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Montana's Forest Products Industry and Timber Harvest, 2018

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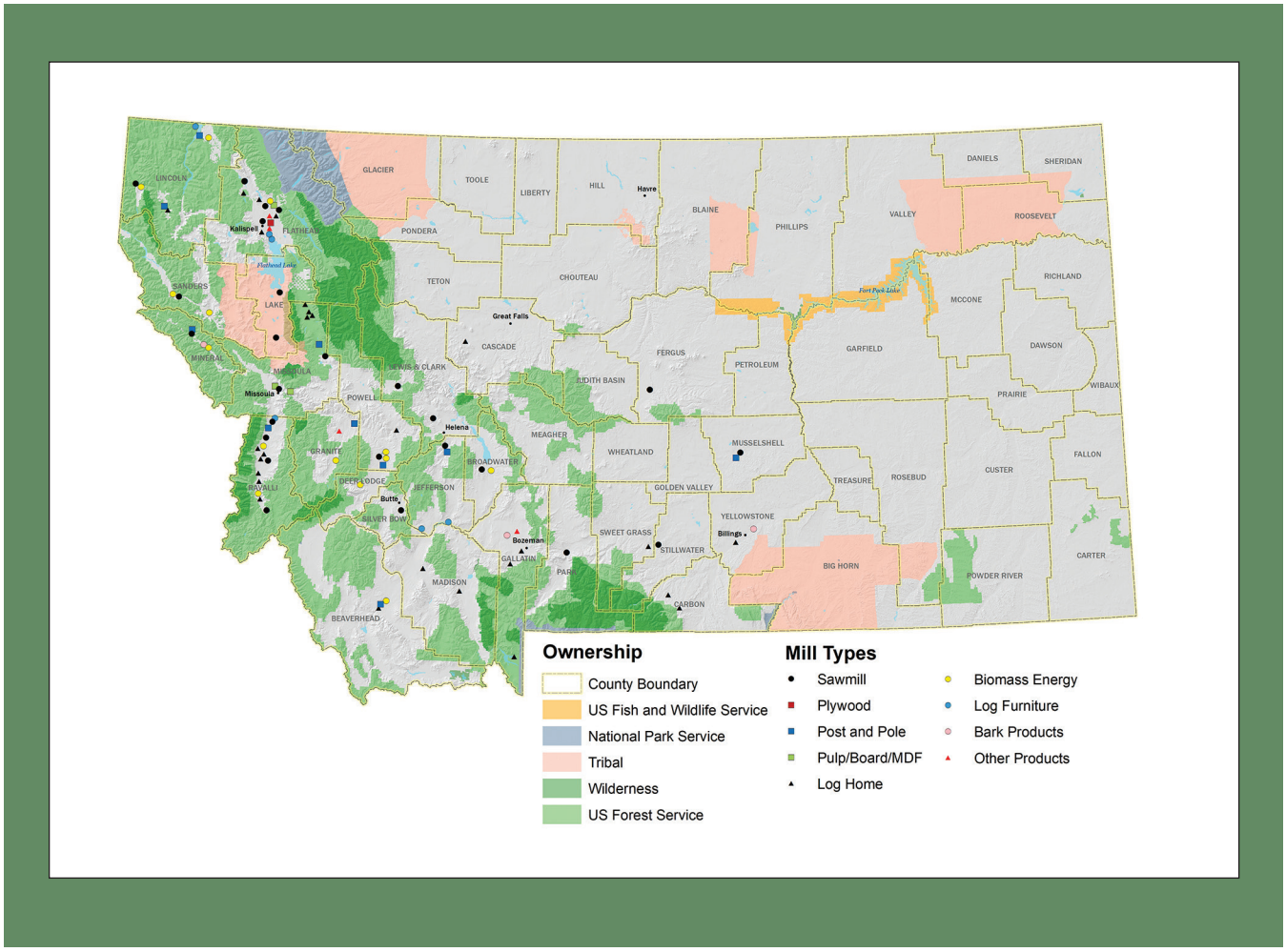

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Abstract

This report traces the flow of Montana's 2018 timber harvest through the primary wood-using industries; provides a description of the structure, capacity, and condition of Montana's primary forest products industry; and quantifies volumes and uses of wood fiber. Historical wood products industry changes are discussed, as well as changes in harvest, production, employment, and sales. objectives.

Keywords: timber harvest, timber processors, forest economics, mill residue, wood utilization

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Cover photo

Map of active Montana primary processing facilities by type.

Report Highlights

- A total of 93 facilities were identified as operating in Montana during 2018:
  - 25 lumber facilities
  - 1 plywood plant
  - 27 house log manufactures
  - 23 bark product, fuel pellet, cedar product, pulp-chip conversion, and energy plants
  - 2 residue board facilities
  - 10 post and pole plants
  - 5 log furniture manufacturers
- Montana's 2018 timber harvest was 376 million board feet (MMBF) Scribner, down from 412 MMBF in 2014. Douglas-fir became the leading species harvested, accounting for 42 percent of the harvest. Sawlogs and veneer logs were the main products harvested, accounting for 93 percent of the harvest volume.
- Public lands supplied 57 percent of the harvest in 2018. This is a significant change as the majority of harvest has come from private lands since the early 1970s.
- National Forest System lands provided about 41 percent (143 MMBF Scribner) of the timber used by Montana mills in 2018. About 16 percent (57 MMBF Scribner) came from State lands. Private and Tribal lands accounted for 39 percent (132 MMBF Scribner) of timber received by Montana mills. The remaining 4 percent (15 MMBF Scribner) of timber received came from other public land, out-of-state, Canada, and unspecified sources.
- Eighty-eight percent of Montana's timber harvest was processed in-state during 2018, down from 96 percent in 2014. Almost 45 MMBF Scribner of timber was shipped out of the state, while 15 MMBF of timber was brought into Montana from other States and Canada.
- Between 2014 and 2018, one large mill, one plywood plant, and numerous small mills in Montana closed permanently. Timber-processing capacity dropped from 635 MMBF in 2014 to 489 MMBF in 2018. Capacity utilization, which historically has exceeded 70 percent, dropped to 59 percent in 2018.
- Montana lumber production dropped from 611 MMBF in 2014 to 483 MMBF in 2018. Panel production (plywood, particle board, and medium-density fiberboard) in Montana in 2018 was 479 MMSF (million square feet), down from 487 MMSF in 2014.
- Sales from Montana's forest products industry were $553 million in 2018. Lumber and plywood accounted for 54 percent, followed by residue-related products with 40 percent. Sales from log home manufacturers were $16 million, accounting for 3 percent of total sales. The North Central States region, with 29 percent of total sales, was the largest market area for Montana's forest products.
- Forest industry employment was 7,981 during 2018, with earnings of $364 million. Both earnings and employment were up from 2014.

Contents

Introduction

This report presents the detailed results of a statewide census of Montana's primary forest products industry for calendar year 2018. The report includes a discussion of trends since the last industry census in 2014, longer-term historic trends drawn from other reports, and trends and developments since 2009, as appropriate. The report's principal goals are to determine the utilization of Montana's timber harvest, identify the type and number of primary forest products firms operating during 2018, identify their sources of raw material, and quantify outputs and sales values of finished products and residue.

The University of Montana's Bureau of Business and Economic Research (BBER) and the USDA Forest Service, Forest Inventory and Analysis (FIA) Program (Ogden, UT) cooperated in the analysis and preparation of this report. BBER, in cooperation with FIA programs at the Rocky Mountain and Pacific Northwest research stations, has developed a system to collect, compile, and make available State- and county-level information on timber harvest and the operations of the forest products industry—the Forest Industries Data Collection System (FIDACS). The system is currently administered in all western States except Washington.[1]

Forest Industries Data Collection System

This report represents the ninth application of FIDACS in Montana; the first was in 1976, with subsequent studies conducted for 1981, 1988, 1993, 1998, 2004, 2009, and 2014 (Hayes et al. 2020a,b; Keegan 1980; Keegan et al. 1990, 1995, 2001; Marcille et al. 2020; McIver et al. 2013; Spoelma et al. 2008). The system is based on censuses of primary forest product manufacturers located in a given State. Primary forest product manufacturers are firms that process timber into manufactured products such as lumber or plywood, facilities like particleboard and medium density fiberboard (MDF) plants, and facilities like particleboard plants and wood pellet plants that use the wood fiber residue directly from primary timber processors. Montana's manufacturers were identified through participation in previous studies, web-based directories, printed directories of the forest products industry (Random Lengths 2019), agency bidder lists, and with the assistance of the manufacturers themselves.

Through a written questionnaire, phone interview, or in-person interview, manufacturers provide the following detailed information for each timber-processing facility for a given calendar year:

- facility type, location, contact information, and opening date
- installed equipment and employment
- number of operating days, shifts per day, and shift length

[1]The Washington Department of Natural Resources conducts a similar mill survey on a biennial basis, which can be found at: https://www.dnr.wa.gov/publications/em_obe_2016_mill_survey_final.pdf?fati8a (Smith 2017).

- shift and annual production capacity in units of output
- preferred and accepted log sizes
- volume of raw material received by timber product, county, and ownership
- species and live/dead proportions of timber received
- beginning- and end-of-year raw material inventory
- volume and destination of log transfers
- finished product types, volumes, sales value, and market locations
- beginning- and end-of-year finished product inventory
- production, utilization, and sales of manufacturing residue

Firms cooperating in the 2018 Montana forest industry census processed the majority (88 percent) of the State's commercial timber harvest. Volume and characteristics of Montana timber processed by out-of-state firms was determined through surveys of mills in adjacent States. Published sources and information provided by Federal, State, and industry managers were used to estimate volumes received by the few nonrespondent firms and to verify estimates of the State's total timber harvest, lumber production, and sales value of primary wood products.

Information collected through FIDACS is stored at the University of Montana's BBER. Because of the substantial detail on the industry and its timber use, there is a time lag between the date of the census and the publication of this report. To make this report more timely, results and a summary are made available online as they are compiled and reviewed (http://www.bber.umt.edu/FIR/S_MT.asp). Key data from other sources are included to provide the most recent measures of general industry activity, and references to other publications dealing with industry conditions are included. Additional information is available by request. However, individual firm-level data are confidential and will not be released.

Historical Overview of Factors Impacting Montana's Forest Products Industry

Forest products activity in Montana can be traced back to the 1840s, when the State's first sawmill was established near Stevensville. Until the late 1800s, Montana's forest products industry consisted of small sawmills mostly producing lumber for local use. The advent of copper mining in Butte and Anaconda resulted in a great demand for mine timbers and fuel for smelters. Expansion of railroads to the Northwest created a demand for railroad ties, as well as material for pilings and bridges, and camps used during construction. Once completed, the railroads gave western lumber producers access to national markets. The industry continued to expand until the Great Depression, which brought about sharp reductions in the size and scale of the industry (Flanagan 2003).

After World War II, strong wood products markets and increasing levels of timber harvest led to continued expansion and modernization of Montana's industry. Sawmills continued to dominate the industry, with production quadrupling from 1945 to 1969. The 1950s and 1960s also saw major diversification within the industry, as shown by the development of the plywood industry and a pulp and paper mill to use wood residue from sawmills and plywood plants.

Markets remained strong through much of the 1970s, and diversification of Montana's industry continued with growth of the plywood sector, the expansion of mill residue use to include a particleboard and MDF plant, and a growing log home industry. The 1980s began with 3 years of poor economic performance, including official recessions in 1980 and 1982. Conditions began to improve in the construction industry in 1983, and by 1984 wood products consumption in the United States hit record levels. However, low prices persisted through 1985, due in large part to increased imports of Canadian softwood lumber made more competitive by the high value of the U.S. dollar. The Montana industry rebounded in the late 1980s, due in part to stronger markets, a weaker U.S. dollar, and a temporary "abundance" of timber because mills had purchased, but not harvested, timber in the early 1980s. Montana's industry responded with very high levels of production and product sales.

The 1990s brought new challenges to Montana's forest products industry. The U.S. and global economies exerted positive and negative influences on Montana's forest products industry, but by far the most significant impact on the industry was a dramatic downturn in timber availability and harvest from National Forests. Issues related to appeals and litigation, threatened and endangered species, the effects of past harvesting, and Federal budgets constrained timber harvesting on National Forests. Throughout the West and in Montana, harvest from these lands fell by more than 70 percent during the 1990s at a time when Federal lands supplied nearly half of the timber used by Montana's industry.

The decade began with a relatively mild national recession followed by a recovery in 1992 and 1993. Increased U.S. construction activity, coupled with reduced Federal timber availability throughout the western United States, led to dramatically higher timber and wood products prices. High prices in the 1990s did not offset the loss of much of the Federal timber program, and the size of Montana's timber-processing industry decreased substantially throughout the decade. Numerous large mills closed and capacity to process timber dropped by one-third from 1990 to 2000.

Operating conditions worsened for Montana's forest products industry in the early 2000s, with a U.S. and global recession in 2001 exacerbated by the September 11 terrorist attacks. A high-valued U.S. dollar and the expiration of the Canadian softwood lumber agreement led to increased imports as lumber production in the United States remained stagnant through 2002. Wood products prices began to rise in the second half

of 2003 in response to increased domestic and global demand for wood products, a weakening U.S. dollar, and a countervailing duty on Canadian softwood lumber. Court decisions related to Federal lands and another severe wildfire season resulted in restrictions on harvesting activity, causing shortages of logs at many mills and rendering them unable to take advantage of the improved market conditions (Keegan et al. 2004).

Both 2004 and 2005 saw strong markets for wood products with record U.S lumber consumption in 2004 and 2005 and housing starts exceeding 2 million in 2005. Demand for wood products was strong and prices reached their highest levels since the late 1990s. However, timber availability continued to constrain Montana's industry with continued mill closures even during these very strong markets (Keegan et al. 2004, 2006). A drastic decline in the U.S. housing market beginning in 2006 led to sharp decreases in prices for most wood products (Keegan et al. 2007). Consequently, 2008 and 2009 saw a severe collapse of the U.S. housing market, bottoming out at 550,000 housing starts in 2009. What came to be known as the Great Recession officially ended in June 2009; however, the economy remained weak through 2011, with housing starts at their lowest levels since the U.S. Census Bureau began tracking them in 1959. Market conditions caused a number of mills to curtail production (Morgan et al. 2011).

Influenced by both wood products markets and timber availability, several large Montana mills closed between 2004 and 2010, and there was a net loss of capacity in the State. Despite good market years in the mid-2000s, there was no increase in harvest from private lands, which raised concerns that timber supply had become an issue on private lands, as well as timber availability from public lands. Another contributing factor along with market volatility and harvest constraints was a substantial change in industrial timberland ownership. Starting in the late 1990s, land holding timber corporations began converting to a Real Estate Investment Trust (REIT) corporate structure, taking advantage of favorable tax laws, and changing the focus of long-term land management. Over a number of years starting in the early 2000s, large tracts of industrial timberlands were being sold to conservation buyers. The largest sale, referred to as the Montana Legacy Project, involved over 300,000 acres to The Nature Conservancy, who acts as an agent to resell the timberland to other private owners or Governmental agencies who would manage the property as timberland and minimize development of the land. The transfer of the ownership as well as the diminished standing volume of merchantable timber on this industrial timberland is one reason for the reduction in harvest volume from industrial land in the period covered by this report.

Montana's Timber Harvest and Flow

Montana has approximately 19.7 million acres of "nonreserved timberland" that are available for timber harvest (table 1). Nonreserved timberland includes land that is "not permanently reserved from wood products utilization through statute or administrative designation" (Bechtold and Patterson 2005). Lands such as those in National Forest Wilderness areas and National Parks and Monuments are considered permanently reserved.

About 61 percent (12.1 million acres) of the nonreserved timberland in the State is part of the USDA Forest Service's National Forest System. Nonindustrial private forest (NIPF) land, including Tribal lands, is the second largest class of ownership with 25.6 percent, or more than 5 million acres. The forest products industry owns about 4.4 percent (867 thousand acres) of the nonreserved timberland in the State, down from 9 percent in 2004. The State of Montana and Bureau of Land Management (BLM) account for about 9 percent of nonreserved timberland, while other public owners account for 0.1 percent. Since the 2009 Montana FIDACS census, the industrial portion of nonreserved timberland in the State has decreased, most notably as a result of the Montana Legacy Project.

Live standing volume on Montana's nonreserved timberland is approximately 118 billion board feet Scribner, which is down from an estimate of nearly 131 billion board feet in 2005 (fig. 1). About 36 percent (42,616 MMBF) of live volume is Douglas-fir, followed by Engelmann spruce (16.1 percent; 18,995 MMBF), lodgepole pine (11.6 percent; 13,673 MMBF), ponderosa pine (9.9 percent; 11,737 MMBF), and western larch (9.6 percent; 11,313 MMBF). Annual net growth on nonreserved timberland is approximately 921 million board feet per year. Lodgepole pine is the only major species

Table 1—Montana nonreserved timberland by ownership class (source: Interior West Forest Inventory and Analysis, 2018, BBER est.).

Ownership class	Thousand acres	Percentage of nonreserved timberland
National Forest	12,097	61.2
Nonindustrial private	5,060	25.6
State	890	4.5
Industrial	867	4.4
Bureau of Land Management	844	4.3
Other public	22	0.1
All owners[a]	19,780	100

[a]Percentage detail may not sum to 100 percent due to rounding.

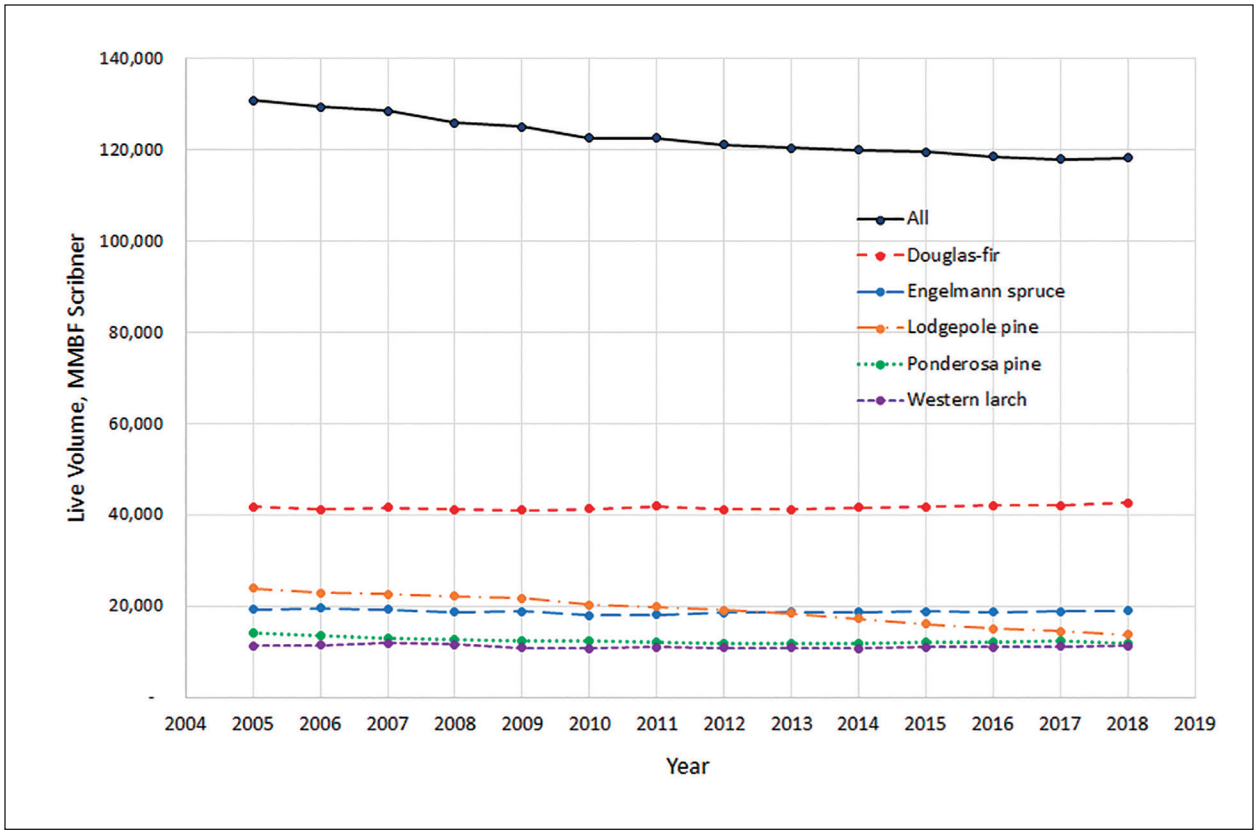

Figure 1—Live standing volume of major timber species in Montana, 2005–2018.

with negative annual net growth, which is estimated to be -609 MMBF. The negative net growth of lodgepole pine is the major contributor to the decline in total live volume since 2005 and has been enough to reduce the rank of lodgepole pine from second- to third-highest volume among species during the past decade. While the other major species have positive net growth overall, net growth in some size classes were negative for some species. Current estimates of net annual growth are 712 MMBF for Douglas-fir, 177 MMBF for Engelmann spruce, 147 MMBF for ponderosa pine, and 245 MMBF for western larch.

Timber Harvest

From the early 1950s through the early 1970s, the National Forests accounted for the majority of Montana's timber harvest, and from 1960 through 1971 supplied about 60 percent of the volume harvested (fig. 2). The total harvest increased from about 325 MMBF in 1945 to over 1,300 MMBF in the late 1960s, before declining slightly until the sharp drop-off in the recession year of 1982. In 1974, private lands surpassed the National Forests as the leading source of timber harvested for the first time in over two decades. From the mid-1970s through the late 1980s, National Forests accounted for 40 to 45 percent of the total harvest and private lands accounted for 50 to 55 percent. Harvest volumes increased rapidly from 1982 and peaked in 1987 at 1,376 MMBF.

Since 1987, the total volume harvested has been declining, primarily due to reductions in timber harvested by National Forests. The volume harvested from National Forests declined 76 percent from 1987 to 1995, and their proportion of the total harvest dropped from over 40 percent to approximately 20 percent. Harvest volume on private lands declined after 1987, but by 1995 had rebounded to the level seen in 1987. However, because of the dramatic decline in National Forest harvest, the proportion of the total harvest contributed by private land increased from 50 percent in 1987 to nearly 80 percent in 1995. Since 1995, harvest volumes on both National Forest and private land have decreased.

Between 2004 and 2009, harvest on all private ownerships (industrial, nonindustrial, and Tribal) dropped off precipitously from a total private harvest of 602 MMBF to 211 MMBF. The harvest from nonindustrial private land was relatively constant from 1998 to 2004 (262 MMBF versus 265 MMBF), but dropped to 96 MMBF in 2009. The very poor lumber markets brought about by the housing collapse and Great Recession of 2007 through 2009 as well as timber inventory constraints on private industrial lands account for much of the reductions in harvest from private ownerships. During the decade preceding 2004, private lands accounted for approximately 70 percent of Montana's timber harvest, and National Forests accounted for about 20 percent. As a result of the drastic reductions in private harvest levels between 2004 and 2009, the proportion of the harvest associated with National Forests increased

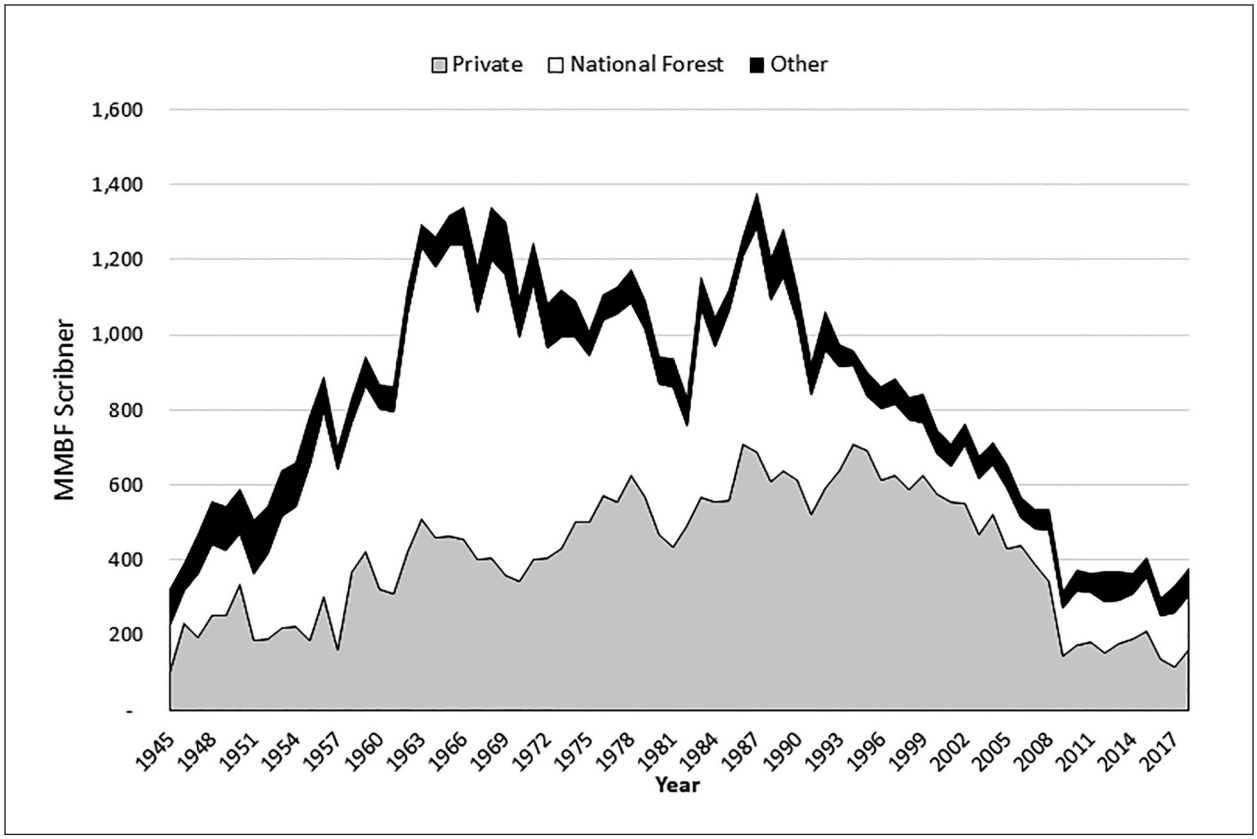

Figure 2—Montana timber harvest by ownership, 1945–2018.

from 15 percent in 2004 to 25 percent in 2009, while the proportion from private lands dropped from 77 percent to 57 percent. Harvest volumes from other public ownerships (e.g., State and BLM lands) increased slightly from 66 MMBF to 69 MMBF, and their share of the total harvest increased from 8 to 18 percent.

Timber harvest in Montana in 2014 totaled 412 MMBF Scribner. This marked a 10 percent increase compared to the 2009 harvest of 374 MMBF (McIver et al. 2013) and a 48 percent decrease from the 2004 harvest of 785 MMBF (Spoelma et al. 2008) (fig. 2). These changes can be explained in part by economic influences affecting wood products markets. The Great Recession and a drop in U.S. home construction between 2007 and 2009 reduced the demand for lumber through 2010 and 2011 (Keegan et al. 2010). Private lands harvest increased nearly 26 percent from 2009 to 2014, while harvest from National Forest lands decreased 11 percent.

During 2018 the timber harvest volume from lands in Montana was 376 (MMBF) (table 2), a decline of nearly 8 percent from the 2014 harvest of 412 MMBF (Hayes et al. 2020a), almost matching the historic low during the recession of 2009. Between 2014 and 2018, harvest on all private ownerships (industrial, nonindustrial, and Tribal) declined by almost 40 percent from a total harvest of 266 MMBF to 162 MMBF. The harvest from industrial private ownership showed the largest decline at almost 60 percent from 2014 (95 MMBF versus 40 MMBF). In contrast, harvest from public ownership showed an increase of almost 50 percent between 2014 and 2018 (146 MMBF versus 214 MMBF), which is a major shift from the previous reporting periods. National Forests provided the largest increase in harvest from 83 MMBF to 144 MMBF, a 73 percent increase, while the State and other public were consistent with their contribution to the harvest at around 16 percent of the total. Since 2014, increases in domestic home construction and overseas demand have led to improved markets for wood products. The decline in overall timber harvest is still affected by a constrained log supply from National Forests. As public harvest has increased, the private harvest has decreased at a faster pace, resulting in less timber readily available to supply logs to the mills. A consistent, predictable log supply is necessary for mills to be able to plan for capital upgrades and labor force needs.

Douglas-fir was the leading species harvested in Montana in 2018 (table 3). Lodgepole pine was the second-most harvested species and western larch was third. The proportion of ponderosa pine decreased from 16 percent in 2014 to 11 percent in 2018, making it the fourth-most harvested species. The decreased proportion of ponderosa pine can be attributed to a drop in harvest levels from nonindustrial private lands in eastern Montana. The decreased proportion of lodgepole pine harvest is likely reflecting that the impacts of the mountain pine beetle infestation have somewhat subsided, and the resulting standing dead lodgepole pine are no longer of commercial value.

The proportion of volume harvested for various products in 2018 saw some shifts (table 4). Beginning in 2009, veneer logs were combined

Table 2a—Montana timber harvest by ownership class, selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Ownership class	1981	1988	1993	1998	2004	2009	2014	2018
				Thousand board feet, Scribner				
Private	**583,413**	**689,986**	**694,160**	**640,709**	**602,043**	**211,210**	**265,597**	**162,024**
Industrial	351,744	397,853	304,854	354,430	285,324	115,590	94,943	39,990
Non-industrial private and Tribal[a]	231,669	292,133	389,306	286,279	316,719	95,619	170,654	122,034
Public	**451,664**	**546,308**	**307,069**	**228,699**	**182,915**	**162,329**	**145,998**	**214,231**
National Forest	412,867	496,803	282,324	190,870	116,965	93,580	83,148	144,405
State	c	c	c	36,006	59,458	63,093	57,893	58,389
Other public[b]	38,797	49,505	24,745	1,823	6,492	5,656	4,957	11,437
All owners	**1,035,077**	**1,236,294**	**1,001,229**	**869,408**	**784,958**	**373,538**	**411,595**	**376,255**

Table 2b—Montana timber harvest by ownership class, selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Ownership class	1981	1988	1993	1998	2004	2009	2014	2018
				Percentage of harvest				
Private	**56.4**	**55.8**	**69.3**	**73.7**	**77.0**	**56.5**	**64.5**	**43.1**
Industrial	34.0	32.2	30.4	40.8	36.0	30.9	23.1	10.6
Nonindustrial private and Tribal[a]	22.4	23.6	38.9	32.9	41.0	25.6	41.5	32.4
Public	**43.6**	**44.2**	**30.7**	**26.4**	**23.4**	**43.5**	**35.5**	**56.9**
National Forest	39.9	40.2	28.2	22.0	15.0	25.1	20.2	38.4
State	c	c	c	4.1	7.6	16.9	14.1	15.5
Other public[b]	3.7	4.0	2.5	0.2	0.8	1.5	1.2	3.0
All owners[d]	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

[a]Nonindustrial private and Tribal combined to prevent disclosure.

[b]Other public includes BLM.

[c]State included in Other public.

[d]Percentage detail may not sum to 100 percent due to rounding.

Table 3—Proportion of Montana timber harvest (percentage, MBF, Scribner) by species, selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Species	1981	1988	1993	1998	2004	2009	2014	2018
Douglas-fir	27	27	29	34	38	31	41	42
Lodgepole pine	25	28	26	25	18	35	21	17
Western larch	16	14	12	10	12	7	7	12
Ponderosa pine	12	17	19	15	19	15	16	11
Other species[a]	12	7	8	7	6	4	7	10
Spruces	8	7	6	8	7	8	8	8
All species[b]	100	100	100	100	100	100	100	100

[a]Other species include true firs, western white pine, western redcedar, western hemlock, Rocky Mountain juniper, aspen and cottonwood, and other softwoods.

[b]Percentage detail may not sum to 100 percent due to rounding.

Table 4—Proportion of Montana timber harvest (percentage, MBF, Scribner) by product, selected years (Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Product	1981	1988	1993	1998	2004	2009	2014	2018
Sawlogs	71	81	79	77	76	73	89	93
Veneer logs	22	17	17	18	16	a	a	a
Other timber products[b]	7	3	5	6	8	27	11	7
All products[c]	100	100	100	100	100	100	100	100

[a]Harvest of veneer logs included in sawlog category to prevent disclosure.

[b]Other timber products include logs used for pulpwood, posts and poles, house logs, cedar products, log furniture, and industrial fuelwood.

[c]Percentage detail may not sum to 100 percent due to rounding.

with saw log harvest figures due to disclosure issues. For 2018, the percent of the total harvest associated with saw and veneer logs combined was 93 percent, compared to the low of 73 percent in 2009. Also of significance was the continued decrease in the proportion of the harvest of other timber products, from an average of 27 percent in 2009 to 11 percent in 2014, to 7 percent in 2018. This decrease is likely due to a return to the stronger lumber and plywood markets of the post Great Recession period.

With the closure of the pulp and paper mill in Missoula County in 2010 and a return to more normal wood products markets, the harvest of roundwood pulpwood is expected to fall to much lower levels than experienced in the past. Harvest of this material is an important product of forest restoration and wildfire mitigation practices. A roundwood

chipping facility opened in Bonner, Montana, in 2012. This facility provided an outlet for the roundwood material resulting from these restoration practices. Having this outlet provides all ownerships with a market for this material, which would in many cases be left on the site and increase land management costs rather than reduce them. A second chipping yard recently opened in Columbia Falls, Montana. This chipping yard provides the feedstock for the MDF plant located on that site.

All regions of Montana (fig. 3) showed declines in harvest between 2014 and 2018, with the largest proportionate changes since 2014 occurring in the eastern region of Montana (table 5). The four counties (Flathead, Lake, Lincoln, Sanders) in the northwest region provided over half of Montana's 2018 harvest (58 percent), with Lincoln and Flathead Counties, having the highest harvest volumes in the State, respectively. Since 2014, the volume harvested from the northwest region showed a slight decrease—from 222 MMBF to 217 MMBF. The 2018 volume harvested from the northwest region is just 34 percent of the 1981 harvest. The Lincoln and Sanders Counties' harvest proportion has been increasing since 2004, while Flathead and Lake Counties have declined. The four counties in the western region (Granite, Mineral, Missoula, Ravalli) accounted for almost one-fifth of Montana's harvest, with Missoula County providing the most volume in this region and providing 8 percent of the statewide harvest. The western region's harvest volume has steadily declined since 1981, although its proportion of the harvest has remained relatively stable (between 18 and 22 percent over the last two reporting periods). In the six counties making up the southwest region, (Beaverhead, Deerlodge, Gallatin, Madison, Park, Silver Bow) harvest volumes have fluctuated, reaching a high of almost 90 MMBF in 1993, but then dropped to less than one-third of their previous high levels in 2018. The southwest region's proportion of the statewide harvest has also declined over time and has fluctuated from a high of 9 percent of the State harvest in 2009 to 6 percent in 2018.

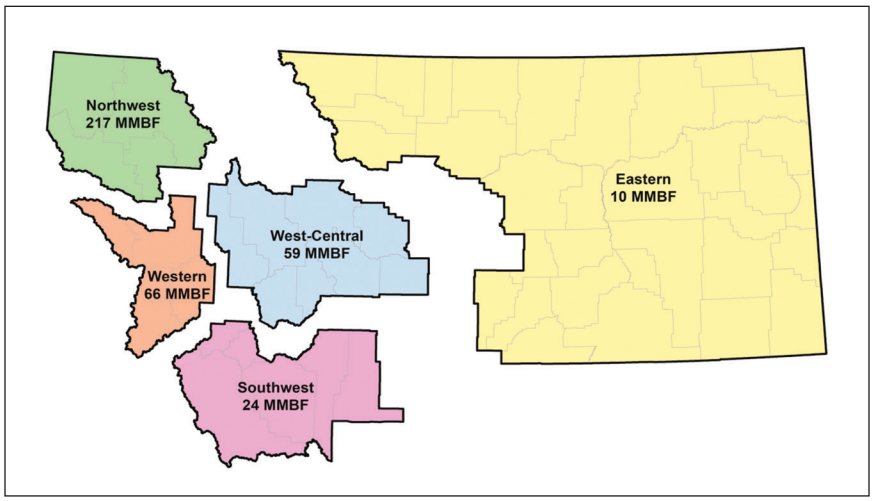

Figure 3—Map of Montana timber harvest by region.

Table 5—Montana timber harvest (million board feet, Scribner) by county, selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

	MMBF Scribner								Percent of total							
County	**1981**	**1988**	**1993**	**1998**	**2004**	**2009**	**2014**	**2018**	**1981**	**1988**	**1993**	**1998**	**2004**	**2009**	**2014**	**2018**
Northwest Montana	**633**	**725**	**519**	**415**	**383**	**171**	**222**	**217**	**61**	**59**	**52**	**48**	**49**	**45.9**	**54**	**58**
Flathead	245	255	150	148	156	79	91	64	24	21	15	17	20	21	22	17
Lake	28	53	53	38	33	23	31	17	3	4	5	4	4	6	8	5
Lincoln	267	324	208	153	119	43	60	80	26	26	21	18	15	12	15	21
Sanders	93	93	107	76	75	26	40	56	9	8	11	9	10	7	10	15
Western Montana	**229**	**246**	**229**	**203**	**189**	**79**	**70**	**66**	**22**	**20**	**23**	**23**	**24**	**21**	**17**	**18**
Granite	23	29	21	31	25	6	7	14	2	2	2	4	3	2	2	4
Mineral	45	40	32	20	41	13	16	7	4	3	3	2	5	3	4	2
Missoula	120	141	136	129	109	56	43	31	12	11	14	15	14	15	11	8
Ravalli	41	36	40	23	13	4	4	14	4	3	4	3	2	1	1	4
Southwest Montana	**68**	**88**	**72**	**32**	**37**	**32**	**28**	**24**	**7**	**7**	**7**	**4**	**5**	**9**	**7**	**6**
Beaverhead	10	16	5	2	6	11	5	8	1	1	1	0	1	3	1	2
Deer Lodge	8	6	11	8	4	7	2	1a	1	1	1	1	1	2	0	0
Gallatin	36	29	30	4	8	2	8	7	4	2	3	1	1	1	2	2
Madison	3	18	9	11	5	3	9	5	0	1	1	1	1	1	2	1
Park	8	16	11	6	8	6	4	2	1	1	1	1	1	2	1	1
Silver Bow	3	3	5	1	5	3	1	1	0	0	1	0	1	1	0	0

(continued on next page)

Table 5 (continued)—Montana timber harvest (million board feet, Scribner) by county, selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

	MMBF Scribner								Percent of total							
County	**1981**	**1988**	**1993**	**1998**	**2004**	**2009**	**2014**	**2018**	**1981**	**1988**	**1993**	**1998**	**2004**	**2009**	**2014**	**2018**
West-Central Montana	**80**	**105**	**80**	**136**	**92**	**70**	**73**	**59**	**8**	**9**	**8**	**16**	**12**	**19**	**18**	**16**
Broadwater	7	2	4	4	2	8	1	1a	1	0	0	1	0	2	0	0
Cascade	1	5	1	10	3	1	2	1a	0	0	0	1	0	0	1	0
Jefferson	8	8	3	6	12	6	5	4	1	1	0	1	2	2	1	1
Judith Basin	1	—	3	5	0	0	—	1	0	0	0	1	0	0	—	0
Lewis & Clark	26	17	13	30	21	24	31	11	3	1	1	4	3	6	8	3
Meagher	17	15	12	27	6	3	11	18	2	1	1	3	1	1	3	5
Powell	20	56	43	50	46	27	14	25	2	5	4	6	6	7	3	7
Wheatland	—	1	1	4	—	1	2	—	0	0	0	1	0	0	1	0
Other counties							7	—							2	0
Eastern Montana	**26**	**73**	**102**	**73**	**84**	**20**	**18**	**10**	**2**	**6**	**10**	**8**	**11**	**5**	**4**	**3**
Big Horn	3	12	13	12	16	3	1	1a	0	1	1	1	2	1	0	0
Fergus	9	11	24	9	15	3	3	6	1	1	2	1	2	1	1	2
Musselshell	2	4	13	6	1	1	2	1a	0	0	1	1	0	0	0	0
Powder River	1	15	11	8	18	—	1	1a	0	1	1	1	2	—	0	0
Rosebud	6	12	8	11	6	—	1	—	1	1	1	1	1	—	0	0
Other counties	4	19	34	26	28	14	11	2	0	2	3	3	4	4	3	1
Unspecified	**—**	**—**	**—**	**10**	**—**	**1**	**—**	**—**	**0**	**0**	**0**	**1**	**0**	**0**	**—**	**0**
All counties[b]	**1,035**	**1,236**	**1,001**	**869**	**785**	**373**	**412**	**376**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

[a]Volume is less than 1 MMBF.

[b]Percentage detail may not sum to 100 percent due to rounding.

In contrast to the western region, harvest volume percentage contribution in the west-central region has increased since 1981. In 2018, the region accounted for 16 percent of the State's harvest, down slightly from 19 percent in 2009. However, total harvest volume actually decreased from 136 MMBF to 59 MMBF during this time.

In the eastern region, harvest volume has fluctuated substantially. The harvest has ranged from 102 MMBF in 1993 to a low of 10 MMBF in 2018. As a contributor to the statewide harvest, the proportion of the harvest has also been highly variable. This region has contributed from a low of 2 percent of the State harvest in 1981 to 11 percent in 2004. Since 2004, harvest volume decreased drastically, from a high of 84 MMBF to 10 MMBF in 2018, or only 3 percent of the statewide harvest. These declines were due to decreased harvesting on all ownerships, particularly on the price sensitive nonindustrial private lands and the lack of processing facilities within a feasible haul distance.

During 2018, public lands provided most of each species harvested (table 6). National Forests provided 57 MMBF of Douglas-fir, 27 MMBF of lodgepole pine, 16 MMBF of ponderosa pine, 16 MMBF of western larch, 11 MMBF of spruce, and 6 MMBF of other species. Public lands also provided the majority of the saw and veneer logs harvested (201 MMBF) (table 7). House log harvest volume was predominately sourced from public land (1.4 MMBF), while NIPF lands were the leading source of other product volume (13 MMBF). NIPF lands accounted for significant volumes of Douglas-fir, lodgepole pine, and western larch.

During 2018, Douglas-fir accounted for the majority of saw and veneer logs, while lodgepole pine accounted for the majority of house logs and other products (table 8). Saw and veneer logs accounted for the largest volume across all species. Logs from dead trees accounted for 7.5 percent (28 MMBF) of Montana's total timber harvest volume during 2018, down from 20 percent (74MMBF) in 2009, near the height of the mountain pine beetle epidemic.

Table 6a—Montana timber harvest by ownership class and species, 2018 (thousand board feet, Scribner).

Ownership class	Douglas-fir	Lodgepole pine	Ponderosa pine	Spruces	Other species[a]	Western larch	All species
			Thousand board feet, Scribner				
Private	**72,732**	**28,157**	**17,374**	**12,337**	**11,743**	**19,681**	**162,024**
Industrial	19,204	5,007	2,992	2,672	4,371	5,743	39,990
Nonindustrial private and Tribal[b]	53,528	23,150	14,382	9,665	7,372	13,937	122,034
Public	**84,683**	**36,864**	**24,749**	**15,688**	**26,291**	**25,956**	**214,231**
National Forest	57,000	27,370	15,685	11,182	17,256	15,912	144,405
State	21,628	7,205	7,324	3,869	8,867	9,497	58,389
Other public[c]	6,055	2,290	1,740	637	168	547	11,437
All owners	**157,415**	**65,021**	**42,123**	**28,025**	**38,034**	**45,637**	**376,255**

Table 6b—Montana timber harvest by ownership class and species, 2018 (percentage of harvest).

Ownership class	Douglas-fir	Lodgepole pine	Ponderosa pine	Spruces	Other species[a]	Western larch	All species
			Percentage of harvest				
Private	**19.3**	**7.5**	**4.6**	**3.3**	**3.1**	**5.2**	**43.1**
Industrial	5.1	1.3	0.8	0.7	1.2	1.5	10.6
Nonindustrial private and Tribal[b]	14.2	6.2	3.8	2.6	2.0	3.7	32.4
Public	**22.5**	**9.8**	**6.6**	**4.2**	**7.0**	**6.9**	**56.9**
National Forest	15.1	7.3	4.2	3.0	4.6	4.2	38.4
State	5.7	1.9	1.9	1.0	2.4	2.5	15.5
Other public[c]	1.6	0.6	0.5	0.2	0.0	0.1	3.0
All owners[d]	**41.8**	**17.3**	**11.2**	**7.4**	**10.1**	**12.1**	**100**

[a]Other species include: true firs, western white pine, western redcedar, western hemlock, Rocky Mountain juniper, aspen and cottonwood, and other softwoods.

[b]Nonindustrial private and Tribal combined to prevent disclosure.

[c]Other public includes BLM.

[d]Percentage detail may not sum to 100 percent due to rounding.

Table 7a—Montana timber harvest by ownership class and product, 2018 (thousand board feet, Scribner).

Ownership class	Saw and veneer logs	House logs	Other products[a]	All products
Private	**149,272**	**170**	**12,582**	**162,024**
Industrial	39,990	0	0	39,990
Nonindustrial private and Tribal[b]	109,282	170	12,582	122,034
Public	**201,277**	**1,447**	**11,508**	**214,231**
National Forest	135,873	1,196	7,336	144,405
State	54,763	251	3,376	58,389
Other public[c]	10,641	0	796	11,437
All owners	**350,549**	**1,617**	**24,090**	**376,255**

Table 7b—Montana timber harvest by ownership class and product, 2018 (percentage of harvest).

Ownership class	Saw and veneer logs	House logs	Other products[a]	All products
Private	**39.7**	**0.0**	**3.3**	**43.1**
Industrial	10.6	0.0	0.0	10.6
Nonindustrial private and Tribal[b]	29.0	0.0	3.3	32.4
Public	**53.5**	**0.4**	**3.1**	**56.9**
National Forest	36.1	0.3	1.9	38.4
State	14.6	0.1	0.9	15.5
Other public[c]	2.8	0.0	0.2	3.0
All owners[d]	**93.2**	**0.4**	**6.4**	**100**

[a]Other products include logs used for pulpwood, posts and poles, cedar products, log furniture, and industrial fuelwood.

[b]Nonindustrial private and Tribal combined to prevent disclosure.

[c]Other public includes BLM.

[d]Percentage detail may not sum to 100 percent due to rounding.

Table 8a—Montana timber harvest by species and product, 2018 (thousand board feet, Scribner).

Species	Saw and veneer logs	House logs	Other products[a]	All products
Douglas-fir	150,865	317	6,234	157,415
Lodgepole pine	53,683	881	10,457	65,021
Western larch	43,713	246	1,679	45,637
Ponderosa pine	38,160	—	3,963	42,123
Other species[b]	37,000	53	981	38,034
Spruces	27,128	121	76	28,025
All species	**350,549**	**1,617**	**24,090**	**376,255**

Table 8b—Montana timber harvest by species and product, 2018 (percentage of harvest).

Species	Saw and veneer logs	House logs	Other products[a]	All products
Douglas-fir	40.1	0.1	1.7	41.8
Lodgepole pine	14.3	0.2	2.8	17.3
Western larch	11.6	0.1	0.4	12.1
Ponderosa pine	10.1	0.0	1.1	11.2
Other species[b]	9.8	0.0	0.3	10.1
Spruces	7.2	0.0	0.2	7.4
All species[c]	**93.2**	**0.4**	**6.4**	**100**

[a]Other products include logs used for pulpwood, posts and poles, cedar products, log furniture, and industrial fuelwood.

[b]Other species include: true firs, western white pine, western redcedar, western hemlock, Rocky Mountain juniper, cottonwood and aspen, and other softwoods.

[c]Percentage detail may not sum to 100 percent due to rounding.

Timber Flow Into and Out of Montana

During 2018, the majority (88 percent) of Montana's timber harvest was processed in-state. As was the case in 2009, Montana had a net outflow of timber. Timber processors in Montana brought in 15 MMBF of timber from other States, while mills in adjacent States used almost 45 MMBF of timber harvested in Montana (table 9). As in previous years, all of the timber exported from Montana during 2018 stayed within the United States and was processed in Idaho, South Dakota, and Wyoming.

Sawlogs accounted for all the timber harvested in Montana and shipped to other States for processing, as well as the majority (11.6 MMBF) of timber imported into the State for processing. The largest share (7.9 MMBF) of the total volume imported came from Wyoming, followed by Idaho (4.5 MMBF), with the remainder coming from Washington, Utah, Oregon, and other unspecified out-of-state sources. Saw, veneer, and house logs made up most imports into Montana from Idaho and Wyoming.

Timber Flow Within Montana

Because most of Montana's mills and timber-processing capacity are found in the western and northwest regions, timber harvested in those regions is usually processed in those regions, while timber harvested in other regions generally flow toward these two western regions. This results in a typical east-to-west timber flow within Montana.

Of the 217 MMBF harvested in the 4 counties of the northwest region, 73 percent was processed in those counties. Six percent of the northwest region's harvest was processed in the western Montana region, and almost 20 percent was processed in Idaho. Western Montana was the only other region in Montana that processed the majority of its own harvest, with 82 percent of its harvest remaining there for processing, when compared to other regions, was the highest percentage processed in the region where it was harvested. Mills in the northwest region received 10.5 percent of the harvest from western Montana. Of the 283 MMBF harvested in the northwest and western regions combined, 232 MMBF

Table 9—Timber flow into and out of Montana, 2018 (thousand board feet, Scribner).

Timber products	Log flow into Montana	Log flow out of Montana	Net inflow (net outflow)
Saw and veneer logs	11,619	44,557	(32,938)
House logs	3,102	—	3,102
Other products[a]	119	—	119
All products	14,840	44,557	(29,717)

[a]Other products include logs for pulpwood and posts and poles.

was processed in those two regions. An additional 26 MMBF from other regions of Montana was processed in northwest and western Montana. Together, these 2 regions processed 69 percent of Montana's 2018 timber harvest.

Most of the timber harvested in other regions of Montana was processed in the region of harvest or in an adjacent region, with the remaining being processed in western or northwest Montana. For the southwest region, 33 percent was used within the region and 53 percent of the harvest in that region was processed in the west-central region. Most of the remaining harvest in the southwest region (14 percent) was processed in western Montana or in eastern Montana. Forty-seven percent of the 60 MMBF harvested from the west-central region was processed there, while 35 percent was processed in the northwest and western regions. The remaining 18 percent was processed in the eastern region. The timber harvested in the eastern region during 2018 was processed in all regions of the State. The western regions of the State received around 32 percent, the west-central region processed 27 percent, while another 23 percent was processed in the southwest. Eighteen percent of the timber harvested in the eastern region remained in that region for processing.

Utilization of Montana's Timber Harvest

Montana's 2018 timber harvest was approximately 95.6 million cubic feet (MMCF), excluding bark (fig. 4), and went to timber processors both within and outside of the State. Of this volume, 86.6 MMCF went as logs to sawmills and plywood plants, 0.3 MMCF went to log home manufacturers, and 8.6 MMCF went to other facilities, including producers of posts and poles, cedar products, energy products, and chipping plants. In this report, volumes are presented in cubic feet rather than board feet Scribner since the cubic measure better expresses the total amount of wood fiber in the log, thus accounting for both mill residues and timber products. The following factors converting Scribner board foot volume to cubic feet were developed from log size specifications and product and residue recovery information provided by processors of Montana's 2018 timber harvest:

- 5.4 board feet per cubic foot for house logs,
- 4.0 board feet per cubic foot for sawlog and veneer logs, and
- 2.8 board feet per cubic foot for all other timber products.

Of the 86.7 MMCF of timber received by sawmills and plywood plants, 39.3 MMCF (45 percent) became finished lumber, other sawn products, or plywood, and about 1.6 MMCF (2 percent) was lost to shrinkage. The remaining 45.8 MMCF became mill residue. Of the sawmill residue utilized both within Montana and in other States, 1.5 MMCF was sold or used internally for biomass energy and almost 43 MMCF was used for pulp, particleboard, and MDF. The remaining 1.2 MMCF was used for livestock bedding, mulch, and other uses. Less than 0.03 MMCF of sawmill/plywood residue went unused. Of the 0.3 MMCF of timber received by log home manufacturers, 0.17 MMCF

(57 percent) became house logs. The remaining 0.128 MMCF became mill residue. Most house log residue (almost 67 percent) was used for energy, while 16 percent went to other uses and another 17 percent remained unused. The 8.58 MMCF of timber received by other timber-processing facilities was utilized for solid wood products such as posts, poles, log furniture, and firewood, or was combined with residues from other sectors for use in residue-related products like pulp and energy products.

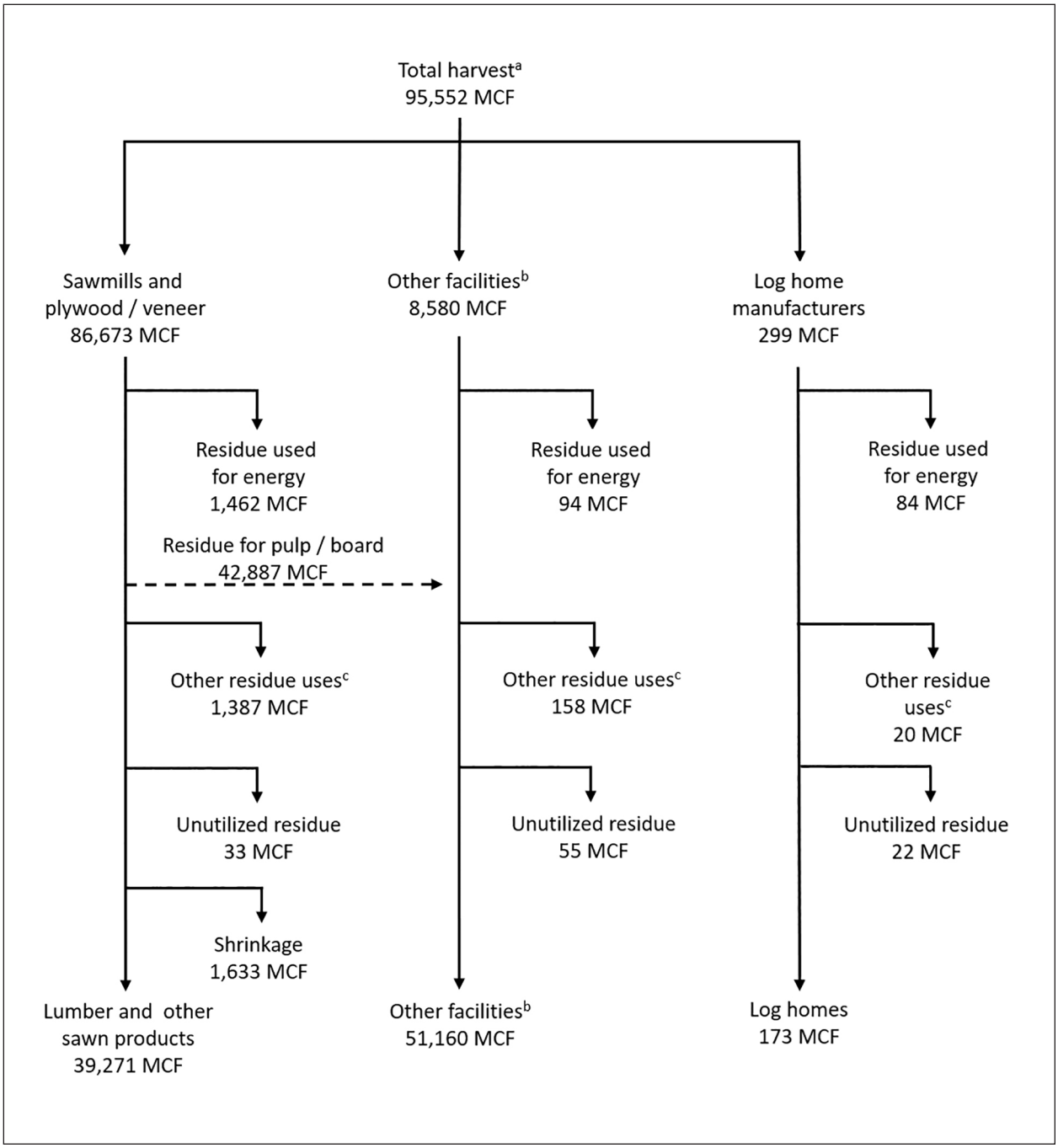

Figure 4—Montana timber harvest and flow, 2018.

Montana's Forest Products Industry

During 2018, Montana's primary forest products industry consisted of 93 active facilities,[2] down from 102 in 2014, located in 26 counties (table 10). The majority of facilities tended to be located near the forest resource in the northwestern and western portions of the State (fig. 5). The sawmill sector, manufacturing lumber and related products, had the largest number of facilities operating in Montana during 2018. This sector experienced the sharpest decline in the total number of facilities losing 7, or 22 percent, since 2014. Nearly all sectors experienced a slight decrease in the total number of active facilities, except for log home manufactures, which added two facilities. The largest sector decline by percentage of facilities and impact to the industry was associated with the plywood sector, which dropped from 2 to 1 active facilities between 2014 and 2018.

Timber Received by Montana Mills

Montana mills received over 346 MMBF Scribner of timber for processing during 2018. Timber receipts refer to the volume of timber delivered to Montana mills from both in-state and out-of-state sources. Timber receipts for Montana mills differs from the State's timber harvest because some timber harvested in Montana was processed in other States, and some of the timber processed in Montana was harvested outside the State.

National Forests were the leading supplier of timber to Montana mills in 1976, 1981, and 1988, supplying 40 percent or more of the State's receipts each year (table 11; Keegan 1980; Keegan et al. 1983; Keegan et al. 1990). However, as harvest levels from National Forests declined, so did the industry's use of National Forest timber. Since 1998, industrial lands have been the leading source of timber received by Montana mills (Keegan et al. 1995; Keegan et al. 2001; Spoelma et al. 2008). However, the gap narrowed considerably in 2009 and approximates the proportions of the 1980s when timber from private and public ownerships was nearly equal. In 2009, timber from National Forest lands increased as a percentage to match nonindustrial private at 24 percent of the State's receipts.

Public lands supplied the majority of each timber product processed by Montana mills during 2018 (table 12). Contrary to 2009 and 2014, when private land was the leading supplier of sawlogs and veneer logs, public lands provided almost 63 percent (197 MMBF) in 2018. Nonindustrial and Tribal land provided the majority of volume (13 MMBF) for other products.

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[2]Another five facilities did not actively receive or process timber during 2018 or had ceased operation prior to 2018 but still had operable equipment installed.

Table 10—Active Montana primary wood products facilities by county and product during 2018 and other years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

County	Lumber	Plywood	Pulp and particle board	Post and poles	Log homes	Log furniture	Other products[a]	All products
Northwest Montana	**8**	**1**	**1**	**2**	**5**	**3**	**8**	**28**
Flathead	4	1	1	—	4	2	4	16
Lake	2	—	—	—	—	—	—	2
Lincoln	1	—	—	2	1	1	2	7
Sanders	1	—	—	—	—	—	2	3
Western Montana	**7**	**—**	**1**	**4**	**10**	**1**	**7**	**30**
Granite	—	—	—	1	—	—	2	3
Mineral	1	—	—	1	—	—	2	4
Missoula	2	—	1	1	4	—	1	9
Ravalli	4	—	—	1	6	1	2	14
Southwest Montana	**2**	**—**	**—**	**1**	**6**	**—**	**4**	**13**
Beaverhead	—	—	—	1	1	—	1	3
Deerlodge	—	—	—	—	—	—	1	1
Gallatin	—	—	—	—	3	—	2	5
Madison	—	—	—	—	2	—	—	2
Park	1	—	—	—	—	—	—	1
Silver Bow	1	—	—	—	—	—	—	1
West-Central Montana	**5**	**—**	**—**	**1**	**2**	**1**	**3**	**12**
Broadwater	1	—	—	—	—	—	1	2
Cascade	—	—	—	—	1	—	—	1
Jefferson	1	—	—	1	—	1	—	3
Lewis & Clark	2	—	—	—	—	—	—	2
Powell	1	—	—	—	1	—	2	4
Eastern Montana	**3**	**—**	**—**	**2**	**4**	**—**	**1**	**10**
Carbon	—	—	—	—	2	—	—	2
Custer	—	—	—	1	—	—	—	1
Fergus	1	—	—	—	—	—	—	1
Musselshell	1	—	—	1	—	—	—	2
Stillwater	1	—	—	—	—	—	—	1
Sweet Grass	—	—	—	—	1	—	—	1
Yellowstone	—	—	—	—	1	—	1	2
2018 Total	**25**	**1**	**2**	**10**	**27**	**5**	**23**	**93**
2014 Total	32	2	2	12	25	5	24	102
2009 Total	41	2	3	14	33	14	20	127
2004 Total	57	3	3	22	88	29	13	215
1998 Total	73	4	3	29	75	25	11	220
1993 Total	86	4	3	31	59	4	10	197
1988 Total	87	4	3	37	35	2	15	183
1981 Total	142	4	3	35	27	0	17	228

[a]Other products include biomass energy, cedar shakes and shingles, decorative bark and mulch, roundwood pulp—chip conversion, and fuel pellets.

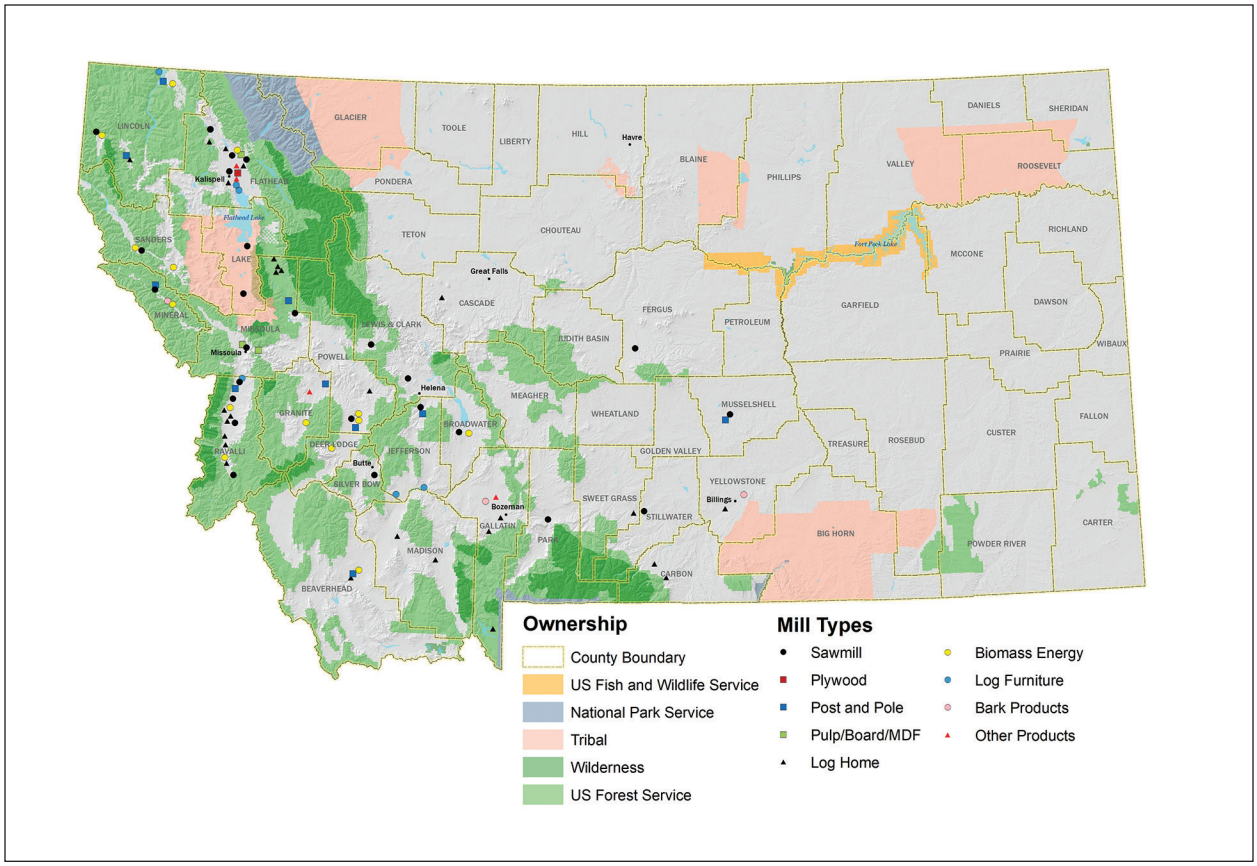

Figure 5—Map of active Montana primary processing facilities by type.

Table 11—Proportion of timber received by Montana facilities (MBF, Scribner) by ownership class, selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Ownership class	1981	1988	1993	1998	2004	2009	2014	2018
	Percentage of timber received							
Private	**56**	**56**	**67**	**73**	**75**	**55**	**60**	**39**
Industrial	34	34	31	43	39	31	20	6
Nonindustrial private and Tribal[a]	22	22	36	30	36	24	40	32
Public	**44**	**45**	**33**	**27**	**26**	**45**	**40**	**61**
National Forest	41	40	30	22	15	24	23	41
State	[b]	[b]	[b]	4	7	16	15	16
Other public[c]	4	5	2	1	3	5	2	4
All owners[d]	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

[a]Nonindustrial private and Tribal combined to prevent disclosure.

[b]State included in Other public.

[c]Includes timber received from Canada and unspecified out-of-state sources.

[d]Percentage detail may not sum to 100 percent due to rounding.

Table 12—Timber received by Montana facilities by ownership class and product, 2018.

Ownership class	Saw and veneer logs	House logs	Other products[a]	All products
	Thousand board feet, Scribner			
Private	**118,434**	**882**	**12,597**	**131,913**
Industrial	21,312	439	15	21,766
Nonindustrial private and Tribal[b]	97,122	442	12,582	110,146
Public	**199,028**	**2,067**	**11,507**	**212,602**
National Forest	133,594	1,816	7,336	142,746
State	53,838	251	3,375	57,464
Other public	11,596	0	796	12,392
Canadian and unspecified[c]	**148**	**1,771**	**104**	**2,023**
All owners	**317,611**	**4,720**	**24,208**	**346,538**

[a]Other products include logs used for pulpwood, posts and poles, log furniture, and industrial fuelwood.

[b]Nonindustrial private and Tribal combined to prevent disclosure.

[c]Includes timber received from Canada and unspecified out-of-state owners.

As in previous years, sawlogs and veneer logs constitute the vast majority (92 percent) of Montana's timber receipts while the proportion of other timber products has declined considerably since 2009, which was a high point for other timber products (table 13). Logs used for other timber products, including posts and poles, house logs, log furniture, pulpwood, and industrial fuelwood, accounted for 28 percent of receipts in 2009, versus 8 percent in 2018. The reduced proportion of other timber products is due to a combination of factors: a sharp decline in the total volume of timber harvested and processed in Montana, a decrease in the amount of pulpwood harvested since 1998, and good markets for Montana's sawmill and plywood/veneer sectors.

Douglas-fir was the predominant species received by Montana mills, accounting for nearly 41 percent of receipts (table 14). Douglas-fir accounted for the largest proportion of sawlog and veneer log receipts. Lodgepole pine accounted for the largest share of house logs and other products. Sawlog and veneer log receipts accounted for the largest volume for each species. National Forest land was the major source for each species received by Montana mills (table 15).

Table 13—Proportion of timber received by Montana facilities (percentage of timber received, MBF, Scribner) by product, selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Product	1981	1988	1993	1998	2004	2009	2014	2018
Saw and veneer logs	92	97	95	94	89	72	88	92
Other timber products[a]	8	3	5	6	11	28	12	8
All products	100	100	100	100	100	100	100	100

[a]Other timber products include logs used for posts and poles, house logs, pulpwood, log furniture, and industrial fuelwood.

Table 14a—Timber received by Montana facilities by species and product, thousand board feet, Scribner, 2018.

Species	Saw and veneer logs	House logs	Other products[a]	All products
Douglas-fir	133,262	860	6,234	140,355
Lodgepole pine	47,720	2,252	10,472	60,445
Western larch	42,884	492	1,679	45,054
Ponderosa pine	28,678	—	3,963	32,642
Other species[b]	37,952	513	1,084	39,549
Spruces	27,115	602	776	28,493
All species	317,610	4,720	24,208	346,538

Table 14b—Timber received by Montana facilities by species and product, percentage of timber received, 2018.

Species	Saw and veneer logs	House logs	Other products[a]	All products
Douglas-fir	38.5	0.2	1.8	40.5
Lodgepole pine	13.8	0.6	3.0	17.4
Western larch	12.4	0.1	0.5	13.0
Ponderosa pine	8.3	—	1.1	9.4
Other species[b]	11.0	—	0.3	11.3
Spruces	7.8	0.2	0.2	8.2
All species[c]	91.7	1.2	7.0	100

[a]Other products include logs used for pulpwood, posts and poles, log furniture, and industrial fuelwood.

[b]Other species include: true firs, western white pine, western redcedar, western hemlock, Rocky Mountain juniper, cottonwood and poplar, and other softwoods.

[c]Percentage detail may not sum to 100 percent due to rounding.

Table 15a—Timber received by Montana facilities by ownership class and species, thousand board feet, Scribner, 2018.

Ownership class	Douglas-fir	Lodgepole pine	Ponderosa pine	Spruce	Other species[a]	Western larch	All species
Private	**57,444**	**23,229**	**11,291**	**11,418**	**10,099**	**18,431**	**131,913**
Industrial	9,539	2,950	736	1,725	2,362	4,455	21,766
Nonindustrial private and Tribal[b]	47,904	20,280	10,555	9,694	7,737	13,977	110,146
Public	**82,539**	**36,381**	**21,347**	**16,724**	**29,225**	**26,387**	**212,602**
National Forest	55,437	27,063	12,846	12,206	19,031	16,164	142,746
State	21,047	6,961	6,665	3,871	9,348	9,572	57,464
Other public	6,055	2,357	1,835	647	846	652	12,392
Canadian and unspecified[c]	**373**	**835**	**4**	**351**	**225**	**235**	**2,023**
All owners	**140,355**	**60,445**	**32,642**	**28,493**	**39,549**	**45,054**	**346,538**

Table 15b—Timber received by Montana facilities by ownership class and species, percentage of timber received, 2018.

Ownership class	Douglas-fir	Lodgepole pine	Ponderosa pine	Spruce	Other species[a]	Western larch	All species
Private	**16.6**	**6.7**	**3.3**	**3.3**	**2.9**	**5.3**	**38.1**
Industrial	2.8	0.9	0.2	0.5	0.7	1.3	6.3
Non-industrial private and Tribal[b]	13.8	5.9	3.0	2.8	2.2	4.0	31.8
Public	**23.8**	**10.5**	**6.2**	**4.8**	**8.4**	**7.6**	**61.4**
National Forest	16.0	7.8	3.7	3.5	5.5	4.7	41.2
State	6.1	2.0	1.9	1.1	2.7	2.8	16.6
Other public	1.7	0.7	0.5	0.2	0.2	0.2	3.6
Canadian and unspecified[c]	**0.1**	**0.2**	**0.0**	**0.1**	**0.1**	**0.1**	**0.6**
All owners[d]	**40.5**	**17.4**	**9.4**	**8.2**	**11.4**	**13.0**	**100.0**

[a]Other species include true firs, western white pine, western redcedar, western hemlock, rocky mountain juniper, cottonwood and aspen, and other softwood species.

[b]Nonindustrial and Tribal combined to prevent disclosure.

[c]Includes timber receipts from Canada and unspecified out-of-state owners.

[d]Percentage detail may not sum to 100 percent due to rounding.

Sawmill Sector

The sawmill sector is the largest sector of Montana's forest products industry in terms of the number of facilities, employment, and the volume of timber processed. Montana's 25 sawmills produced 483 MMBF (lumber tally) of lumber and other sawn products in 2018, which is 1.3 percent of total U.S. softwood lumber production, and about 1 percent of U.S. softwood lumber consumption (Western Wood Products Association 2018).

Virtually all the timber used by the sawmill sector came from softwood species, with Douglas-fir, lodgepole pine, western larch, and ponderosa pine the most commonly used. Lumber is the main product produced by Montana sawmills, although small amounts of structural timbers and other specialized products such as flooring, siding, molding, and paneling are also produced. For 2018, about 90 percent of the lumber produced was dimension lumber used in construction applications.

In the 4 decades following World War II with generally strong demand and substantial volumes of timber available from private and public timberlands, production of lumber in Montana grew from 342 MMBF lumber tally, peaking at 1,640 MMBF in 1987. With the dramatic reduction in National Forest harvest and to a lesser degree private timber availability, sawmills closed and lumber production dropped through the 1990s and into the 2000s, with production in the very strong market year of 2005 at 1,001 MMBF. With the housing collapse and recession beginning in 2007, Montana's lumber production fell to 449 MMBF in 2009—the lowest since 1947 (fig. 6). Since 2009, annual lumber production has consistently stayed between 450 MMBF and 600 MMBF lumber tally, driven by market conditions and lack of log supply.

Sawmill Lumber Recovery

Product recovery ratios, or the volume of output per unit of input, are a measure of efficiency reported as lumber recovery factors (LRF) and lumber overrun (LO). The LRF is the lumber output (in thousand board feet lumber tally) divided by the timber input (thousand cubic feet). The lumber overrun is the amount of lumber recovered in excess of the amount predicted by the log scale, expressed as a proportion of the log scale. Although LO is the most commonly quoted measure of lumber recovery or efficiency, LO fails to accurately capture differences in lumber output per unit of timber input primarily due to the Scribner log scale. LRF better illustrates increased lumber output as a function of improvements in technology and sawing techniques (Keegan et al. 2010).

Both LO and LRF have shown substantial increases over the past 45 years as shown in figure 7 and table 16. LO had a steady increase from 1.30 in 1976 to 1.97 in 2018 (Hayes et al. 2020b; Keegan et al. 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008), with a slight decline to 1.81 in 2014 and during the Great Recession years (fig. 7). LRFs followed a similar pattern, increasing from about 6.7 board feet lumber tally per cubic foot of sawlog input in 1981, to 7.76 board feet in 2018 (table 16).

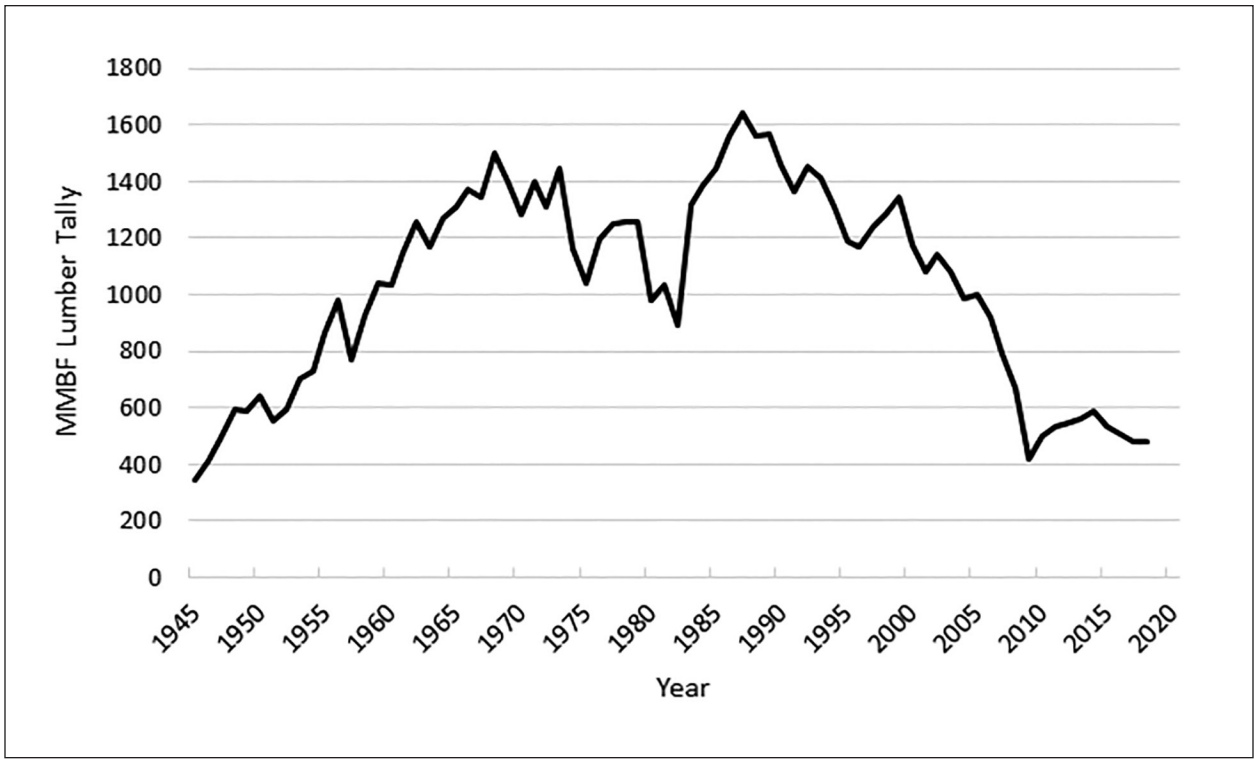

Figure 6—Montana lumber production, 1945–2018.

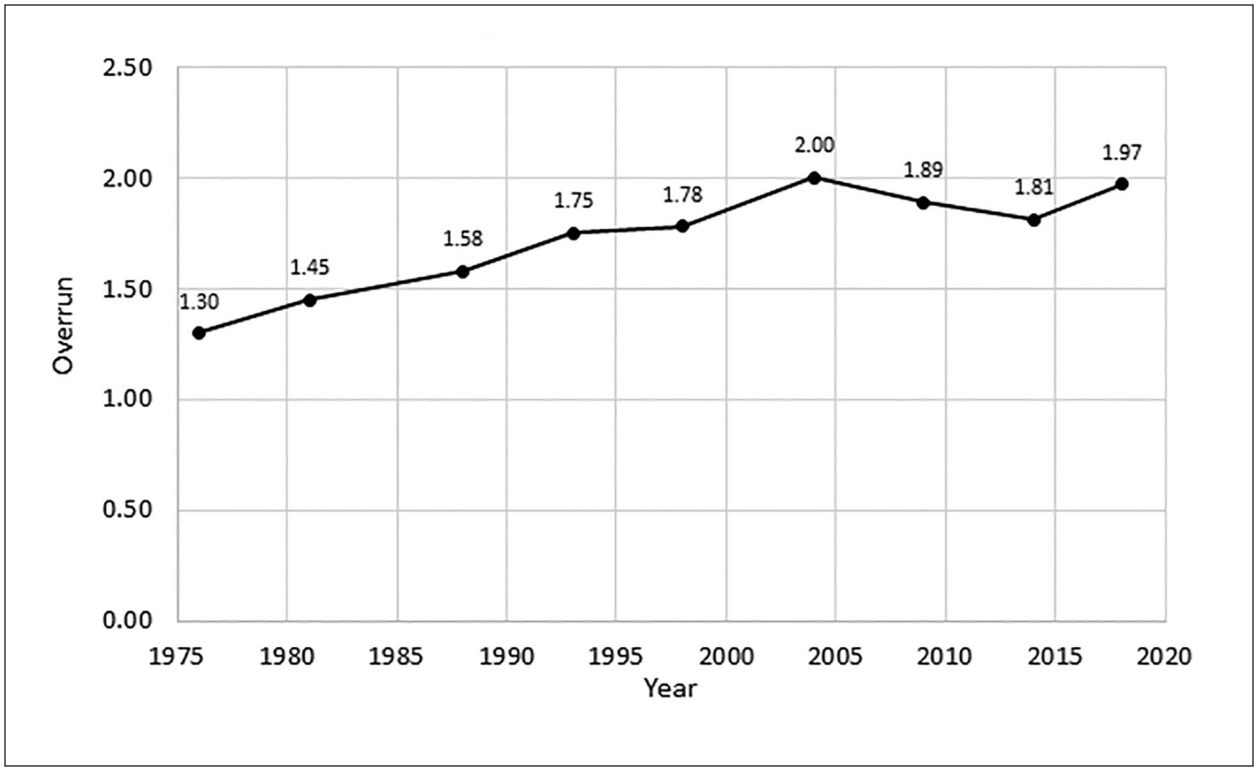

Figure 7—Average overrun for Montana sawmills, selected years.

Table 16—Montana lumber overrun and lumber recovery factor (LRF), selected years (sources: Hayes et al. 2020a; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Year	Timber processed (MMBF[a] Scribner)	Lumber produced (MMBF[a] lumber tally)	Overrun	LRF[b]
2018	245	483	1.97	7.76
2014	337	611	1.81	7.11
2009	237	449	1.89	7.35
2004	521	1,040	2.00	7.26
1998	725	1,287	1.78	7.17
1993	782	1,367	1.75	6.97
1988	985	1,558	1.58	6.79
1981	739	1,071	1.45	6.67

[a]MMBF = million board feet.

[b]LRF = board feet of lumber per cubic foot of log input.

The increase in Montana lumber recovery since 1976 is due primarily to improved sawing technology, with LO also influenced by the characteristics of the Scribner log scale. Technological improvements have made Montana mills more efficient in numerous ways. For example, computerized log size (diameter and length) sensing capabilities are used to determine the best sawing pattern to maximize volume recovery from each log, improved sawing accuracy has reduced the amount of size variation in sawn lumber that increases solid wood recovery, and thinner kerf saws have reduced the proportion of the log that becomes sawdust.

As log diameters decrease, the Scribner log rule, which is used in Montana, increasingly underestimates the volume of lumber that can be recovered from a log, thus increasing overrun. The average log diameter processed by Montana sawmills has decreased over the past 3 decades as milling technology has facilitated a shift from large ponderosa pine and spruce to smaller-diameter lodgepole pine and other species (Spoelma et al. 2008). The slight increase in overrun between 2014 and 2018 was largely a function of an improved market for lumber in 2018.

Sawmill Capacity

The number of Montana's sawmills has been declining since 1981 (table 17), and the lumber production has been increasingly concentrated in larger sawmills (table 18). In 1956, the peak of the post-World War II housing boom, 333 sawmills were operating in Montana, but only 26 produced more than 10 MMBF of lumber annually. By 1966, the number of sawmills in operation decreased to 148; however, the number of mills producing more than 10 MMBF increased to 37. Mills producing more than 10 MMBF accounted for 90 percent of lumber production in 1966,

Table 17—Number of Montana sawmills by annual lumber production, selected years (sources: Hayes et al. 2020b; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Schweitzer et al. 1975; Setzer and Wilson 1970; Spoelma et al. 2008).

Year	Annual lumber production			Total mills
	Less than 10 MMBF[a]	*10 MMBF*[a] *to 50 MMBF*	*More than 50 MMBF*[a]	
2018	17	4	4	25
2014	23	3	6	32
2009	30	6	5	41
2004	43	3	11	57
1998	54	8	11	73
1993	60	14	12	86
1988	58	16	13	87
1981	114	23	5	142
1976	68	24	6	98
1973	86	22	7	115
1966	111	37	[b]	148
1956	307	26	[b]	333

[a]MMBF = million board feet, lumber tally.

[b]Mills with production over 50 MMBF are included in the 10 MMBF to 50 MMBF category.

Table 18—Proportion of Montana lumber production by sawmill size class, selected years (sources: Hayes et al. 2020b; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Schweitzer et al. 1975; Setzer and Wilson 1970; Spoelma et al. 2008).

Year	Percentage of production		Million board feet	
	Less than 10 MMBF[a]	*More than 10 MMBF*[a]	*Total lumber production*	*Average production per mill*
2018	3	97	483	19.31
2014	2	98	611	19.09
2009	2	98	449	10.96
2004	3	97	1,040	18.24
1998	2	98	1,287	17.63
1993	4	96	1,367	15.90
1988	4	96	1,558	17.91
1981	8	92	1,071	7.54
1976	4	96	1,176	12.00
1966	10	90	1,375	11.96
1962	13	87	1,259	8.51
1956	33	67	979	2.97

[a]MMBF = million board feet, lumber tally.

versus 67 percent in 1956. The number of sawmills continued to decline through 1976, when 98 sawmills were operating in Montana. The number of large mills decreased to 30, but their proportion of total production increased to 96 percent.

By 1981, the trend in declining numbers of sawmills had reversed itself to 142, with 28 mills producing more than 10 MMBF of lumber. The increase in the total number of mills was due to an increase in the number of small sawmills, from 68 in 1976 to 114 in 1981, though large mills still accounted for 92 percent of total lumber production in Montana. From 1988 through 1998, the number of small mills operating in Montana remained relatively stable, but the number of mills producing over 10 MMBF decreased from 29 in 1988 to 19 in 1998. However, the proportion of production from mills producing over 10 MMBF of lumber increased from 96 percent in 1988 to 98 percent in 1998.

Since 1998, the number of small and large mills has decreased. In 2018, Montana had 25 sawmills operating, the fewest of any previous census (17 were small mills and 8 were large mills producing more than 10 MMBF annually). The proportion of total production from large mills decreased slightly to 97 percent, but the average production per mill, 19.31 MMBF, was the highest recorded. Of the 8 large mills, four produced more than 50 MMBF, accounting for 58.3 percent of lumber production (table 19). Mills producing between 10 and 50 MMBF accounted for 38.3 percent of the 483 MMBF of lumber produced in 2018. Of the 17 small mills, 7 produced between 1 and 10 MMBF of lumber, while the remaining 10 produced less than 0.15 MMBF each. Since 2014, 1 mill producing over 10 MMBF has permanently closed, and other small mills have permanently or temporarily curtailed production in response to timber availability issues and the overall economic situation.

Table 19—Lumber production by Montana sawmills, 2018.

Lumber production size class	Number of mills	Percentage of production	Lumber production (MMBF[a])	Average production per mill (MMBF[a])
More than 50 MMBF[a]	4	58.3	297	74.16
10 to 50 MMBF	4	38.3	172	42.97
1 to 10 MMBF	7	2.9	13	1.80
Less than 1 MMBF	10	0.5	2	0.15
Total	**25**	**100.0**	**483**	**19.31**

[a]MMBF = million board feet, lumber tally.

Log Home Sector

The Great Recession of 2007-2009 and related collapse in the U.S housing market impacted Montana's log home industry more severely than any other sector of the State's wood products industry. The number of log home manufacturers in Montana increased in every census year, from 19 in 1976 to 88 in 2004. With the impact of the Great Recession, the number of log home facilities decreased to 33 facilities, a 63 percent decline in 2009 (table 10). In 2018 the number of log home manufacturers operating was 27, 2 more than was reported in 2014. Along with the decrease in the number of manufacturers, sales dropped by an even greater proportion, from the high of $84 million in 2004 to approximately $22 million in 2009 and 2014. Sales continued to decline to $18 million in 2018. Production also declined, from 6 million lineal feet in 2004 to 2 million lineal feet in 2018. The high-end resort and recreation properties were the major markets for the Montana log home industry. This component of the real estate market has declined dramatically since the Great Recession. Ravalli, Missoula, Flathead, and Gallatin Counties continue to be relative centers of activity for the industry, with over 60 percent of the production coming from facilities in these counties.

As with the sawmill sector, the availability of raw material for the log home sector has been problematic. In 2014, 61 percent (2.7 MMBF) of the 4.46 MMBF of timber received by Montana's log home manufacturers was sourced from outside Montana, including 1.8 MMBF from Canada. For comparison, in 2018, 65 percent (3.07 MMBF) of the 4.7 MMBF of timber received by Montana's log home manufacturers was sourced from outside Montana, with approximately 1.5 MMBF from Canada and, the remaining house logs coming from nearby and adjacent States.

Montana's log home manufacturers offer three styles of house logs: sawn, machined (lathe turned or machine contoured), or hand-hewn. Some manufacturers focus on log railings and other accent pieces. Various methods of construction, including Swedish cope, double-round tongue and groove, American chinked, and D-style, are available. Various degrees of assembly are also offered, ranging from house log packages to shells and completed homes.

In 2018, machined logs accounted for 29 percent of sales, compared to 55 percent in 2014. Hand-hewn logs accounted for 40 percent of sales, compared to 20 percent in 2014. Sawn logs were 29 percent of sales, compared to 25 percent in 2014. About $326 thousand of sales (close to 2 percent) from the log home sector in 2018 consisted of specialty products, such as log railings and accent pieces.

Other Sectors

Other sectors of Montana's forest products industry include a plywood plant; manufacturers of posts, poles, and other roundwood products; manufacturers of log furniture; roundwood pulp-chip conversion facilities; and facilities that utilize mill residues as their primary input.

One plywood plant operated in Montana in 2018, one fewer than operated during 2014. Douglas-fir and western larch are the primary species used for plywood and veneer, although small amounts of other species are also used. The remaining plywood plant in Montana generally produces specialized plywood for RV and boat construction. The plywood sector in Montana produced 133 million square feet (MMSF), 3/8" basis, of plywood in 2018, compared to 167 MMSF in 2014. Montana's annual plywood production peaked in 1989 at 725 MMSF and fluctuated around 600 MMSF annually through the 1990s and the early 2000s.

The post, pole, and other roundwood products sector consists of manufacturers of fence posts, small poles, and rails used in fence construction. These products are often treated with wood preservatives, but untreated products are also available. Since 1988, when 37 post and pole manufacturers operated in Montana, the number of manufacturers in this sector has steadily declined (table 10). In 2018, 10 post and pole manufacturers operated in Montana, and total sales from the sector were about $10.2 million, down nearly 37 percent from $16.2 million in 2014. Closures have occurred primarily among the smaller facilities due to increased competition for raw materials and stricter regulations related to preservative treatments. However, sales have declined proportionately less than in other wood products sectors in part due to the strong agricultural markets in Montana and across the United States. These markets are the main users of post and pole material.

The log furniture sector saw an increase in the number of facilities since 1993, although the sector has contracted considerably since 2004. During 2018, 5 log furniture manufacturers operated in Montana, the same as operated in 2014. An additional two facilities were inactive in 2018 but could reopen in the future. There is considerable turnover of manufacturers in this sector, as very little capital or equipment are required to manufacture log furniture, making it easy to start and stop operation. Like post and pole manufacturers, makers of log furniture also prefer to use smaller (2- to 6-inch diameter) lodgepole pine. A number of products are produced by log furniture manufacturers in Montana, with headboards, footboards, and frames for beds, as well as other bedroom furniture, chairs and tables being the most common items. Sales value from Montana's log furniture sector was about $2 million in 2018 compared to $800 thousand in 2014. Like the log home industry, much of the sales of log furniture were in the high-end housing market, which has suffered large declines in the recent decade.

In 2018, Montana's residue-utilizing sector consisted of several types of facilities, including 1 particleboard plant, 1 MDF plant, 3 firewood plants, 1 shaving facility producing animal bedding, 4 producers of bark and landscape products, 2 chipping facilities producing wood chips for MDF, pulp and paper mills, and 14 facilities that utilize mill and other residues to produce heat for public schools and other institutions. The primary input for most of these facilities is wood residue produced as a byproduct from manufacturing other wood products, most notably lumber and plywood. These facilities play an important role in Montana's forest products industry, not only for the products that they generate, but also as users of wood fiber residue from sawmills and plywood plants. The sales value of mill residue and residue-related products from Montana facilities totaled $222 million during 2018, an 8 percent decline from the inflation-adjusted sales value of $241 million in 2014.

Most Montana mill residue volume is used by facilities manufacturing particleboard and MDF. These facilities utilize clean chips, sawdust, and planer shavings from sawmills and plywood plants, as well as chipped roundwood from chipping plants, to produce pulp and board products. The State's particleboard and MDF plants opened during the 1970s, and both plants have seen several expansions since then. The particleboard plant currently has the capacity to produce 150 thousand square feet (MSF 3/4" basis) per 8-hour shift, while the MDF plant's current capacity is 250 MSF (3/4" basis) per 8-hour shift (Random Lengths 2019).

Other residue-utilizing sub-sectors have also seen declines in recent years. The number of facilities generating bark and landscape products decreased from 6 in 2004 to 4 in 2018. These facilities produce landscape products such as decorative bark, mulch, and compost.

Industry Capacity

Montana's timber-processing facilities report shift capacity and annual production capacity in volume of outputs that could be produced given a sufficient supply of raw material, firm market demand for their products, and ordinary maintenance and down-time. Facilities also report the number and length of daily shifts and number of annual operating days. Sawmills report annual capacity and shift capacity in MMBF of lumber; plywood plants in MMSF (3/8" basis); post and pole and log furniture manufacturers in number of pieces; and log home manufacturers in thousands of lineal feet. Although different units are used by each industry sector to measure output, a common unit, MBF Scribner, has been used by each sector to quantify timber input. Calculating capacity in terms of timber input allows capacity for different sectors to be combined, which in turn provides a better understanding of the entire forest products industry's size and ability to process timber. The measurement of capacity in units of timber input is referred to as timber-processing capacity, and it is calculated by dividing each mill's stated production capacity in units of output by its product recovery per board foot Scribner of timber processed (Keegan et al. 2006). Three sectors—the sawmill sector, the plywood sector, and the log home sector—use

sawtimber-sized material as their primary input, while post and pole and log furniture manufacturers use smaller material. Capacity for sawtimber users is discussed separately from non-sawtimber users.

In 2018, annual sawtimber processing capacity was 489 MMBF, Scribner, and 59 percent (289 MMBF) of capacity was utilized (table 20).[3] Sawtimber processing capacity has steadily declined since the late 1980s (fig. 8). Capacity remained steady at nearly 1,600 MMBF during the late 1970s and then slightly declined during the recession years of the early 1980s before climbing to a near peak of 1,561 MMBF in 1988. Since the late 1980s, reductions in timber availability have led to steady declines in capacity, even during periods of high lumber prices and high demand.

The percentage of annual sawtimber processing capacity utilized has fluctuated since 1976, when 75 percent was utilized. In 1982, during a severe recession, capacity utilization dropped to 53 percent. By the late 1980s, the percentage of utilized capacity had rebounded to about 80 percent, and it stayed at that level through the early 1990s. From 1996 through 2001, capacity utilization ranged from 84 to 88 percent, before dropping back to 43 percent in 2009, which is the lowest level of utilization on record. The low level of utilization was due primarily to the Great Recession of 2007, weak markets and, to a lesser extent, timber availability. Because sawmills account for the bulk of processing capacity, the percent of total sawtimber capacity utilized generally follows the percent of processing capacity utilized at sawmills.

Sawmills have consistently accounted for about 80 percent of sawtimber processing capacity. Annual sawtimber processing capacity at Montana's sawmills was 421 MMBF Scribner in 2018, and sawmills utilized 58 percent of their capacity by processing 245 MMBF Scribner of timber in 2018. Capacity utilization rates differ by the size of the mill, with larger mills typically utilizing a greater percentage of their processing capacity. Montana's sawmills with processing capacities greater than 10 MMBF (Scribner) accounted for 97 percent (408 MMBF) of the sawtimber processing capacity, while utilizing 57 percent of that capacity. Sawmills processing less than 10 MMBF (Scribner) accounted for the remaining 3 percent (13 MMBF) and utilized 84 percent of their capacity. Sawmills with timber-processing capacities greater than 10 MMBF expressed their annual capacity in terms of two 8- or 10-hour shifts or three 8-hour shifts daily, for a 220- to 260-day operating year. Sawmills with processing capacities fewer than 10 MMBF usually expressed annual capacity in terms of one 8- or 10-hour shift for an operating year of not more than 250 days.

Other users of sawtimber—plywood plants, house log manufacturers, and utility pole manufacturers—account for about 14 percent of sawtimber processing capacity. These facilities had 68 MMBF Scribner of sawtimber processing capacity in 2018 and utilized 65 percent of this

[3]Volume of timber utilized may differ from total mill receipts for these sectors due to changes in log inventories at individual mills.

Table 20—Sawtimber processing capacity and utilization, selected years (sources: Hayes et al. 2020b; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

	Plant type	Processing capacity	Volume processed	Percentage of capacity utilized
		Million board feet, Scribner		
2018	Sawmills	421	245	58
	Other sawtimber users[a]	68	44	65
	Total	489	289	59
2014	Sawmills	546	337	62
	Other sawtimber users[a]	89	57	64
	Total	635	394	62
2009	Sawmills	554	237	43
	Other sawtimber users[a]	106	66	62
	Total	660	303	46
2004	Sawmills	743	521	70
	Other sawtimber users[a]	191	135	71
	Total	934	656	70
1998	Sawmills	844	725	86
	Other sawtimber users[a]	247	221	89
	Total	1,091	946	87
1993	Sawmills	964	782	81
	Other sawtimber users[a]	287	234	82
	Total	1,251	1,016	81
1988	Sawmills	1,237	985	80
	Other sawtimber users[a]	324	241	74
	Total	1,561	1,226	79
1981	Sawmills	1,207	739	61
	Other sawtimber users[a]	276	241	87
	Total	1,483	980	66

[a]Other sawtimber users include plywood and veneer plants, house log manufacturers, and utility pole plants.

[b]2009 numbers revised from McIver et al. 2013.

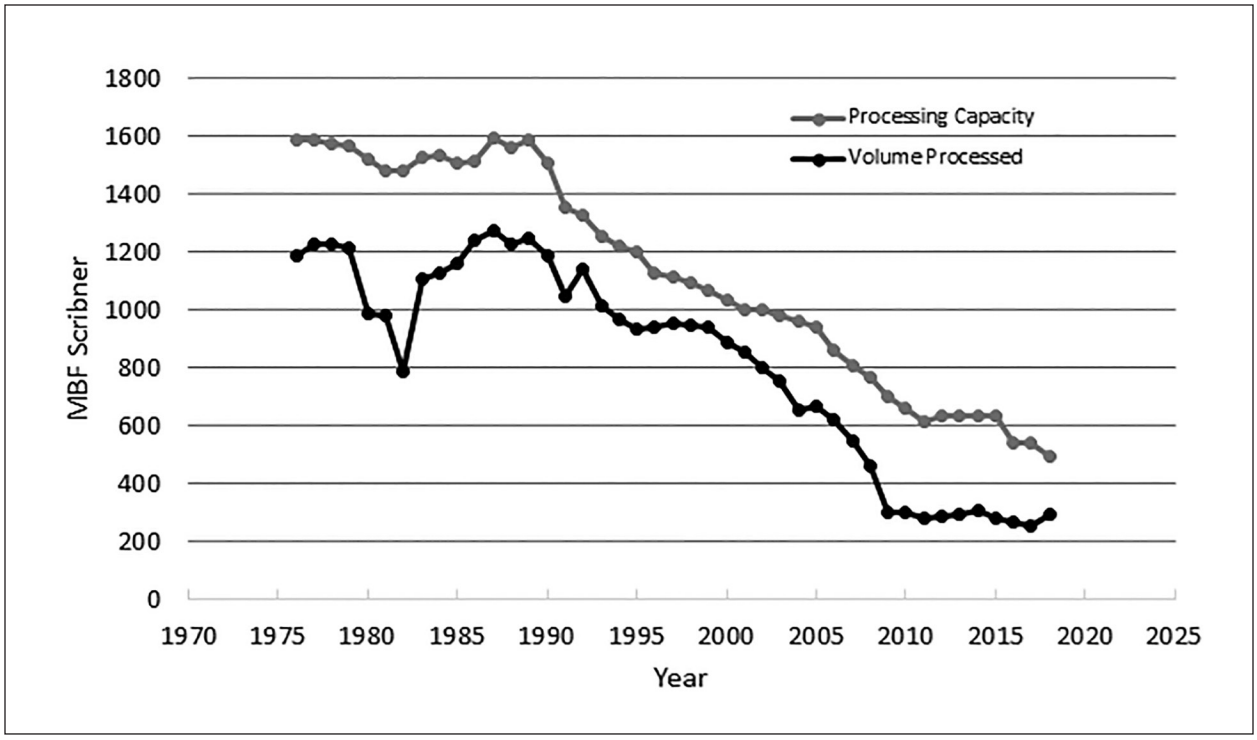

Figure 8—Montana timber-processing capacity and utilization, 1976–2018.

capacity, processing 44 MMBF of timber. In previous surveys, capacity for plywood plants was reported separately from house log and utility pole manufacturers; however, their capacity has been combined in this report to prevent disclosure of firm-level data. It is important to note that plywood plants historically have used over 90 percent of their processing capacity, while house log and utility pole plants have not used more than 63 percent of their processing capacity (Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001). Plywood plants are the largest of other sawtimber users and tend to operate at high levels of capacity utilization, which boosts overall capacity utilization. Montana's plywood facilities express their annual capacities in terms of three 8-hour shifts for a 240- to 290-day operating year. Log home manufacturers usually express their annual production capacity in terms of one 8-hour shift per day for an operating year not exceeding 240 days.

Non-sawtimber users, such as post and pole plants, cedar products, and log furniture manufacturers, also reported their shift and annual production capacity. These facilities are typically small operations and capacity can be influenced by the operators as much as the processing equipment. For example, the operators of many of these facilities choose to harvest their own timber, which in turn limits the number of days that they can operate processing equipment. These facilities usually express their annual production capacity in terms of one 8-hour shift per day for an operating year of 250 days or less. In 2018, annual timber-processing capacity for non-sawtimber users was 16 MMBF Scribner, with 39 percent (6.2 MMBF) of capacity utilized.

Mill Residue Production and Use

Wood residue from the manufacturing of primary wood products is the major source of material for pulp and paper mills, particle board and MDF plants, and other manufacturers of residue-based products in Montana and other western States. Mill residue is also used for fuel by sawmills, plywood plants, and pulp mills, as well as by schools and other public buildings in the "Fuels for Schools and Beyond" program. The outlets provided by the residue-utilizing sector are very important to Montana's forest products industry because disposing of residue would be difficult and costly. Mill residue falls into three general categories: (1) coarse residue or chippable material such as slabs, edging, and trim, log ends, and defective veneer; (2) fine residue, including sawdust, sander dust, and planer shavings; and (3) bark. The volume of mill residue produced during a given year is closely linked to lumber and plywood production in that year. In addition, milling equipment, species and size of logs, amount of defect in logs, and market conditions also influence the amount of residue generated by timber processors.

Factors quantifying the volume of residue generated by sawmills in bone-dry units (BDU, 2,400 lbs. oven-dry weight) per thousand board feet of lumber produced were developed for each of Montana's sawmills (table 21) based on each mill's lumber and residue production. In 2018, 0.84 BDUs of residue were generated per MBF of lumber produced. Coarse residue accounts for 39 percent of the residue produced per unit of lumber, with sawdust, planer shavings, and bark accounting for 11 to 20 percent each. Since 1981, the total residue factor for sawmills has been decreasing, attributable to improved milling technology and a shift toward producing more dimension lumber, which has a greater nominal thickness (2" to 5") than boards (less than 2"). The decrease in the bark factor is likewise due to improved milling technology. The coarse residue factor has varied slightly but has not decreased to the extent of other factors because of the increased use of smaller-diameter logs, which tend to create somewhat more residue despite the technological improvements that make lumber recovery possible from the smaller logs.

Table 21—Montana sawmill residue factors, selected years (sources: Hayes et al. 2020b; Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; McIver et al. 2013; Spoelma et al. 2008).

Type of residue	1981	1988	1993	1998	2004	2009	2014	2018
	BDU of residue per MBF lumber tally[a]							
Coarse	0.47	0.51	0.48	0.49	0.47	0.44	0.42	0.39
Sawdust	0.25	0.22	0.23	0.22	0.19	0.21	0.21	0.20
Bark	0.23	0.21	0.21	0.19	0.20	0.19	0.16	0.14
Planer shavings	0.22	0.18	0.16	0.17	0.15	0.14	0.12	0.11
Total	1.17	1.12	1.08	1.07	1.01	0.98	0.91	0.84

[a]Bone-dry unit (BDU) = 2,400 lb of oven-dry wood) of residue generated for every 1,000 board feet of lumber manufactured.

The total volume of residue produced by Montana's sawmills and plywood plants during 2018 was 465 thousand BDUs (table 22). This is the lowest residue production compared to previous surveys (Hayes et al. 2020 a,b; McIver et al. 2013; Keegan 1980; Keegan et al. 1983, 1990, 2001, 2004; Spoelma et al. 2008), and corresponds to the lower lumber production in 2018. In contrast to the low level of residue production, the utilization of residue has reached record highs in recent years, with virtually all residue from sawmills and plywood plants utilized. Nearly 80 percent of all residue was used for pulp and board, and more than 14 percent was used as fuel for energy. The remainder was used for landscape products or animal bedding. Less than 0.2 percent of residue from sawmills and plywood plants was unutilized in 2018.

Coarse residue accounted for 48 percent of the residue volume produced by sawmill and plywood plants (222,834 BDU), and 93 percent of that was used by pulp and board mills. The remaining 7 percent

Table 22a—Production and disposition of residues from Montana sawmills and plywood plants, 2018.

Residue type	Total utilized	Pulp and particle board	Energy	Mulch or animal bedding	Unspecified use	Unutilized	Total produced
			Bone dry units[a]				
Coarse	222,789	208,124	11,602	--	3,063	45	222,834
Fine	164,434	161,313	1,174	1,859	88	276	164,710
Sawdust	110,032	108,005	748	1,278	--	188	110,220
Planer shavings	54,402	53,308	426	581	88	88	54,490
Bark	76,271	--	53,105	23,166	--	828	77,099
All residues	463,494	369,437	65,881	25,024	3,151	1,149	464,643

Table 22b—Production and disposition of residues from Montana sawmills and plywood plants, 2018.

Residue type	Total utilized	Pulp and particle board	Energy	Mulch or animal bedding	Unspecified use	Unutilized	Total produced
			Percentage of residue use by type				
Coarse	100.0	93.4	5.2	-	1.4	0.0	100
Fine	99.8	97.9	0.7	1.1	0.1	0.2	100
Sawdust	99.8	98.0	0.7	1.2	--	0.2	100
Planer shavings	99.8	97.8	0.8	1.1	0.2	0.2	100
Bark	98.9	--	68.9	30.0	--	1.1	100
All residues	99.8	79.5	14.2	5.4	0.7	0.2	100

[a]Bone dry unit = 2,400 lb oven-dry wood.

(14,665 BDU) of coarse residue was used for energy, mulch, animal bedding, or an unspecified use. Less than 1 percent went unutilized.

Fine residues from sawmills and plywood plants totaled 165 thousand BDUs in 2018, of which 67 percent was sawdust and 33 percent was planer shavings. Most sawdust (98 percent) was used by pulp and board mills, with 1 percent used for landscape products or animal bedding and less than 1 percent used for energy. With planer shavings, a similar proportion (98 percent) was used by pulp and board mills, while nearly equal amounts (< 1 percent each) were used for energy and landscape products or animal bedding. In summary, pulp and board mills used 98 percent of fine residues as raw material for their products, while less than 1 percent was used for energy and 1 percent was used for mulch or animal bedding. Less than 1 percent of fine residues went unutilized.

During 2018, Montana sawmills and plywood plants produced 77 thousand BDUs of bark residue. Slightly less than 69 percent of bark residue was used for energy, and 30 percent of the bark residue was used for landscape products, animal bedding, or unspecified uses. One percent of the bark residue produced by sawmills and plywood plants in Montana in 2018 was unutilized.

Other manufacturers, including house log manufacturers, post and pole plants, cedar product manufacturers, and log furniture manufacturers produce a small volume of residues (table 23). In 2018, these facilities produced about 19.4 thousand BDUs, of which about 87 percent (16,760 BDU) was used. The most common use for this material was energy (9,024 BDU), followed by landscape products, animal bedding and other uses (6,787 BDU) and pulp and board (949 BDU). The remaining 13 percent (2,602 BDU) of residue from these facilities was unutilized.

Table 23a—Production and disposition of residues from Montana's primary wood products sectors, 2018.

Sector	Total utilized	Pulp and particle board	Energy	Mulch or animal bedding	Unspecified use	Unutilized	Total produced
				Bone dry units[a]			
Lumber, plywood, and other sawn products	463,494	369,437	65,881	25,024	3,151	1,149	464,643
House logs and log homes	3,561	--	2,969	252	340	802	4,363
Posts and poles	12,516	949	5,840	2,366	3,361	1,700	14,215
Other sectors[b]	5,414	--	5,215	190	9	118	5,532
All sectors	484,985	370,386	79,905	27,833	6,861	3,769	488,753

Table 23b—Production and disposition of residues from Montana's primary wood products sectors, 2018.

Sector	Total utilized	Pulp and particle board	Energy	Mulch or animal bedding	Unspecified use	Unutilized	Total produced
	Percentage of residue use production and use by sector						
Sawmill and plywood	99.8	79.5	14.2	5.4	0.7	0.2	100
House log and log home	81.6	-	68.0	5.8	7.8	18.4	100
Post and pole	88.0	6.7	41.1	16.6	23.6	12.0	100
Other sectors[b]	97.9	--	94.3	3.4	0.2	2.1	100
All sectors	99.2	75.8	16.3	5.7	1.4	0.8	100

[a]Bone dry unit = 2,400 lb oven-dry wood.

[b]Other sectors include firewood, pulp chipping, and log furniture.

Economic Aspects of Montana's Forest Industry: Products, Markets, and Sales Value

The sales value of primary forest products produced in Montana has increased through the years, from just under $338 million (2018 dollars) in 1945 to $2.2 billion in 1994. However, after the massive downturn in the national economy, sales value of products from Montana mills fell to $380 million in 2010 (fig. 9). The growth in sales value between 1945 and 1994 was due to growth in the sawmill sector and diversification in the industry, particularly the addition of the plywood and residue-utilizing sectors. With the emergence of the residue-utilizing sector, the proportion of total sales from lumber and plywood decreased from about 95 percent in 1956 to 30 percent in 2009. While the proportion of sales from lumber and plywood decreased, the proportion of sales from the residue-utilizing sector increased significantly—from under 40 percent in 2004 to nearly 63 percent in 2009 (table 24). This was mostly a function of the Great Recession's impact on the lumber industry. However, the residue-related proportion of sales fell to less than 31 percent by 2010, after the closure of Montana's only pulp and paper mill. The proportion of sales from other products, such as posts and poles, clean chips, and log furniture, was constant with about 3 percent of total sales during 2014 and 2018.

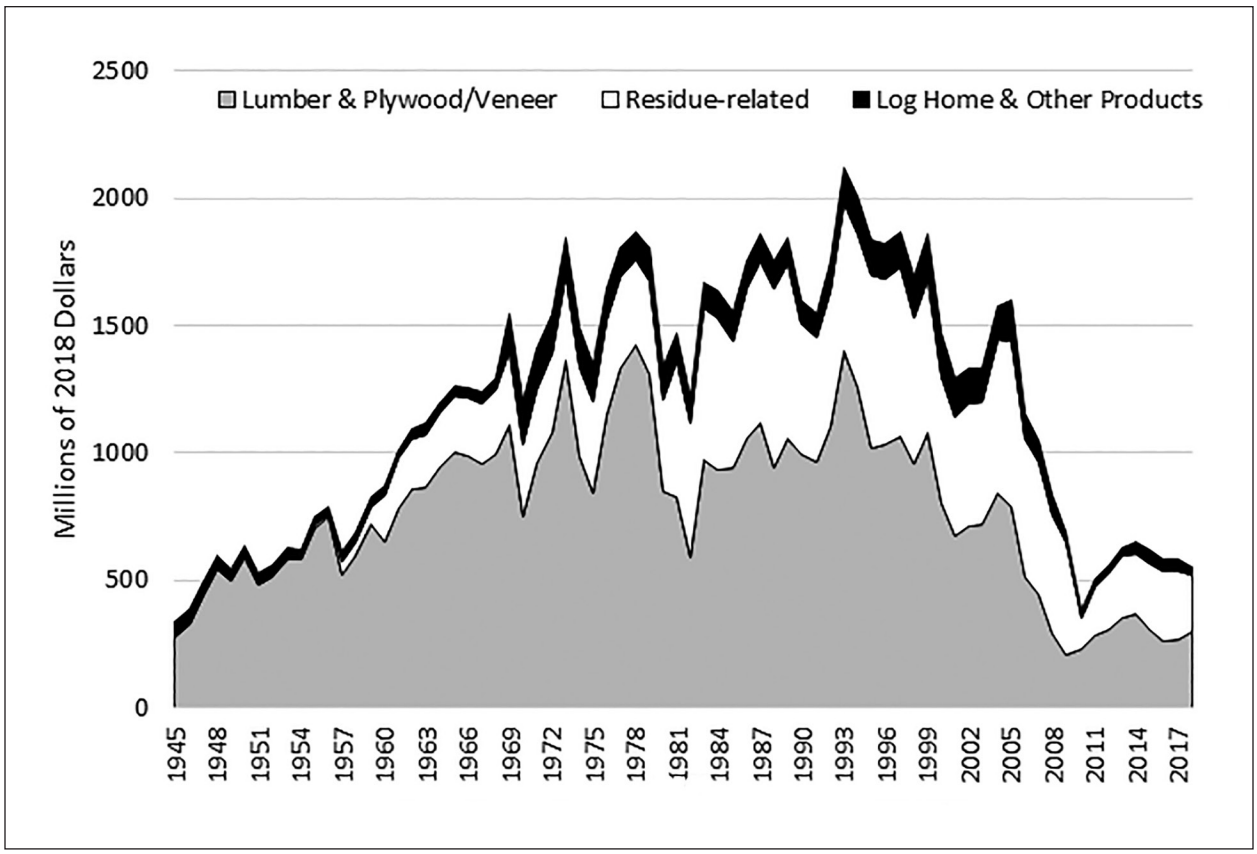

Figure 9—Sales value of Montana's primary forest products, 1945–2018.

Table 24—Proportion of finished product sales of Montana's primary wood products sectors, selected years (sources: Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; Marcille et al. 2020; McIver et al. 2013; Spoelma et al. 2008).

Sector	1981	1988	1993	1998	2004	2009	2014	2018
	Percentage of sales value							
Lumber, plywood, and other sawn products	58	55	67	60	53	29	57	54
Pulp, particle board, and residue-related products	38	41	28	30	39	63	36	40
House logs and log homes	2	3	5	9	7	4	4	3
Other products[a]	2	1	1	1	1	4	3	3
All products[b]	100	100	100	100	100	100	100	100

[a]Other products include: posts and poles, log furniture, and energy products.

[b]Percentage detail may not sum to 100 percent due to rounding.

Sales of plywood, lumber, and other sawn products were lower in 2018 than in 2014, with sales of just under $300 million (table 25), compared with nearly $364 million in 2014 (2018 dollars) (Marcille et al. 2020). The decline in sales was due to volatile markets and declining lumber prices compared to 2014. Two large facilities closed during this period, reducing sales value in the sector. The long-anticipated return to normal in U.S. housing starts following the historic low during the Great Recession in 2007 has yet to materialize. This is one of the primary reasons that wood products markets suffered, another factor being the Canadian lumber tariff negotiations.

During 2018, sales from residue-related products were $222 million, including the value of mill residues sold to residue-utilizing facilities within and outside of Montana. The majority of sales in this sector was from pulp chips, particleboard, and MDF. The $222 million in sales in 2018 was a decline of 5 percent from 2014, when sales of these products had an inflation-adjusted sales value of $234 million. Sales of house logs and log homes were $16 million in 2018, down from $23 million in 2014 and $24 million in 2009 (2018 dollars). Sales from posts and poles, firewood, cedar products, and log furniture were about $19 million in 2018.

Table 25a—Destination and sales value of Montana's primary wood products, 2018.

Product	North Central[a]	Far West[b]	South[c]	Montana	Rocky Mountains[d]	Northeast[e]	Other countries[f]	Total
				Thousand 2018 dollars				
Lumber, plywood, and other sawn products	90,664	11,840	61,301	62,081	54,253	14,529	1,933	296,601
Residue-related products[g]	70,830	66,129	21,548	6,676	26,912	2,894	27,452	222,441
House logs and log homes	959	3,050	1,182	6,612	2,481	967	1,035	16,286
Other finished products	654	2,944	329	10,656	2,577	679	172	18,011
All products and residues	163,107	83,963	84,360	86,024	86,223	19,069	30,592	553,339

Table 25b—Destination and sales value of Montana's primary wood products, 2018.

Product	North Central[a]	Far West[b]	South[c]	Montana	Rocky Mountains[d]	Northeast[e]	Other countries[f]	Total
				Percentage of sales				
Lumber, plywood, and other sawn products	16	2	11	11	10	3	0	54
Residue-related products[g]	13	12	4	1	5	1	5	40
House logs and log homes	0	1	0	1	0	0	0	3
Other finished products	0	1	0	2	0	0	0	3
All products and residues[h]	29	15	15	16	16	3	6	100

[a]North Central includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

[b]Far West includes Alaska, California, Hawaii, Oregon, and Washington

[c]South includes Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

[d]Rocky Mountains includes Arizona, Colorado, Idaho, Nevada, New Mexico, Utah, and Wyoming.

[e]Northeast includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, Pennsylvania, Rhode Island, and Vermont.

fOther countries include Canada, Pacific Rim countries, and other countries.

[g]Residue-related products include pulp chips, MDF and particleboard, fuel pellets, and bark products.

[h]Percentage detail may not sum to 100 percent due to rounding.

Montana wood products firms were asked to indicate the proportion of their sales by market region[4] (fig. 10; table 26). In 2018, the top three regions in terms of sales value were the North Central (29 percent), the Rockies (16 percent), and Montana (16 percent). Montana has increased its market share, going from being the fifth largest market in 2004 to fourth largest in 2009 and 2014. When Montana is combined with other Rocky Mountain States, the region is the largest at 32 percent of sales. Sales to other countries stayed relatively stable at 6 percent, the same as in 2014, and the Northeast fell from 4 percent of sales in 2014 to 3 percent in 2018.

The two largest market regions for residue-related products in 2018 were the North Central and the Far West, followed by other countries, Rocky Mountains States (other than Montana), the South, Montana, and the Northeast. The majority of sales from house logs and other products remained in Montana.

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[4]**North Central:** Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.

South: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia.

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont.

Rocky Mountains: Arizona, Colorado, Idaho, Nevada, New Mexico, Utah, Wyoming.

Far West: Alaska, California, Hawaii, Oregon, Washington.

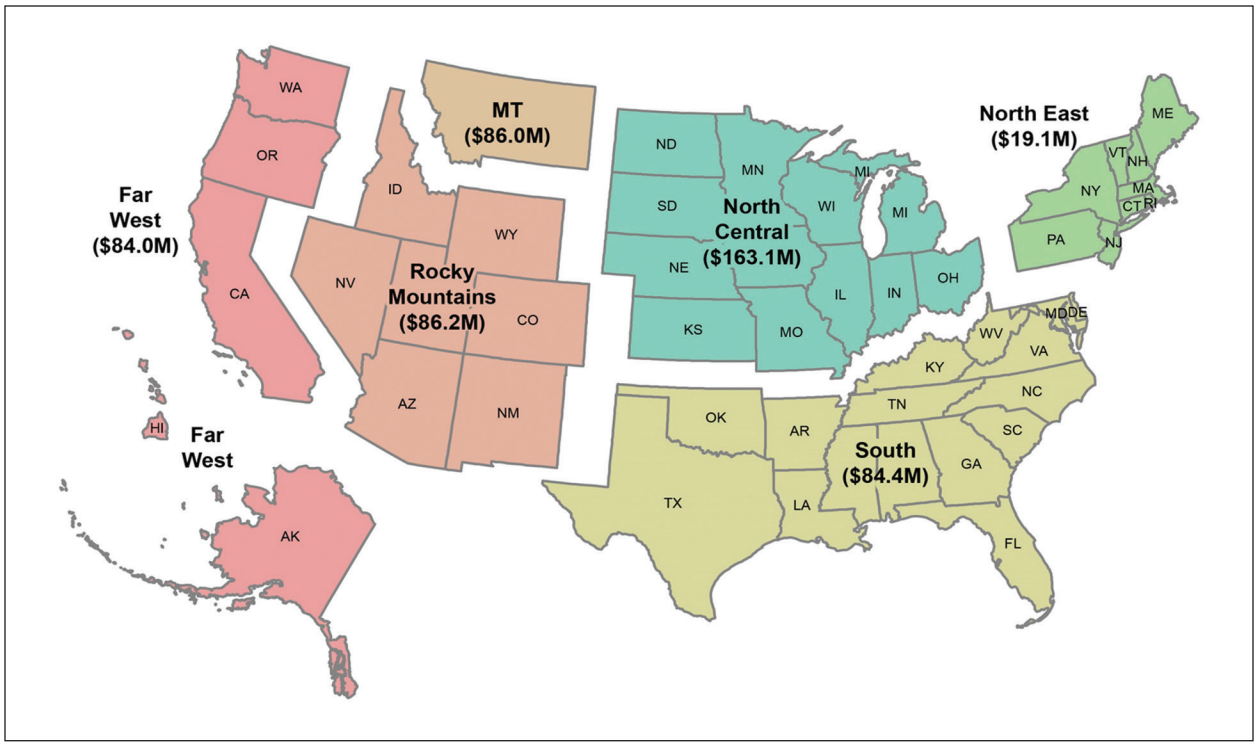

Figure 10—Destination and sales value of Montana's primary wood products, 2018.

Table 26—Proportion of Montana primary wood product sales by market region, selected years (sources: Keegan 1980; Keegan et al. 1983, 1990, 1995, 2001; Marcille et al. 2020; McIver et al. 2013; Spoelma et al. 2008).

Market area	1981	1988	1993	1998	2004[a]	2009[a]	2014[a]	2018[a]
				Percentage of sales				
North Central	34	40	37	28	28	27	31	29
Montana	7	5	10	12	12	12	14	16
Rocky Mountains	14	11	15	13	10	11	14	16
Far West	22	17	15	19	17	18	17	15
South	10	10	11	16	15	13	15	15
Other countries[b]	3	9	6	4	6	10	6	6
Northeast	6	7	6	9	12	8	4	3
Unknown	4	1	0	0	0	0	0	0
All areas[c]	100	100	100	100	100	100	100	100

[a]Includes mill residue sales; previous years do not include residue sales.

[b]Other countries include Canada, Pacific Rim countries, and other countries.

[c]Percentage detail may not sum to 100 percent due to rounding.

Montana's Forest Industry Employment and Labor Income

Primary forest products manufacturers are just one component of the broader forest industry in Montana. The classification of forest industries used here follows the North American Industry Classification System (NAICS) available online via the U.S. Department of Commerce Bureau of Economic Analysis (BEA) website. The forest industry can be found in four categories: NAICS 113—forestry and logging; NAICS 1153—forestry support activities; NAICS 321—wood products manufacturing; and NAICS 322—paper manufacturing. These categories include employees who work in both the primary and secondary wood products and paper manufacturing sectors. County Business Patterns (CBP) data from the U.S. Census Bureau are used to distinguish primary from secondary manufacturing employment and labor income. Wage and production data collected by BBER in cooperation with the Inland Northwest Forest Products Research Consortium were used in conjunction with CBP to further refine primary and secondary wood products manufacturing categories.

It should be noted that the four NAICS categories used to characterize the forest industry likely underestimate total employment because they do not include log-hauling (trucking) companies, lumber and construction material wholesalers, road construction and maintenance contractors, and forest management services performed by government agencies or nonprofit organizations. The Bureau of Labor Statistics' (BLS) Quarterly Census of Employment and Wages (QCEW) data are

combined with BEA data to estimate forestry support activities. These publicly available data sources provide another point of comparison for estimates of employees and labor income for the primary forest products manufacturers to compare with BBER survey data, as well as additional information on the larger forest industry.

In 2018, total employment in the forest industry in Montana was an estimated 7,975 full- and part-time workers (USDC BEA 2020; USDC CB 2020; USDL BLS 2020). Of these, approximately 1,940 workers were employed in the manufacturing of primary wood products. In addition, an estimated 1,351 workers were employed in forestry and logging, 3,498 workers provided supporting activities for forestry operations, and the remaining 1,187 workers were employed in secondary manufacturing of wood and paper products (fig. 11).

Between the 2014 and 2018 mill surveys, a number of changes occurred in the various sectors that compose the forest products industry in Montana. Overall, employment in the forest industry increased by 6 percent, from 7,528 full-time and part-time workers in 2014 to 7,975 in 2018. Associated labor income increased from $326,423 (in constant 2018 dollars) to $357,923, an increase of 9 percent. This is equivalent to average per-person labor income of $44,881 annually, which constitutes an increase of close to 4 percent since 2014 (figs. 12 and 13).

The industry employment increase was confined to the forestry support sector, which saw growth of 24 percent, and an increase in labor

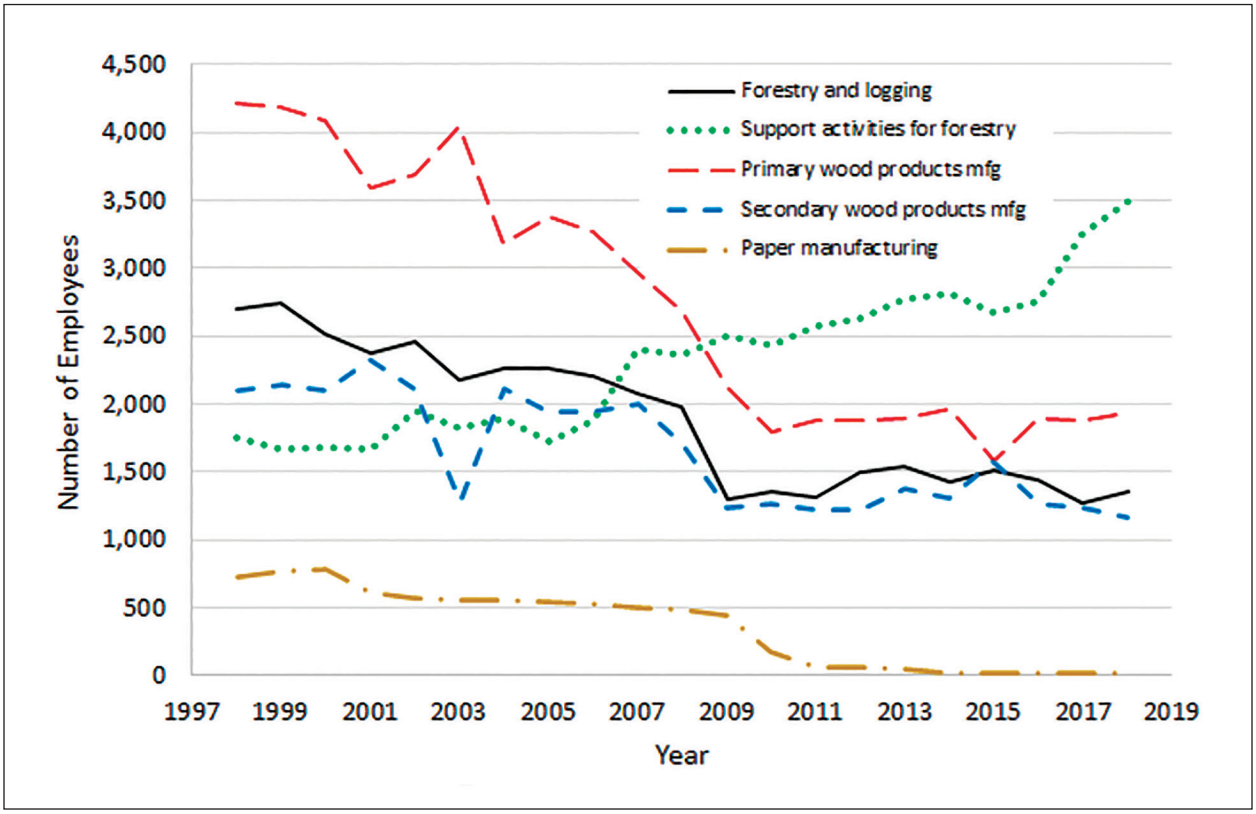

Figure 11—Montana forest industry employment, 1998–2018.

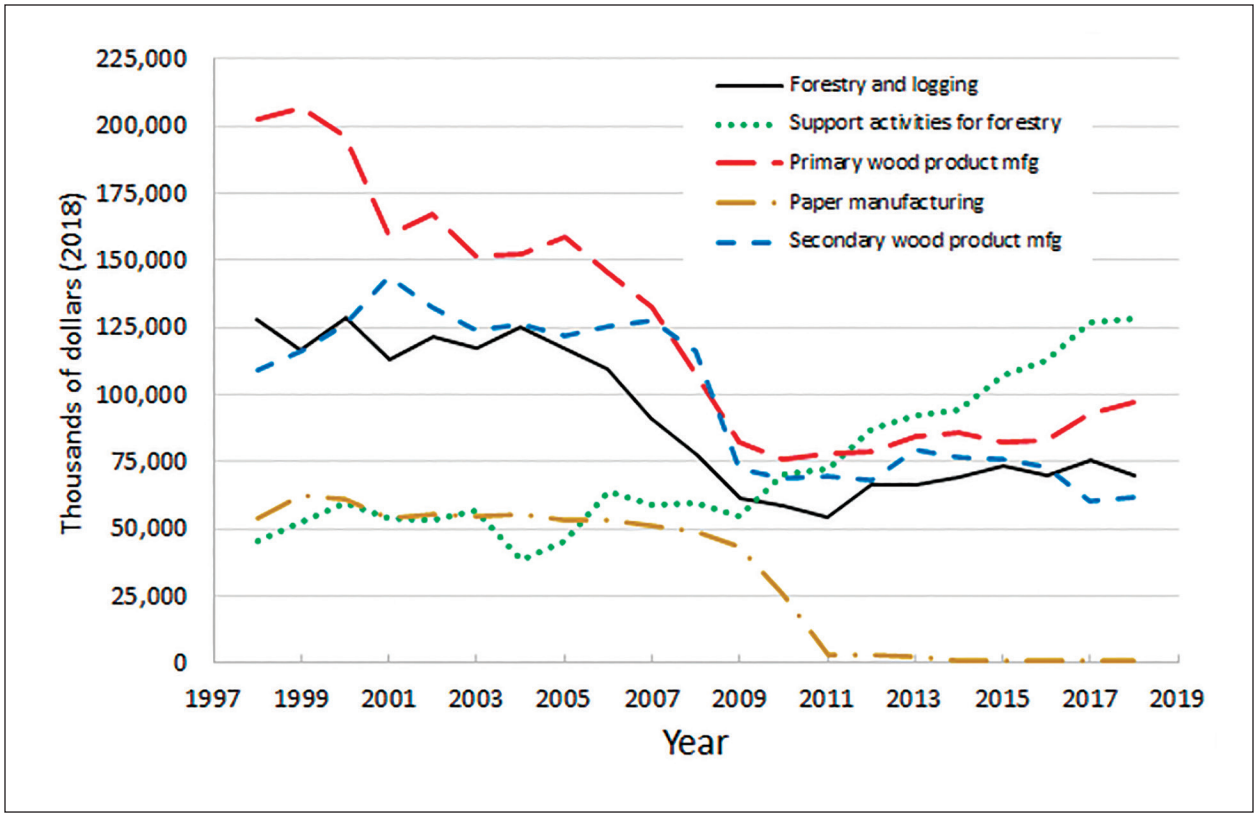

Figure 12—Montana forest industry labor income, 1998–2018.

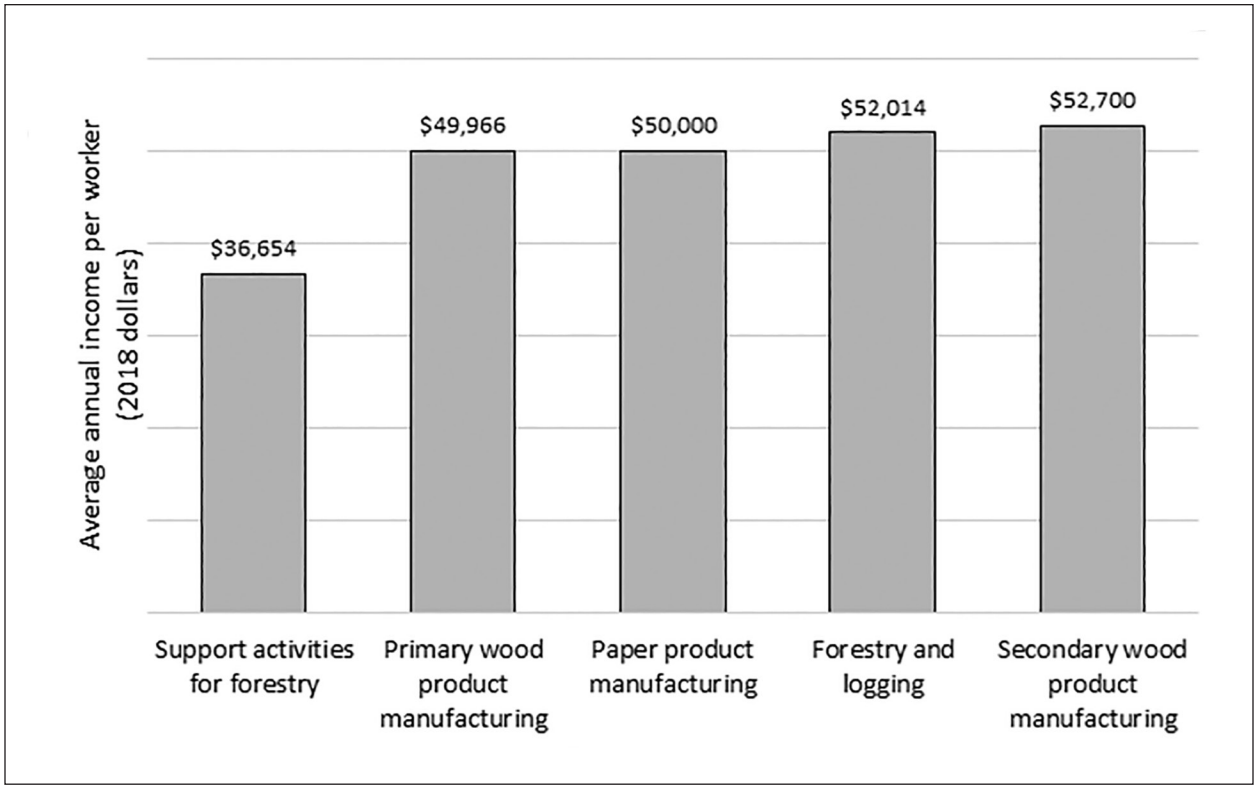

Figure 13—Annual labor income per worker, by sector (2018).

income of 36 percent. Average labor income for this sector was still well below the industry average, at $36,654. The majority of these jobs are seasonal, as well as contract work consisting of low-skill crew work.

Support activities for forestry encompasses a variety of activities including wildfire suppression and prevention activities, tree thinning and planting, and pest management. The employment and wage growth experienced in this category can be explained by a number of interrelated factors, such as commercial timber harvesting diversifying into noncommercial activities, causing reclassification of some businesses from forestry and logging to support activities for forestry. Additionally, investments in noncommercial forest management activities have increased in western States, including Montana, due to extensive mortality in the wake of the mountain pine beetle epidemic.

It is not unusual for the magnitude of change to be greater for labor income than for employment. Employees who were previously part-time are likely adding more hours or days of work, which increases wages paid by businesses but does not change the overall employment estimate. Similarly, decreases in wages paid without equivalent decreases in employment would be the result of reduced work hours rather than a reduction in the number of workers.

The forestry support sector was the only sector to experience employment growth between 2014 and 2018; the other sectors all experienced decreases of varying magnitude. The number of workers in the primary wood product manufacturing sector remained virtually flat, dropping by only 1 percent. Labor income, on the other hand, increased by 13 percent, to a total of $97 million, or an average of $49,966 per worker. A number of mills have added work shifts, or hours to days to increase production, and take advantage of better markets, thus increasing labor income to workers.

The forestry and logging sector also experienced a modest decrease in employment numbers, from 1,422 in 2014 to 1,351 in 2018—a drop of 5 percent. Labor income, however, went up by 2 percent, to reach $52,000 in 2018. This may have been the result of attempts to retain experienced workers by paying a higher wage to keep a business going.

Secondary wood product manufacturing experienced a drop in employment of 11 percent between 2014 and 2018, and an associated drop in labor income of 19 percent. This greater reduction in labor income resulted in a 10 percent drop in average earnings, which reached $52,700—still well above average for the industry as a whole. In fact, though the secondary manufacturing sector was the only one with reduced average labor income for the period, workers in this sector are still paid the highest wages. As the industry modernizes, more highly skilled job functions are required that then require a higher salary to retain qualified workers.

The paper product manufacturing sector saw the greatest decrease in employment of all the forest industry sectors, at 23 percent. Between 2014 and 2018, total labor income dropped by only 6 percent, however, resulting in a sizeable increase in average wages, up 22 percent, reaching $50,000. Total labor income for the sector was approximately $1 million.

Economic Contribution of Montana's Wood Products Manufacturers to State Economy

Economic contribution analyses measure gross changes in economic activity that can be associated with an industry, event, or policy on an existing regional economy (Watson et al. 2007). This report assesses the contribution of Montana's forest industry as dollars spent on intermediate inputs, taxes, labor, and, in turn, by households, generating economic opportunities as additional spending cycles through the State's economy.

Primary and secondary wood products manufacturers, forestry, logging, and forestry support firms contribute approximately 7,975 direct jobs and $358 million in labor income to the State. The economic activity associated with this direct employment generated additional economic opportunities by relying upon other industries for raw and intermediate inputs and services, thus indirectly bolstering employment and wages in additional sectors. Using regional data and existing linkages within Montana's economy represented by the BEA's RIMS II multipliers,[5] BBER estimates that the primary wood products manufacturing sector alone supports more than 5,000 full- and part-time jobs and an associated $295 million in labor income (table 27). Thus, for every wood products manufacturing job in the State, another 1.62 jobs are supported in related sectors, for a combined contribution of 2.62 jobs. Further, for every $1 dollar paid in direct labor income by wood products manufacturers, another $1.86 is paid in supporting sectors, including forestry and logging, forestry support, trucking, wholesale trade, and management, for a combined contribution of $2.86.

Likewise, BBER estimates that the 1,351 people employed in the forestry and logging sector support an additional 1,549 full- and part-time jobs along with an additional $69 million in labor income in supporting sectors such as equipment sales and repair. It should be noted that sectors are not aggregated and estimates are not provided for the total employment and labor income contribution for the entire forest industry. This is done to avoid double counting since some employment and labor income constitute both direct contributions to their sector as well as indirect contributions to other sectors. For example, some or all of the direct employment and labor income in the forestry and logging sector would be included with the indirect and induced contributions from primary wood products manufacturing since these manufacturers rely upon forestry and logging businesses to supply their raw material inputs.

[5]The Bureau of Economic Analysis does not endorse any resulting estimates and/or conclusions about the contribution of a given sector on an area.

Table 27—Annual employment and labor income contributions of Montana's forest industry, 2018.

Sector	Direct employment	Indirect and induced employment	Total employment contribution[a]	Direct labor income	Indirect and induced labor income	Total labor income contribution[a]
				Thousand 2018 dollars		
Wood product manufacturing	3,107	5,029	8,136	$158,434.00	$295,305.00	$453,739.00
Primary wood product manufacturing	1,940	4,453	6,393	$96,934.00	$249,295.00	$346,229.00
Secondary wood product manufacturing	1,167	1,099	2,266	$61,500.00	$71,094.00	$132,594.00
Forestry and logging	1,351	1,549	2,900	$70,271.00	$68,648.00	$138,919.00
Forest support activities	3,498	1,137	4,635	$128,217.00	$54,774.00	$182,991.00
Pulp and paper manufacturing	20	20	40	$1,000.00	$760.00	$1,760.00
Total forest industry	**7,976**	[a]	[a]	**$357,922.00**	[a]	[a]

[a]Indirect and induced employment and labor income should not be summed for multiple sectors due to some employment and income showing up as both direct contributions to their sector and indirect contributions to other sectors.

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