



Montana's Forest Products Industry and Timber Harvest, 2009

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Abstract

This report traces the flow of Montana's 2009 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.

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

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Report Highlights

- A total of 127 facilities were identified as operating in Montana during 2009:
 - 41 lumber facilities
 - 2 plywood and veneer plants
 - 33 house log manufacturers
 - 3 pulp and board facilities
 - 14 post and pole plants
 - 14 log furniture manufacturers
 - 20 bark product, fuel pellet, cedar product, pulp-chip conversion, and energy plants
- With the drop in U.S. housing beginning in 2006, the global financial crisis in 2008, and record low housing starts in 2009, the value of wood and paper products from Montana producers fell from over \$1.2 billion in 2004 to \$592 million in 2009, about \$325 million in 2010, and an estimated \$313 million in 2011.
- Montana's 2009 timber harvest was 374 million board feet (MMBF) Scribner, down from 785 MMBF in 2004. Private lands supplied 57 percent of the harvest. Lodgepole pine became the leading species harvested, accounting for 35 percent of the harvest, likely as a result of the ongoing Mountain Pine Beetle epidemic. Sawlogs and veneer logs were the main products harvested, accounting for 73 percent of the harvest volume.
- Between 2004 and 2009 six large mills and numerous small mills in Montana closed permanently. Operations at most other facilities were curtailed in 2009 and 2010. Timber processing capacity dropped from 934 MMBF in 2004 to 606 MMBF in 2009. Capacity utilization, which normally exceeds 70 percent, dropped to 50 percent in 2009.
- Montana lumber production dropped from 1,040 MMBF in 2004 to 449 MMBF in 2009. Plywood production in Montana in 2009 hit an all-time low of 155 million square feet (MMSF), down from 444 MMSF in 2004.
- Ninety-three percent of Montana's timber harvest was processed in-state during 2009. Almost 25 MMBF Scribner of timber was shipped out of the state, while 17 MMBF of timber was brought into Montana from other states and Canada.
- Forest industry employment fell from 10,695 to 7,051 between 2004 and 2009, while worker earnings dropped from \$463 million to \$276 million over the same period.
- Sales from Montana's forest products industry were \$592 million in 2009. Residue related products, such as particleboard, MDF and pulp and paper, accounted for 63 percent, followed by lumber and plywood with 29 percent. Sales from log home manufacturers were \$21 million, accounting for 4 percent of total sales. The North Central states region, with 27 percent of total sales, was the largest market area for Montana's forest products.

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Introduction

This report presents the detailed results of a statewide census of Montana's primary forest products industry for calendar year 2009. The report includes discussion of trends since the last industry census in 2004, 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 2009 and 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, Utah) 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 Washington¹.

Forest Industries Data Collection System

This report represents the seventh application of FIDACS in Montana; the first was in 1976, with subsequent studies conducted for 1981, 1988, 1993, 1998 and 2004 (Keegan 1980; Keegan 1980; Keegan et al. 1990; Keegan et al. 1995; Keegan et al. 2001; Spoelma et al. 2008). The system is based on a census 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, and facilities like pulp mills and wood pellet plants that use the wood fiber residue directly from timber processors. Montana's manufacturers were identified through participation in previous studies, web-based directories, printed directories of the forest products industry (Random Lengths 2010), agency bidder lists, and with the assistance of the manufacturers themselves.

Through a written questionnaire, phone interview or in-person interview, manufacturers provided 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
- 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

¹ The Washington Department of Natural Resources conducts a similar mill survey on a biennial basis, which can be found at: http://www.dnr.wa.gov/BusinessPermits/Topics/EconomicReports/Pages/obe_washington_state_millsurvey.aspx (Smith 2012).

Firms cooperating in the 2009 Montana forest industry census processed virtually all 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 non-respondent 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 Bureau of Business and Economic Research. 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 (www.bber.umt.edu/forest/regionalreports.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 construction material for pilings, bridges, and camps. 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 medium density fiberboard plant, and a growing log home industry. The 1980s began with three 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 U.S. 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 through 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 U.S. 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 incapable of taking 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. 2005 and 2006a). 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 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.

Montana's Timber Harvest and Flow

Montana has approximately 19.9 million acres of "non-reserved timberlands" that are available for timber harvest (table 1). Non-reserved 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 62 percent (12.2 million acres) of the non-reserved timberland in the state is part of the USDA Forest Service's National Forest System. Non-industrial private forest (NIPF) land, including tribal lands, is the second largest class of ownership with 23 percent, or more than 4.5 million acres. The forest products industry owns close to 7 percent (1.3 million acres) of the non-reserved timberland in the state, down from 9 percent in 2004. The State of Montana and Bureau of Land Management (BLM) account for about 8 percent of non-reserved timberland, while other public owners

Table 1--Montana nonreserved timberland by ownership class
(source: Interior West Forest Inventory and Analysis, 2003-2009).

Ownership class	Thousand acres	Percentage of nonreserved timberland
National Forest	12,240	61.6
Non-industrial private	4,635	23.3
Industrial	1,313	6.6
Bureau of Land Management	852	4.3
State	825	4.2
Other public	10	0.1
All owners ^a	19,874	100

^aPercentage detail may not sum to 100% due to rounding.

account for 0.1 percent. Since the 2004 Montana FIDACS census, the industrial portion of non-reserved timberland in the state has decreased, most notably as a result of the Montana Legacy Project, which involved over 300,000 acres of industrial forest land being transferred from industrial ownership to public or non-industrial private ownership (<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/montana/mlp.pdf>).

Standing volume on Montana's non-reserved timberland is approximately 124.2 billion board feet Scribner. About 33 percent of standing volume is Douglas-fir, followed by lodgepole pine (17 percent), Engelmann spruce (15 percent), and ponderosa pine (10 percent). Annual net growth on non-reserved timberland is approximately 2.1 billion board feet per year. Douglas-fir accounts for 27 percent of net growth, followed by lodgepole pine (19 percent), ponderosa pine (13 percent), and Engelmann spruce (12 percent).

Timber Harvest

The timber harvest volume from lands in Montana was 374 million board feet (MMBF) Scribner during 2009 (table 2), a decline of nearly 48 percent from the 2004 harvest of 785 MMBF (Spoelma et al. 2008), and the lowest on record since the Great Depression.

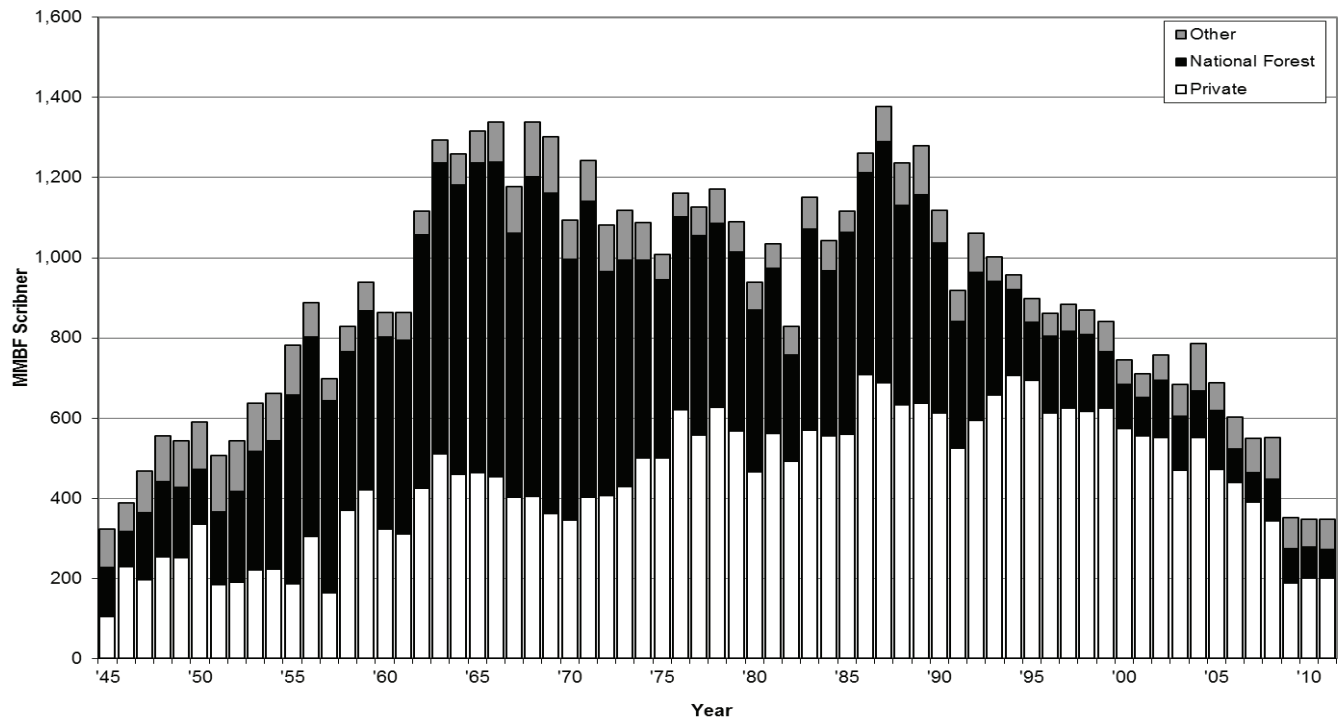
From the early 1950s through the early 1970s, the National Forests accounted for the majority of Montana's timber harvest, and from 1960 through 1971 supplied about 60 percent of the volume harvested (fig. 1). The total harvest increased from about 325 MMBF in 1945 to over 1,300 MMBF in the late 1960s, 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.

Table 2—Proportion of Montana timber harvest by ownership class, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Ownership class	1981	1988	1993	1998	2004	2009
----- Thousand board feet, Scribner -----						
Private	583,413	689,986	694,160	640,709	602,043	211,210
Industrial	351,744	397,853	304,854	354,430	285,324	100,950
Non-industrial private	208,815	235,381	353,092	262,566	265,691	95,619
Tribal	22,854	56,752	36,214	23,713	51,028	14,641
Public	451,664	546,308	307,069	228,699	182,915	162,329
National Forest	412,867	496,803	282,324	190,870	116,965	93,580
Other public	38,797	49,505	24,745	37,829	65,950	68,749
All owners	1,035,077	1,236,294	1,001,229	869,408	784,958	373,538
----- Percentage of harvest -----						
Private	56.4	55.8	69.3	73.7	77.0	56.5
Industrial	34.0	32.2	30.4	40.8	36.0	27.0
Non-industrial private	20.2	19.0	35.3	30.2	34.0	25.6
Tribal	2.2	4.6	3.6	2.7	7.0	3.9
Public	43.6	44.2	30.7	26.3	23.0	43.5
National Forest	39.9	40.2	28.2	22.0	15.0	25.1
Other public ^b	3.7	4.0	2.5	4.3	8.0	18.4
All owners^a	100	100	100	100	100	100

^aPercentage detail may not sum to 100% due to rounding.

^bOther public includes state, BLM and other public ownerships.



Source: USDA Forest Service, Region One, Missoula, MT.

Figure 1—Montana timber harvest by ownership, 1945-2011.

Between 2004 and 2009, harvest on all private ownerships (industrial, non-industrial and tribal) dropped off precipitously from a total private harvest of 602 MMBF to 211 MMBF. The harvest from non-industrial 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 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 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 reduced overall harvest increased their share of the total from 8 to 18 percent.

Lodgepole pine was the leading species harvested in Montana in 2009. Lodgepole pine’s 35 percent of the harvest is its highest proportion of the total harvest when compared to previous censuses (table 3). Douglas-fir, which in previous years was firmly the leading species, fell to the second most-harvested species in 2009. The proportion of ponderosa pine decreased from 19 percent in 2004 to 15 percent in 2009, making it the third most-harvested species. The increased proportion of lodgepole pine is likely due to attempts to mitigate the impacts of the Mountain Pine Beetle through harvest of dead and dying trees. The decreased proportion of ponderosa pine can be attributed to decreasing harvest levels from non-industrial private lands in eastern Montana. Mill closures, high transportation costs and poor markets have all played a role in the reduction in harvest of this species. The proportion of volume harvested for various products in 2009 saw some significant shifts (table 4). For the first time in a FIDACS census, veneer logs were combined with saw log harvest figures due to disclosure issues. Even combined, the percent of the total harvest associated with saw and veneer logs was less than that reported in 2004 for sawlogs alone (73 versus 76 percent). Also of significance was the increase in the proportion of the harvest of other timber products from an average of 6 percent in previous years to 27 percent in 2009, likely due to a stronger pulp market and weak lumber markets.

Pulp mills, which are the primary users of mill residue, are not as cyclic as the lumber industry. They tend to have high fixed costs and, therefore, often do not curtail operations as readily as sawmills or plywood plants. In 2007 through 2009, this led to strong

Table 3--Proportion of Montana timber harvest (measured in MBF, Scribner) by species, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Species	1981	1988	1993	1998	2004	2009
	----- <i>Percentage of harvest</i> -----					
Lodgepole pine	25	28	26	25	18	35
Douglas-fir	27	27	29	34	38	31
Ponderosa pine	12	17	19	15	19	15
Spruces	8	7	6	8	7	8
Western larch	16	14	12	10	12	7
Other species ^a	12	7	8	7	6	4
All species ^b	100	100	100	100	100	100

^aOther species include: true firs, western white pine, western redcedar, western hemlock, rocky mountain juniper, aspen and cottonwood, and other softwood species.

^bPercentage detail may not sum to 100% due to rounding.

Table 4--Proportion of Montana timber harvest (measured in MBF, Scribner) by product, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Timber Products	1981	1988	1993	1998	2004	2009
	----- <i>Percentage of harvest</i> -----					
Sawlogs	71	81	79	77	76	73
Veneer logs	22	17	17	18	16	c
Other timber products ^a	7	3	5	6	8	27
All products ^b	100	100	100	100	100	100

^aOther timber products include logs used for pulpwood, posts and poles, house logs, cedar products, log furniture, and industrial fuelwood.

^bPercentage detail may not sum to 100% due to rounding.

^cHarvest of veneer logs included in sawlog category for 2009 due to disclosure considerations.

demand for fiber which could not be satisfied by mill residue. As a result, the harvest of timber for the pulp and paper industry (pulpwood) was at historically high levels. With the closure of the pulp and paper mill in Missoula County 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 2009.

All regions of Montana (fig. 2) showed substantial declines in harvest between 2004 and 2009, with the largest proportionate changes since 2004 occurring in the Eastern region of Montana (table 5). The four counties making up the Northwest region provided nearly half of Montana's 2009 harvest, led by Flathead and Lincoln counties, which had the first and third highest harvest volumes in the state. Although the Northwest region still provides the bulk of Montana's timber harvest, both the volume and proportion of the state total that the region provided declined between 1976 and 2004. Since 2004, the volume harvested from the Northwest region has continued to decrease—from 383 MMBF to 171 MMBF. The 2009 volume harvested from the Northwest region is just 27 percent of what it was in 1981. Flathead and Lake County's proportion of the harvest has been increasing since 1998, while Lincoln and Sanders have been declining. The four counties in the western region accounted for almost one-quarter of Montana's harvest, with Missoula county providing 15 percent of the statewide harvest, second only to Flathead County at 21 percent. The western region's harvest volume has declined since 1981, although its proportion of the harvest has remained relatively stable at about 22 percent. In the six counties making up the Southwest region, harvest volumes fluctuated between 60 and 90 MMBF through 1993, then in 1998 through 2009 dropped to less than one-half of their previous levels. The southwest region's proportion of the statewide harvest also declined in 1998, but has been steadily increasing since then, reaching an all-time high of 8.5 percent in 2009.

The West-Central region's proportion of the state's timber harvest almost doubled between 1993 and 1998. And after a slight decline in 2004, the region reached a new high, accounting for 19 percent of the state's harvest in 2009. Harvest volume actually decreased from 92 MMBF to 70 MMBF during the time period that its relative proportion increased. In the Eastern region, harvest volume and the proportion of the statewide harvest have generally increased since 1981 except for the period 2004 to 2009 when harvest volume decreased 64 MMBF (76 percent). These declines were due to decreased harvesting on all ownerships, particularly non-industrial private lands, which tend to be more sensitive to market conditions.

Table 5—Montana timber harvest (MMBF, Scribner) by county, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

County	1981		1988		1993		1998		2004		2009	
	MMBF, Scribner	Percent of Total	MMBF, Scribner	Percent of Total	MMBF, Scribner	Percent of Total	MMBF, Scribner	Percent of Total	MMBF, Scribner	Percent of Total	MMBF, Scribner	Percent of Total
Northwest Montana	633	61.1	725	58.6	519	51.8	415	47.7	383	48.7	171	45.9
Flathead	245	23.6	255	20.6	150	15.0	148	17.0	156	19.8	79	21.2
Lake	28	2.7	53	4.3	53	5.3	38	4.4	33	4.2	23	6.2
Lincoln	267	25.8	324	26.2	208	20.8	153	17.6	119	15.1	43	11.6
Sanders	93	9.0	93	7.5	107	10.7	76	8.7	75	9.6	26	6.9
Western Montana	229	22.3	246	20.0	229	22.9	203	23.3	189	24.0	79	21.2
Granite	23	2.3	29	2.4	21	2.1	31	3.6	25	3.2	6	1.6
Mineral	45	4.4	40	3.3	32	3.2	20	2.3	41	5.2	13	3.4
Missoula	120	11.6	141	11.4	136	13.6	129	14.8	109	13.9	56	15.0
Ravalli	41	4.0	36	2.9	40	4.0	23	2.6	13	1.7	4	1.2
Southwest Montana	68	6.5	88	7.0	72	7.0	32	3.7	37	4.8	32	8.5
Beaverhead	10	1.0	16	1.3	5	0.5	2	0.2	6	0.8	11	2.9
Deer Lodge	8	0.7	6	0.5	11	1.1	8	0.9	4	0.5	7	1.9
Gallatin	36	3.5	29	2.3	30	2.9	4	0.5	8	1.0	2	0.5
Madison	3	0.3	18	1.4	9	0.9	11	1.3	5	0.7	3	0.8
Park	8	0.8	16	1.3	11	1.1	6	0.7	8	1.1	6	1.5
Silver Bow	3	0.2	3	0.2	5	0.5	1	0.1	5	0.7	3	0.8
West-Central Montana	80	7.6	105	8.6	80	8.0	136	15.8	92	11.7	70	18.7
Broadwater	7	0.7	2	0.2	4	0.4	4	0.5	2	0.3	8	2.2
Cascade	1	0.1	5	0.4	1	0.1	10	1.2	3	0.4	1	0.2
Jefferson	8	0.7	8	0.7	3	0.3	6	0.7	12	1.5	6	1.7
Judith Basin	1	0.1	-	0.0	3	0.3	5	0.6	0	0.1	0	0.0
Lewis & Clark	26	2.5	17	1.4	13	1.3	30	3.5	21	2.7	24	6.4
Meagher	17	1.6	15	1.2	12	1.2	27	3.1	6	0.8	3	0.7
Powell	20	1.9	56	4.6	43	4.3	50	5.7	46	5.9	27	7.3
Wheatland	-	0.0	1	0.1	1	0.1	4	0.5	-	0.0	1	0.2
Eastern Montana	26	2.4	73	6.0	102	10.3	73	8.4	84	10.8	20	5.4
Big Horn	3	0.3	12	1.0	13	1.3	12	1.4	16	2.0	3	0.7
Fergus	9	0.9	11	0.9	24	2.4	9	1.0	15	2.0	3	0.9
Musselshell	2	0.1	4	0.3	13	1.3	6	0.7	1	0.2	1	0.2
Powder River	1	0.1	15	1.2	11	1.1	8	0.9	18	2.3	-	0.0
Rosebud	6	0.6	12	1.0	8	0.8	11	1.3	6	0.8	-	0.0
Other counties	4	0.4	19	1.6	34	3.4	26	3.1	28	3.5	14	3.6
Unspecified	-	0.0	-	0.0	-	0.0	10	1.1	-	0.0	1	0.4
All counties*	1,035	100	1,236	100	1,001	100	869	100	785	100	373	100

*Percentage detail may not sum to 100% due to rounding.

During 2009, private lands provided the majority of each species (table 6) with the exception of grand fir and subalpine fir. Industrial timberlands provided more Douglas-fir (34 MMBF), Ponderosa pine (16 MMBF), western larch (12 MMBF), and spruce (11 MMBF) than any other ownership. NIPF lands accounted for the majority of lodgepole pine (43 MMBF), and National Forests accounted for the majority of “Other species” (6 MMBF). National Forest lands accounted for significant volumes of Douglas-fir, lodgepole pine, and western larch. Private lands also provided the majority of the saw and veneer log volume harvested (table 7). Harvest volumes of house logs and other products were evenly split between private and public sources. In 2009, NIPF lands were the leading source of saw and veneer logs (81 MMBF), but were essentially tied with National Forests as the leading source of house logs, while industrial lands were the leading source of other products (32 MMBF).

During 2009, lodgepole pine accounted for the majority of saw and veneer logs, house logs, and other products (table 8). Sawlogs accounted for the largest volume within each species. Dead trees accounted for 20 percent (nearly 74 MMBF) of Montana’s total timber harvest volume during 2009, up from 9 percent (68 MMBF) in 2004.

Table 6--Montana timber harvest by ownership class and species, 2009.

Ownership class	Thousand board feet, Scribner					All species ^b
	Lodgepole pine	Douglas-fir	Ponderosa pine	Spruces	Western larch	
Private	72,607	63,056	35,216	18,926	15,181	211,210
Industrial	25,023	34,392	15,798	11,040	11,985	100,950
Non-industrial private	43,222	25,039	14,827	6,877	2,258	95,619
Tribal	4,363	3,626	4,590	1,009	938	14,641
Public	57,280	54,390	21,359	10,243	10,677	162,329
National Forest	29,878	32,575	11,895	6,752	6,146	93,580
Other public	27,402	21,815	9,464	3,491	4,532	68,749
All owners	129,887	117,446	56,574	29,168	25,858	373,538
	-----Percentage of harvest-----					
Private	19.4	16.9	9.4	5.1	4.1	56.5
Industrial	6.7	9.2	4.2	3.0	3.2	27.0
Non-industrial private	11.6	6.7	4.0	1.8	0.6	25.6
Tribal	1.2	1.0	1.2	0.3	0.3	3.9
Public	15.3	14.6	5.7	2.7	2.9	43.5
National Forest	8.0	8.7	3.2	1.8	1.6	25.1
Other public	7.3	5.8	2.5	0.9	1.2	18.4
All owners ^b	34.8	31.4	15.1	7.8	6.9	100.0

^aOther species include: true firs, western white pine, western redcedar, western hemlock, rocky mountain juniper, aspen and cottonwood, and other softwood species.

^bPercentage detail may not sum to 100% due to rounding.

Table 7--Montana timber harvest by ownership class and product, 2009.

Ownership class	Saw and veneer logs	House logs	Other products ^a	All products ^b
	----- Thousand board feet, Scribner -----			
Private	159,669	1,165	50,376	211,210
Industrial	68,992	405	31,553	100,950
Non-industrial private	81,126	735	13,759	95,619
Tribal	9,551	25	5,065	14,641
Public	112,283	1,012	49,034	162,329
National Forest	65,646	876	27,057	93,580
Other public ^c	46,637	135	21,977	68,749
All owners	271,952	2,177	99,410	373,538
	----- Percentage of harvest -----			
Private	42.7	0.3	13.5	56.5
Industrial	18.5	0.1	8.4	27.0
Non-industrial private	21.7	0.2	3.7	25.6
Tribal	2.6	0.0	1.4	3.9
Public	30.1	0.3	13.1	43.5
National Forest	17.6	0.2	7.2	25.1
Other public ^c	12.5	0.0	5.9	18.4
All owners ^b	72.8	0.6	26.6	100.0

^aOther products include logs used for pulpwood, posts and poles, cedar products, log furniture, and industrial fuelwood.

^bPercentage detail may not sum to 100% due to rounding.

^cOther public includes state, BLM and other public ownerships.

Table 8--Montana timber harvest by species and product, 2009.

Species	Saw and veneer logs	House logs	Other products ^a	All products ^b
	----- Thousand board feet, Scribner -----			
Lodgepole pine	90,847	1,185	37,855	129,887
Douglas-fir	86,674	157	30,615	117,446
Ponderosa pine	39,091	120	17,363	56,574
Spruces	22,164	615	6,389	29,168
Western larch	19,866	100	5,893	25,858
Other species ^c	13,309		1,295	14,604
All species	271,952	2,177	99,410	373,538
	----- Percentage of harvest -----			
Lodgepole pine	24.3	0.3	10.1	34.8
Douglas-fir	23.2	0.0	8.2	31.4
Ponderosa pine	10.5	0.0	4.6	15.1
Spruces	5.9	0.2	1.7	7.8
Western larch	5.3	0.0	1.6	6.9
Other species ^c	3.6	0.0	0.3	3.9
All species ^b	72.8	0.6	26.6	100.0

^aOther products include logs used for pulpwood, posts and poles, cedar products, log furniture, and industrial fuelwood.

^bPercentage detail may not sum to 100% due to rounding.

^cOther species include: true firs, western white pine, western redcedar, western hemlock, Rocky Mountain juniper, cottonwood and aspen, and other softwood species.

Timber Flow Into and Out of Montana

During 2009, the majority (93 percent) of Montana’s timber harvest was processed in-State. As in 2004, Montana had a net outflow of timber. Timber processors in Montana brought in 16 MMBF of timber from other states, while mills in adjacent states used 25 MMBF of timber harvested from Montana (table 9). Montana was a net importer of timber during 1976, 1981, 1993, and 1998 (Keegan 1980; Keegan, Jackson, and Johnson 1983; Keegan et al. 1995; Keegan et al. 2001) and a net exporter of timber in 1988 and 2004, with a net flow of almost 34 MMBF and 37 MMBF, respectively, going to mills outside the state (Keegan et al. 1990; Keegan et al. 1990; Spoelma et al. 2008). As in previous years, nearly all of the timber exported from Montana during 2009 stayed within the United States and was processed in Idaho, Utah, Washington, or Wyoming.

Sawlogs accounted for nearly all of the timber harvested in Montana and shipped to other states for processing as well as the majority (14.5 MMBF) of timber imported into the state for processing. The largest share (13 MMBF) of the total volume imported came from Idaho, followed by Wyoming (2 MMBF), with the remainder coming from Washington, Utah, Oregon and other unspecified out-of-state sources. Saw and pulp logs made up the majority of imports into Montana from Idaho.

Table 9--Timber flow into (imports) and out of (exports) Montana, 2009.

Timber products	Imports	Exports	Net imports (net exports)
	----- Thousand board feet, Scribner -----		
Saw and veneer logs	14,577	25,071	(10,493)
House logs	749	2	747
Other products ^a	647	-	1,447
All products	15,973	25,072	(9,099)

^aOther products include logs for pulpwood and posts and poles.

Timber Flow Within Montana

Because the majority 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 flows toward these two western regions. This results in a general east-to-west timber flow within Montana.

Of the 171 MMBF harvested in the four counties of Northwest Montana, 61 percent was processed in those counties. Twenty-six percent of Northwest Montana’s harvest was processed in the Western Montana region, and 11 percent was processed in Idaho. Western Montana was the only other region in Montana that processed the majority of its harvest, with 71 percent of its harvest remaining there for processing, which, when compared to other regions, was the highest percentage processed in the region from which it was harvested. Mills in Northwest Montana received 17 percent of the harvest from Western Montana. Of the 250 MMBF harvested in Northwest Montana and Western Montana combined, 219 MMBF was processed in those two regions. An additional 57 MMBF from other regions of Montana was processed in Northwest and Western Montana. Together, these two regions processed 73 percent of Montana’s 2009 timber harvest.

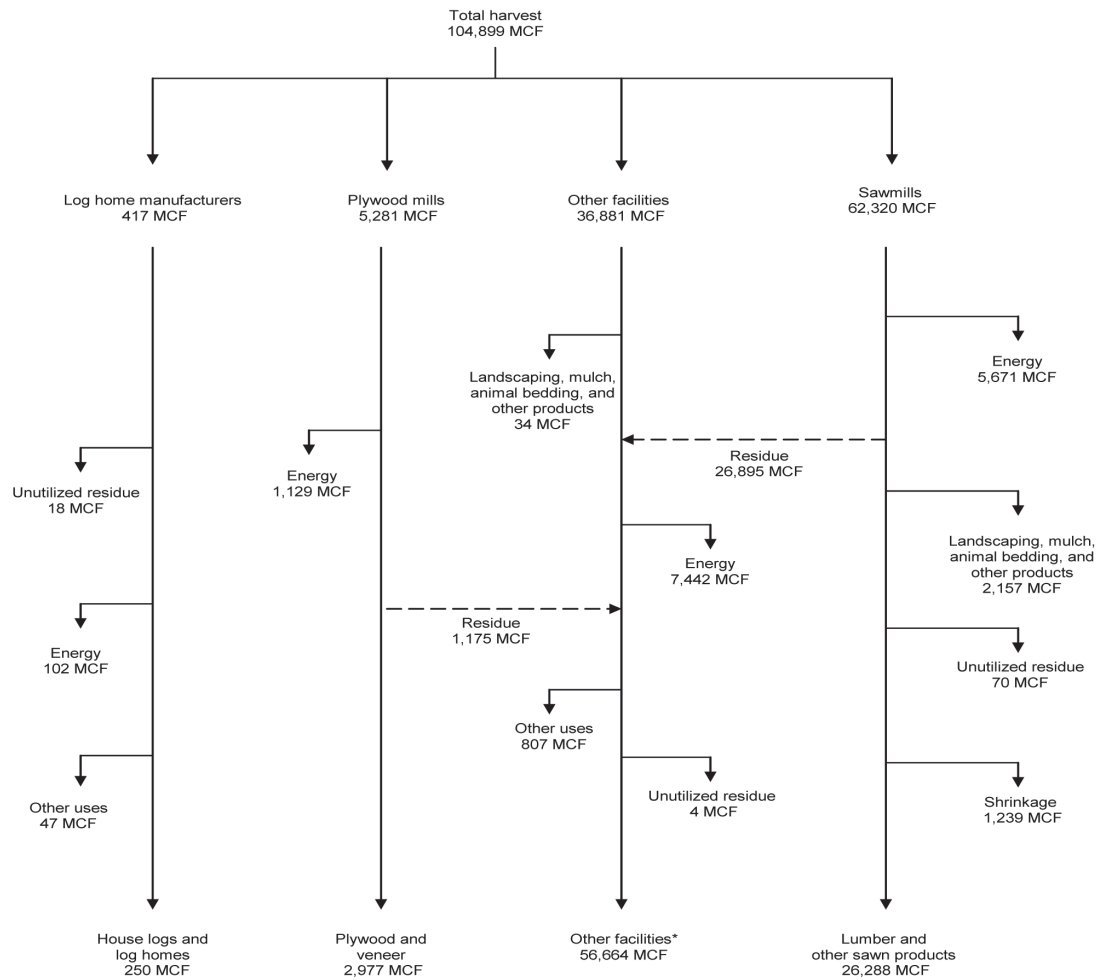
The majority of timber harvested in other regions of Montana was processed in Western or Northwest Montana or in other states, with the exception of Southwest Montana, where 61 percent of the harvest in that region was processed in the West-Central region. The majority of the remaining harvest in Southwest Montana (20 percent) was processed in Western Montana. Forty-four percent of the 70 MMBF harvested from West-Central Montana was processed in Western Montana, and 37 percent was processed in West-Central Montana. The vast majority (82 percent) of the timber harvested in Eastern Montana during 2009 was processed in the western regions of the state, while another 12 percent was processed in Wyoming. Just 5 percent of the timber harvested in Eastern Montana was processed in that region.

Utilization of Montana's Timber Harvest

Montana's 2009 timber harvest was approximately 105 million cubic feet (MMCF), excluding bark (fig. 3), and went to timber-processors both within and outside of the state. Of this volume, 62.3 MMCF went as logs to sawmills, 5.3 MMCF went to plywood plants, 0.5 MMCF went to log home manufacturers, and 36.8 MMCF went to other facilities, including producers of posts and poles, cedar products, energy products, and pulp mills. Volumes are presented in cubic feet rather than board feet Scribner because 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 conversion factors, converting Scribner board foot volume to cubic feet, were developed from log size specifications, as well as product and residue recovery information, provided by processors of Montana's 2009 timber harvest:

- 5.55 board feet per cubic foot for veneer logs
- 5.22 board feet per cubic foot for house logs
- 3.90 board feet per cubic foot for sawlogs
- 2.69 board feet per cubic foot for all other timber products

Of the 62.3 MMCF of timber received by sawmills, 26.3 MMCF (42 percent) became finished lumber or other sawn products, and about 1.2 MMCF (2 percent) was lost to shrinkage. The remaining 34.8 MMCF became mill residue. Of the sawmill residue utilized both within Montana and in other States—5.7 MMCF was sold or used internally for biomass energy; and 26.9 MMCF was used for pulp, particleboard, and medium density fiberboard (MDF). The remaining 2.2 MMCF was used for livestock bedding, mulch and other uses. Less than 0.1 MMCF of sawmill residue went unused. About 2.3 MMCF of wood fiber delivered to plywood plants became residue that was utilized internally or by other sectors of the forest products industry, while 3.0 MMCF became finished plywood or veneer. Of the 0.4 MMCF of timber received by log home manufacturers, 0.2 MMCF (60 percent) became house logs. The remaining 0.2 MMCF became mill residue. Most house log residue (61 percent) was used for energy, while 28 percent went to other uses and another 11 percent remained unused. The 34.4 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.



*Other facilities include post, pole, log furniture, cedar products, firewood and pulp and reconstituted board plants.

Figure 3—Montana timber harvest and flow, 2009.

Montana’s Forest Products Industry

During 2009, Montana’s primary forest products industry consisted of 127 active facilities² in 25 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. 4). The sawmill sector, manufacturing lumber and related products, had the largest number of facilities operating in Montana during 2009. Nearly all sectors experienced a decrease in the total number of active facilities, with the exception of the pulp and board and biomass sectors. The relatively large increase in the biomass sector can be attributed to a regional partnership between the state of Montana and the USFS Fuels for Schools and Beyond program, which has facilitated the development of small-scale energy projects across the state. The log home sector, manufacturing log homes and house logs, experienced

² Another 20 facilities did not actively receive or process timber during 2009 or had ceased operation prior to 2009 but still had operable equipment installed.

Table 10--Active Montana primary wood products facilities by county and product during 2009 and other years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

County	Lumber	Plywood	Pulp and board	Post and poles	Log homes	Log furniture	Other products ^a	All products
Northwest Montana	17	2	1	1	6	6	8	41
Flathead	8	2	1	-	3	2	3	19
Lake	6	-	-	1	1	1	-	9
Lincoln	-	-	-	-	1	2	4	7
Sanders	3	-	-	-	1	1	1	6
Western Montana	8	-	2	7	14	5	6	42
Granite	-	-	-	3	-	-	1	4
Mineral	1	-	-	1	1	-	2	5
Missoula	5	-	2	2	4	2	1	16
Ravalli	2	-	-	1	9	3	2	17
Southwest Montana	4	-	-	2	8	1	2	17
Beaverhead	1	-	-	1	-	-	1	3
Gallatin	1	-	-	-	5	-	1	7
Madison	-	-	-	-	3	-	-	3
Park	1	-	-	1	-	1	-	3
Silver Bow	1	-	-	-	-	-	-	1
West-Central Montana	6	-	-	3	1	1	3	14
Broadwater	1	-	-	-	-	-	1	2
Cascade	1	-	-	-	-	-	1	2
Jefferson	1	-	-	1	1	-	-	3
Lewis & Clark	2	-	-	1	-	1	-	4
Powell	1	-	-	1	-	-	1	3
Eastern Montana	6	-	-	1	4	1	1	13
Carbon	-	-	-	-	2	-	-	2
Chouteau	-	-	-	-	-	1	-	1
Fergus	1	-	-	-	-	-	-	1
Musselshell	2	-	-	1	-	-	-	3
Stillwater	1	-	-	-	-	-	-	1
Sweetgrass	1	-	-	-	1	-	-	2
Yellowstone	1	-	-	-	1	-	1	3
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

^aOther products include biomass energy, cedar shakes and shingles, decorative bark and mulch, roundwood pulp-chip conversion, and fuel pellets.

the sharpest decline both in number and percent, losing 55 facilities, or 63 percent, since 2004. The second largest decline in number of facilities was associated with the log furniture sector which dropped from 29 to 14 active facilities between 2004 and 2009.

Timber Received by Montana Mills

Montana mills received over 364 MMBF Scribner of timber for processing during 2009. Timber receipts refers 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 (Keegan 1980; Keegan, Jackson, and Johnson 1983; Keegan et al. 1990; table 11). However, as harvest levels from National Forests have continued to decline, so has 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 non-industrial private at 24 percent of the state's receipts.

Table 11--Proportion of Montana timber receipts (MBF, Scribner) by ownership class, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Ownership class	1981	1988	1993	1998	2004	2009
----- <i>Percentage of receipts</i> -----						
Private	56	55	67	73	74	55
Industrial	34	34	31	43	39	28
Non-industrial private	20	18	33	27	31	24
Tribal	2	4	3	3	5	3
Public	44	45	33	27	26	45
National Forest	41	40	30	22	15	24
Other public ^a	4	5	2	5	11	21
All owners ^b	100	100	100	100	100	100

^aIncludes timber receipts from Canada and unspecified out-of-state sources.

^bPercentage detail may not sum to 100% due to rounding.

Private lands supplied the majority of each timber product processed by Montana mills during 2009 (table 12). Contrary to 1998 and 2004, non-industrial private land was the leading supplier of sawlogs and veneer logs (73 MMBF) in 2009. Industrial land provided the majority of volume (31 MMBF) for other products.

As in previous years, sawlogs and veneer logs constituted the vast majority (72 percent) of Montana's timber receipts, although the proportion of other timber products more than doubled from 2004 and quadrupled since 1998 (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 11 percent in 2004 and 6 percent in 1998. The increasing 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, an increase in the amount of pulpwood harvested since 1998, and declines in Montana's sawmill and plywood/veneer sectors.

Table 12--Montana timber receipts by ownership class and product, 2009.

Ownership class	Saw and veneer logs	House logs	Other products ^a	All products ^b
----- <i>Thousand board feet, Scribner</i> -----				
Private	148,904	1,323	50,376	200,604
Industrial	68,780	445	31,553	100,778
Non-industrial private	73,073	853	13,759	87,685
Tribal	7,051	25	5,065	12,141
Public	110,881	1,019	49,108	161,008
National Forest	57,939	884	27,057	85,880
Other public	52,942	135	22,051	75,128
Canadian and unspecified^c	1,673	511	573	2,758
All owners	261,458	2,854	100,057	364,370

^aOther products include logs used for pulpwood, posts and poles, log furniture, and industrial fuelwood.

^bPercentage detail may not sum to 100% due to rounding.

^cIncludes timber receipts from Canada and unspecified out-of-state sources.

Table 13--Proportion of Montana timber receipts (MBF, Scribner) by product, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Species	1981	1988	1993	1998	2004	2009
----- <i>Percentage of receipts</i> -----						
Saw and veneer logs	92	97	95	94	89	72
Other timber products ^a	8	3	5	6	11	28
All products ^b	100	100	100	100	100	100

^aOther timber products include logs used for posts and poles, house logs, pulpwood, log furniture, and industrial fuelwood.

^bPercentage detail may not sum to 100% due to rounding.

Lodgepole pine was the leading species received by Montana mills, accounting for 36 percent of receipts (table 14). Industrial land was the leading ownership source for Douglas-fir, Ponderosa Pine, Spruces and Western larch received by Montana mills, while non-industrial private land and National Forest land were the leading suppliers of Lodgepole pine and other species, respectively (table 15). Douglas-fir was the leading species received from industrial, National Forest, Canadian, and unspecified out-of-state lands, while lodgepole pine was the leading species received from all other ownerships.

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 41 sawmills produced 449 MMBF (lumber tally) of lumber and other sawn products in 2009, accounting for about \$172 million in sales, 1.9 percent of total U.S. softwood lumber production, and 1.4 percent of U.S. consumption (Western Wood Products Association (WWPA) 1964-2010).

Table 14--Montana timber receipts by species and product, 2009.

Species	Saw and veneer logs	House logs	Other products ^a	All products ^b
----- <i>Thousand board feet, Scribner</i> -----				
Lodgepole pine	89,943	1,590	38,132	129,665
Douglas-fir	82,018	306	30,798	113,123
Ponderosa pine	31,151	160	17,451	48,762
Spruces	24,892	686	6,440	32,019
Western larch	19,905	112	5,940	25,957
Other species ^c	13,548		1,295	14,844
All species	261,458	2,854	100,057	364,370
----- <i>Percentage of receipts</i> -----				
Lodgepole pine	24.7	0.4	10.5	35.6
Douglas-fir	22.5	0.1	8.5	31.0
Ponderosa pine	8.5	0.0	4.8	13.4
Spruces	6.8	0.2	1.8	8.8
Western larch	5.5	0.0	1.6	7.1
Other species ^c	3.7	0.0	0.4	4.1
All species ^b	71.8	0.8	27.5	100.0

^aOther products include logs used for pulpwood, posts and poles, log furniture, and industrial fuelwood.

^bPercentage detail may not sum to 100% due to rounding.

^cOther species include: true firs, western white pine, western redcedar, western hemlock, Rocky Mountain juniper, cottonwood and poplar, and other softwood species.

Table 15—Montana timber receipts by ownership class and species, 2009.

Ownership class	Lodgepole pine	Douglas-fir	Ponderosa pine	Spruces	Western larch	Other species ^a	All species ^b
-----Thousand board feet, Stribner-----							
Private	70,869	59,296	30,225	18,955	15,058	6,201	200,604
Industrial	25,138	34,345	15,690	11,045	11,867	2,693	100,778
Non-industrial private	41,369	21,325	12,445	6,901	2,254	3,392	87,685
Tribal	4,363	3,626	2,090	1,009	938	116	12,141
Public	57,954	52,746	18,121	12,944	10,722	8,522	161,008
National Forest	27,976	28,730	9,983	6,752	6,119	6,320	85,880
Other public	29,977	24,016	8,138	6,192	4,603	2,202	75,128
Canadian and unspecified^c	841	1,081	416	120	178	121	2,758
All owners	129,665	113,123	48,762	32,019	25,957	14,844	364,370
-----Percentage of receipts-----							
Private	19.4	16.3	8.3	5.2	4.1	1.7	55.1
Industrial	6.9	9.4	4.3	3.0	3.3	0.7	27.7
Non-industrial private	11.4	5.9	3.4	1.9	0.6	0.9	24.1
Tribal	1.2	1.0	0.6	0.3	0.3	0.0	3.3
Public	15.9	14.5	5.0	3.6	2.9	2.3	44.2
National Forest	7.7	7.9	2.7	1.9	1.7	1.7	23.6
Other public	8.2	6.6	2.2	1.7	1.3	0.6	20.6
Canadian and unspecified^c	0.2	0.3	0.1	0.0	0.0	0.0	0.8
All owners ^b	35.6	31.0	13.4	8.8	7.1	4.1	100.0

^aOther species include: true firs, western white pine, western redcedar, western hemlock, rocky mountain juniper, cottonwood and aspen, and other softwood species.

^bPercentage detail may not sum to 100% due to rounding.

^cIncludes timber receipts from Canada and unspecified out-of-state sources.

Virtually all of the timber used by the sawmill sector came from softwood species, with lodgepole pine, Douglas-fir, and ponderosa pine most commonly used. Lumber is the most common product produced at Montana sawmills, although small amounts of structural timbers and other specialized products, such as flooring, siding, molding, and paneling are also produced. About 73 percent of the lumber produced is dimension lumber used in construction applications. Of the remaining 27%, the vast majority is board and shop lumber, a higher grade of lumber used for woodworking and finish carpentry applications.

In the four decades following the Second World War 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 to a peak of 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 of 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. 5).

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 overrun. The LRF is the lumber output (in thousand board feet lumber tally) divided by the timber input (thousand cubic feet). Lumber overrun (LO) is the amount of lumber actually 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/efficiency, LO fails to accurately portray differences in lumber output per unit of timber input primarily due to the Scribner scale. The (LRF), better illustrates increased lumber output as a function of improvements in technology and sawing techniques (Keegan et al. 2010).



Figure 5—Montana lumber production, 1945-2011.

Both LO and LRF have shown substantial increases over the past 35 years as shown in Figure 6 and Table 16. Lumber overrun increased from 1.30 in 1976 to 2.00 in 2004 (Keegan et al. 1990; Keegan et al. 1995; Keegan et al. 2001; Spoelma et al. 2008) before a slight decline to 1.89 in 2009 (fig. 6). Lumber recovery factors followed a similar pattern, increasing from about 6.8 board feet lumber tally per cubic foot of sawlog input in 1976 to 7.35 board feet in 2009 (table 16).

The increase in Montana lumber recovery since 1976 is due primarily to improved sawing technology with lumber overrun also influenced by the characteristics of the Scribner log scale. Technological improvements have made Montana mills more efficient in numerous ways. Log size (diameter and length) sensing capabilities linked to computers determine the best sawing pattern for logs to recover either the greatest volume or greatest value from each log. Improved sawing accuracy has reduced the amount of size variation in sawn lumber which increases solid wood recovery. Thinner kerf saws reduce the proportion of the log that becomes sawdust.

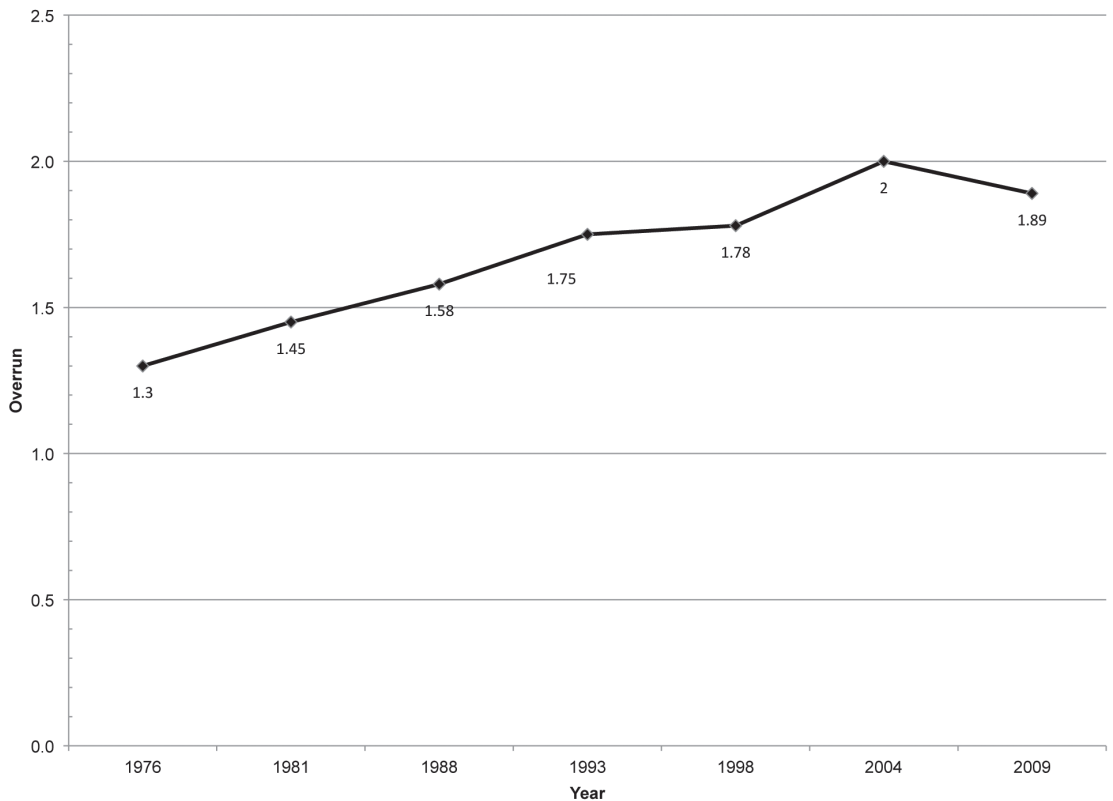


Figure 6—Average overrun for Montana sawmills, selected years.

Table 16—Overrun and lumber recovery factors, selected years (Keegan and others 2001; Keegan and others 1995; Keegan and others 1990; Spoelma 2008).

	1976	1981	1988	1993	1998	2004	2009
Overrun	1.30	1.45	1.58	1.75	1.78	2.00	1.89
Lumber recovery factor ^a	6.79	6.67	6.79	6.97	7.17	7.26	7.35

^aCalculation uses revised board foot/cubic foot ratios for all previous years.

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 three decades as milling technology has facilitated a shift from large ponderosa pine and spruce to smaller diameter lodgepole pine and other species (Spoelma and others 2008). This shift was also dictated by new harvest treatments that were acceptable to various public and private entities such as thin from below and salvage of beetle killed lodgepole pine, which is generally smaller diameter than ponderosa pine or Douglas-fir. The slight decline in overrun between 2004 and 2009 was largely a function of the poor market for lumber in 2009.

Sawmill Capacity

The number of Montana's sawmills has been declining since 1981 (table 17), and the proportion of 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 had been reduced 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, 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.

Between 1976 and 1981, the trend in declining numbers of sawmills had reversed itself, and the number of sawmills in Montana climbed to 142, with 28 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. Large mills, however, 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.

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

Year	Annual lumber production			Total mills
	Less than 10 MMBF ^a	10 MMBF ^a to 50 MMBF	More than 50 MMBF ^a	
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

^aMMBF = million board feet, lumber tally.

^bMills 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: Schweitzer and others 1975; Setzer and Wilson 1970; Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Year	Less than 10 MMBF ^a	More than 10 MMBF ^a	Total lumber production	Average production per mill
	<i>Percentage of production</i>		<i>----- Million board feet -----</i>	
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

^aMMBF = million board feet, lumber tally.

Since 1998, the number of small and large mills has decreased. Montana had 41 sawmills operating in 2009, the fewest of any previous census; 30 were small sawmills and 11 were large mills producing more than 10 MMBF annually. The proportion of total production from large mills increased slightly to 98 percent, but the average production per mill, 10.96 MMBF, was the lowest recorded since 1981. Of the 11 large mills, five produced more than 50 MMBF, accounting for 62.9 percent of lumber production (table 19). Mills producing between 10 and 50 MMBF accounted for nearly 35 percent of the 449 MMBF of lumber produced in 2009. Of the 30 small mills, three produced between 1 MMBF and 10 MMBF of lumber, while the remaining 27 produced less than 1 MMBF each. Since 2004, six mills producing over 10 MMBF have permanently closed, and other mills have permanently or temporarily curtailed production in response to the overall economic downturn and timber availability issues.

Log Home Sector

The “Great Recession” of 2007 to 2009 and the 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, but by 2009 there was a 63 percent decline to just 33 facilities. Along with the decrease in the number of

Table 19--Lumber production by Montana sawmills, 2009.

Lumber production size class	Number of mills	Percentage of production	Lumber production	Average production per mill
			<i>----- Million board feet -----</i>	
More than 50 MMBF ^a	5	62.9	283	56.52
10 to 50 MMBF	6	34.6	155	25.90
1 to 10 MMBF	3	0.9	4	1.40
Less than 1 MMBF	27	1.6	7	0.26
Total	41	100	449	10.96

^aMMBF = million board feet, lumber tally.

manufacturers, sales dropped by an even greater proportion from \$92 million³ in 2004 to \$21 million in 2009. Production also declined from 6 million lineal feet in 2004 to 1 million lineal feet in 2009. The Montana log home industry has had much of its sales in high-end resort and recreation properties, and this component of the real estate market declined dramatically during the recession. Ravalli and Gallatin counties continue to be relative centers of activity for Montana's log home industry with 9 and 5 facilities, respectively.

There were modest declines in Montana's log home industry early in the 21st century with the closure of some larger log home manufacturers. As with the sawmill sector, the availability of raw material for the log home sector has been problematic. In 2004, 67 percent (13.6 MMBF) of the 20.2 MMBF of timber received by Montana's log home manufacturers came from outside Montana, including 7.7 MMBF from Canada. In comparison, in 2009, 24 percent (0.7 MMBF) of the 2.8 MMBF of timber received by Montana's log home manufacturers came from outside Montana.

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 2009, machined logs accounted for 32 percent of sales, compared to 41 percent in 2004. Hand-hewn logs accounted for 58 percent of sales, compared to 51 percent in 2004. Sawn logs were 9 percent of sales, compared to 7 percent in 2004. About \$250,000 of sales (1 percent) from the log home sector in 2009 consisted of specialty products, such as log railings and accent pieces.

Other Sectors

Other sectors of Montana's forest products industry include plywood and veneer plants, 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.

Two plywood plants operated in Montana in 2009, one fewer than operated during 2004. Douglas-fir and western larch are the primary species used for plywood and veneer, although small amounts of other species are also used. Plywood plants in Montana generally produce specialized plywood for RVs and boat construction. Plywood plants in Montana produced 154 million square feet (MMSF), 3/8" basis, of plywood in 2009⁴, compared to 444 MMSF in 2004⁵ (Keegan et al. 2001). 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

³ All sales value and earnings figures in this report have been adjusted to 2009 dollars.

⁴ Plum Creek 2009 Annual Report.

⁵ Adair. C. 2005. Personal communication. Market Research Director, The Engineered Wood Association (APA). P.O. Box 11700, Tacoma, WA 98411.

in this sector has steadily declined (table 10). In 2009, 13 post and pole manufacturers operated in Montana, and total sales from the sector were about \$9.2 million, down nearly 18 percent from \$11.2 million in 2004. 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 other wood products sectors in part due to the strong agricultural markets in Montana and across the United States, as well as demand for post, poles and other fencing materials by the oil and gas industry.

The log furniture sector has seen an increase in the number of facilities since 1993, although the sector has contracted since 2004. During 2009, 14 log furniture manufacturers operated in Montana, compared to 29 in 2004, 25 in 1998, and four in 1993. An additional two facilities were inactive in 2009 but could reopen in the future. There is considerable turnover of manufacturers in this sector, as very little capital or equipment is required to manufacture log furniture, making it easy to start up 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 manufactured by log furniture manufacturers in Montana, but headboards, footboards, and frames for beds, chairs, tables, and bedroom furniture are the most common items. Sales value from Montana's log furniture sector was about \$4 million in 2009 compared to \$8 million in 2004. Like the log home industry much of the sales of log furniture were in the high-end housing market, which suffered large declines in the recent recession.

In 2009, Montana's residue-utilizing sector consisted of a number of types of facilities, including one pulp and paper mill, one particleboard plant, one medium-density fiberboard (MDF) plant, three wood pellet plants, three producers of bark and landscape products, and ten facilities that utilize mill and other residues to produce heat for public schools. 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 provide, but also as an outlet for wood fiber residue from sawmills and plywood plants. The sales value of mill residue and residue-related products from Montana facilities totaled \$372 million during 2009, the smallest percentage decline among all sectors since 2004. In early 2010, the largest component of this sector and the state's only pulp and paper mill, permanently closed its doors. Sales from the residue-utilizing sector subsequently fell to less than \$200 million in 2010 and 2011 (Morgan et al. 2011).

Most mill residue volume is used by facilities manufacturing pulp, 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. Up until 2010, Montana's only pulp mill, which had been in operation since the late 1950s, had the capacity to produce 593,000 tons per year of kraft linerboard (RISI 2008). The particleboard and MDF plants opened during the 1970s, and both plants have seen several expansions since their opening. The particleboard plant currently has the capacity to produce 150 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 2010).

Other portions of Montana's residue-utilizing sector have also seen declines in recent years. The number of facilities producing bark and landscape products decreased from six in 2004 to three in 2009. These facilities produce landscape products such as decorative bark, mulch, and compost. The number of producers of wood pellets for home heating stayed stable at three facilities in 2004 and 2009, although one has since closed permanently and another pellet mill has opened.

A new development in the residue-utilizing sector since 1998 has been the “Fuels for Schools” projects. These facilities were expected to operate using chipped slash and forest residues from fire/fuel hazard reduction projects to provide economical heat in public schools. To this point, however, inputs for these facilities have been a mix of mill residues, chipped forest residues, and small diameter timber. In 2004, two such facilities were operating in Darby and Victor. Since 2004, eight similar facilities have also begun operating.

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 downtime. 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 summed together, 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 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). Four sectors—the sawmill sector, plywood sector, and 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 2009, annual sawtimber processing capacity was 611 MMBF, Scribner, and 50 percent (303 MMBF) of capacity was utilized⁶ (table 20). Sawtimber processing capacity has steadily declined since the late 1980s (fig. 7). Capacity remained steady at nearly 1,600 MMBF during the late 1970s then slightly declined during the recession years of the early 1980s before climbing to its peak (1,595 MMBF) in 1987. 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. Capacity utilization dropped back to 50 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.

⁶ 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: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Plant Type	Processing capacity	Volume processed	Percentage of capacity utilized
----- Million Board Feet, Scribner -----			
2009			
Sawmills	505	237	47%
Other sawtimber users ^a	106	66	62%
Total	611	303	50%
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	783	81%
Other sawtimber users ^a	287	234	82%
Total	1,251	1,017	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%

^aOther sawtimber users include plywood and veneer plants, house log manufacturers, and utility pole plants.

Sawmills have consistently accounted for about 80 percent of sawtimber processing capacity. Annual sawtimber processing capacity at Montana's sawmills was 505 MMBF Scribner in 2009, and sawmills utilized 47 percent of their capacity by processing 237 MMBF Scribner of timber 2009. Capacity utilization rates differ by the size of sawmill, 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 95 percent (479 MMBF) of the sawtimber processing capacity, utilizing 48 percent of capacity. Sawmills processing less than 10 MMBF (Scribner) accounted for the remaining 5 percent (26 MMBF) and utilized 35 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 less 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.

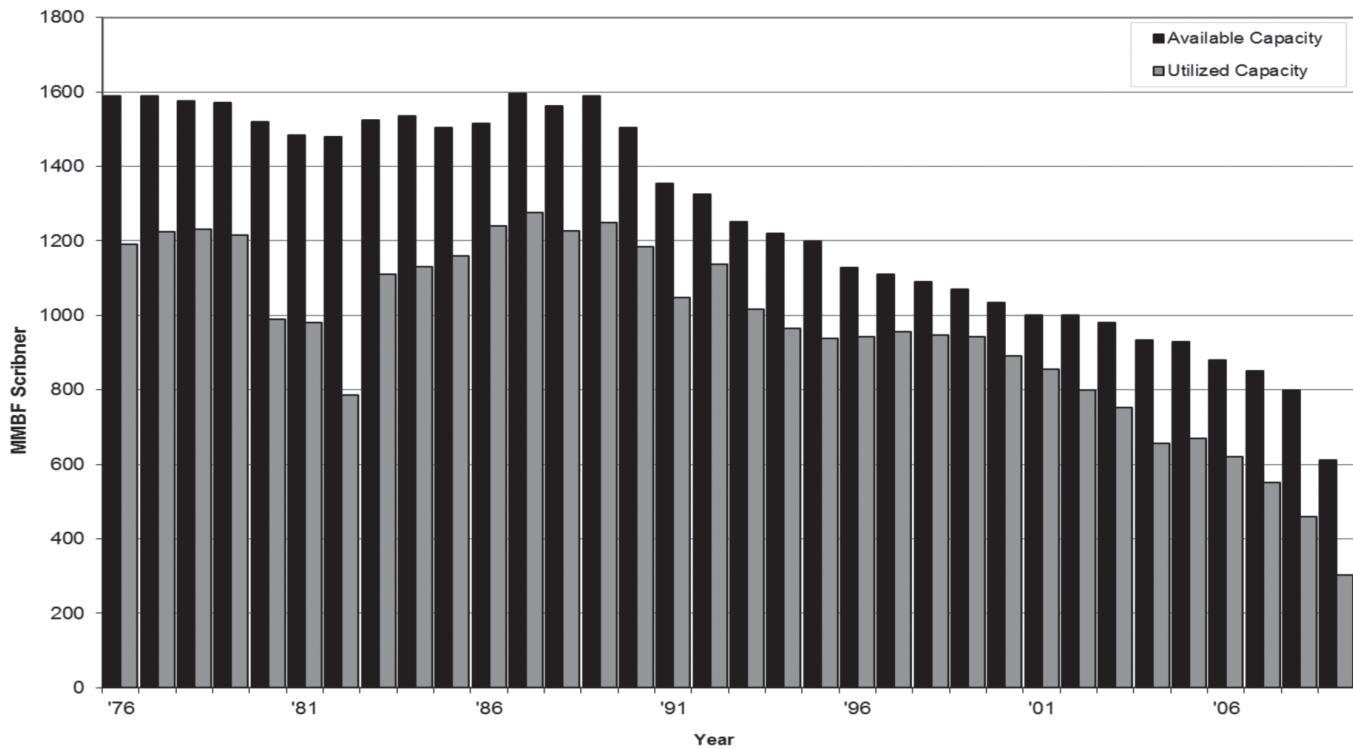


Figure 7—Montana timber-processing capacity and utilization, 1976-2011.

Other users of sawtimber—plywood and veneer plants, house log manufacturers, and utility pole manufacturers—account for about 17 percent of sawtimber processing capacity. These facilities had 106 MMBF Scribner of sawtimber processing capacity in 2009 and utilized 62 percent of their capacity by processing 66 MMBF of timber. In previous surveys, capacity for plywood and veneer 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 1980; Keegan, Jackson, and Johnson 1983; Keegan et al. 1990; Keegan et al. 1995; Keegan et al. 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 expressed their annual capacities in terms of three 8-hour shifts for a 240- to 290-day operating year. Log home manufacturers usually expressed 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 expressed their annual production capacity in terms of one 8-hour shift per day for an operating year of 250 days or less. In 2009, annual timber-processing capacity for non-sawtimber users was 16 MMBF Scribner with 35 percent (6.8 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, board 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 the residue would otherwise be difficult and costly to dispose of. 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 2009, 0.93 BDUs of residue were generated per thousand board feet of lumber produced. Coarse residue accounts for 44 percent of the residue produced per unit of lumber, with sawdust, planer shavings, and bark accounting for 14 to 21 percent each. Since 1981, the total residue factor for sawmills has been decreasing. Decreases in the factors for sawdust and planer shaving are 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.

The total volume of residue produced by Montana’s sawmills and plywood plants during 2009 was 512,824 BDUs (table 22). This is the lowest residue production compared to previous surveys (Keegan 1980; Keegan 1980; Keegan, Jackson, and Johnson 1983; Keegan et al. 1990; Keegan et al. 2001; Keegan et al. 2004; Spoelma et al. 2008), and corresponds to low lumber production in 2009. 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 three-quarters of all residue was used for pulp and board, and more than 20 percent was used as fuel for energy. The remainder was used for landscape products or animal bedding. Less than 0.1 percent of residue from sawmills and plywood plants was unutilized in 2009.

Table 21--Montana sawmill residue factors^a, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Type of residue	1981	1988	1993	1998	2004	2009
Coarse	0.47	0.51	0.48	0.49	0.47	0.44
Sawdust	0.25	0.22	0.23	0.22	0.19	0.21
Bark	0.23	0.21	0.21	0.19	0.20	0.19
Planer Shavings	0.22	0.18	0.16	0.17	0.15	0.14
Total	1.17	1.12	1.08	1.07	1.01	0.98

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

Table 22--Production and disposition of residues from Montana sawmills and plywood plants, 2009.

Residue type	Total utilized	Pulp and board		Energy	Mulch or animal bedding	Bone dry units ^a		Total produced
		Total utilized	Energy			Unspecified use	Unutilized	
Coarse	236,551	229,695	5,711	-	1,144	210	236,761	
Fine	155,872	145,896	4,288	3,079	2,609	137	156,009	
Sawdust	93,229	84,357	3,743	2,520	2,609	118	93,347	
Planer shavings	62,644	61,539	546	559	-	19	62,663	
Bark	120,003	1,374	97,887	10,112	10,630	52	120,055	
All residues	512,425	376,965	107,886	13,191	14,383	399	512,824	
----- Percentage of residue use by type -----								
Coarse	99.9	97.0	2.4	-	0.5	0.1	100.0	
Fine	99.9	93.5	2.7	2.0	1.7	0.1	100.0	
Sawdust	99.9	90.4	4.0	2.7	2.8	0.1	100.0	
Planer shavings	100.0	98.2	0.9	0.9	-	0.0	100.0	
Bark	100.0	1.1	81.5	8.4	8.9	0.0	100.0	
All residues	99.9	73.5	21.0	2.6	2.8	0.1	100.0	

^aBone dry unit= 2,400 lb oven-dry wood.

Coarse residue accounted for 46 percent of the residue volume produced by sawmill and plywood plants (236,761 BDU), and 97 percent of that was used by pulp and board mills. Virtually all remaining coarse residue (5,711 BDU) was used for energy.

Fine residues from sawmills and plywood plants totaled 156,009 BDUs in 2009, of which 60 percent was sawdust and 40 percent was planer shavings. Most sawdust (90 percent) was used by pulp and board mills, with 4 percent used for energy and 3 percent for landscape products or animal bedding. With planer shavings, a higher 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. All told, pulp and board mills used 94 percent of fine residues as raw material for their products, while 3 percent was used for energy and 2 percent was used for mulch or animal bedding. Less than 1 percent of fine residues were unutilized.

During 2009, Montana sawmills and plywood plants produced 120,003 BDUs of bark residue. Just over 80 percent of bark residue was used for energy, and the remaining utilized volume went to landscape products, animal bedding or unspecified uses. Virtually all of the bark residue produced by sawmills and plywood plants in Montana was utilized in 2009.

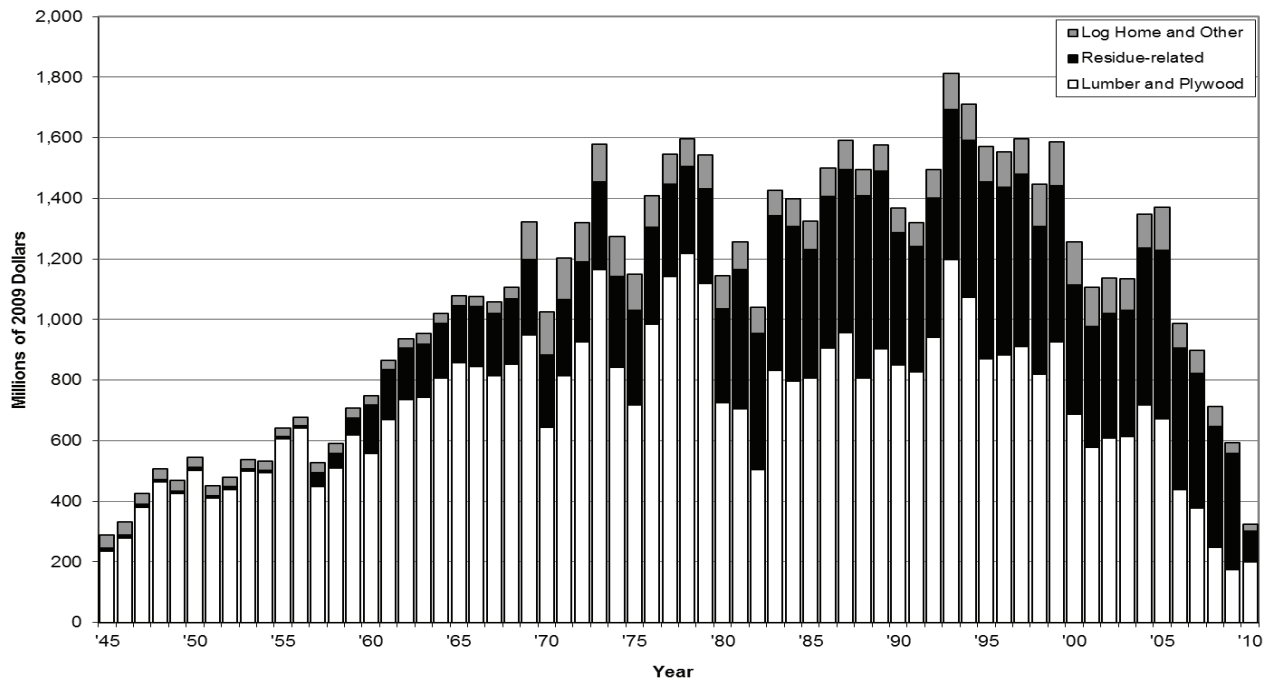
Other manufacturers, including house log manufacturers, post and pole plants, cedar products, and log furniture manufacturers produce a small volume of residues (table 23). In 2009, these facilities produced 20,276 BDUs, of which 96 percent (20,004 BDU) was used. The most common use for this material was energy (10,900 BDU), followed by landscape products, animal bedding and other uses (7,576 BDU). The remaining residue from these facilities (272 BDU) was unutilized.

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

Mills summarized their 2009 shipments of finished wood products, providing information on volume, sales value, and geographic destination. Mills usually distributed their products in two ways: through their own channels, or through independent wholesalers and selling agents. Because of subsequent wholesaling transactions, the geographic destination reported here may not precisely reflect final delivery points of the shipments.

The sales value of primary forest products produced in Montana has increased through the years, from just under \$290 million in 1945 to \$1.3 billion in 2004. However, in the wake of the 2007-2009 recession, sales value from Montana mills fell to \$592 million in 2009 and \$325 million in 2010 (fig. 8). The sales growth between 1945 and 2004 was due to growth in the sawmill sector and diversification in the industry, particularly the addition of the residue-utilizing sector. 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 53 percent in 2004 and 29 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). However, the residue-related proportion of sales fell to less than 26 percent by 2011, after the closure of Montana's only pulp and paper mill in 2010. The proportion of sales from other products, such as posts and poles, clean chips and log furniture, increased from one to four percent of total sales between 2004 and 2009.

Sales of plywood, lumber, and other sawn products were much lower in 2009 than in 2004, with sales of just under \$175 million (table 25), compared with nearly \$717 million in 2004 (Spoelma et al. 2008). The dramatic decline in sales was due to very weak markets and low lumber prices compared to 2004. The 75 percent drop in U.S. housing starts from 2005 to 2009 is one of the primary reasons that wood products markets suffered.



Source: Western Wood Products Association (WWPA), 1964-2010

Figure 8—Sales value of Montana’s primary forest products, 1945-2010.

Table 24—Proportion of finished product sales of Montana’s primary wood products sectors, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Sector	1981	1988	1993	1998	2004	2009
	----- <i>Percentage of sales value</i> -----					
Lumber, plywood, and other sawn products	58	55	67	60	53	29
Pulp, board, and residue-related products	38	41	28	30	39	63
House logs and log homes	2	3	5	9	7	4
Other products ^a	2	1	1	1	1	4
All products^b	100	100	100	100	100	100

^aOther products include: posts and poles. log furniture. clean chips. cedar products and firewood.

^bPercentage detail may not sum to 100% due to rounding.

Table 25-- Destination and sales value of Montana's primary wood products, 2009.

Product	North Central ^a	Far West ^b	South ^c	Montana	Rockies ^d	Northeast ^e	Other countries ^f	Total
	-----Thousand 2009 dollars-----							
Lumber, plywood, and other sawn products	59,286	10,703	28,618	35,362	21,442	11,334	7,913	174,657
House logs and log homes	2,360	3,526	743	11,155	3,039	205	-	21,028
Residue-related products ^g	100,131	88,653	48,246	9,920	37,767	36,179	51,368	372,263
Other finished products	913	5,288	687	13,608	3,246	265	145	24,152
All products and residues	162,690	108,170	78,293	70,045	65,494	47,983	59,426	592,101
	-----Percentage of sales-----							
Lumber, plywood, and other sawn products	10	2	5	6	4	2	1	29
House logs and log homes	0	1	0	2	1	0	-	4
Residue-related products ^g	17	15	8	2	6	6	9	63
Other finished products	0	1	0	2	1	0	0	4
All products and residues ^h	27	18	13	12	11	8	10	100

^aNorth Central includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

^bFar West includes Alaska, California, Hawaii, Oregon, and Washington

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

^dRocky Mountains includes Arizona, Colorado, Idaho, Nevada, New Mexico, Utah, and Wyoming.

^eNortheast includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, Pennsylvania, Rhode Island, and Vermont.

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

^gResidue-related products include pulp, board, fuel pellets, and bark products.

^hPercentage detail may not sum to 100% due to rounding.

During 2009, sales from residue-related products were \$372 million. The majority of sales in this sector were from pulp and paper, particleboard, and MDF. The 2009 sales value of \$372 million was the lowest since 1980, when sales of these products were \$308 million. Residue sector sales fell to a new low of approximately \$100 million during 2010. Sales of house logs and log homes were \$21 million in 2009, down from \$126 million in 1998 and \$92 million in 2004. Sales from posts and poles, clean chips and log furniture were about \$24 million in 2009.

Wood products firms were asked to indicate the proportion of their sales by market region⁷ (tables 25 and 26). In both 2004 and 2009, the top three regions in terms of sales value were the North Central, the Far West, and the South. Montana held steady at 12 percent of sales during 1998, 2004 and 2009, but if Montana were combined with other Rocky Mountain states, the region would be the second largest market area at 23 percent of sales. Sales to other countries jumped from 6 percent in 2004 to 10 percent in 2009, and the Northeast fell from 12 percent of sales in 2004 to 8 percent in 2009.

The two largest market regions for residue-related products in 2009 were the North Central and the Far West, followed by other countries, the South, Rocky Mountains states (other than Montana), the Northeast, and Montana. The majority of sales from house logs and other products remained in Montana.

⁷**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

Table 26--Proportion of Montana primary wood product sales by market region, selected years (sources: Keegan 1980; Keegan and others 1983, 1990, 1995, 2001; Spoelma and others 2008).

Market area	1981	1988	1993	1998	2004 ^c	2009 ^c
	----- <i>Percentage of sales</i> -----					
North Central	34	40	37	28	28	27
Far West	22	17	15	19	17	18
South	10	10	11	16	15	13
Montana	7	5	10	12	12	12
Rocky Mountains	14	11	15	13	10	11
Northeast	6	7	6	9	12	8
Other countries ^a	3	9	6	4	6	10
Unknown	4	1	0	0	0	0
All areas ^b	100	100	100	101	100	100

^aOther countries include Canada, Pacific Rim countries, and other countries.

^bPercentage detail may not sum to 100% due to rounding.

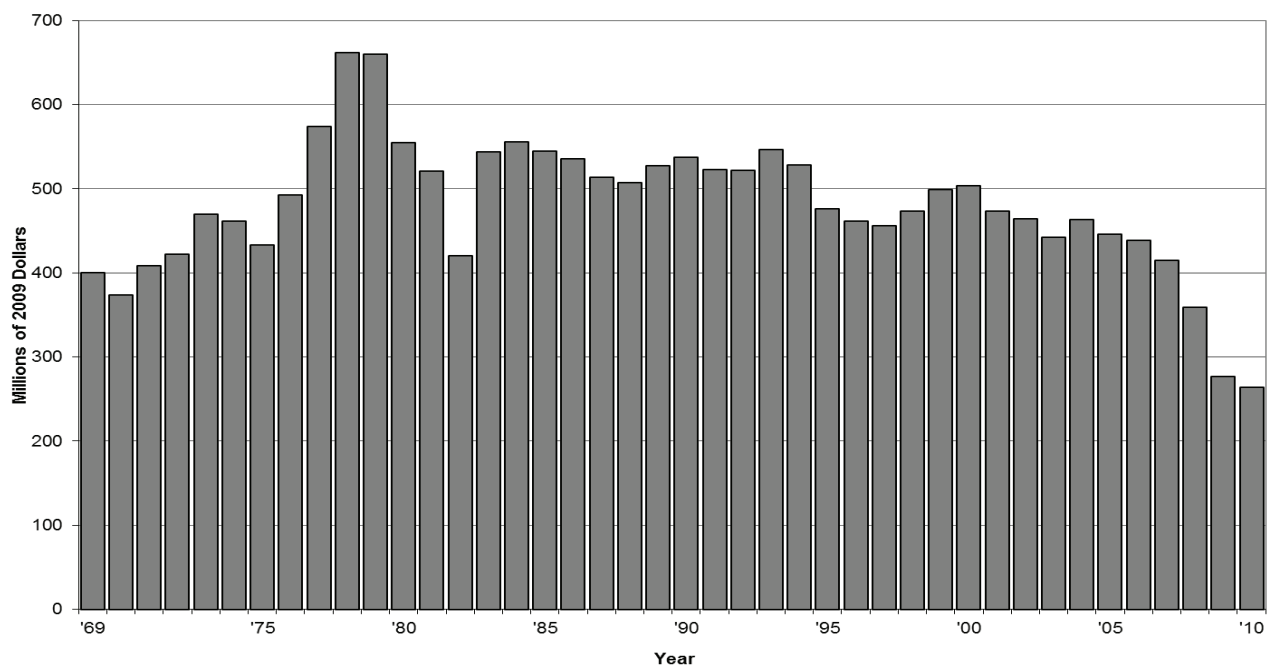
^cIncludes mill residue sales; previous years do not include any residue sales.

Employment and Earnings

Employment and earnings data for this section are taken from the Regional Economic Information System (REIS), published by the U.S. Department of Commerce, Bureau of Economic Analysis (U.S. Department of Commerce, Bureau of Economic Analysis (BEA) 2012). The forest industry can be found in four categories (Office of Management and Budget 1998): NAICS 113—forestry and logging; NAICS 1153—forestry support activities; NAICS 321—wood product manufacturing; and NAICS 322—paper manufacturing. A number of activities involving several thousand workers associated with forest products are not included in these categories, such as: log hauling by independent truckers; truck or rail transport of logs, wood fiber, or finished products; and timber product management activities by government employees. Conversely, some workers in the secondary industry not directly related to Montana’s timber resources are included in these categories, such as truss or mobile home manufacturers whose activities are more closely related to the region’s construction activity.

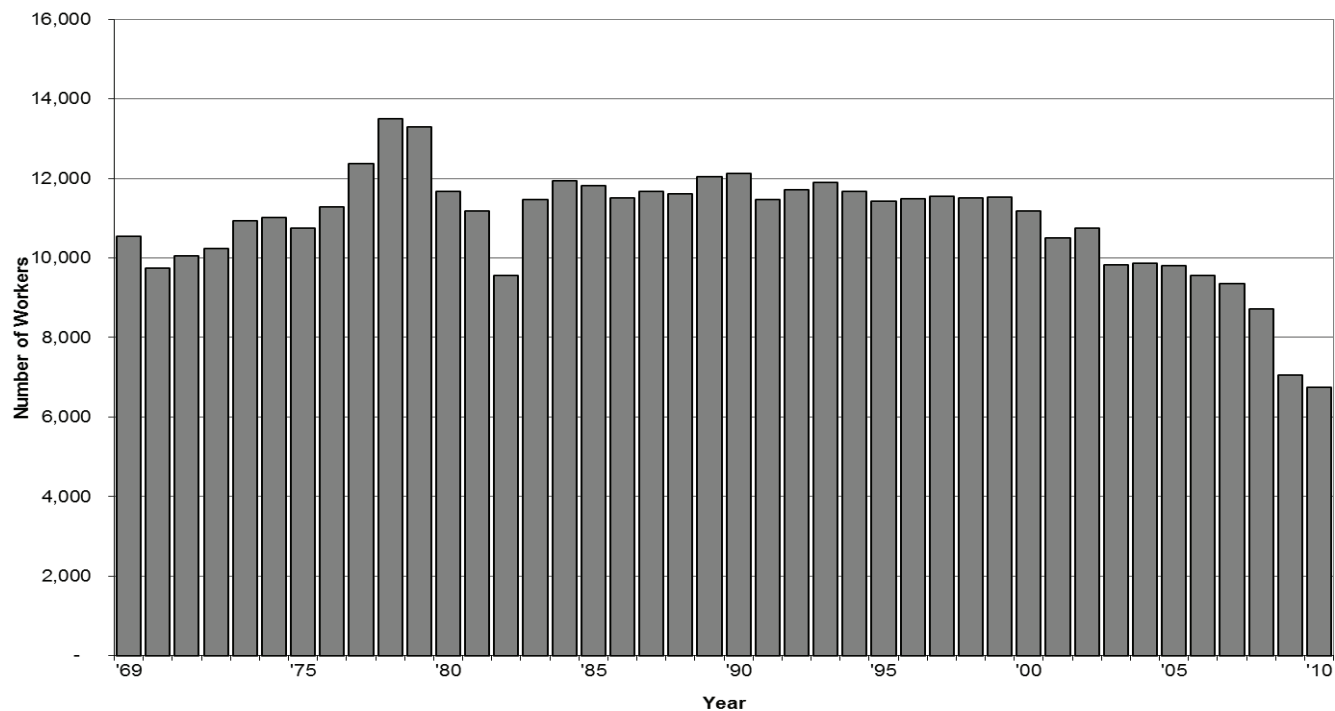
Over the past 40 years, Montana forest industry earnings and employment have followed the same general trends, but the changes from year to year have tended to be greater for earnings (fig. 9) than for employment (fig. 10). Frequently, when the economy is booming, employees are paid bonuses or given raises, but new employees may or may not be hired. Conversely, as the economy slows, changes in earnings due to shortened workweeks or temporary curtailments may be much larger than changes in employment; the workers that are still employed tend to have lower earnings.

In 1969, the Montana forest products industry employed 10,546 workers and earnings were \$400 million. Through gradual increases, both employment and earnings peaked in 1978, when 13,494 Montanans were employed in the industry, with earnings of over \$662 million. However, while this represented a 15 percent increase in earnings from the 1977 level, employment increased only 9 percent. After increasing throughout most of the 1970s, both employment and earnings fell during the recessions of the



Source: Bureau of Economic Analysis (BEA) 2011.

Figure 9—Montana forest industry worker earnings, 1969-2010



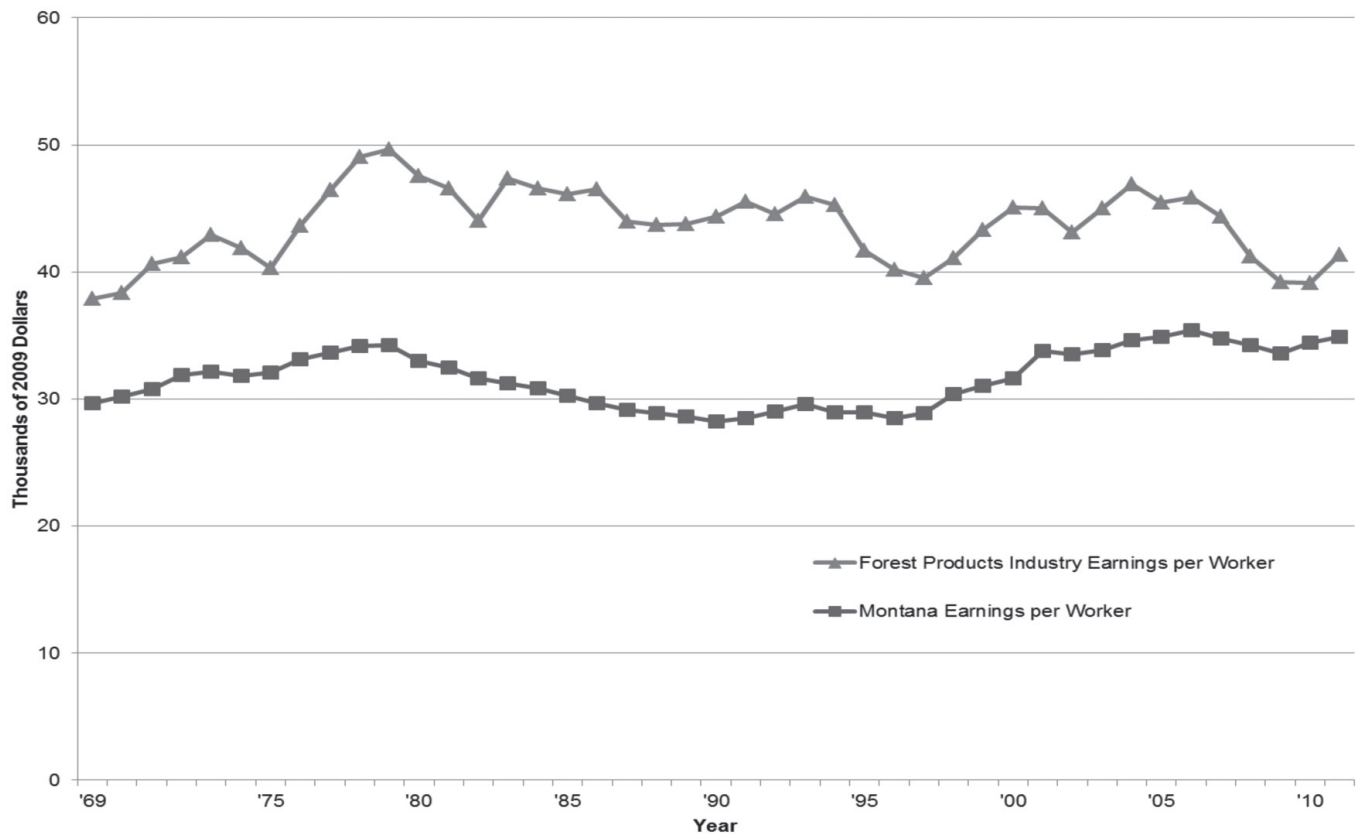
Source: Bureau of Economic Analysis (BEA) 2011.

Figure 10—Montana forest industry employment, 1969-2010

early 1980s, and in 1982 fell to 9,551 workers and \$421 million, respectively. The low numbers represented a 19 percent decrease in earnings since 1981, and a 15 percent decrease in employment. For the remainder of the 1980s and through 1993, earnings and employment remained relatively stable, averaging \$532 million and 11,753 workers per year before starting to drop in 1994. From 1994 through 2000, earnings averaged \$485 million per year and employment averaged 11,477. Again, employment declined by a much lower percentage than earnings. Earnings reached a low in 1997 at \$456 million, whereas employment continued to decrease since its last peak of 12,116 workers in 1990. Looking at 2004 through 2009, forest industry employment continued to fall, from 9,875 in 2004 to 7,051 in 2009, a drop of 29 percent. Earnings followed a similar trend from \$463 million in 2004 to \$276 million in 2009, a drop of 33 percent. However, while inflation-adjusted overall earnings in the industry have decreased through time, earnings per worker in the forest products industry have consistently been higher than average Montana earnings (fig. 11).

Basic Industries and Trends in the State Economy

The economic base of a region consists of industries whose economic activity is dependent on factors external to the state or local economy. These “basic” industries are important to an economy because they have the potential to inject new funds by way of payrolls, taxes, and purchases of local goods and services. Changes in these industries have a strong influence on trends in the overall economy because they also stimulate changes in the derivative or non-basic sectors (Polzin et al. 1988; Polzin 1990; Polzin 2006).



Source: Bureau of Economic Analysis (BEA) 2012.

Figure 11—Montana forest products industry and statewide earnings per worker.

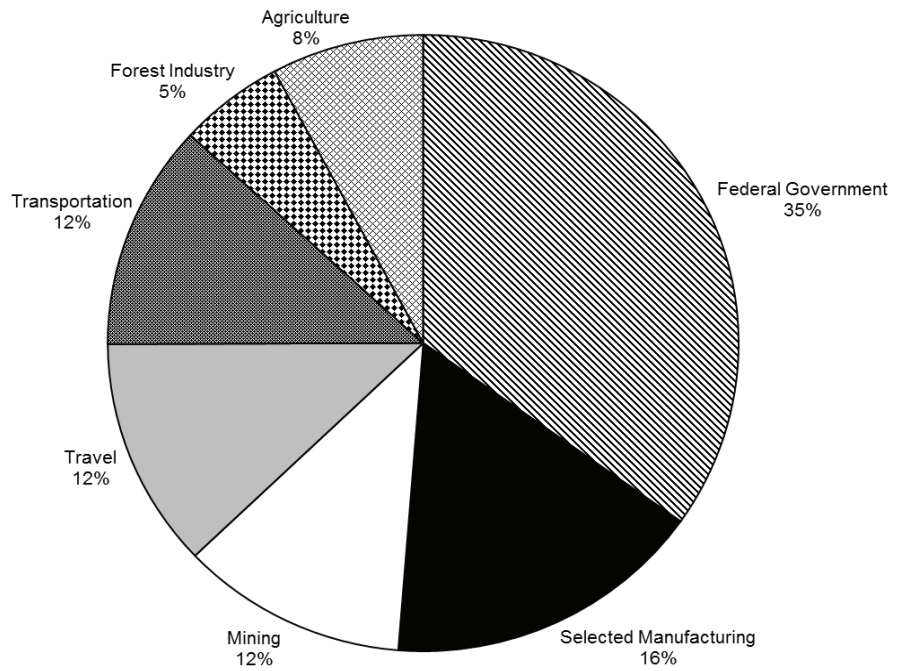
Polzin has defined Montana’s basic industries as wood and paper products manufacturing, other manufacturing industries (with the exception of printing and publishing), railroad and truck transportation, nonresident travel, the federal government (including military and civilian personnel), mining, and agriculture. Earnings are used as a measure of overall economic activity in Montana.

After increasing dramatically to approximately 13 percent during the 25 years following WWII, the contribution of Montana’s forest industry to the state’s economic base continued to increase through the 1970s and 1980s, reaching approximately 16 percent in the late 1980s (Keegan et al. 2001). During the 1990s, the forest industry share of Montana’s economic base fell to approximately 10 percent. That share fell to 9 percent by 2006, and the estimated \$276 million in earnings in 2009 (Morgan et al. 2012) accounted for just 5 percent of Montana’s economic base (fig. 12).

Regional Dependence on the Forest Industry

Although mills received timber from 34 of Montana’s 56 counties in 2009, approximately 74 percent (over \$235 million) of forest industry earnings occurred in nine western Montana counties⁸, where the forest industry is a substantial component of the

⁸ Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Powell, Ravalli, and Sanders counties.



Source: Bureau of Economic Analysis (BEA) 2011. Institute for Tourism and Recreation Research (2010)

Figure 12—Worker earnings in basic industries, Montana, 2009.

economic base. The forest industry also accounts for a significant portion of economic activity in several counties in central and southeastern Montana, contributing at least \$1 million in earnings in each of eight counties in that area.⁹

From 2004 to 2009, Montana’s forest industry suffered more than any other major component of the economic base (Morgan et al. 2011). With the dramatic falloff in housing starts, a generally depressed economy, and an 18-month national recession from December 2007 through June 2009 (Keegan et al. 2012), earnings of forest industry workers in western Montana fell from over \$360 million in 2004 to \$235 million in 2009 and less than \$200 million in 2010. This decline in employment and worker earnings over this period was a major factor in the weak economic conditions and high unemployment rates that plagued the region beginning in 2008.

The share of western Montana’s basic worker earnings provided by the forest products industry ranged from nearly 40 percent in the late 1960s to about 25 percent in the late 1990s, 20 percent in 2006, and fell to under 15 percent by 2009. Given existing mills are currently operating at just over half of their capacity, with an upturn in housing and wood products markets, Montana’s industry output could rise quickly by increasing their use of capacity to 80 percent or more. This could provide a rapid boost to the western Montana economy, and the industry’s share of the region’s economy would likely increase.

⁹Broadwater, Cascade, Gallatin, Jefferson, Lewis & Clark, Madison, Park, and Yellowstone counties.

Current Issues and Outlook

To gain a better understanding of the importance of issues affecting manufacturing in Montana, the Bureau of Business and Economic Research conducts an annual survey of manufacturers in Montana (Hayes et al. 2012). Included in this survey are 23 companies accounting for 28 primary wood products manufacturing facilities, including sawmills, plywood plants, post and pole plants, house log and log home manufacturers, and pulp and board plants. These facilities account for over 90 percent of the timber processed and sales value of production in Montana.

Respondents were asked two open-ended questions regarding major issues affecting their company. The first asked them to list the major issues affecting their plant during 2011, and the second asked them what issues they expected to affect their company during 2012. The sluggish economy, characterized by poor market conditions and a severe housing slump, was the most frequently listed major issue in 2011, with over 40 percent of respondents citing it. Timber availability and availability of qualified workers were the next most frequently cited issues for 2011. Nearly 50 percent of respondents expected the economy and markets to be a major issue facing their business in 2012, and another 35 percent expected timber availability to be a major issue affecting primary wood products manufacturers in 2012. There was considerable overlap in respondents citing these two issues, with half of the respondents citing the economy and markets also indicating timber availability as a major issue going forward.

Survey participants were also asked to rank eight business-related issues, excluding markets, in terms of importance from “very important” to “very unimportant” to their business. No time frame was specified for the issues. Among the eight issues respondents were asked to rank, workers’ compensation rates and health insurance costs were the two most important issues, with over 70 percent of respondents ranking these issues as “very important” (fig. 13). Workers’ compensation rules and raw material availability

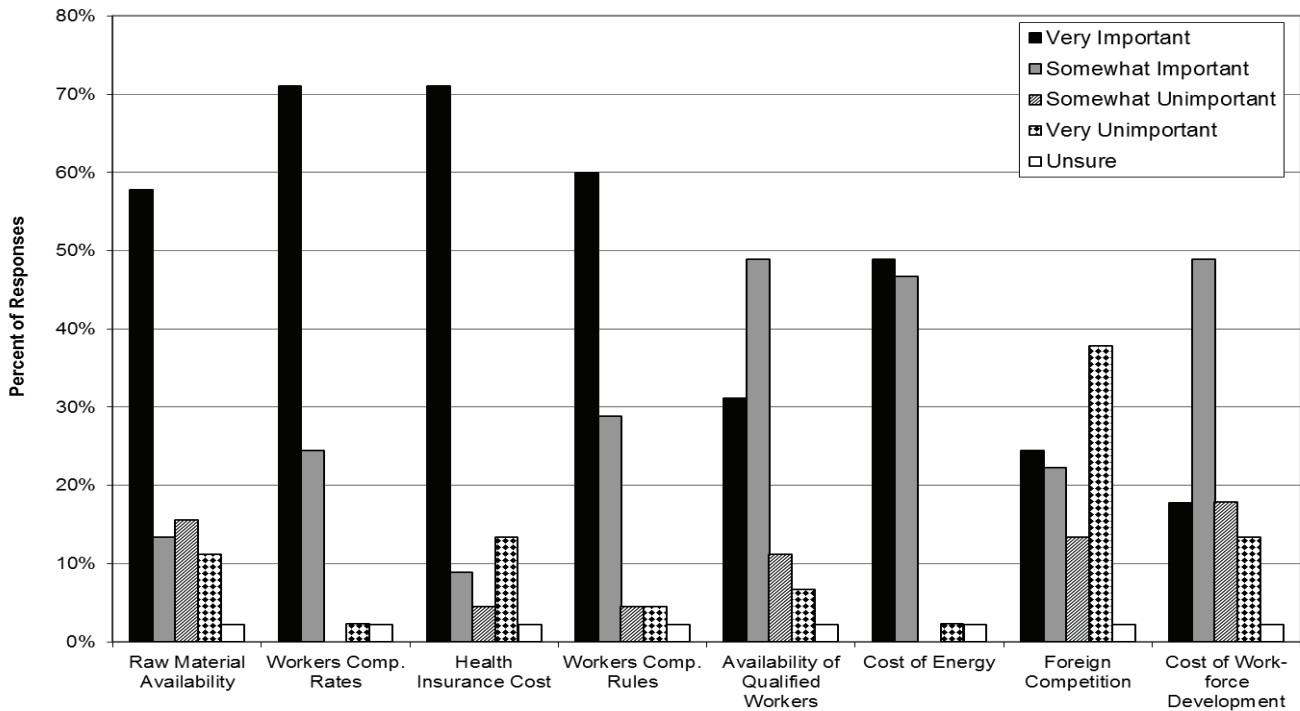


Figure 13—Relative importance of issues facing Montana forest products manufacturers.

were ranked “very important” by more than half of the respondents, and more than 30 percent of respondents ranked cost of energy and availability of qualified workers as very important. Approximately 25 percent ranked foreign competition very important, and 18 percent ranked workforce development costs as very important to their business.

The critical issues identified by these survey respondents are likely to remain very important to Montana’s forest industry in the coming years. The impact of changing health care legislation will be important to nearly all business, including wood products firms, and workers’ compensation rules and rates will remain important as well. Timber availability will continue to be a major challenge to the industry, with National Forest difficulties compounded by declining industrial timber inventories and changing patterns in timberland ownership. Global and domestic demand for wood products, the impact of foreign wood products and energy prices will also continue as factors influencing the industry.

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