	—	—	—	30,190
All types	1,096,731	391,947	33,818	467	1,522,963

¹Includes paper birch.

Table 14—Net volume of sawtimber (International ¼-inch rule) on timberland outside National Forests by forest type and stand-size class in west-central Montana, 1989

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, International ¼-inch rule -----					
Douglas-fir	2,929,439	178,750	66,088	—	3,174,277
Ponderosa pine	885,713	51,346	24,780	1,935	963,774
Lodgepole pine	611,847	246,460	35,447	—	893,754
Western larch	—	—	3,652	—	3,652
Limber pine	12,708	9,314	—	—	22,022
Spruce-fir	—	39,224	—	—	39,224
Engelmann spruce	—	12,877	—	—	12,877
Aspen	163,165	25,642	—	—	188,807
Cottonwood ¹	134,204	—	—	—	134,204
All types	4,737,076	563,613	129,967	1,935	5,432,591

¹Includes paper birch.

Table 15—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by forest type and stand-size class in west-central Montana, 1989

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, Scribner rule -----					
Douglas-fir	2,385,193	135,742	51,502	—	2,572,437
Ponderosa pine	708,166	34,071	19,089	1,652	762,978
Lodgepole pine	518,849	204,914	30,340	—	754,103
Western larch	—	—	2,983	—	2,983
Limber pine	9,511	6,721	—	—	16,232
Spruce-fir	—	32,522	—	—	32,522
Engelmann spruce	—	10,683	—	—	10,683
Aspen	139,179	20,794	—	—	159,973
Cottonwood ¹	116,951	—	—	—	116,951
All types	3,877,849	445,447	103,914	1,652	4,428,862

¹Includes paper birch.

Table 16—Net volume of growing stock on timberland outside National Forests by species and owner group in west-central Montana, 1989

Species	Owner group					Total
	Other public			Forest industry	NonIndustrial private	
	State	Other	Total other public			
----- Thousand cubic feet -----						
Douglas-fir	87,451	99,136	186,587	47,525	494,389	728,501
Ponderosa pine	41,673	19,070	60,743	3,155	173,918	237,816
Lodgepole pine	19,200	139,763	158,963	40,898	182,507	382,368
Whitebark pine	1,245	3,732	4,977	2	857	5,836
Limber pine	927	1,357	2,284	84	13,370	15,738
Western larch	1,683	2,542	4,225	3,582	381	8,188
Subalpine fir	—	9,532	9,532	3,238	8,806	21,576
Engelmann spruce	2,396	13,522	15,918	1	11,345	27,264
Total softwoods	154,575	288,654	443,229	98,485	885,573	1,427,287
Aspen	700	217	917	236	59,202	60,355
Cottonwood¹	1,179	2,163	3,342	17	31,962	35,321
Total hardwoods	1,879	2,380	4,259	253	91,164	95,676
All species	156,454	291,034	447,488	98,738	976,737	1,522,963

¹Includes paper birch.**Table 17—Net volume of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and owner group in west-central Montana, 1989**

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand board feet, International 1/4-inch rule -----						
Douglas-fir	325,913	383,209	709,122	215,613	1,854,729	2,779,464
Ponderosa pine	167,011	101,111	268,122	13,038	826,439	1,107,599
Lodgepole pine	62,170	345,877	408,047	73,884	527,069	1,009,000
Whitebark pine	693	2,079	2,772	6	2,285	5,063
Limber pine	3,685	5,187	8,872	247	40,921	50,040
Western larch	9,747	13,899	23,646	17,455	1,133	42,234
Subalpine fir	—	16,233	16,233	3,200	19,540	38,973
Engelmann spruce	11,585	48,373	59,958	5	50,956	110,919
Total softwoods	580,804	915,968	1,496,772	323,448	3,323,072	5,143,292
Aspen	941	291	1,232	502	123,625	125,359
Cottonwood ¹	5,477	10,865	16,342	79	147,519	163,940
Total hardwoods	6,418	11,156	17,574	581	271,144	289,299
All species	587,222	927,124	1,514,346	324,029	3,594,216	5,432,591

¹Includes paper birch.

Table 18—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by species and owner group in west-central Montana, 1989

Species	Owner group					Total
	Other public			Forest Industry	NonIndustrial private	
	State	Other	Total other public			
----- Thousand board feet, Scribner rule -----						
Douglas-fir	265,903	309,425	575,328	178,659	1,486,068	2,240,055
Ponderosa pine	131,571	81,589	213,160	10,399	661,762	885,321
Lodgepole pine	52,270	290,108	342,378	61,621	447,979	851,978
Whitebark pine	617	1,850	2,467	5	1,744	4,216
Limber pine	2,552	4,136	6,688	190	31,279	38,157
Western larch	8,469	12,265	20,734	13,890	816	35,440
Subalpine fir	—	13,329	13,329	2,610	15,807	31,746
Engelmann spruce	10,134	40,909	51,043	4	43,079	94,126
Total softwoods	471,516	753,611	1,225,127	267,378	2,688,534	4,181,039
Aspen	763	236	999	416	103,732	105,147
Cottonwood ¹	4,751	9,040	13,791	70	128,815	142,676
Total hardwoods	5,514	9,276	14,790	486	232,547	247,823
All species	477,030	762,887	1,239,917	267,864	2,921,081	4,428,862

¹Includes paper birch.

Table 19—Net volume of growing stock on timberland outside National Forests by species and diameter class in west-central Montana, 1989

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- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+			
----- Thousand cubic feet -----																
Douglas-fir	75,659	96,627	121,430	127,723	91,677	63,654	48,096	38,715	19,005	14,379	8,292	7,132	16,113	728,502		
Ponderosa pine	10,358	26,593	29,535	31,658	28,245	27,540	24,470	16,554	6,574	12,759	6,581	7,476	9,475	237,818		
Lodgepole pine	66,989	112,628	88,907	54,614	22,458	20,255	9,301	3,991	1,092	511	573	542	508	382,369		
Whitebark pine	967	3,578	923	368	—	—	—	—	—	—	—	—	—	5,836		
Limber pine	3,762	3,450	2,758	2,194	2,589	217	539	—	228	—	—	—	—	15,737		
Western larch	265	—	2,237	539	—	436	592	2,258	374	—	1,486	—	—	8,187		
Subalpine fir	8,121	5,306	2,995	1,979	1,374	1,159	—	641	—	—	—	—	—	21,575		
Engelmann spruce	3,558	2,973	1,521	2,819	331	4,363	5,908	2,294	726	1,021	1,750	—	—	27,264		
Total softwoods	169,679	251,155	250,306	221,894	146,674	117,624	88,906	64,453	27,999	28,670	18,682	15,150	26,096	1,427,288		
Aspen	8,169	13,629	14,444	15,465	6,058	2,161	428	—	—	—	—	—	—	60,354		
Cottonwood ¹	—	216	205	2,191	4,930	2,506	4,880	3,068	2,753	6,679	3,202	2,712	1,979	35,321		
Total hardwoods	8,169	13,845	14,649	17,656	10,988	4,667	5,308	3,068	2,753	6,679	3,202	2,712	1,979	95,675		
All species	177,848	265,000	264,955	239,550	157,662	122,291	94,214	67,521	30,752	35,349	21,884	17,862	28,075	1,522,963		

¹Includes paper birch.

Table 20—Net volume of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and diameter class in west-central Montana, 1989

Species	Diameter class (inches at breast height)												All classes
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+		
----- Thousand board feet, International 1/4-inch rule -----													
Douglas-fir	427,833	598,228	475,637	350,948	276,986	230,288	117,494	91,422	53,441	46,315	110,872	2,779,464	
Ponderosa pine	93,413	130,505	143,948	163,953	157,535	111,064	45,270	89,689	47,080	54,455	70,687	1,107,599	
Lodgepole pine	372,326	310,549	126,862	111,162	49,931	20,607	5,903	2,771	3,074	2,965	2,851	1,009,001	
Whitebark pine	2,772	2,291	—	—	—	—	—	—	—	—	—	5,063	
Limber pine	13,377	14,377	16,198	1,403	3,262	—	1,423	—	—	—	—	50,040	
Western larch	8,189	3,132	—	2,463	3,595	13,454	2,260	—	9,140	—	—	42,233	
Subalpine fir	12,037	10,374	7,142	6,077	—	3,343	—	—	—	—	—	38,973	
Engelmann spruce	8,179	15,210	1,755	23,353	31,195	12,045	3,813	5,497	9,872	—	—	110,919	
Total softwoods	938,126	1,084,666	771,542	659,359	522,504	390,801	176,163	189,379	122,607	103,735	184,410	5,143,292	
Aspen	XXXXX	80,715	31,482	11,038	2,124	—	—	—	—	—	—	125,359	
Cottonwood ¹	XXXXX	11,140	24,799	12,306	23,357	14,287	12,464	30,014	14,316	12,171	9,086	163,940	
Total hardwoods	XXXXX	91,855	56,281	23,344	25,481	14,287	12,464	30,014	14,316	12,171	9,086	289,299	
All species	938,126	1,176,521	827,823	682,703	547,985	405,088	188,627	219,393	136,923	115,906	193,496	5,432,591	

¹Includes paper birch.

Table 21—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class in west-central Montana, 1989

Species	Diameter class (Inches at breast height)												All classes
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+		
----- Thousand board feet, Scribner rule -----													
Douglas-fir	298,351	453,297	384,117	294,441	236,956	199,499	104,570	81,365	47,563	41,220	98,676	2,240,055	
Ponderosa pine	57,619	91,452	110,424	133,311	131,491	93,875	38,606	77,017	40,943	47,671	62,912	885,321	
Lodgepole pine	311,430	257,731	107,882	96,878	44,086	18,340	5,254	2,466	2,735	2,639	2,537	851,978	
Whitebark pine	2,467	1,749	—	—	—	—	—	—	—	—	—	4,216	
Limber pine	9,609	10,534	12,943	1,108	2,733	—	1,230	—	—	—	—	38,157	
Western larch	6,228	2,246	—	2,095	3,044	11,727	1,992	—	8,109	—	—	35,441	
Subalpine fir	9,274	8,435	5,844	5,245	—	2,948	—	—	—	—	—	31,746	
Engelmann spruce	6,156	11,951	1,391	19,992	26,999	10,564	3,393	4,893	8,786	—	—	94,125	
Total softwoods	701,134	837,395	622,601	553,070	445,309	336,953	155,045	165,741	108,136	91,530	164,125	4,181,039	
Aspen	XXXXX	66,596	27,040	9,657	1,854	—	—	—	—	—	—	105,147	
Cottonwood ¹	XXXXX	9,058	20,845	10,555	20,281	12,555	11,029	26,695	12,740	10,832	8,086	142,676	
Total hardwoods	XXXXX	75,654	47,885	20,212	22,135	12,555	11,029	26,695	12,740	10,832	8,086	247,823	
All species	701,134	913,049	670,486	573,282	467,444	349,508	166,074	192,436	120,876	102,362	172,211	4,428,862	

¹Includes paper birch.

Table 22—Net volume of timber on timberland outside National Forests by class of timber, and softwoods and hardwoods in west-central Montana, 1989

Class of timber	Softwoods	Hardwoods	Total
<i>----- Thousand cubic feet -----</i>			
Sawtimber trees:			
Sawlog portion	885,538	45,677	931,215
Upper-stem portion	120,915	13,334	134,249
Total	1,006,453	59,011	1,065,464
Poletimber trees	420,835	36,664	457,499
All growing-stock trees	1,427,288	95,675	1,522,963
Rough cull trees	24,686	3,416	28,102
Rotten cull trees	2,570	2,994	5,564
Salvable dead trees	24,526	4,673	29,199
All timber	1,479,070	106,758	1,585,828

Table 23—Net volume of growing stock on timberland outside National Forests by forest type and species in west-central Montana, 1989

Forest type	Species												
	Douglas-fir	Ponderosa pine	Lodgepole pine	Whitebark pine	Limber pine	Western larch	Subalpine fir	Engelmann spruce	Total softwoods	Aspen	Cottonwood ¹ hardwoods	Total All species	
----- Thousand cubic feet -----													
Douglas-fir	663,742	38,681	78,465	—	2,556	7,212	4,618	14,076	809,350	5,732	3,931	9,663	819,013
Ponderosa pine	23,476	193,351	551	—	5,498	—	—	—	222,876	274	474	748	223,624
Lodgepole pine	35,761	1,580	293,017	4,977	—	—	3,194	2,049	340,578	870	1,904	2,774	343,352
Western larch	—	—	—	—	—	381	—	—	381	489	—	489	870
Limber pine	1,643	—	—	—	7,683	—	—	—	9,326	—	—	—	9,326
Spruce-fir	849	—	2,839	859	—	594	12,977	6,798	24,916	—	—	—	24,916
Engelmann spruce	375	—	1,705	—	—	—	787	2,613	5,480	—	—	—	5,480
Aspen	2,438	4,205	5,792	—	—	—	—	1,728	14,163	52,030	—	52,030	66,193
Cottonwood ¹	218	—	—	—	—	—	—	—	218	960	29,011	29,971	30,189
All types	728,502	237,817	382,369	5,836	15,737	8,187	21,576	27,264	1,427,288	60,355	35,320	95,675	1,522,963

¹Includes paper birch.

Table 24—Net volume of sawtimber (International 1/4-inch rule) on timberland outside National Forests by forest type and species in west-central Montana, 1989

Forest type	Species												
	Douglas-fir	Ponderosa pine	Lodgepole pine	Whitebark pine	Limber pine	Western larch	Subalpine fir	Engelmann spruce	Total softwoods	Aspen	Cottonwood ¹	Total hardwoods	All species
----- Thousand board feet, International 1/4-inch rule -----													
Douglas-fir	2,580,521	198,109	241,877	—	7,756	37,430	13,943	70,930	3,150,566	5,323	18,389	23,712	3,174,278
Ponderosa pine	67,659	869,205	3,194	—	21,384	—	—	—	961,442	—	2,332	2,332	963,774
Lodgepole pine	109,117	10,150	743,080	2,772	—	—	12,909	6,064	884,092	—	9,661	9,661	893,753
Western larch	—	—	—	—	—	1,133	—	—	1,133	2,519	—	2,519	3,652
Limber pine	1,122	—	—	—	20,900	—	—	—	22,022	—	—	—	22,022
Spruce-fir	3,980	—	3,351	2,291	—	3,671	9,625	16,307	39,225	—	—	—	39,225
Engelmann spruce	1,990	—	—	—	—	—	2,497	8,389	12,876	—	—	—	12,876
Aspen	14,427	30,135	17,498	—	—	—	—	9,229	71,289	117,517	—	117,517	188,806
Cottonwood ¹	647	—	—	—	—	—	—	—	647	—	133,558	133,558	134,205
All types	2,779,463	1,107,599	1,009,000	5,063	50,040	42,234	38,974	110,919	5,143,292	125,359	163,940	289,299	5,432,591

¹Includes paper birch.

Table 25—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by forest type and species in west-central Montana, 1989

Forest type	Species												
	Douglas- fir	Ponderosa pine	Lodgepole pine	Whitebark pine	Limber pine	Western larch	Subalpine fir	Engelmann spruce	Total softwoods	Aspen	Cottonwood¹	Total hardwoods	All species
----- Thousand board feet, Scribner rule -----													
Douglas-fir	2,077,652	161,473	203,332	—	5,846	31,436	11,583	60,723	2,552,045	4,304	16,088	20,392	2,572,437
Ponderosa pine	52,512	689,050	2,636	—	16,752	—	—	—	760,950	—	2,029	2,029	762,979
Lodgepole pine	91,218	8,514	628,316	2,467	—	—	10,437	5,155	746,107	—	7,996	7,996	754,103
Western larch	—	—	—	—	—	816	—	—	816	2,166	—	2,166	2,982
Limber pine	673	—	—	—	15,559	—	—	—	16,232	—	—	—	16,232
Spruce-fir	3,542	—	2,571	1,749	—	3,188	7,731	13,741	32,522	—	—	—	32,522
Engelmann spruce	1,628	—	—	—	—	—	1,995	7,060	10,683	—	—	—	10,683
Aspen	12,442	26,284	15,124	—	—	—	—	7,446	61,296	98,677	—	98,677	159,973
Cottonwood¹	388	—	—	—	—	—	—	—	388	—	116,563	116,563	116,951
All types	2,240,055	885,321	851,979	4,216	38,157	35,440	31,746	94,125	4,181,039	105,147	142,676	247,823	4,428,862

¹Includes paper birch.

Growth

Table 26—Net annual growth of growing stock on timberland outside National Forests by species and owner group in west-central Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest Industry	NonIndustrial private	
	State	Other				
----- Thousand cubic feet -----						
Douglas-fir	1,926	2,781	4,707	885	14,223	19,815
Ponderosa pine	1,003	300	1,303	211	4,718	6,232
Lodgepole pine	585	1,777	2,362	819	3,366	6,547
Whitebark pine	38	115	153	(1)	23	176
Limber pine	16	-13	3	2	335	340
Western larch	19	37	56	38	6	100
Subalpine fir	—	1,425	1,425	484	89	1,998
Engelmann spruce	37	377	414	(1)	350	764
Total softwoods	3,624	6,799	10,423	2,439	23,110	35,972
Aspen	(2)	(2)	(2)	-34	-595	-629
Cottonwood ³	6	30	36	-2	80	114
Total hardwoods	6	30	36	-36	-515	-515
All species	3,630	6,829	10,459	2,403	22,595	35,457

¹Less than 500 cubic feet.

²Less than 500 cubic feet, negative.

³Includes paper birch.

Table 27—Net annual growth of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and owner group in west-central Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest Industry	NonIndustrial private	
	State	Other				
----- Thousand board feet, International 1/4-inch rule -----						
Douglas-fir	7,876	9,248	17,124	4,550	62,636	84,310
Ponderosa pine	6,804	1,560	8,364	918	25,625	34,907
Lodgepole pine	1,395	2,752	4,147	3,762	8,920	16,829
Whitebark pine	13	37	50	(1)	36	86
Limber pine	103	98	201	3	699	903
Western larch	110	153	263	94	1,133	1,490
Subalpine fir	—	98	98	1,040	18	1,156
Engelmann spruce	174	832	1,006	(1)	1,398	2,404
Total softwoods	16,475	14,778	31,253	10,367	100,465	142,085
Aspen	26	9	35	9	9,763	9,807
Cottonwood ²	26	145	171	—8	374	537
Total hardwoods	52	154	206	1	10,137	10,344
All species	16,527	14,932	31,459	10,368	110,602	152,429

¹Less than 500 board feet.

²Includes paper birch.

Table 28—Net annual growth of sawtimber (Scribner rule) on timberland outside National Forests by species and owner group in west-central Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial private	
	State	Other				
----- Thousand board feet, Scribner rule -----						
Douglas-fir	6,773	7,578	14,351	4,024	51,714	70,089
Ponderosa pine	5,357	1,443	6,800	801	20,717	28,318
Lodgepole pine	1,267	3,000	4,267	3,378	8,134	15,779
Whitebark pine	11	34	45	(¹)	34	79
Limber pine	73	90	163	3	617	783
Western larch	102	140	242	167	816	1,225
Subalpine fir	—	97	97	925	89	1,111
Engelmann spruce	156	750	906	(¹)	1,264	2,170
Total softwoods	13,739	13,132	26,871	9,298	83,385	119,554
Aspen	25	7	32	9	8,084	8,125
Cottonwood ²	25	135	160	—8	419	571
Total hardwoods	50	142	192	1	8,503	8,696
All species	13,789	13,274	27,063	9,299	91,888	128,250

¹Less than 500 board feet.

²Includes paper birch.

Table 29—Net annual growth of growing stock on timberland outside National Forests by species and diameter class in west-central Montana, 1988

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- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+			
----- Thousand cubic feet -----																
Douglas-fir	5,320	2,901	3,553	3,168	1,851	1,252	708	553	280	177	-79	83	50	19,817		
Ponderosa pine	636	1,109	955	1,029	619	669	445	235	103	227	23	97	86	6,233		
Lodgepole pine	3,287	1,693	709	227	232	281	106	44	-64	8	8	7	7	6,545		
Whitebark pine	32	120	17	7	—	—	—	—	—	—	—	—	—	176		
Limber pine	54	113	65	44	43	9	11	—	1	—	—	—	—	340		
Western larch	10	—	13	16	—	4	9	28	2	—	18	—	—	100		
Subalpine fir	1,834	151	-70	35	20	18	—	10	—	—	—	—	—	1,998		
Engelmann spruce	172	145	42	128	17	84	105	38	10	12	11	—	—	764		
Total softwoods	11,345	6,232	5,284	4,654	2,782	2,317	1,384	908	332	424	-19	187	143	35,973		
Aspen	-427	17	-87	70	-197	31	-36	—	—	—	—	—	—	-629		
Cottonwood ¹	—	5	-32	-6	85	-17	8	7	-70	52	15	37	29	113		
Total hardwoods	-427	22	-119	64	-112	14	-28	7	-70	52	15	37	29	-516		
All species	10,918	6,254	5,165	4,718	2,670	2,331	1,356	915	262	476	-4	224	172	35,457		

¹Includes paper birch.

Table 30—Net annual growth of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and diameter class in west-central Montana, 1988

Species	Diameter class (Inches at breast height)														All classes	
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+					
----- Thousand board feet, International 1/4-inch rule -----																
Douglas-fir	34,676	18,918	11,452	7,768	4,503	3,569	1,820	1,170	-428	546	315	84,309				
Ponderosa pine	8,409	6,842	5,184	5,164	3,369	1,819	778	1,712	199	791	640	34,907				
Lodgepole pine	12,998	866	1,150	1,327	490	205	-367	42	41	38	40	16,830				
Whitebark pine	50	37	—	—	—	—	—	—	—	—	—	87				
Limber pine	301	254	240	48	58	—	4	—	—	—	—	905				
Western larch	1,043	92	—	21	55	170	15	—	94	—	—	1,490				
Subalpine fir	710	189	109	93	—	54	—	—	—	—	—	1,155				
Engelmann spruce	237	702	92	430	535	196	51	85	75	—	—	2,403				
Total softwoods	58,424	27,900	18,227	14,851	9,010	6,013	2,301	3,009	-19	1,375	995	142,086				
Aspen	XXXXX	10,881	-1,042	149	-181	—	—	—	—	—	—	9,807				
Cottonwood ¹	XXXXX	-29	407	-106	-14	14	-337	226	64	169	142	536				
Total hardwoods	XXXXX	10,852	-635	43	-195	14	-337	226	64	169	142	10,343				
All species	58,424	38,752	17,592	14,894	8,815	6,027	1,964	3,235	45	1,544	1,137	152,429				

¹Includes paper birch.

Table 31—Net annual growth of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class in west-central Montana, 1988

Species	Diameter class (Inches at breast height)												All classes
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+		
----- Thousand board feet, Scribner rule -----													
Douglas-fir	25,319	16,988	10,402	7,012	4,086	3,237	1,620	1,041	-381	486	280	70,090	
Ponderosa pine	5,311	5,591	4,637	4,560	2,962	1,616	683	1,504	182	700	570	28,316	
Lodgepole pine	11,805	1,210	1,103	1,211	447	183	-325	38	36	34	35	15,777	
Whitebark pine	45	34	—	—	—	—	—	—	—	—	—	79	
Limber pine	225	234	222	44	53	—	3	—	—	—	—	781	
Western larch	812	86	—	19	51	158	14	—	85	—	—	1,225	
Subalpine fir	702	175	100	85	—	49	—	—	—	—	—	1,111	
Engelmann spruce	215	636	83	389	483	177	46	76	67	—	—	2,172	
Total softwoods	44,434	24,954	16,547	13,320	8,082	5,420	2,041	2,659	-11	1,220	885	119,551	
Aspen	XXXXX	8,973	-830	140	-157	—	—	—	—	—	—	8,126	
Cottonwood ¹	XXXXX	-5	377	-72	6	18	-297	203	64	152	127	573	
Total hardwoods	XXXXX	8,968	-453	68	-151	18	-297	203	64	152	127	8,699	
All species	44,434	33,922	16,094	13,388	7,931	5,438	1,744	2,862	53	1,372	1,012	128,250	

¹Includes paper birch.

Mortality

Table 32—Annual mortality of growing stock on timberland outside National Forests by species and owner group in west-central Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest Industry	Nonindustrial private	
	State	Other				
----- Thousand cubic feet -----						
Douglas-fir	148	—	148	225	443	816
Ponderosa pine	21	230	251	17	131	399
Lodgepole pine	—	1,844	1,844	187	499	2,530
Whitebark pine	—	—	—	—	—	—
Limber pine	19	57	76	—	—	76
Western larch	—	—	—	47	—	47
Subalpine fir	—	98	98	—	73	171
Engelmann spruce	—	—	—	(1)	—	(1)
Total softwoods	188	2,229	2,417	476	1,146	4,039
Aspen	20	6	26	39	1,985	2,050
Cottonwood ²	8	2	10	2	446	458
Total hardwoods	28	8	36	41	2,431	2,508
All species	216	2,237	2,453	517	3,577	6,547

¹Less than 500 cubic feet.

²Includes paper birch.

Table 33—Annual mortality of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and owner group in west-central Montana, 1988

Species	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial private	
	State	Other				
----- Thousand board feet, International 1/4-inch rule -----						
Douglas-fir	721	—	721	374	2,318	3,413
Ponderosa pine	69	998	1,067	—	699	1,766
Lodgepole pine	—	5,429	5,429	206	1,079	6,714
Whitebark pine	—	—	—	—	—	—
Limber pine	—	—	—	—	—	—
Western larch	—	—	—	264	—	264
Subalpine fir	—	286	286	1	360	647
Engelmann spruce	—	—	—	—	—	—
Total softwoods	790	6,713	7,503	845	4,456	12,804
Aspen	—	—	—	—	3,249	3,249
Cottonwood ¹	38	8	46	9	1,885	1,940
Total hardwoods	38	8	46	9	5,134	5,189
All species	828	6,721	7,549	854	9,590	17,993

¹Includes paper birch.

Table 34—Annual mortality of sawtimber (Scribner rule) on timberland outside National Forests by species and owner group in west-central Montana, 1988

Species	Owner group					Total
	Other public			Forest industry	NonIndustrial private	
	State	Other	Total other public			
----- Thousand board feet, Scribner rule -----						
Douglas-fir	642	—	642	333	1,953	2,928
Ponderosa pine	43	705	748	—	549	1,297
Lodgepole pine	—	4,387	4,387	183	924	5,494
Whitebark pine	—	—	—	—	—	—
Limber pine	—	—	—	—	—	—
Western larch	—	—	—	160	—	160
Subalpine fir	—	254	254	1	257	512
Engelmann spruce	—	—	—	—	—	—
Total softwoods	685	5,346	6,031	677	3,683	10,391
Aspen	—	—	—	—	2,723	2,723
Cottonwood ¹	33	7	40	8	1,641	1,689
Total hardwoods	33	7	40	8	4,364	4,412
All species	718	5,353	6,071	685	8,047	14,803

¹Includes paper birch.

Table 35—Annual mortality of growing stock on timberland outside National Forests by species and diameter class in west-central Montana, 1988

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	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+			
----- Thousand cubic feet -----																
Douglas-fir	97	142	25	—	137	—	77	65	—	—	179	—	93	815	—	—
Ponderosa pine	17	—	113	—	167	21	—	46	—	—	35	—	—	399	—	—
Lodgepole pine	449	641	815	479	72	—	—	—	74	—	—	—	—	2,530	—	—
Whitebark pine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Limber pine	76	—	—	—	—	—	—	—	—	—	—	—	—	76	—	—
Western larch	—	—	47	—	—	—	—	—	—	—	—	—	—	47	—	—
Subalpine fir	—	—	171	—	—	—	—	—	—	—	—	—	—	171	—	—
Engelmann spruce	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total softwoods	639	783	1,171	479	376	21	77	111	74	—	214	—	93	4,038	—	—
Aspen	660	369	394	283	305	—	40	—	—	—	—	—	—	2,051	—	—
Cottonwood ¹	—	—	46	36	—	78	83	25	116	30	44	—	—	458	—	—
Total hardwoods	660	369	440	319	305	78	123	25	116	30	44	—	—	2,509	—	—
All species	1,299	1,152	1,611	798	681	99	200	136	190	30	258	—	93	6,547	—	—

¹Includes paper birch.

Table 36—Annual mortality of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and diameter class in west-central Montana, 1988

Species	Diameter class (inches at breast height)												All classes	
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+			
----- Thousand board feet, International 1/4-inch rule -----														
Douglas-fir	92	—	722	—	447	402	—	—	1,086	—	665	3,414		
Ponderosa pine	337	—	791	87	—	296	—	—	254	—	—	1,765		
Lodgepole pine	2,938	2,921	435	—	—	—	420	—	—	—	—	6,714		
Whitebark pine	—	—	—	—	—	—	—	—	—	—	—	—		
Limber pine	—	—	—	—	—	—	—	—	—	—	—	—		
Western larch	264	—	—	—	—	—	—	—	—	—	—	264		
Subalpine fir	646	—	—	—	—	—	—	—	—	—	—	646		
Engelmann spruce	—	—	—	—	—	—	—	—	—	—	—	—		
Total softwoods	4,277	2,921	1,948	87	447	698	420	—	1,340	—	665	12,803		
Aspen	XXXXX	1,474	1,578	—	198	—	—	—	—	—	—	3,250		
Cottonwood ¹	XXXXX	183	—	379	398	115	530	135	200	—	—	1,940		
Total hardwoods	XXXXX	1,657	1,578	379	596	115	530	135	200	—	—	5,190		
All species	4,277	4,578	3,526	466	1,043	813	950	135	1,540	—	665	17,993		

¹Includes paper birch.

Table 37—Annual mortality of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class in west-central Montana, 1988

Species	Diameter class (Inches at breast height)												All classes	
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+			
----- Thousand board feet, Scribner rule -----														
Douglas-fir	55	—	589	—	380	345	—	—	967	—	592	2,928		
Ponderosa pine	202	—	577	58	—	242	—	—	218	—	—	1,297		
Lodgepole pine	2,483	2,278	360	—	—	—	373	—	—	—	—	5,494		
Whitebark pine	—	—	—	—	—	—	—	—	—	—	—	—		
Limber pine	—	—	—	—	—	—	—	—	—	—	—	—		
Western larch	160	—	—	—	—	—	—	—	—	—	—	160		
Subalpine fir	512	—	—	—	—	—	—	—	—	—	—	512		
Engelmann spruce	—	—	—	—	—	—	—	—	—	—	—	—		
Total softwoods	3,412	2,278	1,526	58	380	587	373	—	1,185	—	592	10,391		
Aspen	XXXXX	1,217	1,333	—	173	—	—	—	—	—	—	2,723		
Cottonwood ¹	XXXXX	147	—	324	349	101	471	119	178	—	—	1,689		
Total hardwoods	XXXXX	1,364	1,333	324	522	101	471	119	178	—	—	4,412		
All species	3,412	3,642	2,859	382	902	688	844	119	1,363	—	592	14,803		

¹Includes paper birch.

Table 38—Annual mortality of growing stock on timberland outside National Forests by species and cause of death in west-central Montana, 1988

Species	Cause of death								Total
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown¹	Logging	
----- Thousand cubic feet -----									
Douglas-fir	290	124	—	—	174	—	209	18	815
Ponderosa pine	75	—	167	—	46	—	94	17	399
Lodgepole pine	167	660	1,206	123	161	—	162	51	2,530
Whitebark pine	—	—	—	—	—	—	—	—	—
Limber pine	—	—	—	76	—	—	—	—	76
Western larch	—	—	—	—	47	—	—	—	47
Subalpine fir	—	—	—	—	—	—	171	—	171
Engelmann spruce	—	—	—	—	—	—	—	—	—
Total softwoods	532	784	1,373	199	428	—	636	86	4,038
Aspen	—	1,278	35	—	205	—	493	40	2,051
Cottonwood²	—	429	—	—	—	—	29	—	458
Total hardwoods	—	1,707	35	—	205	—	522	40	2,509
All species	532	2,491	1,408	199	633	—	1,158	126	6,547

¹Because many destructive agents often attack trees in concert or in succession, it is often difficult to identify the actual causal agent. When the primary cause of death cannot be precisely determined, it is listed as unknown.

²Includes paper birch.

Table 39—Annual mortality of sawtimber (International ¼-inch rule) on timberland outside National Forests by species and cause of death in west-central Montana, 1988

Species	Cause of death								Total
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown	Logging	
----- Thousand board feet, International 1/4-inch rule -----									
Douglas-fir	1,183	632	—	—	721	—	878	—	3,414
Ponderosa pine	385	—	657	—	240	—	483	—	1,765
Lodgepole pine	591	1,745	3,840	—	338	—	201	—	6,715
Whitebark pine	—	—	—	—	—	—	—	—	—
Limber pine	—	—	—	—	—	—	—	—	—
Western larch	—	—	—	—	263	—	—	—	263
Subalpine fir	—	—	—	—	—	—	646	—	646
Engelmann spruce	—	—	—	—	—	—	—	—	—
Total softwoods	2,159	2,377	4,497	—	1,562	—	2,208	—	12,803
Aspen	—	2,063	176	—	262	—	748	—	3,249
Cottonwood¹	—	1,798	—	—	—	—	143	—	1,941
Total hardwoods	—	3,861	176	—	262	—	891	—	5,190
All species	2,159	6,238	4,673	—	1,824	—	3,099	—	17,993

¹Includes paper birch.

Table 40—Annual mortality of sawtimber (Scribner rule) on timberland outside National Forests by species and cause of death in west-central Montana, 1988

Species	Cause of death								Total
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown	Logging	
	----- <i>Thousand board feet, Scribner rule</i> -----								
Douglas-fir	993	538	—	—	642	—	754	—	2,927
Ponderosa pine	296	—	446	—	184	—	372	—	1,298
Lodgepole pine	489	1,482	3,043	—	301	—	179	—	5,494
Whitebark pine	—	—	—	—	—	—	—	—	—
Limber pine	—	—	—	—	—	—	—	—	—
Western larch	—	—	—	—	160	—	—	—	160
Subalpine fir	—	—	—	—	—	—	512	—	512
Engelmann spruce	—	—	—	—	—	—	—	—	—
Total softwoods	1,778	2,020	3,489	—	1,287	—	1,817	—	10,391
Aspen	—	1,740	132	—	222	—	629	—	2,723
Cottonwood ¹	—	1,568	—	—	—	—	121	—	1,689
Total hardwoods	—	3,308	132	—	222	—	750	—	4,412
All species	1,778	5,328	3,621	—	1,509	—	2,567	—	14,803

¹Includes paper birch.

COUNTY TABLES

Table 41—Area of timberland outside National Forests by county in west-central Montana, 1989

County	Area
	<i>Acres</i>
Broadwater	56,416
Cascade	130,355
Jefferson	135,875
Judith Basin	32,663
Lewis and Clark	374,841
Meagher	170,679
Powell	356,587
Wheatland	23,572
Total	1,280,988

Table 42—Net volume of growing stock and sawtimber on timberland outside National Forests by county in west-central Montana, 1989

County	Growing stock	Sawtimber	
		<i>Thousand board feet International 1/4-inch rule</i>	<i>Thousand board feet Scribner rule</i>
	<i>Thousand cubic feet</i>		
Broadwater	53,388	243,728	204,215
Cascade	184,218	724,174	590,991
Jefferson	135,727	472,992	371,661
Judith Basin	45,161	174,912	142,677
Lewis and Clark	387,058	1,374,200	1,106,359
Meagher	185,650	547,145	442,712
Powell	508,948	1,808,362	1,497,750
Wheatland	22,813	87,078	72,497
Total	1,522,963	5,432,591	4,428,862

Table 43—Net annual growth of growing stock and sawtimber on timberland outside National Forests by county in west-central Montana, 1988

County	Growing stock	Sawtimber	
	<i>Thousand cubic feet</i>	<i>Thousand board feet International 1/4-inch rule</i>	<i>Thousand board feet Scribner rule</i>
Broadwater	1,087	7,113	6,242
Cascade	3,777	17,876	14,864
Jefferson	3,702	17,754	14,654
Judith Basin	939	4,422	3,657
Lewis and Clark	8,412	43,267	35,797
Meagher	4,438	12,322	10,650
Powell	12,778	48,497	41,405
Wheatland	324	1,178	981
Total	35,457	152,429	128,250

Table 44—Annual mortality of growing stock and sawtimber on timberland outside National Forests by county in west-central Montana, 1988

County	Growing stock	Sawtimber	
	<i>Thousand cubic feet</i>	<i>Thousand board feet International 1/4-inch rule</i>	<i>Thousand board feet Scribner rule</i>
Broadwater	197	223	173
Cascade	406	1,463	1,212
Jefferson	323	654	542
Judith Basin	117	352	292
Lewis and Clark	2,379	7,116	5,658
Meagher	346	723	573
Powell	2,648	6,986	5,939
Wheatland	131	476	414
Total	6,547	17,993	14,803

O'Brien, Renee A.; Collins, Dennis C. 1991. Forest statistics for land outside National Forests in west-central Montana, 1989. Resour Bull. INT-72. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 43 p.

Presents land area, timberland area, associated volume, and components of change for the forest lands outside the National Forests in west-central Montana.

KEYWORDS: forest survey, inventory, volume

2

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