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76706
United States
Department
of Agriculture

Forest Service

Intermountain
Research Station

Resource Bulletin
INT-71

April 1991

Forest Statistics for Land Outside National Forests in Eastern Montana, 1989

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RESEARCH SUMMARY

There are about 2.8 million acres of forest land outside the National Forests in eastern Montana, almost all of it timberland. Three-fourths of the forest land is privately owned. The estimated volume of wood on timberland is around 2 billion cubic feet. Net annual growth in 1988 was about 50 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.

ACKNOWLEDGMENTS

The Intermountain Research Station gratefully acknowledges the cooperation of the Montana Department of Lands, Forestry Division, the Bureaus of Land Management and Indian Affairs, U.S. Department of the Interior, and the Northern Region, Forest Service, U.S. Department of Agriculture. We extend a special note of thanks to Gary Brown, Montana State Forester, and his staff; and the private land owners who provided information and access to field sample locations.

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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 34 counties that compose eastern Montana contain 59.2 million acres. The majority of the land—77 percent—is privately owned with 8 percent in Indian ownership and none owned by forest industry. From the public sector, BLM administers 11 percent and National Forests administer 3 percent of the total land area (fig. 2).

Figure 2—Distribution of land by ownership in eastern Montana, 1989.

Of the 57 million acres of land outside National Forests in eastern Montana, only about 2.8 million—5 percent—meet minimum stocking requirements to be classified as forest land (fig. 3). Only 3 percent of the forest land is classified as woodland.

Almost ninety-six percent of the 2 million acres of timberland in private holdings is nonreserved, which means it is potentially available for harvesting. Of the 0.7 million acres of timberland administered by public agencies other than National Forest, 24 percent is reserved.

Stands in which ponderosa pine (*Pinus ponderosa*) predominates constitute almost three-fourths of the timberland area (fig. 4). Other forest types occurring include Douglas-fir, aspen, cottonwood, lodgepole pine, limber pine, spruce-fir, and Engelmann spruce.

Sawtimber stands occupy over half of the timberland area (fig. 5). About 18 percent of the timberland area is in the less mature poletimber category, with 16 percent and 11 percent in sapling/seedling and nonstocked, respectively.

Most of the timberland acres are capable of producing 20 cubic feet or more of wood fiber per acre on an annual basis. Only 2 percent of the area is capable of producing 85 cubic feet or more per acre per year.

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

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

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

Some 86 percent of the timberland acres supports stands containing less than 5,000 board feet per acre (fig. 6). Just over 45 percent of the timberland area contains less than 1,500 board feet per acre, while only 6 percent supports stands containing 10,000 or more board feet per acre.

Stand Composition and Volume

The timberlands of eastern Montana contain 585 million growing-stock trees. Of this, 84 percent are coniferous species, with aspen (*Populus tremuloides*) and cottonwood (*Populus* spp.) making up the remaining 16 percent. About 56 percent of the trees are less than 5.0 inches diameter at breast height (d.b.h.), and only 16 percent are sawtimber sized trees (fig. 7). Half the growing-stock trees are ponderosa pine. In addition to the growing-stock trees, timberland stands contain more than 10 million cull trees. There are another 18 million trees that are dead but still sufficiently sound to meet minimum merchantability standards.

Roughly 60 percent of the timberland acres are less than fully stocked, and another 10 percent, some 260,000 acres, are nonstocked (fig. 8). About 10 percent of the acres are at full stocking, and only 2 percent are overstocked. Mature stands, where trees in excess of 100 years old account for the majority of the stocking, occupy almost 406,000 acres, or 16 percent of the timberland area.

Timberland supports 2.0 billion cubic feet of growing stock, including 6.9 billion board feet (International ¼-inch rule) of sawtimber. The volume in rough and rotten cull trees and salvable dead trees adds an additional 112 million cubic feet to the timberland “woodpile.”

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

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

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

Sawtimber stands contain 86 percent of the board-foot volume on timberland. Poletimber and sapling/seedling stands account for 8 and 5 percent respectively. The average net volume per acre of growing stock on timberland is 822 cubic feet.

Over half of the growing-stock volume is found in six of the 34 counties: Fergus, Glacier, Big Horn, Rosebud, Musselshell, and Sweet Grass Counties. Private land contains 84 percent of the growing-stock and sawtimber volume.

Only 16 percent of the growing-stock volume is found in large sawtimber trees, those 17.0 inches d.b.h. and larger. Sawtimber trees under 17.0 inches d.b.h. account for almost 58 percent. The remaining 26 percent of the growing-stock volume is in poletimber size trees (fig. 9).

Ponderosa pine, Douglas-fir (*Pseudotsuga menziesii*), and lodgepole pine (*Pinus contorta*) account for 83 percent of the growing-stock volume and 88 percent of the sawtimber volume (fig. 10). Ponderosa pine alone accounts for about 1.2 billion cubic feet or 58 percent of the inventory. Subalpine fir, lodgepole pine, and aspen have over half their volume in poletimber stands.

Components of Change

Total growing-stock volume increased by an estimated 65.2 million cubic feet in 1988. That same year, however, some 16.6 million cubic feet were lost to mortality, resulting in a net change in growing-stock inventory of roughly 48.6 million cubic feet. Ponderosa pine accounted for nearly three quarters of the annual mortality (fig. 11) and lost nearly 10 million cubic feet to wildfire. This loss helped make fire the principal agent of destruction of eastern Montana's forest land. An additional 25 percent of all mortality was due to unknown causes.

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

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

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

The productive potential of the timberland acres in eastern Montana, which averages just 42 cubic feet per acre per year, is the lowest in the State. The poor productive capacity is primarily due to the region's dry climate. Actual gross production averaged 27 cubic feet per acre in 1988. After deducting for mortality, net growth averaged only 20 cubic feet per acre that year, less than half of potential.

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 231,988 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 9,038 field sample locations, of which 425 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 a $\frac{1}{10}$ -acre or a $\frac{1}{5}$ -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.

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

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).

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 inch 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 inch 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 eastern Montana, 1989

Ownership class	Nonreserved				Reserved				Total			
	Timberland	Woodland	Nonforest	Total	Timberland	Woodland	Nonforest	Total	Timberland	Woodland	Nonforest	Total
----- Acres -----												
Land:												
Public:												
National Forest	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other public:												
Bureau of Land Management	313,675	15,332	6,242,969	6,571,976	9,829	—	81,783	91,612	323,504	15,332	6,324,752	6,663,588
National Parks ²	—	—	—	—	153,308	7,369	242,126	402,803	153,308	7,369	242,126	402,803
Miscellaneous Federal	80,774	3,806	902,562	987,142	1,426	—	22,604	24,030	82,200	3,806	925,166	1,011,172
State	124,908	4,724	3,448,571	3,578,203	988	224	14,981	16,193	125,896	4,948	3,463,552	3,594,396
County and municipal	1,797	107	19,678	21,582	—	—	—	—	1,797	107	19,678	21,582
Total other public	521,154	23,969	10,613,780	11,158,903	165,551	7,593	361,494	534,638	686,705	31,562	10,975,274	11,693,541
Total public	521,154	23,969	10,613,780	11,158,903	165,551	7,593	361,494	534,638	686,705	31,562	10,975,274	13,535,081
Private:												
Indian Trust	327,399	1,747	3,945,963	4,275,109	81,811	12,766	221,598	316,175	409,210	14,513	4,167,561	4,591,284
Forest industry	—	—	—	—	—	—	—	—	—	—	—	—
Other private	1,596,853	34,117	39,090,067	40,721,037	988	—	37,859	38,847	1,597,841	34,117	39,127,926	40,759,884
Total private	1,924,252	35,864	43,036,030	44,996,146	82,799	12,766	259,457	355,022	2,007,051	48,630	43,295,487	45,351,168
Total land area	2,445,406	59,833	53,649,810	56,155,049	248,350	20,359	620,951	889,660	2,693,756	80,192	54,270,761	58,886,249
Water												340,099
Total land and water ³	2,445,406	59,833	53,649,810	56,155,049	248,350	20,359	620,951	889,660	2,693,756	80,192	54,270,761	59,226,348

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 eastern Montana, 1989

Item	Acres	Percent standard error
Timberland	2,445,406	±3.1
Woodland	59,832	±29.6
Reserved forest land: ¹		
Timberland	248,350	
Woodland	20,359	
Total forest land ²	2,773,947	

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 eastern Montana

Item	All species	
	Volume	Percent standard error
Net volume, 1989:		
Growing stock (M cubic feet)	2,011,142	±5.8
Sawtimber ¹ (M board feet)	6,932,140	±6.8
Sawtimber ² (M board feet)	5,727,356	±6.9
Net annual growth, 1988:		
Growing stock (M cubic feet)	48,616	±9.6
Sawtimber ¹ (M board feet)	211,030	±8.7
Sawtimber ² (M board feet)	169,258	±8.7
Annual mortality, 1988:		
Growing stock (M cubic feet)	16,600	±15.5
Sawtimber ¹ (M board feet)	44,055	±15.0
Sawtimber ² (M board feet)	36,070	±15.0

¹International ¼-inch rule.

²Scribner rule.

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

Land class	Owner group					Total
	Other public			Forest industry	NonIndustrial private	
	State	Other	Total other public			
	----- Acres -----					
Timberland:						
Reserved	988	164,563	165,551	—	82,799	248,350
Nonreserved	124,908	396,246	521,154	—	1,924,252	2,445,406
Total	125,896	560,809	686,705	—	2,007,051	2,693,756
Woodland:						
Reserved	224	7,369	7,593	—	12,766	20,359
Nonreserved	4,724	19,244	23,968	—	35,864	59,832
Total	4,948	26,613	31,561	—	48,630	80,191
Total forest land:						
Reserved	1,212	171,932	173,144	—	95,565	268,709
Nonreserved	129,632	415,490	545,122	—	1,960,116	2,505,238
Total	130,844	587,422	718,266	—	2,055,681	2,773,947
Nonforest land	3,463,552	7,511,723	10,975,275	—	43,295,487	54,270,762
Total land area	3,594,396	8,099,145	11,693,541	—	45,351,168	57,044,709

TIMBERLAND TABLES

Area

Table 5—Area of timberland outside National Forests by forest type, stand-size class, and productivity class in eastern 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	—	15,892	57,207	77,542	—	150,641
Poletimber	—	—	11,459	54,002	—	65,461
Sapling and seedling	—	—	—	10,385	—	10,385
Nonstocked	—	—	—	14,324	—	14,324
Total	—	15,892	68,666	156,253	—	240,811
Ponderosa pine:						
Sawtimber	—	5,685	209,216	849,964	—	1,064,865
Poletimber	—	—	5,685	195,820	5,869	207,374
Sapling and seedling	—	—	29,124	260,621	—	289,745
Nonstocked	—	—	—	222,844	6,242	229,086
Total	—	5,685	244,025	1,529,249	12,111	1,791,070
Lodgepole pine:						
Sawtimber	—	—	—	10,385	—	10,385
Poletimber	—	—	4,521	51,876	—	56,397
Sapling and seedling	—	—	—	5,774	—	5,774
Nonstocked	—	—	—	—	—	—
Total	—	—	4,521	68,035	—	72,556
Limber pine:						
Sawtimber	—	—	6,554	—	5,859	12,413
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	14,324	—	14,324
Nonstocked	—	—	—	4,409	—	4,409
Total	—	—	6,554	18,733	5,859	31,146
Spruce-fir:						
Sawtimber	—	—	—	5,715	—	5,715
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	5,716	—	5,716
Nonstocked	—	—	—	—	—	—
Total	—	—	—	11,431	—	11,431
Engelmann spruce:						
Sawtimber	—	—	12,270	—	—	12,270
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	12,270	—	—	12,270
Aspen:						
Sawtimber	—	—	5,685	5,685	—	11,370
Poletimber	—	—	29,941	51,975	5,716	87,632
Sapling and seedling	—	—	—	20,039	11,401	31,440
Nonstocked	—	—	—	6,242	—	6,242
Total	—	—	35,626	83,941	17,117	136,684
Cottonwood: ¹						
Sawtimber	—	23,117	24,041	41,628	5,690	94,476
Poletimber	—	11,931	14,509	5,716	—	32,156
Sapling and seedling	—	—	5,685	11,431	—	17,116
Nonstocked	—	—	5,690	—	—	5,690
Total	—	35,048	49,925	58,775	5,690	149,438
All types:						
Sawtimber	—	44,694	314,973	990,919	11,549	1,362,135
Poletimber	—	11,931	66,115	359,389	11,585	449,020
Sapling and seedling	—	—	34,809	328,290	11,401	374,500
Nonstocked	—	—	5,690	247,819	6,242	259,751
Total	—	56,625	421,587	1,926,417	40,777	2,445,406

¹Includes paper birch.

Table 6—Area of other publicly owned timberland by forest type, stand-size class, and productivity class in eastern 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	—	—	6,967	27,686	—	34,653
Poletimber	—	—	5,774	20,885	—	26,659
Sapling and seedling	—	—	—	4,669	—	4,669
Nonstocked	—	—	—	—	—	—
Total	—	—	12,741	53,240	—	65,981
Ponderosa pine:						
Sawtimber	—	—	23,157	216,537	—	239,694
Poletimber	—	—	—	64,366	—	64,366
Sapling and seedling	—	—	615	61,846	—	62,461
Nonstocked	—	—	—	35,832	1,220	37,052
Total	—	—	23,772	378,581	1,220	403,573
Lodgepole pine:						
Sawtimber	—	—	—	4,669	—	4,669
Poletimber	—	—	—	23,184	—	23,184
Sapling and seedling	—	—	—	5,774	—	5,774
Nonstocked	—	—	—	—	—	—
Total	—	—	—	33,627	—	33,627
Limber pine:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	732	—	732
Total	—	—	—	732	—	732
Spruce-fir:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Engelmann spruce:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Aspen:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	6,994	1,219	—	8,213
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	1,220	—	1,220
Total	—	—	6,994	2,439	—	9,433
Cottonwood: ¹						
Sawtimber	—	—	2,439	2,685	—	5,124
Poletimber	—	1,219	1,465	—	—	2,684
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	1,219	3,904	2,685	—	7,808
All types:						
Sawtimber	—	—	32,563	251,577	—	284,140
Poletimber	—	1,219	14,233	109,654	—	125,106
Sapling and seedling	—	—	615	72,289	—	72,904
Nonstocked	—	—	—	37,784	1,220	39,004
Total	—	1,219	47,411	471,304	1,220	521,154

¹Includes paper birch.

Table 7—Area of forest industry owned timberland by forest type, stand-size class, and productivity class in eastern Montana, 1989. (This table is presented to be consistent with reports on other Montana sample areas even though there is no forest industry owned timberland in eastern Montana)

Forest type and stand-size class	Productivity class					Total acres
	120-164	85-119	50-84	20-49	0-19	
	----- Acres -----					
Douglas-fir:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Ponderosa pine:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Lodgepole pine:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Limber pine:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Spruce-fir:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Engelmann spruce:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Aspen:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
Cottonwood: ¹						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—
All types:						
Sawtimber	—	—	—	—	—	—
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	—	—	—	—

¹Includes paper birch.

Table 8—Area of nonindustrial private timberland by forest type, stand-size class, and productivity class in eastern 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	—	15,892	50,240	49,856	—	115,988
Poletimber	—	—	5,685	33,117	—	38,802
Sapling and seedling	—	—	—	5,716	—	5,716
Nonstocked	—	—	—	14,324	—	14,324
Total	—	15,892	55,925	103,013	—	174,830
Ponderosa pine:						
Sawtimber	—	5,685	186,059	633,427	—	825,171
Poletimber	—	—	5,685	131,454	5,869	143,008
Sapling and seedling	—	—	28,509	198,775	—	227,284
Nonstocked	—	—	—	187,012	5,022	192,034
Total	—	5,685	220,253	1,150,668	10,891	1,387,497
Lodgepole pine:						
Sawtimber	—	—	—	5,716	—	5,716
Poletimber	—	—	4,521	28,692	—	33,213
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	4,521	34,408	—	38,929
Limber pine:						
Sawtimber	—	—	6,554	—	5,859	12,413
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	14,324	—	14,324
Nonstocked	—	—	—	3,677	—	3,677
Total	—	—	6,554	18,001	5,859	30,414
Spruce-fir:						
Sawtimber	—	—	—	5,715	—	5,715
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	5,716	—	5,716
Nonstocked	—	—	—	—	—	—
Total	—	—	—	11,431	—	11,431
Engelmann spruce:						
Sawtimber	—	—	12,270	—	—	12,270
Poletimber	—	—	—	—	—	—
Sapling and seedling	—	—	—	—	—	—
Nonstocked	—	—	—	—	—	—
Total	—	—	12,270	—	—	12,270
Aspen:						
Sawtimber	—	—	5,685	5,685	—	11,370
Poletimber	—	—	22,947	50,756	5,716	79,419
Sapling and seedling	—	—	—	20,039	11,401	31,440
Nonstocked	—	—	—	5,022	—	5,022
Total	—	—	28,632	81,502	17,117	127,251
Cottonwood: ¹						
Sawtimber	—	23,117	21,602	38,943	5,690	89,352
Poletimber	—	10,712	13,044	5,716	—	29,472
Sapling and seedling	—	—	5,685	11,431	—	17,116
Nonstocked	—	—	5,690	—	—	5,690
Total	—	33,829	46,021	56,090	5,690	141,630
All types:						
Sawtimber	—	44,694	282,410	739,342	11,549	1,077,995
Poletimber	—	10,712	51,882	249,735	11,585	323,914
Sapling and seedling	—	—	34,194	256,001	11,401	301,596
Nonstocked	—	—	5,690	210,035	5,022	220,747
Total	—	55,406	374,176	1,455,113	39,557	1,924,252

¹Includes paper birch.

Table 9—Area of timberland outside National Forests by stand volume and owner group in eastern 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	64,424	246,341	310,765	—	798,600	1,109,365
1,500 to 4,999 board feet	51,047	119,389	170,436	—	824,511	994,947
5,000 to 9,999 board feet	3,809	18,875	22,684	—	183,690	206,374
10,000 board feet or more	5,628	11,641	17,269	—	117,451	134,720
All classes	124,908	396,246	521,154	—	1,924,252	2,445,406

¹International ¼-inch rule.

Table 10—Area of timberland outside National Forests by forest type and stocking condition in eastern Montana, 1989

Forest type	Stocking conditlon						All classes
	Overstocked	Fully stocked	Medium to fully stocked	Poorly	Mature	Nonstocked	
		----- Acres -----					
Douglas-fir	25,143	39,738	60,268	37,217	64,122	14,324	240,812
Ponderosa pine	—	109,319	482,227	677,751	292,688	229,085	1,791,070
Lodgepole pine	10,237	16,128	35,807	—	10,384	—	72,556
Limber pine	—	—	6,554	20,182	—	4,410	31,146
Spruce-fir	—	—	5,716	—	5,715	—	11,431
Engelmann spruce	5,716	—	—	—	6,554	—	12,270
Aspen	11,957	52,377	60,424	—	5,685	6,241	136,684
Cottonwood ¹	—	5,690	29,007	88,301	20,750	5,689	149,437
All types	53,053	223,252	680,003	823,451	405,898	259,749	2,445,406

¹Includes paper birch.

Number of Trees

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

Species	Diameter class (inches at breast height)														All 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	29.0+	
----- Thousand trees -----																
Douglas-fir	33,923	15,399	14,684	11,038	7,781	4,027	2,510	1,320	769	287	269	118	60	26	53	92,264
Ponderosa pine	91,265	61,983	47,658	33,285	23,033	17,365	10,713	4,424	2,320	947	361	152	70	28	34	293,638
Lodgepole pine	13,906	21,919	12,906	8,579	3,090	1,386	533	53	40	11	—	—	—	—	—	62,423
Limber pine	5,454	3,190	3,371	857	917	260	114	56	—	37	—	—	—	—	—	14,256
Subalpine fir	8,993	4,169	1,409	863	258	194	22	18	—	—	—	—	—	—	—	15,926
Engelmann spruce	3,935	3,094	1,416	1,145	945	783	372	214	144	66	26	—	—	6	—	12,146
Total softwoods	157,476	109,754	81,444	55,767	36,024	24,015	14,264	6,085	3,273	1,348	656	270	130	60	87	490,653
Aspen	30,259	22,376	10,926	8,017	3,193	587	139	—	—	—	—	—	—	—	—	75,497
Cottonwood ¹	8,758	1,141	2,628	1,676	1,479	1,191	800	287	457	348	214	110	49	34	81	19,253
Total hardwoods	39,017	23,517	13,554	9,693	4,672	1,778	939	287	457	348	214	110	49	34	81	94,750
All species	196,493	133,271	94,998	65,460	40,696	25,793	15,203	6,372	3,730	1,696	870	380	179	94	168	585,403

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 eastern Montana, 1989

Owner group	Species group	Cull trees			Salvable dead trees	Total
		Rough	Rotten	Total		
----- Thousand trees -----						
Other public:						
State:	Softwood	354	2	356	715	1,071
	Hardwoods	16	39	55	6	61
	Total	370	41	411	721	1,132
Other:	Softwoods	1,116	3	1,119	1,333	2,452
	Hardwoods	33	74	107	53	160
	Total	1,149	77	1,226	1,386	2,612
Total other public:	Softwoods	1,470	5	1,475	2,048	3,523
	Hardwoods	49	113	162	59	221
	Total	1,519	118	1,637	2,107	3,744
Forest industry:						
	Softwoods	—	—	—	—	—
	Hardwoods	—	—	—	—	—
	Total	—	—	—	—	—
Nonindustrial private:						
	Softwoods	5,292	437	5,729	15,222	20,951
	Hardwoods	577	2,122	2,699	683	3,382
	Total	5,869	2,559	8,428	15,905	24,333
Total:						
	Softwoods	6,762	442	7,204	17,270	24,474
	Hardwoods	626	2,235	2,861	742	3,603
	Total	7,388	2,677	10,065	18,012	28,077

Volume

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

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/seedling	Nonstocked	
----- Thousand cubic feet -----					
Douglas-fir	315,402	62,721	—	1,560	379,683
Ponderosa pine	958,252	105,476	87,230	17,673	1,168,631
Lodgepole pine	29,657	89,481	215	—	119,353
Limber pine	10,611	—	1,609	—	12,220
Spruce-fir	25,346	—	1,493	—	26,839
Engelmann spruce	53,709	—	—	—	53,709
Aspen	14,386	111,361	6,201	—	131,948
Cottonwood ¹	91,978	20,264	6,215	302	118,759
All types	1,499,341	389,303	102,963	19,535	2,011,142

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 eastern Montana, 1989

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
	----- Thousand board feet, International 1/4-inch rule -----				
Douglas-fir	1,307,397	124,646	—	3,012	1,435,055
Ponderosa pine	3,755,340	212,722	328,270	67,776	4,364,108
Lodgepole pine	91,861	97,868	—	—	189,729
Limber pine	55,671	—	6,407	—	62,078
Spruce-fir	80,461	—	3,190	—	83,651
Engelmann spruce	217,743	—	—	—	217,743
Aspen	46,306	121,228	5,098	—	172,632
Cottonwood ¹	376,415	28,002	1,330	1,397	407,144
All types	5,931,194	584,466	344,295	72,185	6,932,140

¹Includes paper birch.

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

Forest type	Stand-size class				All classes
	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	
----- Thousand board feet, Scribner rule -----					
Douglas-fir	1,080,439	96,979	—	2,134	1,179,552
Ponderosa pine	3,110,456	169,320	273,586	55,951	3,609,313
Lodgepole pine	74,076	79,869	—	—	153,945
Limber pine	44,367	—	4,375	—	48,742
Spruce-fir	66,801	—	2,093	—	68,894
Engelmann spruce	179,511	—	—	—	179,511
Aspen	37,550	97,582	3,976	—	139,108
Cottonwood ¹	323,471	22,541	1,035	1,244	348,291
All types	4,916,671	466,291	285,065	59,329	5,727,356

¹Includes paper birch.

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

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand cubic feet -----						
Douglas-fir	34,171	60,736	94,907	—	251,245	346,152
Ponderosa pine	45,366	159,884	205,250	—	963,458	1,168,708
Lodgepole pine	11,073	20,056	31,129	—	132,801	163,930
Limber pine	587	922	1,509	—	20,679	22,188
Subalpine fir	—	—	—	—	17,701	17,701
Engelmann spruce	1,098	1,574	2,672	—	66,478	69,150
Total softwoods	92,295	243,172	335,467	—	1,452,362	1,787,829
Aspen	1,442	7,924	9,366	—	97,744	107,110
Cottonwood ¹	1,904	3,508	5,412	—	110,791	116,203
Total hardwoods	3,346	11,432	14,778	—	208,535	223,313
All species	95,641	254,604	350,245	—	1,660,897	2,011,142

¹Includes paper birch.

Table 17—Net volume of sawtimber (International ¼-inch rule) on timberland outside National Forests by species and owner group in eastern Montana, 1989

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand board feet, International ¼-inch rule -----						
Douglas-fir	140,923	233,435	374,358	—	944,635	1,318,993
Ponderosa pine	149,614	521,954	671,568	—	3,703,531	4,375,099
Lodgepole pine	22,173	31,552	53,725	—	327,957	381,682
Limber pine	1,680	2,942	4,622	—	64,783	69,405
Subalpine fir	—	—	—	—	31,926	31,926
Engelmann spruce	—	—	—	—	291,561	291,561
Total softwoods	314,390	789,883	1,104,273	—	5,364,393	6,468,666
Aspen	460	937	1,397	—	50,915	52,312
Cottonwood ¹	6,468	11,717	18,185	—	392,977	411,162
Total hardwoods	6,928	12,654	19,582	—	443,892	463,474
All species	321,318	802,537	1,123,855	—	5,808,285	6,932,140

¹Includes paper birch.

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

Species	Owner group					Total
	Other public			Forest industry	NonIndustrial private	
	State	Other	Total other public			
----- Thousand board feet, Scribner rule -----						
Douglas-fir	117,196	191,430	308,626	—	760,811	1,069,437
Ponderosa pine	122,188	425,636	547,824	—	3,078,416	3,626,240
Lodgepole pine	18,197	25,692	43,889	—	271,108	314,997
Limber pine	1,148	2,010	3,158	—	50,781	53,939
Subalpine fir	—	—	—	—	25,136	25,136
Engelmann spruce	—	—	—	—	244,116	244,116
Total softwoods	258,729	644,768	903,497	—	4,430,368	5,333,865
Aspen	370	753	1,123	—	40,673	41,796
Cottonwood ¹	5,586	10,131	15,717	—	335,978	351,695
Total hardwoods	5,956	10,884	16,840	—	376,651	393,491
All species	264,685	655,652	920,337	—	4,807,019	5,727,356

¹Includes paper birch.

Table 19—Net volume of growing stock on timberland outside National Forests by species and diameter class in eastern 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+	All		
----- Thousand cubic feet -----																
Douglas-fir	29,132	49,508	62,914	49,549	47,472	32,229	26,517	12,129	15,645	7,607	4,390	2,702	6,358	346,152		
Ponderosa pine	59,817	137,894	192,123	242,748	217,937	131,733	88,944	48,183	21,618	12,082	7,442	2,594	5,593	1,168,708		
Lodgepole pine	35,113	53,060	34,418	24,543	12,563	1,830	1,848	557	—	—	—	—	—	163,932		
Limber pine	6,000	3,376	6,186	2,275	1,882	1,169	—	1,299	—	—	—	—	—	22,187		
Subalpine fir	5,162	5,983	2,601	3,211	240	503	—	—	—	—	—	—	—	17,700		
Engelmann spruce	4,369	7,729	11,524	14,585	9,640	8,374	6,139	4,221	1,942	—	—	627	—	69,150		
Total softwoods	139,593	257,550	309,766	336,911	289,734	175,838	123,448	66,389	39,205	19,689	11,832	5,923	11,951	1,787,829		
Aspen	24,726	43,660	28,455	7,433	2,837	—	—	—	—	—	—	—	—	107,111		
Cottonwood¹	6,753	9,612	13,954	15,257	12,922	6,611	13,646	10,610	8,021	5,837	3,333	2,353	7,293	116,202		
Total hardwoods	31,479	53,272	42,409	22,690	15,759	6,611	13,646	10,610	8,021	5,837	3,333	2,353	7,293	223,313		
All species	171,072	310,822	352,175	359,601	305,493	182,449	137,094	76,999	47,226	25,526	15,165	8,276	19,244	2,011,142		

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 eastern 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	214,706	230,681	244,745	177,316	151,808	71,878	93,428	46,611	27,718	16,464	43,638	1,318,993	
Ponderosa pine	600,758	967,523	1,030,431	695,649	497,536	282,616	129,034	73,922	46,301	15,946	35,383	4,375,099	
Lodgepole pine	141,468	144,201	72,884	10,224	9,922	2,983	—	—	—	—	—	381,682	
Limber pine	28,643	14,839	11,525	7,015	—	7,383	—	—	—	—	—	69,405	
Subalpine fir	11,483	16,650	1,156	2,637	—	—	—	—	—	—	—	31,926	
Engelmann spruce	46,794	79,544	52,258	44,627	32,415	22,177	10,183	—	—	3,562	—	291,560	
Total softwoods	1,043,852	1,453,438	1,412,999	937,468	691,681	387,037	232,645	120,533	74,019	35,972	79,021	6,468,665	
Aspen	XXXXX	37,693	14,619	—	—	—	—	—	—	—	—	52,312	
Cottonwood ¹	XXXXX	77,613	65,088	32,615	65,174	49,231	36,381	26,245	14,975	10,573	33,268	411,163	
Total hardwoods	XXXXX	115,306	79,707	32,615	65,174	49,231	36,381	26,245	14,975	10,573	33,268	463,475	
All species	1,043,852	1,568,744	1,492,706	970,083	756,855	436,268	269,026	146,778	88,994	46,545	112,289	6,932,140	

¹Includes paper birch.

Table 21—Net volume of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class in eastern 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	154,369	172,866	198,527	148,341	130,201	62,338	83,151	41,484	24,669	14,653	38,839	1,069,438	
Ponderosa pine	440,662	821,918	866,099	574,727	413,408	243,610	113,272	65,656	41,208	14,188	31,491	3,626,239	
Lodgepole pine	116,828	116,823	61,062	8,833	8,798	2,653	—	—	—	—	—	314,997	
Limber pine	21,535	10,754	9,349	5,852	—	6,449	—	—	—	—	—	53,939	
Subalpine fir	8,665	13,374	851	2,246	—	—	—	—	—	—	—	25,136	
Engelmann spruce	38,266	64,324	43,665	38,292	27,944	19,392	9,062	—	—	3,171	—	244,116	
Total softwoods	780,325	1,200,059	1,179,553	778,291	580,351	334,442	205,485	107,140	65,877	32,012	70,330	5,333,865	
Aspen	XXXXX	29,509	12,287	—	—	—	—	—	—	—	—	41,796	
Cottonwood ¹	XXXXX	62,378	54,028	27,933	56,717	42,964	32,030	23,323	13,328	9,403	29,591	351,695	
Total hardwoods	XXXXX	91,887	66,315	27,933	56,717	42,964	32,030	23,323	13,328	9,403	29,591	393,491	
All species	780,325	1,291,946	1,245,868	806,224	637,068	377,406	237,515	130,463	79,205	41,415	99,921	5,727,356	

¹Includes paper birch.

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

Class of timber	Softwoods	Hardwoods	Total
<i>----- Thousand cubic feet -----</i>			
Sawtimber trees:			
Sawlog portion	1,187,497	74,784	1,262,281
Upper-stem portion	203,188	21,369	224,557
Total	1,390,685	96,153	1,486,838
Poletimber trees	397,144	127,160	524,304
All growing-stock trees	1,787,829	223,313	2,011,142
Rough cull trees	25,043	3,084	28,127
Rotten cull trees	1,805	4,407	6,212
Salvable dead trees	74,933	2,540	77,473
All timber	1,889,610	233,344	2,122,954

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

Forest type	Species									Total hardwoods species	
	Douglas- fir	Ponderosa pine	Lodgepole pine	Umber pine	Subalpine fir	Engelmann spruce	Total softwoods	Aspen	Cottonwood ¹		
----- Thousand cubic feet -----											
Douglas-fir	282,265	29,954	36,137	3,781	5,172	22,374	379,683	—	—	—	379,683
Ponderosa pine	31,427	1,132,926	917	1,265	—	441	1,166,976	844	812	1,656	1,168,632
Lodgepole pine	3,995	—	105,991	533	3,631	4,918	119,068	285	—	285	119,353
Limber pine	3,277	—	491	8,060	—	—	11,828	392	—	392	12,220
Spruce-fir	—	—	13,080	237	5,845	7,677	26,839	—	—	—	26,839
Engelmann spruce	9,224	—	3,967	7,301	1,531	31,686	53,709	—	—	—	53,709
Aspen	15,477	5,827	3,347	1,012	1,522	2,053	29,238	102,386	322	102,708	131,946
Cottonwood ¹	487	—	—	—	—	—	487	3,204	115,069	118,273	118,760
All types	346,152	1,168,707	163,930	22,189	17,701	69,149	1,787,828	107,111	116,203	223,314	2,011,142

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 eastern Montana, 1989

Forest type	Species										
	Douglas- fir	Ponderosa pine	Lodgepole pine	Limber pine	Subalpine fir	Engelmann spruce	Total softwoods	Aspen	Cottonwood¹	Total hardwoods	All species
----- Thousand board feet, International ¼-inch rule -----											
Douglas-fir	1,064,978	118,851	144,653	8,596	20,082	77,894	1,435,054	—	—	—	1,435,054
Ponderosa pine	127,400	4,225,089	2,647	4,954	—	—	4,360,090	—	4,019	4,019	4,364,109
Lodgepole pine	12,767	—	149,650	1,120	4,118	22,073	189,728	—	—	—	189,728
Limber pine	17,950	—	3,016	41,112	—	—	62,078	—	—	—	62,078
Spruce-fir	—	—	40,702	—	5,089	37,860	83,651	—	—	—	83,651
Engelmann spruce	36,107	—	22,911	12,068	2,637	144,021	217,744	—	—	—	217,744
Aspen	59,792	31,159	18,103	1,554	—	9,712	120,320	52,312	—	52,312	172,632
Cottonwood¹	—	—	—	—	—	—	—	—	407,144	407,144	407,144
All types	1,318,994	4,375,099	381,682	69,404	31,926	291,560	6,468,665	52,312	411,163	463,475	6,932,140

¹Includes paper birch.

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

Forest type	Species							
	Douglas- fir	Ponderosa pine	Lodgepole pine	Limber pine	Subalpine fir	Engelmann spruce	Total softwoods	Total hardwoods
	----- Thousand board feet, Scribner rule -----							
Douglas-fir	867,687	100,853	121,568	6,827	16,144	66,472	1,179,551	—
Ponderosa pine	101,777	3,498,720	2,049	3,363	—	—	3,605,909	—
Lodgepole pine	9,542	—	121,703	997	2,962	18,740	153,944	—
Limber pine	14,956	—	2,286	31,501	—	—	48,743	—
Spruce-fir	—	—	33,805	—	3,784	31,305	68,894	—
Engelmann spruce	28,916	—	18,716	9,868	2,246	119,766	179,512	—
Aspen	46,560	26,667	14,870	1,383	—	7,832	97,312	41,796
Cottonwood ¹	—	—	—	—	—	—	—	348,290
All types	1,069,438	3,626,240	314,997	53,939	25,136	244,115	5,333,865	393,491
								5,727,356

¹Includes paper birch.

Growth

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

Species	Owner group					Total
	Other public			Forest industry	Nonindustrial private	
	State	Other	Total other public			
----- Thousand cubic feet -----						
Douglas-fir	398	1,128	1,526	—	6,036	7,562
Ponderosa pine	1,318	4,772	6,090	—	21,433	27,523
Lodgepole pine	423	787	1,210	—	2,486	3,696
Limber pine	11	17	28	—	188	216
Subalpine fir	—	—	—	—	1,248	1,248
Engelmann spruce	199	286	485	—	1,106	1,591
Total softwoods	2,349	6,990	9,339	—	32,497	41,836
Aspen	122	913	1,035	—	3,178	4,213
Cottonwood ¹	45	86	131	—	2,436	2,567
Total hardwoods	167	999	1,166	—	5,614	6,780
All species	2,516	7,989	10,505	—	38,111	48,616

¹Includes 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 eastern Montana, 1988

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	2,905	5,131	8,036	—	33,554	41,590
Ponderosa pine	5,076	16,994	22,070	—	117,356	139,426
Lodgepole pine	514	819	1,333	—	9,441	10,774
Limber pine	29	56	85	—	1,109	1,194
Subalpine fir	—	—	—	—	514	514
Engelmann spruce	—	—	—	—	4,470	4,470
Total softwoods	8,524	23,000	31,524	—	166,444	197,968
Aspen	-33	-66	-99	—	-277	-376
Cottonwood ¹	196	404	600	—	12,838	13,438
Total hardwoods	163	338	501	—	12,561	13,062
All species	8,687	23,338	32,025	—	179,005	211,030

¹Includes paper birch.

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

Species	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial private	
	State	Other				
----- Thousand board feet, Scribner rule -----						
Douglas-fir	2,184	3,879	6,063	—	27,161	33,224
Ponderosa pine	3,813	12,764	16,577	—	92,682	109,259
Lodgepole pine	468	745	1,213	—	8,833	10,046
Limber pine	21	44	65	—	985	1,050
Subalpine fir	—	—	—	—	457	457
Engelmann spruce	—	—	—	—	4,041	4,041
Total softwoods	6,486	17,432	23,918	—	134,159	158,077
Aspen	-26	-52	-78	—	-156	-234
Cottonwood ¹	163	335	498	—	10,917	11,415
Total hardwoods	137	283	420	—	10,761	11,181
All species	6,623	17,715	24,338	—	144,920	169,258

¹Includes paper birch.

Table 29—Net annual growth of growing stock on timberland outside National Forests by species and diameter class in eastern 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+ classes
----- Thousand cubic feet -----													
Douglas-fir	1,869	1,066	1,405	1,036	880	517	402	148	121	49	17	8	46
Ponderosa pine	5,860	4,055	4,282	5,445	4,222	1,896	1,151	449	268	-26	-82	-37	40
Lodgepole pine	2,740	532	269	-46	152	26	12	11	—	—	—	—	—
Limber pine	34	-35	79	53	38	22	—	25	—	—	—	—	—
Subalpine fir	1,279	-133	48	37	10	6	—	—	—	—	—	—	—
Engelmann spruce	539	155	194	288	150	153	103	61	-58	—	—	5	—
Total softwoods	12,321	5,640	6,277	6,813	5,452	2,620	1,668	694	331	23	-65	-24	86
Aspen	2,983	778	533	-40	38	—	-79	—	—	—	—	—	—
Coltonwood ¹	421	487	614	315	154	-17	238	143	117	50	4	38	3
Total hardwoods	3,404	1,265	1,147	275	192	-17	159	143	117	50	4	38	3
All species	15,725	6,905	7,424	7,088	5,644	2,603	1,827	837	448	73	-61	14	89

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 eastern 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	21,468	6,430	5,361	3,287	2,545	944	776	315	107	52	305	41,590	
Ponderosa pine	49,073	35,209	28,410	13,783	8,403	3,316	1,777	-89	-493	-223	260	139,426	
Lodgepole pine	10,134	-405	810	128	55	52	—	—	—	—	—	10,774	
Limber pine	435	304	208	120	—	128	—	—	—	—	—	1,195	
Subalpine fir	224	205	55	30	—	—	—	—	—	—	—	514	
Engelmann spruce	755	1,573	793	780	524	311	-300	—	—	34	—	4,470	
Total softwoods	82,089	43,316	35,637	18,128	11,527	4,751	2,253	226	-386	-137	565	197,969	
Aspen	XXXXX	-183	189	—	-383	—	—	—	—	—	—	-377	
Cottonwood ¹	XXXXX	10,327	735	-131	990	581	480	215	23	178	40	13,438	
Total hardwoods	XXXXX	10,144	924	-131	607	581	480	215	23	178	40	13,061	
All species	82,089	53,460	36,561	17,997	12,134	5,332	2,733	441	-363	41	605	211,030	

¹Includes paper birch.

Table 31—Net annual growth of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class in eastern 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	15,010	5,836	4,843	3,003	2,297	852	690	280	95	46	272	33,224	
Ponderosa pine	33,309	28,856	23,026	11,649	7,821	3,375	1,688	-63	-439	-194	231	109,259	
Lodgepole pine	9,196	-115	748	118	51	48	—	—	—	—	—	10,046	
Limber pine	353	275	193	111	—	117	—	—	—	—	—	1,049	
Subalpine fir	190	189	51	27	—	—	—	—	—	—	—	457	
Engelmann spruce	678	1,424	718	705	473	280	-267	—	—	30	—	4,041	
Total softwoods	58,736	36,465	29,579	15,613	10,642	4,672	2,111	217	-344	-118	503	158,076	
Aspen	XXXXX	-80	177	—	-330	—	—	—	—	—	—	-233	
Cottonwood ¹	XXXXX	8,495	719	-81	910	531	433	193	21	159	35	11,415	
Total hardwoods	XXXXX	8,415	896	-81	580	531	433	193	21	159	35	11,182	
All species	58,736	44,880	30,475	15,532	11,222	5,203	2,544	410	-323	41	538	169,258	

¹Includes paper birch.

Mortality

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

Species	Owner group					Total
	Other public		Total other public	Forest industry	Nonindustrial prlvate	
	State	Other				
----- Thousand cubic feet -----						
Douglas-fir	171	303	474	—	406	880
Ponderosa pine	272	994	1,266	—	10,872	12,138
Lodgepole pine	79	104	183	—	1,366	1,549
Limber pine	—	—	—	—	276	276
Subalpine fir	—	—	—	—	237	237
Engelmann spruce	—	—	—	—	83	83
Total softwoods	522	1,401	1,923	—	13,240	15,163
Aspen	8	16	24	—	928	952
Cottonwood ¹	6	8	14	—	471	485
Total hardwoods	14	24	38	—	1,399	1,437
All species	536	1,425	1,961	—	14,639	16,600

¹Includes paper birch.

Table 33—Annual mortality of sawtimber (International 1/4-inch rule) on timberland outside National Forests by species and owner group in eastern 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	318	512	830	—	724	1,554
Ponderosa pine	1,039	3,742	4,781	—	29,961	34,742
Lodgepole pine	—	—	—	—	3,917	3,917
Limber pine	—	—	—	—	156	156
Subalpine fir	—	—	—	—	—	—
Engelmann spruce	—	—	—	—	435	435
Total softwoods	1,357	4,254	5,611	—	35,193	40,804
Aspen	39	79	118	—	801	919
Cottonwood ¹	29	42	71	—	2,261	2,332
Total hardwoods	68	121	189	—	3,062	3,251
All species	1,425	4,375	5,800	—	38,255	44,055

¹Includes paper birch.

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

Species	Owner group					Total
	Other public		Total other public	Forest Industry	Nonindustrial private	
	State	Other				
----- Thousand board feet, Scribner rule -----						
Douglas-fir	214	354	568	—	532	1,100
Ponderosa pine	874	3,129	4,003	—	24,571	28,574
Lodgepole pine	—	—	—	—	3,161	3,161
Limber pine	—	—	—	—	139	139
Subalpine fir	—	—	—	—	—	—
Engelmann spruce	—	—	—	—	387	387
Total softwoods	1,088	3,483	4,571	—	28,790	33,361
Aspen	31	64	95	—	648	743
Cottonwood ¹	25	34	59	—	1,907	1,966
Total hardwoods	56	98	154	—	2,555	2,709
All species	1,144	3,581	4,725	—	31,345	36,070

¹Includes paper birch.

Table 35—Annual mortality of growing stock on timberland outside National Forests by species and diameter class in eastern 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	134	369	161	134	10	72	—	—	—	—	—	—	—
Ponderosa pine	1,060	2,750	2,788	2,002	1,437	864	528	324	—	155	162	68	—
Lodgepole pine	297	525	325	403	—	—	—	—	—	—	—	—	—
Limber pine	127	97	52	—	—	—	—	—	—	—	—	—	—
Subalpine fir	—	237	—	—	—	—	—	—	—	—	—	—	—
Engelmann spruce	—	—	—	—	—	—	—	—	83	—	—	—	—
Total softwoods	1,618	3,978	3,326	2,539	1,447	936	528	324	83	155	162	68	—
Aspen	436	236	95	106	—	—	79	—	—	—	—	—	—
Cottonwood ¹	—	—	—	102	98	110	—	—	—	35	54	—	85
Total hardwoods	436	236	95	208	98	110	79	—	—	35	54	—	85
All species	2,054	4,214	3,421	2,747	1,545	1,046	607	324	83	190	216	68	85

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 eastern 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	533	602	28	392	—	—	—	—	—	—	—	—	1,555
Ponderosa pine	8,521	7,886	6,814	4,376	2,911	1,854	—	937	1,015	427	—	—	34,741
Lodgepole pine	1,567	2,350	—	—	—	—	—	—	—	—	—	—	3,917
Limber pine	156	—	—	—	—	—	—	—	—	—	—	—	156
Subalpine fir	—	—	—	—	—	—	—	—	—	—	—	—	—
Engelmann spruce	—	—	—	—	—	—	435	—	—	—	—	—	435
Total softwoods	10,777	10,838	6,842	4,768	2,911	1,854	435	937	1,015	427	—	—	40,804
Aspen	XXXXX	536	—	—	383	—	—	—	—	—	—	—	919
Cottonwood ¹	XXXXX	501	497	546	—	—	—	158	245	—	385	—	2,332
Total hardwoods	XXXXX	1,037	497	546	383	—	—	158	245	—	385	—	3,251
All species	10,777	11,875	7,339	5,314	3,294	1,854	435	1,095	1,260	427	385	—	44,055

¹Includes paper birch.

Table 37—Annual mortality of sawtimber (Scribner rule) on timberland outside National Forests by species and diameter class in eastern 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	320	445	17	318	—	—	—	—	—	—	—	1,100	
Ponderosa pine	6,472	6,675	5,711	3,621	2,417	1,561	—	834	903	380	—	28,574	
Lodgepole pine	1,253	1,908	—	—	—	—	—	—	—	—	—	3,161	
Limber pine	139	—	—	—	—	—	—	—	—	—	—	139	
Subalpine fir	—	—	—	—	—	—	—	—	—	—	—	—	
Engelmann spruce	—	—	—	—	—	—	387	—	—	—	—	387	
Total softwoods	8,184	9,028	5,728	3,939	2,417	1,561	387	834	903	380	—	33,361	
Aspen	XXXXX	413	—	—	330	—	—	—	—	—	—	743	
Cottonwood ¹	XXXXX	380	421	465	—	—	—	139	218	—	343	1,966	
Total hardwoods	XXXXX	793	421	465	330	—	—	139	218	—	343	2,709	
All species	8,184	9,821	6,149	4,404	2,747	1,561	387	973	1,121	380	343	36,070	

¹Includes paper birch.

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

Species	Cause of death							Logging	Total
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown ¹		
----- Thousand cubic feet -----									
Douglas-fir	—	—	285	—	42	—	553	—	880
Ponderosa pine	133	139	9,915	—	169	—	1,754	28	12,139
Lodgepole pine	—	276	—	—	466	—	808	—	1,550
Limber pine	48	—	—	—	46	21	161	—	276
Subalpine fir	43	—	—	—	—	—	193	—	236
Engelmann spruce	—	—	—	—	83	—	—	—	83
Total softwoods	224	415	10,200	—	806	21	3,469	28	15,163
Aspen	—	542	—	—	—	—	410	—	952
Cottonwood ²	—	173	—	71	31	—	210	—	485
Total hardwoods	—	715	—	71	31	—	620	—	1,437
All species	224	1,130	10,200	71	837	21	4,089	28	16,600

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 1/4-inch rule) on timberland outside National Forests by species and cause of death in eastern Montana, 1988

Species	Cause of death							Total	
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown		
----- Thousand board feet, International 1/4-inch rule -----									
Douglas-fir	—	—	167	—	208	—	1,180	—	1,555
Ponderosa pine	432	526	26,361	—	596	—	6,826	—	34,741
Lodgepole pine	—	1,442	—	—	1,567	—	908	—	3,917
Limber pine	—	—	—	—	—	—	156	—	156
Subalpine fir	—	—	—	—	—	—	—	—	—
Engelmann spruce	—	—	—	—	435	—	—	—	435
Total softwoods	432	1,968	26,528	—	2,806	—	9,070	—	40,804
Aspen	—	919	—	—	—	—	—	—	919
Cottonwood ¹	—	850	—	359	143	—	980	—	2,332
Total hardwoods	—	1,769	—	359	143	—	980	—	3,251
All species	432	3,737	26,528	359	2,949	—	10,050	—	44,055

¹Includes paper birch.

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

Species	Cause of death								Total
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown	Logging	
----- Thousand board feet, Scribner rule -----									
Douglas-fir	—	—	100	—	162	—	838	—	1,100
Ponderosa pine	385	443	21,447	—	469	—	5,830	—	28,574
Lodgepole pine	—	1,183	—	—	1,253	—	725	—	3,161
Limber pine	—	—	—	—	—	—	139	—	139
Subalpine fir	—	—	—	—	—	—	—	—	—
Engelmann spruce	—	—	—	—	387	—	—	—	387
Total softwoods	385	1,626	21,547	—	2,271	—	7,532	—	33,361
Aspen	—	743	—	—	—	—	—	—	743
Cottonwood ¹	—	728	—	293	87	—	858	—	1,966
Total hardwoods	—	1,471	—	293	87	—	858	—	2,709
All species	385	3,097	21,547	293	2,358	—	8,390	—	36,070

¹Includes paper birch.

COUNTY TABLES

Table 41—Area of timberland outside National Forests by county in eastern Montana, 1989

County	Area
	<i>Acres</i>
Big Horn	228,656
Blaine	107,558
Carbon	42,487
Carter	39,234
Chouteau	72,364
Custer	104,269
Daniels	5,407
Dawson	16,532
Fallon	9,063
Fergus	262,819
Garfield	100,261
Glacier	121,325
Golden Valley	39,685
Hill	32,608
Liberty	9,880
McCone	13,253
Musselshell	243,485
Petroleum	69,112
Phillips	98,841
Pondera	22,412
Powder River	104,843
Prairie	8,273
Richland	17,759
Roosevelt	15,543
Rosebud	230,754
Sheridan	6,313
Stillwater	68,316
Sweet Grass	88,682
Teton	46,378
Toole	11,631
Treasure	44,072
Valley	36,865
Wibaux	6,101
Yellowstone	120,625
Total	2,445,406

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

County	Growing stock	Sawtimber	
		<i>Thousand board feet</i>	<i>Thousand board feet</i>
	<i>Thousand cubic feet</i>	<i>International 1/4-inch rule</i>	<i>Scribner rule</i>
Big Horn	176,351	684,446	566,841
Blaine	111,653	365,817	302,368
Carbon	57,338	229,950	190,992
Carter	22,228	83,274	69,217
Chouteau	75,348	188,846	153,775
Custer	59,038	213,430	177,188
Daniels	2,620	9,093	7,568
Dawson	7,714	28,639	23,920
Fallon	4,746	17,145	14,268
Fergus	319,999	1,064,830	881,945
Garfield	49,285	164,774	135,125
Glacier	184,844	605,758	504,156
Golden Valley	25,729	88,929	72,755
Hill	57,251	187,117	155,962
Liberty	5,812	13,800	11,101
McCone	6,115	21,685	18,101
Musselshell	129,862	459,363	379,143
Petroleum	33,665	111,275	90,960
Phillips	78,172	244,763	201,011
Pondera	13,848	30,502	24,284
Powder River	59,674	215,650	179,027
Prairie	4,113	15,009	12,495
Richland	8,002	29,796	24,929
Roosevelt	7,052	25,700	21,484
Rosebud	162,668	644,485	537,700
Sheridan	3,055	10,587	8,811
Stillwater	82,799	296,902	241,568
Sweet Grass	112,016	410,171	335,001
Teton	32,754	59,097	45,665
Toole	6,613	17,146	13,914
Treasure	25,660	94,666	78,840
Valley	18,180	62,267	51,408
Wibaux	3,225	12,566	10,454
Yellowstone	63,713	224,662	185,380
Total	2,011,142	6,932,140	5,727,356

Table 43—Net annual growth of growing stock and sawtimber on timberland outside National Forests by county in eastern 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>
Big Horn	5,625	28,250	22,431
Blaine	3,149	12,548	10,084
Carbon	1,085	5,398	4,322
Carter	613	2,859	2,239
Chouteau	2,397	4,877	4,175
Custer	1,602	7,819	6,026
Daniels	86	378	303
Dawson	201	845	651
Fallon	144	654	518
Fergus	8,330	35,900	29,050
Garfield	640	3,460	2,649
Glacier	4,302	11,882	10,703
Golden Valley	848	3,631	2,796
Hill	1,586	5,162	4,395
Liberty	206	512	411
McCone	179	771	604
Musselshell	-392	6,209	4,696
Petroleum	456	2,183	1,653
Phillips	2,631	8,622	6,802
Pondera	444	884	725
Powder River	1,610	7,905	6,082
Prairie	123	530	422
Richland	195	810	612
Roosevelt	187	787	605
Rosebud	4,693	25,393	20,182
Sheridan	101	442	354
Stillwater	2,159	8,952	7,238
Sweet Grass	2,766	11,783	9,513
Teton	1,251	1,837	1,459
Toole	229	644	517
Treasure	701	3,495	2,710
Valley	370	1,807	1,421
Wibaux	86	361	286
Yellowstone	13	3,440	2,624
Total	48,616	211,030	169,258

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

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>		
Big Horn	730	2,606	2,167
Blaine	397	972	813
Carbon	317	634	480
Carter	111	465	394
Chouteau	121	119	101
Custer	297	1,137	973
Daniels	4	15	12
Dawson	35	171	143
Fallon	15	61	51
Fergus	1,236	2,946	2,466
Garfield	1,113	3,095	2,529
Glacier	1,571	3,239	2,538
Golden Valley	68	331	283
Hill	76	190	158
Liberty	12	16	13
McCone	17	80	67
Musselshell	4,816	12,390	10,063
Petroleum	756	2,153	1,762
Phillips	228	613	510
Pondera	52	99	83
Powder River	305	1,162	996
Prairie	13	62	51
Richland	40	199	167
Roosevelt	28	140	117
Rosebud	865	2,880	2,413
Sheridan	4	17	14
Stillwater	279	480	378
Sweet Grass	422	739	575
Teton	83	82	69
Toole	14	26	22
Treasure	127	473	406
Valley	265	750	612
Wibaux	17	85	71
Yellowstone	2,166	5,628	4,573
Total	16,600	44,055	36,070

O'Brien, Renee A.; Conner, Roger C. 1991. Forest statistics for land outside National Forests in eastern Montana, 1989. Resour. Bull. INT-71. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 45 p.

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

KEYWORDS: forest survey, inventory, volume

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