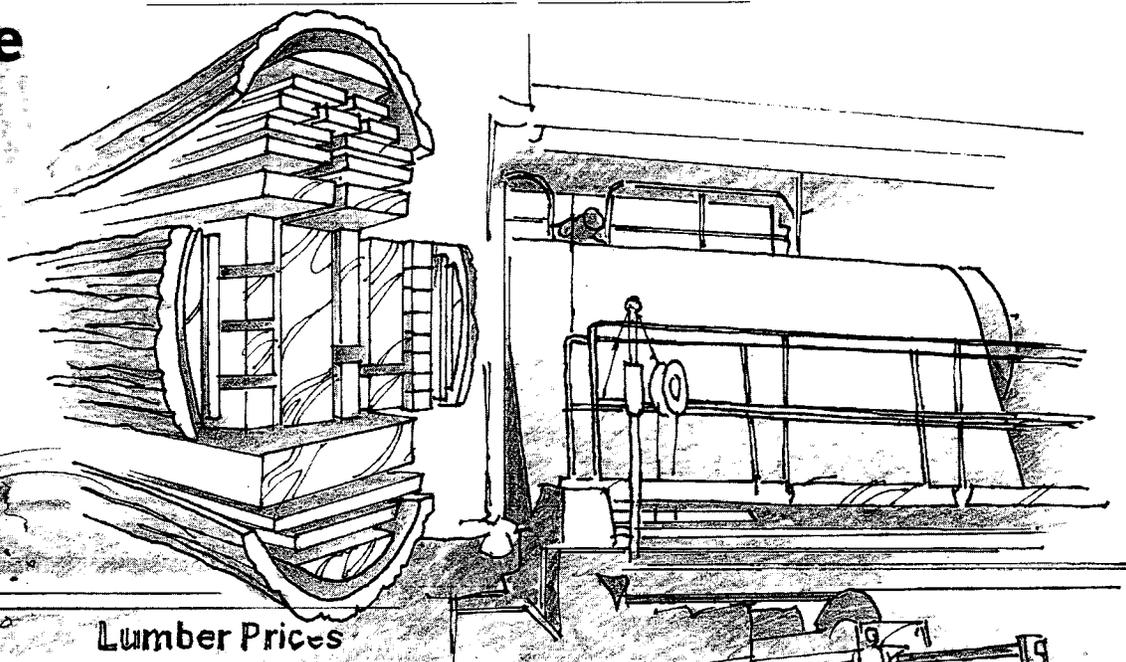
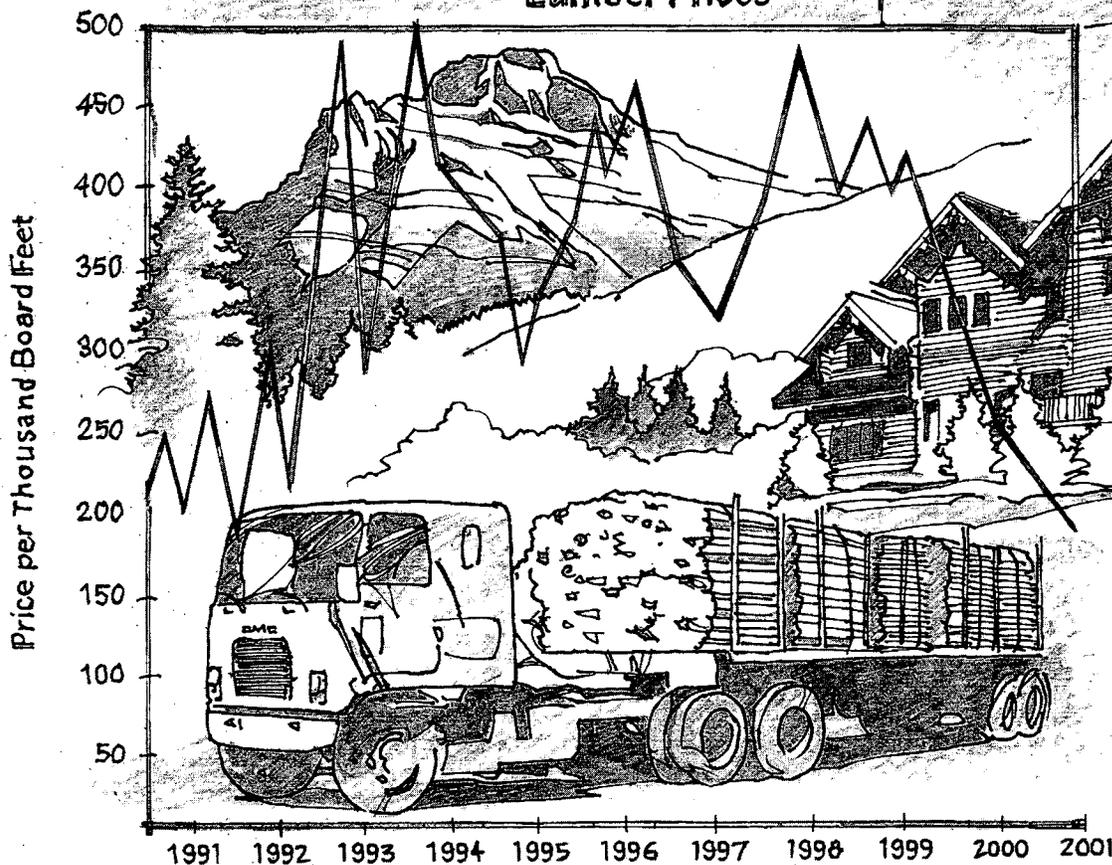


# Montana's Forest Products Industry

A descriptive  
analysis  
1969-2000



Lumber Prices



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# Background

This monograph presents a detailed look at Montana's primary forest products industry for the period 1969-2000. It is based on a census of the industry conducted to collect information for 1998 and on previous censuses collecting information for 1969, 1976, 1981, 1988, and 1993. Detailed comparisons are made for these years; other sources are used to provide information for intervening years and, where possible, to provide information on 1999, 2000, and years prior to 1969.

The periodic censuses are a cooperative effort involving The University of Montana Bureau of Business and Economic Research in Missoula, Montana, and the U.S. Forest Service, Rocky Mountain Research Station, Inventory Monitoring and Evaluation Program in Ogden, Utah. They are the major sources of data for an ongoing system designed to provide reliable and consistent information on the operations of the forest products industry for individual states in the Rocky Mountain Region. This system, the Forest Industries Data Collection System (FIDACS), focuses on the source and volume of timber used and the products manufactured from that timber.

The primary forest products manufacturers provide the following detailed information through written questionnaires and oral communication for each plant for a given calendar year:

- production employment,
- plant production capacity,
- volume of raw material received by county and ownership,
- species of timber received,
- volume, type, sales value, and markets for finished products,
- utilization and marketing of manufacturing residue,
- plant production equipment, and
- beginning and ending inventory levels for raw materials and finished products.

Firms processing virtually all of Montana's timber harvest cooperated in the 1998 census. Estimates were made for information on the few non-respondent firms in order to include all of the activity in Montana's forest products industry. Firms in other states were contacted to determine the volume and type of timber they received from Montana. Information collected through the Forest Industries Data Collection System is stored at The University of Montana, Bureau of Business and Economic Research. In addition to this report, other information is available by request. Individual firm level data are confidential and will not be released.

## **Montana's Forest Products Industry: The Operating Environment During the Past Thirty Years**

The past 30 years has been an extremely volatile period for the forest products industry. During this time, Montana's industry has faced record high levels of demand and product prices as well as near record low prices, economic recessions, structural changes, and declining federal timber harvest levels.

The 1970s was a period of diversification and strong wood products markets. Driven by a strong U.S. economy, with housing starts exceeding 2 million units annually in the late 1970s, wood product prices were very high. In Montana, the increasing substitution of the plywood industry for a portion of the sawmill industry and expansion of sectors using waste wood from sawmills and plywood plants led to increases in labor intensity.

The strong markets of the 1970s ended abruptly in late 1979. High interest rates, causing a sharp drop in the U.S. housing and construction industries, drew the forest products industry into a six-year period that was its most difficult since the Great Depression. Faced with low prices, Montana mills had timber under contract that they could not afford to harvest. By 1983, interest rates fell, leading to improved construction and housing conditions. From 1983-1985, the nation had near-record levels of forest products consumption. However, lumber prices remained low due to a high-valued U.S. dollar, which in turn led to decreased U.S. exports and increased Canadian imports.

It was not until the last half of the 1980s that markets began to see significant improvement, with prices of wood products increasing due to a strong economy and a lower U.S. dollar. Although market conditions and production were stronger, structural changes prevented employment from increasing. Labor intensity decreased during the 1980s due to increased mechanization—a response to competitive market conditions. In addition, there was a shift from mills that produced large-diameter timber to less labor-intensive manufacturing facilities such as stud mills and sawmills that processed small-diameter timber.

During the 1990s, national economic conditions were not the major factor impacting Montana's forest products industry. Restricted timber availability throughout the western United States took a toll on Montana's industry. Harvests from federal timberland in the western United States fell nearly 8.5 billion board feet in the 1990s, a decline of more than 80 percent from 1989 to 1999. This precipitous drop in harvest levels resulted from numerous constraints on harvesting timber on federal lands, including: threatened and endangered species protection, appeals and litigation of timber sales, cumulative impacts of past harvesting, and federal budget levels. Montana's timber harvest volume fell throughout the 1990s, finishing the decade more than 30 percent below the last half of the 1980s, with the harvest on national forest lands declining more than 70 percent.

This is not to say that economic conditions had no effect on the forest products industry in the 1990s. Against the backdrop of ever-decreasing timber availability, changes in U.S. and global economies had a large influence on prices.

The recession that occurred in 1990 and 1991 as a result of the Gulf War brought about much lower lumber prices. However, by 1993, the market shifted to the other extreme. Lumber prices rose to near record levels due to high demand, driven by the now stronger U.S. and global economies and the significant national reductions in the federal timber supply. Employment in Montana's wood products industry during this time remained on par with the late 1980s at about 11,500 workers. Very high prices of the period made it economically feasible to use more labor to recover maximum value from the timber, to harvest timber in biologically and more socially desirable ways, and also to use lower quality timber, which requires more labor to harvest and process. The expansion of the labor-intensive log home industry and secondary processing of other primary wood products also added employment.

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Markets in 1995 weakened due to a slowdown in U.S. and international economies and rising imports of Canadian lumber. Lumber prices fell approximately 20 percent, although they still remained above the prices of the late 1980s.

Beginning in 1996, lumber prices rebounded, reaching record high levels in the first half of 1997 due to a much-improved U.S. economy, improved overseas markets, and a quota-system regulating Canadian softwood lumber entering the United States. However, in the second half of 1997, although the U.S. economy remained strong, Japan and a number of other Asian countries experienced sharp declines in economic activity. With reduced global demand, lumber prices fell for a record 14 straight weeks. By year-end, prices were 10 to 25 percent below June 1997 levels, depending upon grade and species. The Asian economic crisis also further weakened the Canadian dollar, improving the competitiveness of Canadian products.

By 1998, the Asian crisis had become more severe, and lumber prices continued to fall even with record levels of consumption in the United States. Paper prices also weakened, causing a one-month curtailment at Montana's only pulp and paper mill. Montana's lumber and plywood production exceeded 1997 levels, but much of the increase was due to very mild weather in the winter and spring of 1998 that allowed higher than normal levels of logging and temporarily increased log supplies.

In 1999, wood and paper product markets improved considerably due to the U.S. economy's continued strong performance and an improvement in the global economy. During the first half of 1999, forest product prices increased substantially, again reaching near record levels. Prices, however, remained extremely volatile. In late July, prices dropped sharply as a result of very high production from mills throughout North America—a response to high prices earlier in the year. During the last two months of 1999, prices rebounded slightly.

The year 2000 turned out to be one of the most difficult in recent times for Montana's forest products industry. After relatively high prices during the first two months of the year, lumber prices fell sharply in mid-March and remained low for the rest of 2000. Declining prices were due to a combination of factors including:

- high production brought on by increased worldwide milling capacity and unfulfilled strong market expectations at the start of the year,
- higher interest rates and a weaker U.S. economy,
- a strong U.S. dollar and weakness in a number of overseas economies which encouraged lumber imports into the U.S.

In addition to a weaker market situation, wildfires, high electric rates, and continued restrictions on federal timber all negatively impacted Montana's forest products industry in 2000. The year 2000 was one of the worst fire years on record in Montana. The immediate impact on the industry was a disruption in log flows from forests. Timber harvesting—along with virtually all other wildland activities—was prohibited throughout the state for several weeks because of the fire threat. The ban on logging

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forced mills to run down their inventory of logs, and combined with low product prices, led to a number of curtailments. Montana's loggers, who constitute about a third of the Montana forest products industry's workers, bore the brunt of the impact as they were forced to look for other means of support. Some loggers found work in fire-fighting activities, but others were idled during what is normally one of their busiest seasons.

Deregulation of electrical markets in the western United States led to additional problems. Mills that purchase their electricity on the spot market saw prices more than quadruple from the previous year, leading to curtailments in production at several of Montana's mills including Smurfit-Stone Container Corporation papermill in Frenchtown and the Louisiana Pacific particleboard plant in Missoula.

Estimated forest industry employment in 2000 was 10,600, a decrease of about 300 workers from 1999. Employment in Montana's forest products industry increased very slightly in the first quarter of 2001 compared to the previous quarter. However, wages at mills were down by 15 percent because many employees worked considerably less than full time during the period, due largely to electricity-driven curtailments and continued relatively low product prices.

Lumber prices for many grades were up dramatically during April and May of 2001, with much of the spike attributed to a stronger than expected U.S. housing market and uncertainty over the impacts of the expiration of the U.S. Canadian softwood lumber agreement on March 31. However, the unexpected near record lumber price increases were short-lived. The U.S. economy slipped into recession in spring of 2001 and steep price declines since late May have been a stark reminder of the extreme market volatility lumber producers have faced over the past decade.

The September 11, 2001 terrorist attacks on the World Trade Center in New York City and the Pentagon have further weakened U.S. and global economic conditions and heightened uncertainty.

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# Highlights of the Report

## The Forest Products Industry in Montana

- A total of 220 primary forest products plants operated in Montana in 1998, up 23 from 1993. In 1998, the 220 facilities consisted of 73 sawmills, four plywood plants, a medium density fiberboard plant, a particleboard plant, a pulp and paper mill, 75 house log and log home plants, 25 log furniture manufacturers, 29 post and pole plants, three wood pellet plants, three decorative bark plants, two cedar products plants, two chip mills, and a concentration yard. The higher number of forest products plants in 1998 was due primarily to growth in the log furniture and log home/house log sector, which together increased by 37 plants. The major declines were in the sawmill sector, with 13 fewer than in 1993.
- After being stable since the 1970s, the industry's capacity to process sawtimber decreased dramatically during the 1990s, declining 37 percent from 1,561 million board feet (MMBF) Scribner in 1988 to 1,251 MMBF in 1993. Capacity declined even further to 1,035 MMBF in 2000. The reduction was due primarily to a more than 70 percent decline in timber harvest from national forests.
- Total sales value of the primary industry was \$1.1 to 1.3 billion annually from 1997 to 2000, approximately equal to inflation-adjusted sales in the late 1980s. Because of record or near-record product prices, sales value of Montana's primary wood and paper products was a record \$1,466 million in 1993 when adjusted for inflation.
- Four sectors—sawmills, plywood, residue-utilizing plants, and log home producers—accounted for just under 99 percent of industry sales.
- The major markets for Montana's wood products were in the north central states, the far western states, and the Rocky Mountain states.
- Montana sawmills produced 1,287 million board feet (MMBF) lumber tally, over 3 percent of total U.S. output of softwood lumber and about 3 percent of consumption. This figure is down from the record 1,640 MMBF in 1987.
- Montana's four plywood plants produced 654 million square feet (MMSF) 3/8-inch basis of plywood in 1998, accounting for nearly 4 percent of structural panel production in the United States. This figure is down from the record 725 MMSF in 1989.
- Ninety-eight percent of the wood fiber residue generated by Montana's sawmills and plywood plants was utilized in 1998.

## Timber Harvest and Utilization

- Montana's 1998 timber harvest was 869 million board feet Scribner, down 13 percent from the 1993 census year and 37 percent below the record harvest of 1,376 million board feet (MMBF) in 1987. The decline can be attributed to a reduction in the harvest from Montana's national forests of approximately 70 percent.

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- Private timberlands supplied 71 percent of the state's harvested timber in 1998. National forests supplied 22 percent of the 1998 harvest.
  - Ninety-one percent of the state's 1998 timber harvest came from 22 western counties. The eastern counties provided 73 MMBF of the state's timber harvest in 1998 as opposed to 102 MMBF in 1993.
  - Montana mills received 130 MMBF of timber harvested outside the state, while out-of-state firms processed about 37 MMBF of Montana timber, making Montana a net importer of 93 MMBF of timber in 1998.
  - About 77 percent of Montana's 1998 timber harvest went to sawmills for processing. Plywood plants received 18 percent, the pulp and paper industry received almost 4 percent, and house log plants received 1 percent. The remainder of the harvest went to post and pole plants, cedar products manufacturers.
  - Flathead County continues to be the state's leading sawtimber processing county, with 235 MMBF of sawtimber processed in 1998.
  - In spite of a 30 percent decline in timber harvest since the late 1980s, Montana's wood and paper products employment was down by only 8 percent to about 10,600 workers in 2000 because of increased labor intensity.

### **Forest Products and the Montana Economy**

- Earnings for forest industry workers (labor income) totaled \$361 million in 1999 and \$355 million in 2000. These figures—adjusted for inflation—are down about 12 percent from 1990.
- Measured in terms of labor income, the forest products industry accounted for 11 percent of the state's economic base throughout the 1990's.
- The industry is concentrated in nine western Montana counties, which account for over 80 percent of the industry's employment and labor income. In this nine-county area, the industry represented about 35 percent of the local economic base at the end of the century. This is down about 51 percent from its peak in 1978.
- Outside of western Montana there are nine counties in which more than five percent of basic labor income is from forest products. Of these counties, Broadwater, Carter, and Wheatland each derive over 20 percent of basic labor income from the forest products industry.

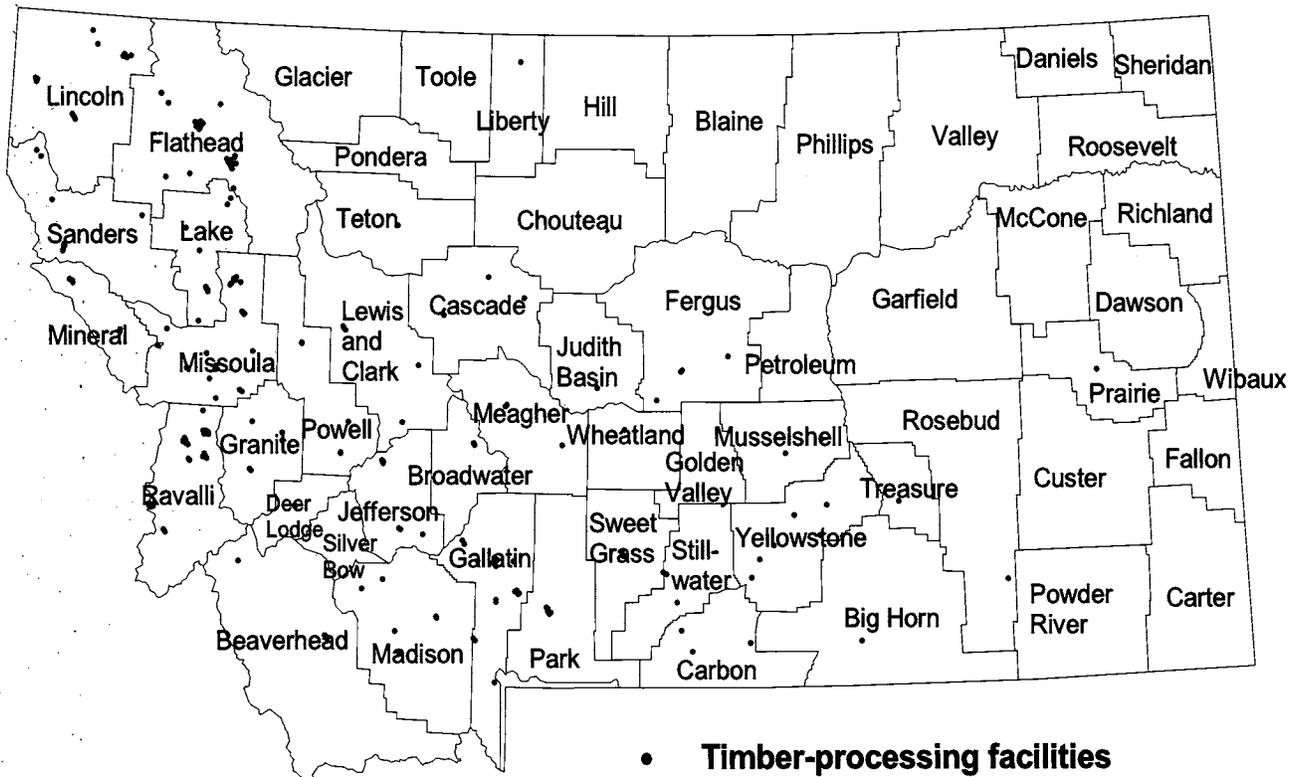
# The Structure of Montana's Forest Products Industry

The 1998 census identified 220 active forest products plants in Montana—23 more than in 1993. These plants produce an array of products including lumber and other sawn products, plywood, pulp and paper, particleboard, medium-density fiberboard, wood pellets, decorative bark, house logs, posts, small poles, log furniture, cedar products, and pulp chips. The higher number of forest products plants in 1998 was due primarily to growth in the log furniture and log home/house log sector, which together increased by 37 plants from 1993 to 1998 and by 63 since 1988 (Table 1). In contrast, the largest decline was among sawmills, with 13 fewer active facilities than in 1993. The number of active post and pole yards declined slightly to 29. Between 1993 and 1998, the state's single utility pole

facility closed. The number of plywood, particleboard, medium-density fiberboard, and pulp and paper facilities remained unchanged from 1993. The number of wood fuel pellet facilities decreased from five to three, and the number of decorative bark plants increased from one to three.

Wood and paper product manufacturing facilities operated in 33 of Montana's 56 counties (Figure 1). Ravalli County contained 35 active timber processing facilities (21 of them log home facilities) in 1998—more than any other county—followed by Flathead County with 30 facilities, two fewer than in 1993. Three other counties had more than 15 facilities each: Missoula with 20, Gallatin with 18, and Lincoln with 16.

**Figure 1**  
**Location of Montana's Active Forest Products Plants, 1998**



**Table 1**  
**Number of Active Primary Forest Products Manufacturing Facilities Identified**  
**by County and Product Produced, 1998**

County	Lumber	Particleboard and Plywood	Fiberboard	Pulp and Paper	Posts and Poles	Log Homes	Cedar Products	Log Furniture	Utility Poles	Other Facilities	Total
Beaverhead	2	-	-	-	1	2	-	-	-	-	5
Bighorn	1	-	-	-	-	-	-	-	-	-	1
Broadwater	1	-	-	-	-	-	-	-	-	1	2
Carbon	-	-	-	-	-	2	-	1	-	-	3
Cascade	2	-	-	-	-	1	-	-	-	-	3
Deer Lodge	-	-	-	-	-	-	-	2	-	-	2
Fergus	4	-	-	-	-	-	-	-	-	-	4
Flathead	12	2	1	-	4	5	-	4	-	2	30
Gallatin	1	-	-	-	1	12	-	4	-	-	18
Granite	2	-	-	-	2	-	-	1	-	-	5
Jefferson	3	-	-	-	3	-	-	-	-	-	6
Judith Basin	1	-	-	-	-	-	-	-	-	-	1
Lake	3	-	-	-	1	3	-	1	-	1	9
Lewis & Clark	4	-	-	-	1	-	-	-	-	-	5
Liberty	1	-	-	-	-	-	-	-	-	-	1
Lincoln	5	1	-	-	-	4	2	1	-	3	16
Madison	-	-	-	-	2	4	-	-	-	-	6
Meagher	2	-	-	-	1	1	-	-	-	-	4
Mineral	2	-	-	-	1	1	-	1	-	1	6
Missoula	4	1	1	1	4	7	-	1	-	1	20
Musselshell	2	-	-	-	-	-	-	-	-	-	2
Park	3	-	-	-	1	2	-	-	-	-	6
Powell	2	-	-	-	-	3	-	-	-	-	5
Prairie	1	-	-	-	-	-	-	-	-	-	1
Ravalli	3	-	-	-	4	21	-	7	-	-	35
Rosebud	1	-	-	-	-	-	-	-	-	-	1
Sanders	5	-	-	-	2	2	-	-	-	-	9
Stillwater	1	-	-	-	-	-	-	1	-	-	2
Sweetgrass	1	-	-	-	-	2	-	-	-	-	3
Teton	-	-	-	-	-	1	-	-	-	-	1
Treasure	1	-	-	-	-	-	-	-	-	-	1
Wheatland	-	-	-	-	1	-	-	-	-	-	1
Yellowstone	3	-	-	-	-	2	-	1	-	-	6
1998 Total	73	4	2	1	29	75	2	25	0	9	220
1993 Total	86	4	2	1	31	59	2	4	1	7	197
1988 Total	87	4	2	1	37	35	3	2	2	10	183
1981 Total	142	4	2	1	35	27	8	0	3	6	228
1976 Total	98	5	2	1	37	19	9	0	3	4	178

Note: Other Facilities include wood fuel pellet mills, roundwood pulp conversion mills, bark processors, and log truss and railings manufacturers.

**Sales Value of Primary Wood and Paper Products and Changes by Industry Sector, 1945-2000**

The periodic censuses, of which 1998 is the most recent, represent the best estimates of sales value for Montana's entire forest products industry. Using a number of other sources, we have made estimates of wood and paper product sales value by year from 1945 to 2000 (Figure 2). This section presents the sales value of products manufactured by the primary wood and paper products industry from 1945 to 2000, focusing on recent years and years for which a complete census of the forest products industry was conducted.

Sales value of the output of Montana's primary forest products industry has increased from just over \$200 million annually (in 1998 dollars) immediately following World War II to more than \$1.2 billion in recent years. Growth in sales in Montana's industry following World War II was due to two factors: expansion of the sawmill sector and diversification of products, including increased utilization of the harvested timber. Prior to 1956, Montana's sawmills accounted for approximately 95 percent of the total sales value. The late 1950s saw the start of substantial industry diversification, with the development over the next two decades of other major sectors: the plywood sector, the residue-utilizing sector, and more recently the house log sector. During the late 1950s, 1960s, and 1970s, the plywood and residue-utilizing sectors' sales values grew relative to the sawmill sector. The house log sector began a

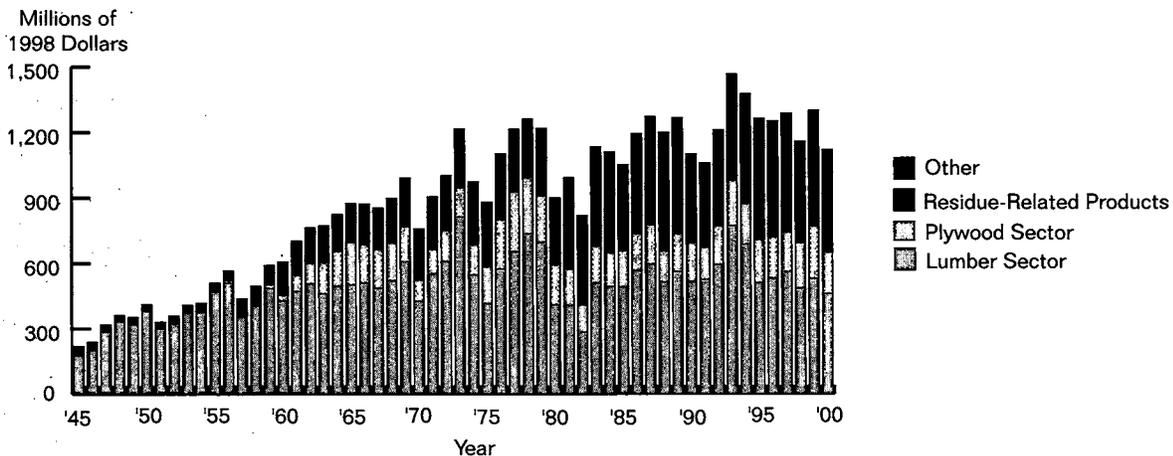
period of rapid growth in the 1970s that extended through the 1990s. By the 1980s, sales of lumber from sawmills contributed less than half the total value for Montana's primary forest products industry.

In 1998, the latest census year, total sales value of the output from Montana's primary wood and paper products industry was \$1.158 billion (1998 dollars), free on board (FOB) the producing mills. Sales declined about 10 percent from 1997 and over 20 percent from a 1993 peak of \$1.466 billion (Table 2). The record sales in 1993 were due to very high prices driven by strong economic conditions, as well as substantial declines in national forest timber availability throughout the west, which contributed to an overall decline in U.S. softwood lumber production. Market conditions in 1999 were much improved over 1998, and sales in Montana's primary forest products industry rose to \$1.3 billion. However, with weaker markets in 2000, they dropped to an estimated \$1.1 billion.

Four sectors—sawmills, plywood, residue-utilizing plants, and log home producers—dominate the primary forest products industry. In 1998, these sectors accounted for \$1.144 billion or just under 99 percent of industry sales (Table 2).

The majority of the decline in sales since the last census came from the sawmill sector where inflation-adjusted sales decreased from \$772.4 million in 1993 to \$486.4 million in 1998. The residue-using sectors also showed a substantial decline in inflation-adjusted sales, from \$405.4 million (1998 dollars) in 1993 to \$350.3 million in 1998. The decline in both of these sectors

**Figure 2**  
**Sales Value of Manufactured Wood and Paper Products, 1945-2000**



Source: BBER, various years; Setzer, T.S., 1971, *Estimates of Timber Products Output and Plant Residues, Montana, 1969*; Western Wood Products Association, *Statistical Yearbook(s) of the Western Lumber Industry, Various Years.*

was due to the global financial crisis, which brought about substantially lower prices, and further declines in national forest timber availability. As a result, a number of sawmills closed between 1993 and 1998.

Sales from the plywood sector saw almost no change between 1993 and 1998 (Table 2). Log home sales (adjusted for inflation) actually increased by 50 percent to \$99.9 million since the last censuses in 1993. Demand for rustic log furniture, in part associated with the log home industry, has fueled the rapid development of this new segment of the industry. In 1998, Montana had 25 firms reporting furniture manufactured directly from raw logs, an increase from four firms in 1993. From 1993 to 1998, sales in the state's log furniture industry, increased from a few hundred thousand dollars per year to nearly \$4 million per year.

The sales of posts, small poles, utility poles, and cedar products decreased slightly (6 percent) from 1993 to 1998 due primarily to the closure of the single utility pole manufacturer. Further detail on the individual sectors is provided in the next few pages.

### The Sawmill Sector

Montana's sawmills produced nearly 1.3 billion board feet of lumber and other sawn products in 1998, almost all from softwoods. The species most commonly used were Douglas-fir, lodgepole pine, and ponderosa pine. All grades of lumber normally produced from these species are found in Montana. High quality, select and shop grades of lumber are available, as are small volumes of large structural timbers. About 80 percent of the sawmill output is dimension lumber, generally two inches in thickness (nominal) and commonly used in construction.

**Table 2**  
**Sales Value of Manufactured Wood and Paper Products,**  
**1969, 1976, 1981, 1988, 1993, and 1998**

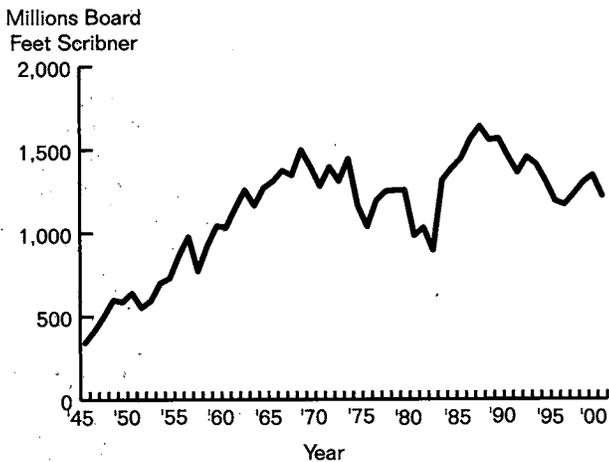
Manufactured Products	Millions of 1998 Dollars					
	1969	1976	1981	1988	1993	1998
Lumber, Structural Timbers and Railroad Ties	\$612.2	\$556.2	\$398.8	\$513.5	\$772.4	\$486.4
Plywood	162.7	218.7	162.1	141.0	206.9	207.7
Residue Related Products	204.1	252.1	368.1	489.9	405.4	350.3
House Logs	-	17.9	18.0	39.3	66.5	99.9
Other	20.0	17.3	17.3	12.9	15.0	14.1
Total	\$999.0	\$1,062.2	\$964.3	\$1,196.7	\$1,466.2	\$1,158.4

Manufactured Products	Percent of Total Sales					
	1969	1976	1981	1988	1993	1998
Lumber, Structural Timbers and Railroad Ties	61	52	41	43	53	42
Plywood	16	21	17	12	14	18
Residue Related Products	20	24	38	41	27	30
House Logs	0	2	2	3	5	9
Other	2	2	2	1	1	1
Total	100%	100%	100%	100%	100%	100%

Note: "Other" includes log furniture producers, post and small pole processors, cedar products, roundwood pulp conversion mills, and log truss and railings manufacturers.

**Figure 3**  
**Montana Lumber Production, 1945-2000**



Source: BBER, various years; Western Wood Products Association, various years.

Based on sales value and amount of timber processed, sawmills remain the largest component of Montana's forest products industry. In 1998, Montana's 73 active sawmills processed almost 77 percent of the timber used by the state's industry to produce 1,287 million board feet (MMBF) lumber tally of lumber. This figure represents nearly 4 percent of the total U.S. production of softwood lumber and about 2.4 percent of U.S. consumption.

### Changes in Lumber Production, 1945-2000

A number of factors have affected Montana's lumber production over the past 55 years, including:

- fluctuating markets for lumber and wood products,
- changes in timber availability,
- increased recovery of lumber per unit volume of log input, and
- management decisions to process more timber into plywood rather than lumber.

From 1945 to 1969, Montana's lumber production grew steadily, driven by strong markets and increases in timber harvest (Figure 3). Harvest levels prior to 1945 on both public and private lands had been low in relation to timber inventories. However, after 1945, public policy encouraged increased harvesting on public lands to meet the strong national demand for building products. Improved prices also encouraged increased harvest on private lands (Flowers et al. 1993).

From 1945 to 1960, the volume of timber harvested

from Montana timberlands increased from 322 MMBF to 939 MMBF Scribner Decimal C log scale and about 95 percent of that timber was processed by the sawmill industry. During the 1960s, lumber production continued to increase, fueled by a nearly 20 percent increase in timber harvest, and an increased recovery of lumber per unit volume of timber processed. These two factors helped to offset the consumption of timber by the newly developing plywood industry. Plywood plants utilize timber that could be processed by sawmills. Consequently, by the late 1960s, plywood plants consumed more than 10 percent of the timber harvest while sawmills consumed about 85 percent.

Due to the plywood industry expansion and constraints on timber availability, lumber production declined in the 1970s. The plywood industry doubled in size during the 1970s while substantial reductions in timber harvest from national forest lands were only partially offset by increased timber harvest from private forest lands. The net result was a lower timber harvest in Montana and a decrease in the portion of state's timber harvest used by sawmills from 85 to 75 percent.

In late 1979, there was an abrupt and extreme downward shift in wood products markets brought on by the most severe recession of the post World War II period. Depressed wood product markets in 1980 and 1982 led to the lowest lumber production in Montana since the 1950s. However, in 1987, Montana sawmills rebounded with a record lumber production of 1,640 MMBF because of a strong national economy, a temporary "abundance" of timber, and continued increases in lumber recovery per unit of timber processed. During this period, there was a small decline in the relative proportion of timber used by the plywood industry.

This "abundance" of timber proved to be temporary indeed. With the low level of market activity in the early 1980s, sawmills and plywood plants acquired, but did not harvest timber. When the markets improved in the last half of the 1980s, these plants used the unharvested national forest timber under contract. At the same time, industrial timberland owners accelerated the harvest of timber on company-owned land to record levels in the same period (Flowers et al. 1993).

From 1987 to 1993, Montana's lumber production slowed due to a sharp decline in timber availability. Total timber harvest in Montana fell by 25 percent, driven primarily by a 50 percent reduction in offerings from the national forest timber program relative to the late 1980s. The amount of timber offered by the national forest timber program declined for a number of reasons, including:

- the protection of threatened and endangered species,
- increased appeals and litigation to stop or decrease the size of timber sales,

- cumulative effects of past harvesting in some areas, and
- reduced U.S. Forest Service budgets.

The decline in timber harvest led to a 20 percent decline in capacity to process timber in the state by 1993—mostly concentrated in the sawmilling sector (see Section 4 for a more detailed discussion of changes in production capacity).

Due to lower prices and continual declines in national forest offerings, capacity fell by an additional 10 percent and lumber production fell from 1,367 MMBF in 1993 to 1,287 MMBF in 1998. In 1999, stronger than expected markets caused mills to increase production slightly to about 1,340 MMBF. But by 2000, weakening markets, a severe wildfire season, and continued declines in national forest offerings caused mill closures and curtailment. Thus lumber production fell by an estimated 10 percent in 2000.

**Lumber Overrun**

Since the 1976 census, there has been a 37 percent increase in the volume of lumber recovered per board foot of sawlog volume processed. In 1998, Montana sawmills produced around 1,287 MMBF (lumber tally) of lumber by processing about 725 MMBF Scribner Decimal C of logs for an overrun of 1.78 (Table 3). This compares to overruns of 1.30 in 1976, 1.45 in 1981, 1.58 in 1988, and 1.75 in 1993. The increased overrun (output per unit of input) is due to many factors, including:

- Improvements in technology have made Montana mills more efficient. For example, 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 accuracies have reduced the amount of size variation in sawn lumber, increasing solid wood recovery. Thinner kerf saws reduce the proportion of the log that becomes sawdust. More recent innovations include such things as curve sawing, which actually controls the saw blades so that they follow the contour of the log allowing increased recovery from timber that is not straight.

- Decreasing log size contributes to increased overrun. As log diameters decrease, the Scribner Decimal C log rule (which is used in Montana) underestimates, by an increasing amount, the volume of lumber that can be recovered from a log. The average log diameter has decreased substantially in the past 20 years.
- Restricted timber supplies may increase timber recovery factors. When timber supplies are suddenly restricted, as was the case throughout the 1990s, mills recover more lumber from lower-quality logs that have low log scale volumes because of deductions for defect.

Lower lumber prices in 1998—relative to 1993—may have negatively influenced lumber overrun. When lumber markets are poor, many lower grades of lumber are not profitable to produce, and this material may be converted to wood pulp or chips, depending on lumber and paper markets. Thus, in 1998, log volume that would have been utilized during periods with higher prices was not processed, and overrun was slightly lower than it could have been.

**Table 3  
Sawmill Lumber Overrun, 1976, 1981, 1988, 1993, and 1998**

Year	Timber Processed (MMBF) <sup>1</sup>	Lumber Production (MMBF) <sup>2</sup>	Lumber Overrun
1976	905	1,176	1.30
1981	739	1,071	1.45
1988	985	1,558	1.58
1993	782	1,367	1.75
1998	725	1,287	1.78

Note: 1) million board feet, Scribner Decimal C, log scale.  
2) million board feet, lumber tally.

## Structure

### Geographic Sources of Lumber Production

The 1998 proportionate geographic distribution of Montana's lumber production was little changed from 1993. Seventy-four percent, 954 MMBF, of the state's lumber output was produced in Montana's eight western counties—Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders—down slightly from 77 percent in 1993 and 76 percent in 1988 (Table 4). Flathead County mills continued to lead the state with lumber production of 334 MMBF (26 percent) of the state's output, followed by Lincoln County with 173 MMBF (13 percent), and Missoula County with 163 MMBF (13 percent). Lake and Sanders counties together produced 146 MMBF (22 percent). Lumber production in eight west-central and southwestern Montana counties—Beaverhead, Broadwater, Gallatin, Lewis and Clark, Madison, Meagher, Park, and Powell—was 293 MMBF, 23 percent of Montana's lumber production. The remaining counties in the state were responsible for nearly 40 MMBF (3 percent) of Montana's production, unchanged from 1993.

### Number and Size of Mills

Over the past 30 years, the number of sawmills operating in Montana has changed dramatically. The heavy demand for housing after World War II resulted in an increase in the number of sawmills operating in

Montana. At the peak of this boom, in 1956, Montana had about 330 sawmills, but only 26 sawmills produced more than 10 MMBF of lumber annually (Table 5).

By 1976, the number of active sawmills in Montana had decreased to 98. The loss was among smaller sawmills, those producing less than 10 MMBF of lumber annually. Although 304 smaller mills operated in 1956, only 68 remained by 1976, and the number of larger mills increased over the period.

A few years later, the trend temporarily reversed itself and the number of active sawmills grew from 98 in 1976 to 142 in 1981. The reversed trend was caused by an increase in the number of small sawmills, from 68 in 1976 to 114 in 1981, with 28 mills producing more than 10 MMBF annually.

By 1988, the general trend was again toward fewer, but larger, sawmills. The number of smaller mills fell by 56 in 1988, and the number of mills producing over 10 MMBF increased by one to 29. Since 1988, the number of small mills has remained relatively stable, with a maximum of 60 in 1993 and a minimum of 54 in 1998. In 1993, Montana had 26 mills, with production over 10 MMBF compared to 19 in 1998 (Table 5).

The concentration of lumber production has followed a similar pattern. In 1956, nearly one-third of the state's total lumber output came from mills each producing less than 10 MMBF of lumber annually (Table 6). By

**Table 4**  
**1998 Lumber Production and 1976, 1981, 1988, 1993, and 1998 Lumber Production Percentage by County and County Groups**

County or County Group	1998 Lumber Production (MMBF)	Percent of Lumber Production				
		1998	1993	1988	1981	1976
Flathead	334,223	26%	22%	22%	21%	21%
Lincoln	172,953	13%	19%	22%	18%	18%
Lake/Sanders	146,331	11%	12%	11%	13%	14%
Missoula	162,743	13%	11%	10%	20%	20%
Mineral/Granite/Ravalli	137,712	11%	13%	11%	9%	10%
Beaverhead/Broadwater/Gallatin/ Lewis & Clark/Madison/ Meagher/Park/Powell	293,401	23%	20%	20%	19%	17%
All Other Counties	39,637	3%	3%	4%	a	a
All Montana Counties	1,287,000	100%	100%	100%	100%	100%

**Table 5**  
**Number of Sawmills by Size of Production,**  
**Selected Years, 1956-1998**

Year	Annual Production			Total Mills
	Under 10 MMBF	10 MMBF to 50 MMBF	Over 50 MMBF	
1956	304	26	a	330
1966	111	37	a	148
1973	86	22	7	115
1976	68	24	6	98
1981	114	23	5	142
1988	58	16	13	87
1993	60	14	12	86
1998	54	8	11	73

Note: a - mills with production over 50 MMBF are included in the 10 MMBF to 50 MMBF category in 1956 and 1966.

Source: BBER, various years; Schweitzer, D.L., R.E. Benson, and R. McConnen, 1975. *A Descriptive Analysis of Montana's Forest Resources*; Setzer, T.S. and A.K. Wilson, 1970, *Timber Products in the Rocky Mountain States, 1966*.

**Table 6**  
**Lumber Output by Size of Mill, Selected Years,**  
**1956-1998**

Year	Percent of Production		Total Lumber Production (MMBF)
	Less Than 10 MMBF Produced Annually	More Than 10 MMBF Produced Annually	
1956	33	67	979
1966	13	87	1,259
1973	10	90	1,375
1976	4	96	1,176
1981	8	92	1,071
1988	4	96	1,558
1993	4	96	1,367
1998	2	98	1,287

Source: BBER, various years; Schweitzer, D.L., R.E. Benson, and R. McConnen, 1975, *A Descriptive Analysis of Montana's Forest Resources*; Setzer, T.S. and A.K. Wilson, 1970, *Timber Products in the Rocky Mountain States, 1966*.

**Table 7  
Lumber Production by Size of Mill, 1998**

Size Class	Number of Mills	Volume (MBF)	Percentage of Total	Average per Mill (MBF)
A - over 50 MMBF	11	1,148,458	89.2%	104,405
B - 25 to 50 MMBF	5	42,000	3.3%	8,400
C - 10 to 25 MMBF	3	66,983	5.2%	22,328
D - 1 to 10 MMBF	8	24,122	1.9%	3,015
E - under 1 MMBF	46	5,437	0.4%	118
Total	73	1,287,00	100.0%	17,630

1976, the 30 largest mills in the state accounted for 96 percent of the state's total lumber output, while the 68 mills producing less than 10 MMBF of lumber contributed only 4 percent.

In 1981, the proportionate contribution of lumber from mills producing less than 10 MMBF increased from 4 percent to 8 percent. Two factors were primarily responsible:

- 1) Strong lumber markets in the late 1970s, coupled with expectations of strong lumber markets in the 1980s, as well as the development of easy-to-operate portable sawmills encouraged small mills to start operating.
- 2) Weaker than expected lumber markets in the early 1980s caused a number of mills, which in good market years produced more than 10 MMBF annually, to fall below this level.

Since 1981, lumber production became even more concentrated in the largest mills (Table 6). In 1988 and 1993, 96 percent of the state's output was from mills producing more than 10 MMBF of lumber for the year. In 1998, 98 percent was produced in these larger mills. Mills producing more than 50 MMBF of lumber in 1998 accounted for 89 percent of the state's production (Table 7), up from 68 percent in 1993 and 1988 and up from 44 and 42 percent respectively for 1981 and 1976.

### Plywood and Veneer Sector

Plywood produced by Montana facilities is primarily manufactured from Douglas-fir and western larch, although Engelmann spruce, lodgepole pine, ponderosa pine, true firs, and hemlock are sometimes used for

inner veneers. The plywood produced in Montana can be placed in two general categories: plywood for industrial uses and plywood for construction purposes. Industrial plywood is touch-sanded and generally plugged, and it is commonly used for manufacturing of products such as recreation vehicles, boats, van liners, and carpet strips. Construction plywood is used for sub-floors, sheathing, and concrete forms.

Montana's four plywood plants produced 654 million square feet (MMSF), 3/8-inch basis in 1998, down about 5 percent from 1993. Montana's output accounted for nearly 3.7 percent of the structural panel production in the United States in 1998 (APA - The Engineered Wood Association 2001). These plants shipped 669 MMSF 3/8-inch basis of plywood and veneer, for total sales of \$207.7 million (Table 2).

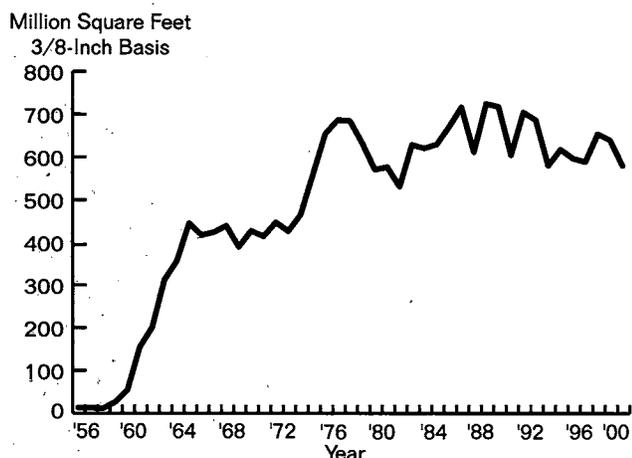
Producing plywood became more and more popular in Montana during the 1960s and 1970s, with output increasing sevenfold from 1960 to 1970 (Figure 4).

During this period, several Montana companies decided to use a larger portion of the available timber resource for plywood manufacturing for several reasons, including:

- New technology allowed peeling of relatively small diameter timber.
- Montana had abundant Douglas-fir and western larch timber, which have excellent qualities for plywood.
- Wood products markets for structural panels were strong.

Montana's plywood production continued to increase through the 1980s, reaching record production of 725 MMSF 3/8-inch basis in 1989. In spite of higher prices in

**Figure 4**  
**Montana Plywood Production, 1956-2000**



1993, production fell because of reduced timber availability and the downsizing of one of Montana's four plywood plants in late 1993. Since 1993, production has fluctuated annually around 600 MMSF 3/8-inch basis.

#### Plywood Recovery

Montana's plywood plants processed 199 MMBF Scribner Decimal C of timber and produced 654 MMSF 3/8-inch basis in 1998, for a recovery of 3.29 (Table 8). This recovery is up slightly from 1993, when Montana's plywood industry processed 213 MMBF of timber to produce 687 MMSF 3/8-inch basis of plywood, for a recovery of 3.23.

Plywood recovery factors are a function of many processing efficiencies that have been developed over the

past 30 years. Technologic improvements in plywood manufacturing—both on the log input end and the plywood output end—allow manufacturers to more precisely buck logs, more accurately center the log for peeling, peel logs to smaller core diameters, and better control the clipping of veneer. Thus, more usable product is recovered from each veneer log. In addition, the diameters of logs processed by Montana's plywood industry, as with the sawmill sector, have decreased. As log diameter decreases, the Scribner Decimal C log rule underestimates by an increasing amount the volume of wood fiber in the log. However, one factor may contribute to a slight over-estimation of plywood recovery. Some mills purchase veneer from outside of Montana, but plywood production numbers includes this purchased veneer, thus slightly overstating actual plywood recovery from logs processed.

#### Residue-Utilizing Sector

Mill residue, particularly wood fiber residue from manufactured lumber and plywood, is the major resource of Montana's residue-utilizing industry. Three large plants—a kraft pulp and paper mill, a particle-board plant, and a medium-density fiberboard plant—dominate this industry. The 1998 census also identified three wood pellet producers and three decorative bark producers that also utilize mill residues.

Prior to the pulp and paper mill's development in the late 1950s, there was no major industrial use of wood residue, although some was used as fuel and locally in small quantities for animal bedding. The pulp and paper mill went through several expansions and remained the state's major user of residue through the 1960s. In 1969, the residue-utilizing sector consisted of a kraft pulp and paper mill and a facility selling electricity generated

**Table 8**  
**Plywood Recovery, 1976, 1981, 1988, 1993, and 1998**

Year	Timber Processed (MMBF) <sup>1</sup>	Plywood Production (MMSF) <sup>2</sup>	Plywood Recovery
1976	267	642	2.40
1981	224	569	2.54
1988	218	612	2.81
1993	213	687	3.23
1998	199	654	3.29

Note: 1-million board feet, Scribner Decimal C, log scale.  
2-million square feet, 3/8-inch basis.



Photo by Patrick O. Connell of Rocky Mountain Log Homes, Hamilton, Montana.

from wood fiber. The 1970s saw the construction of a particleboard plant and a medium-density fiberboard plant, with expansion of each in subsequent years.

In the early 1970s, the pulp and paper mill was capable of producing 1,000 tons of linerboard and 150 tons of bleached kraft pulp per day. By 1993, this capacity had increased to 1,910 tons per day of linerboard, and by the late 1990s, capacity was 2,200 tons per day of unbleached linerboard (Berg et al. 1974, Miller Freeman 1994a). In 1976, the particleboard plant

had an annual capacity of 100 million square feet (MMSF) on a 3/4-inch basis, and the medium-density fiberboard plant had an annual production capacity of 70 MMSF, 3/4-inch basis. By 1993, the capacity of these two facilities had increased to about 150 MMSF for the particleboard plant and 125 MMSF for the fiberboard plant, remaining at about that level through the 1990s (Miller Freeman 1977, Miller Freeman 1994b).

Among the other residue-utilizing plants, the number of decorative bark plants has increased from one in the

1970s to three in 1998. The wood pellet industry emerged in the 1980s, with four active fuel pellet facilities reported in 1988. However, two facilities were just starting production that year, and output was 5,500 tons. Output of the five facilities in 1993 increased substantially to about 52,000 tons of pellets. In 1998, only three wood pellet plants remained, with production down to about 35,000 tons.

As a result of the major expansions, the residue-utilizing sector of Montana's primary forest products industry experienced inflation-adjusted sales increases of approximately 140 percent from 1969 to the census in 1988. However, sales have dropped from the 1988 peak of \$490 million (1998 dollars) to \$350 million in 1998, a 28-percent decline primarily because of weak paper and particleboard markets in 1998 (Table 2).

In addition to being the source of raw materials for a significant industry component, residue sales are a significant source of revenue for lumber and plywood producers. In 1998, the residue-utilizing sectors in both Montana and other states paid \$50 million (1998 dollars) to Montana sawmills and plywood plants for chips, sawdust, planer shavings, bark, slabs, trim ends, and peeler cores.

### **Log Home Industry**

Montana's log home industry is made up of facilities that manufacture a variety of products, ranging from individual house logs to custom-designed log homes and resort log buildings. The industry offers three basic log types: hand-hewn or authentic style, machined (contoured/lathed/planed), and sawn. While several firms manufacture more than one log type, most firms specialize in one of the three styles. In 1993, 46 percent of the sales were machined logs, 36 percent were hand-hewn or authentic style, and 11 percent were sawn house logs.

Montana's log home industry has experienced substantial growth since 1969 when there were an estimated three to five log home plants in Montana with annual sales of about \$4 million (expressed in 1998 dollars). In 1998, the state's 75 active log home manufacturers had sales of about \$99.9 million (Table 2), selling 6.8 million lineal feet of house logs. These figures went up dramatically from 1993, when 59 manufacturers had sales of about \$66 million (1998 dollars) and produced 5.5 million lineal feet of house logs. For a more detailed discussion of Montana's log home industry see "Montana's Log Home Industry—Developments Over the Last Three Decades" in *Montana Business Quarterly*, Vol. 38, No. 4, available from the Bureau of Business and Economic Research, The University of Montana, Missoula, Montana, 59812.

### **Cedar Products and Post & Pole Producers**

In contrast to the log home industry, Montana's cedar products and post and pole industries have declined somewhat since 1993 (Table 1). Sales value has declined from \$15 million in 1993 to \$10.3 million in 1998.

Montana's cedar products consist of shakes and shingles (used for roofing and siding on houses and other structures) and split-rail fencing. The number of active facilities in this sector declined from nine in 1976 and eight in 1981, to three in 1988 and two in 1993 and 1998 (Table 1). The cedar products manufacturers cited limited timber availability near their mills, increasing competition with sawmills for a portion of their raw materials, and marketplace competition from Canadian cedar products manufacturers as reasons for the recent decline in this sector.

Montana's post and pole industry consists of facilities manufacturing posts, small poles, and rails of various sizes primarily for use in fence and corral construction. Many of these products are treated with preservatives. Lodgepole pine is the major species used to manufacture these products. The number of facilities manufacturing posts and small poles in 1998 was 29, down from 31 in 1993. This is down from 37 in 1988, 35 in 1981, and 37 in 1976 (Table 1).

Post and pole industry representatives cited increased competition for a limited timber resource, higher raw material prices, and stricter regulations and requirements relating to preservative treatments as contributing factors to the decline.

The decline in timber harvest since the late 1980s has created strong competition among Montana's post and pole mills, with studmills processing more small diameter timber, thus putting them in direct competition with a portion of the post and pole industry. The pulp and paper industry periodically increases its use of roundwood for chips also competing for small diameter lodgepole pine.

### **Log Furniture Sector**

This sector uses, almost exclusively, small diameter (2 inch to 6 inch), lodgepole pine timber to construct furniture. The timbers are typically debarked and assembled into many different types of furniture including, but not limited to, bed frames, chairs, tables and couch frames.

The log furniture sector has seen rapid growth over the past five years. Four firms were operating in 1993, and two firms were producing as long ago as 1988. In 1998, the state had 25 firms manufacturing log furniture. In 1993, Montana's log furniture manufacturers had sales under \$300,000 compared to \$3.8 million in 1998.

# Montana's Timber Harvest and Utilization

This section examines Montana's timber harvest and the volume contributed by various forest land ownerships. The focus is on ownership and geographic sources of timber, types of timber products harvested, species composition, end uses of the harvested timber, and movement of timber products.

To examine long-term trends in timber harvest levels—statewide and by ownership category—a time series based on land management agency records and industrial production is used (Figure 5). Periodic censuses are used to examine details of the harvest such as product use, species, and geographic location. The census results have been very close to the agency records but slight differences do occur. For example, the U.S. Forest Service Region 1 summarized that Montana's 1998 harvest was 831 MMBF excluding firewood, and the census conducted by the BBER estimated the harvest at nearly 870 MMBF. A number of factors likely give rise to the small differences.

- Harvest is recorded by mills in various units of measure (i.e., board feet Scribner, green tons, cords, pieces). Various sources use different conversion factors to convert products like pulpwood or posts and poles to board foot Scribner scale. Conversion factors the agencies use to summarize harvest data may differ from those the mills or the BBER uses to calculate mill receipts.
- The volume delivered to a mill, usually scaled as it is received, generally forms the basis for the estimate of harvest volume for various ownerships. The volume recorded as processed for that batch of logs may be tallied in a different fashion (e.g., using automated scanning or estimating drain from log deck inventory). Also, different agencies or entities may require specific and differing scaling standards. The mills might purchase logs using these sale contract standards, but keep records based on their own standards. For example, the minimum log diameter required in the sale contract may be 5.5 inches; however, a mill may be able to use logs as small as 3.5 inches small end diameter and record this additional volume in its own receipts data.

- Lump sum timber sales can cause problems with reported harvest levels. Dates of harvest versus dates of consumption or log acquisition may not be exactly the same. Some lump sum timber sales are reported cut when sold by the agencies, but mills may not report them until they are harvested and received. Additionally, the timber volume for a lump sum sale is estimated and can vary from the actual volume delivered to, and reported by, the mills.

As indicated earlier, there has been a substantial decline in the volume of timber available for harvest since the late 1980s. Montana's timber harvest in the late 1990s was down approximately 30 percent from the late 1980s levels due primarily to a more than a 70 percent decline in the timber offered from Montana's national forests. The harvest decline on these lands occurred because of threatened and endangered species protection concerns, appeals and litigation of timber sales, cumulative effects of past harvesting, as well as U.S. Forest Service budget levels (Montana Business Quarterly, Spring 2000). While recent changes in harvest are perhaps the most abrupt in a relatively short period of time, total harvest—particularly harvest from various ownerships—has varied considerably over the past 50 years. Long-term trends in harvest by ownership are discussed in the next section.

## Public, Private, and Tribal Timberlands as Sources of Timber Products

Timber harvest, and the share contributed by various forest land ownerships in Montana, has been influenced largely by the volume of the timber resource, market conditions, corporate and public policy, and industry structure and size. The result of these forces has been a substantial shift over the past 50 years in the volume and percent of Montana's timber harvest supplied by public lands—in particular the national forests.

Strong markets and abundant supplies of timber on both public and private lands allowed for substantial increases in timber harvest following World War II. Public timber inventories in particular were lightly

utilized prior to 1945, but public policy from the late 1940s through the 1960s encouraged increased harvesting on the national forests to meet the nation's strong demand for building products (Flowers et al. 1993).

In the five years immediately after 1945, private lands provided 50 percent of the timber harvested in Montana while the national forests supplied about one-third. During the 1950s and 1960s, the national forests became the dominant player in Montana's timber markets. The harvest from national forests rose from 137 MMBF (23 percent of the harvest) in 1950 to 799 MMBF (61 percent of the harvest) in 1969. This fivefold increase was responsible for more than doubling Montana's total timber harvest during that period (Figure 5).

The year 1969 marked the high point of the harvest from national forests in the state. With increasing emphasis on non-timber resources and numerous pieces of legislation redirecting management emphasis, the timber harvest from the national forests started to decline; during the 1970s and 1980s it was about 60 percent of the harvest level of the late 1960s. The national forest harvest averaged 55 percent of the annual timber harvest from 1952 to 1974, while private forest lands provided about 40 percent. The remaining harvest came from other public (State of Montana and Bureau of Land Management) and tribal forestlands. As the national forest harvest declined, private harvest increased (due to the withdrawal of public timber from the market place and to changes in corporate ownership and management strategies by the industrial landowners). Since 1974, private forest lands have provided more than half the timber volume harvested in Montana.

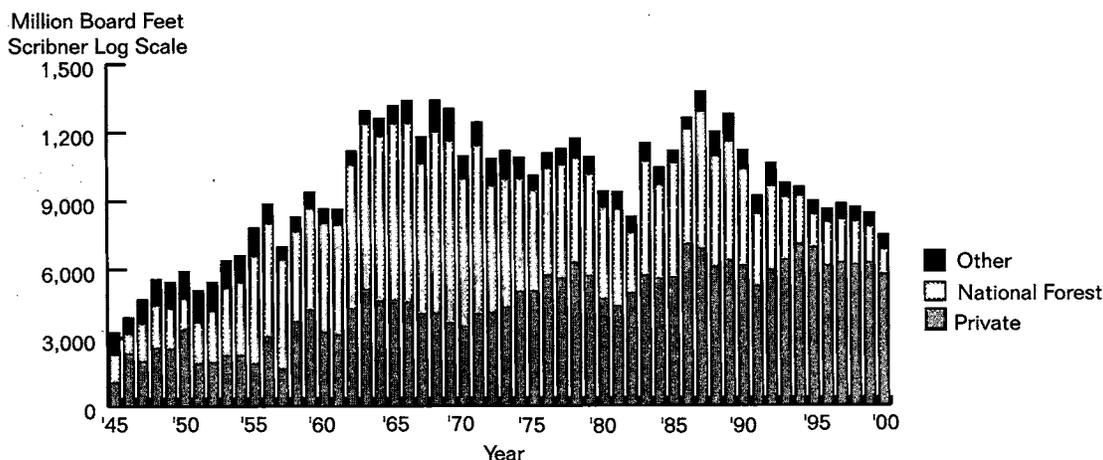
The 1990s saw continuing decline in timber harvest from Montana's ten national forests. In 1989, the harvest

from these national forests was 520 MMBF, 41 percent of Montana's timber harvest. By 1993, the harvest had dropped to about 280 MMBF, 28 percent. In 1998, the harvest from Montana national forests was 191 MMBF, and in 1999, it was 109 MMBF, the lowest harvest level since 1946.

On the other hand, harvest from Montana's private lands has remained relatively stable over the past two decades. The 1999 harvest from private forest landowners was 624 MMBF, slightly higher than the 596 MMBF average annual private harvest for the 1980s and 1990s. Because of the declines from national forests, the proportion of harvest from private lands increased from about 50 percent in the 1980s to more than 70 percent since 1994.

While the total volume harvested from private timberlands is not substantially different from the 1980s, the proportion of timber supplied by industrial forest landowners vs. non-industrial private forest landowners has changed. During the 1980s, non-industrial private forest lands supplied 10 to 15 percent of the timber harvested while industrial forest lands supplied about 40 percent. Harvest from non-industrial private lands increased dramatically in the 1990s in response to higher stumpage prices, while harvest from industrial lands decreased slightly due to limited volumes of standing timber. The non-industrial harvest in the last half of the 1980s averaged just under 160 MMBF annually. By 1994, the harvest from non-industrial forestlands was a record 392 MMBF. In 2000, the harvest from non-industrial forestlands was down to 212 MMBF, while harvest from industrial forest lands increased to 362 MMBF (Montana Department of Natural Resources and Conservation 2001).

**Figure 5**  
**Montana's Timber Harvest, 1945-2000**



## Geographic Source of the Harvest

The shift in timber harvest away from the national forests—and to a degree from industrial forestlands to non-industrial private forestlands—has led to some measurable shifts in the geographic source of timber harvested in the state. In particular, since 1988 there has been a substantial decline in timber harvest from the northwestern and southwestern counties where national forests and industrial forestlands are concentrated and a proportionate increase in the harvest from central and eastern Montana where non-industrial private forestlands predominate (Figure 6).

The harvest from northwestern Montana forestlands dropped 20 percent, from 519 MMBF in 1993 to 415 MMBF in 1998 (Table 9). Within that region, none of the counties showed an increase in timber harvested since 1993, and harvest levels were down nearly 39 percent from the late 1980s. As a result, the four northwestern Montana counties now supply slightly less than half the timber harvested in the state, vs. 52 to 62 percent in previous census years. The southwest region experienced a 55 percent harvest reduction. This decline was due to the reduced timber offering from national forests in these counties where timberlands are predominantly federally owned.

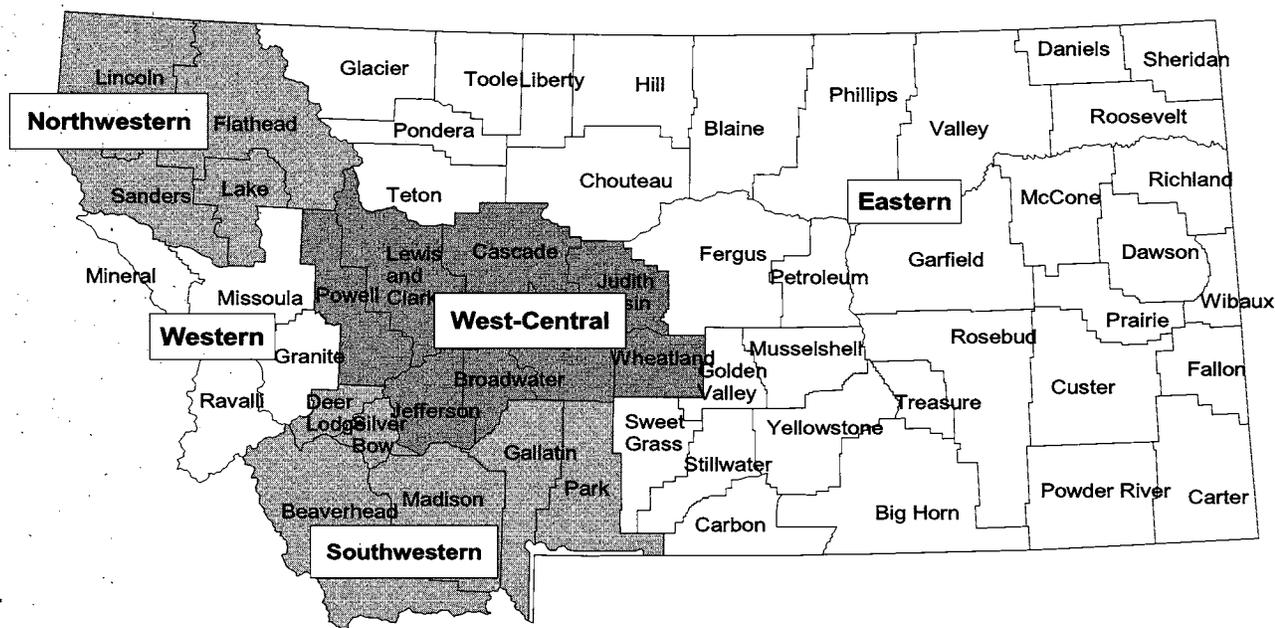
From 1988 to 1993, the harvest in the eastern and north-central counties increased by 40 percent to 102

MMBF (10 percent of the state's harvest). However, harvest levels in these Montana counties dropped to 73 MMBF in 1998, due in large part to lower stumpage prices. The west-central region was the only region to show an increased harvest between 1993 and 1998, increasing 70 percent from 80 MMBF in 1993 to 136 MMBF in 1998. This increase was due to greater harvest levels from non-industrial private lands in these counties (Montana Department of Natural Resources and Conservation 1999).

## Types of Timber Products Harvested

In this report, timber harvest is classified by product type based on end use of the material. This section divides the harvest into four categories: sawlogs, veneer logs, pulpwood, and other timber products. Sawlogs are used to produce sawn products such as lumber, structural timbers, and railroad ties. Veneer logs are used to produce veneer for plywood. Pulpwood refers to timber used—in round form—to produce wood chips for manufacturing pulp and paper products. Other timber products in this report include house logs, logs for posts and small poles, log furniture, rails and other small roundwood products, as well as cedar product logs used to manufacture shakes, shingles, and split rail cedar fencing and larch logs used for chemical extractives.

**Figure 6**  
**Montana Geographic Regions**



**Sawlogs and Veneer Logs:** Even though the volume of sawlogs and veneer logs harvested in Montana declined in 1998, their proportion of the total volume was relatively unchanged; they remain the primary timber products harvested, comprising 94 percent of the 1998 timber harvest.

In 1998, Montana timberlands produced 666 MMBF of sawlogs (77 percent of the total timber harvest) and 155 MMBF of veneer logs (18 percent of the total timber harvest) (Table 10). The volume of sawlogs was down from the 786 MMBF harvested in 1993, and the harvest of veneer logs dropped from 170 MMBF in 1993.

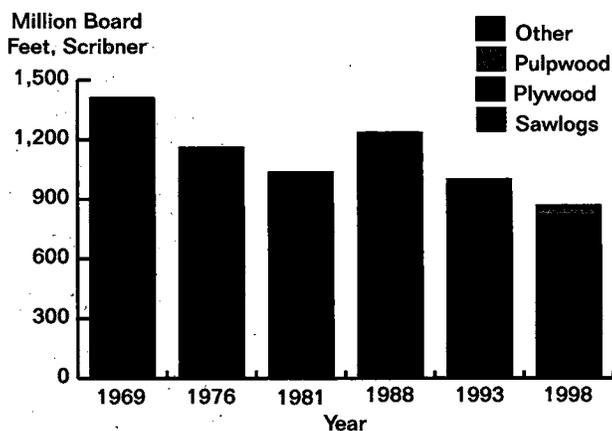
While there has been little change in the proportion of Montana's timber harvest used by the sawmill and plywood industries over the past five years, there has been a major change over the past 50 years. Plywood plants established in Montana the late 1950s shifted large volumes of timber—mostly Douglas-fir and western larch—from sawmills to plywood plants. As the plywood industry grew, the proportion of Montana's harvest processed by sawmills fell from more than 90 percent in the 1950s to less than 75 percent in the 1970s and early 1980s. During the 1980s, there was a slight decline in the plywood industry relative to the sawmill

**Table 9**  
**Timber Products Harvested by County, 1976, 1981, 1988, 1993, and 1998**

County	1976		1981		1988		1993		1998	
	MMBF Scribner	% of Total								
Flathead	232	20%	245	24%	255	21%	150	15%	148	17%
Lake	42	4%	28	3%	53	4%	53	5%	38	4%
Lincoln	293	25%	267	26%	324	26%	208	21%	153	18%
Sanders	153	13%	93	9%	93	8%	107	11%	76	9%
Northwest Montana	720	62%	632	61%	725	59%	519	52%	415	48%
Granite	25	2%	23	2%	29	2%	21	2%	31	4%
Mineral	50	4%	45	4%	40	3%	32	3%	20	2%
Missoula	146	13%	120	12%	141	11%	136	14%	129	15%
Ravalli	35	3%	41	4%	36	3%	40	4%	23	3%
Western Montana	256	22%	229	22%	246	20%	229	23%	203	23%
Beaverhead	17	1%	10	1%	16	1%	5	1%	2	0%
Deerlodge	5	0%	8	1%	6	1%	11	1%	8	1%
Gallatin	29	2%	36	4%	29	2%	30	3%	4	0%
Madison	2	0%	3	0%	18	1%	9	1%	11	1%
Park	21	2%	8	1%	16	1%	11	1%	6	1%
Silver Bow	6	1%	3	0%	3	0%	5	1%	1	0%
Southwest Montana	80	7%	68	7%	88	7%	72	7%	32	4%
Broadwater	4	0%	7	1%	2	0%	4	0%	4	0%
Cascade	1	0%	1	0%	5	0%	1	0%	10	1%
Jefferson	13	1%	8	1%	8	1%	3	0%	6	1%
Judith Basin	0	0%	1	0%	0	0%	3	0%	5	1%
Lewis & Clark	18	2%	26	3%	17	1%	13	1%	30	3%
Meagher	16	1%	17	2%	15	1%	12	1%	27	3%
Powell	36	3%	20	2%	56	5%	43	4%	50	6%
Wheatland	-	0%	0	0%	1	0%	1	0%	4	0%
West-Central Montana	87	7%	80	8%	105	8%	80	8%	136	16%
Big Horn	0	0%	3	0%	12	1%	13	1%	12	1%
Fergus	11	1%	9	1%	11	1%	24	2%	9	1%
Musselshell	3	0%	2	0%	4	0%	13	1%	6	1%
Powder River	0	0%	1	0%	15	1%	11	1%	8	1%
Rosebud	0	0%	6	1%	12	1%	8	1%	11	1%
All Other Counties	3	0%	4	0%	19	2%	34	3%	26	3%
Eastern Montana	17	1%	26	2%	73	6%	102	10%	73	8%
Unspecified	-	-	-	-	-	-	-	-	10	1%
<b>Total Montana</b>	<b>1,160</b>	<b>100%</b>	<b>1,035</b>	<b>100%</b>	<b>1,236</b>	<b>100%</b>	<b>1,001</b>	<b>100%</b>	<b>869</b>	<b>100%</b>

## Harvest

**Figure 7**  
**Timber Products Harvested, 1969, 1976, 1981, 1988, 1993, and 1998**



industry; the share of timber that sawmills processed increased to about 80 percent while the plywood industry's share decreased from more than 20 percent in the 1970s and early 1980s to about 17 percent in 1993 (Figure 7).

**Roundwood Pulpwood:** The most volatile timber product harvested has been pulpwood. In 1969 and 1976, roundwood pulpwood harvest in Montana was 13 MMBF and 10 MMBF respectively. Roundwood pulpwood harvest rose to 54 MMBF in 1981, fell to 11 MMBF in 1988, rose to 26 MMBF in 1993, and rose again to 32 MMBF in 1998.

The primary reason for the volatility of the roundwood pulpwood harvest is that roundwood pulpwood has been used to augment the supply of wood chips to the pulp and paper industry when the preferred raw material—chips from mill residue—are in short supply. Prior to 1990, with the exception of recession years of very low production of lumber and plywood, pulp mills were able to supply virtually all of their wood fiber needs from mill residue. Because pulp and paper mills

**Table 10**  
**Timber Products Harvested by Ownership Source, 1998**

Origin	Thousand Board Feet, Scribner						
	Sawlogs	Veneer Logs	Pulpwood	Posts and Poles	House Logs	Other	All Products
Private Timberlands	460,422	133,269	13,625	2,274	5,692	1,714	616,996
Industrial	239,224	112,586	2,620	-	-	-	354,430
Nonindustrial	221,198	20,683	11,005	2,274	5,692	1,714	262,566
Tribal Timberlands	20,089	3,480	-	110	34	-	23,713
Public Timberlands	185,095	18,200	18,680	802	5,841	61	228,679
National Forest	151,565	15,203	17,541	794	5,706	61	190,870
Other	33,530	2,997	1,139	8	135	-	37,809
Unspecified	-	-	-	-	20	-	20
<b>Total</b>	<b>665,607</b>	<b>154,950</b>	<b>32,304</b>	<b>3,186</b>	<b>11,587</b>	<b>1,775</b>	<b>869,409</b>
Origin	Percentage of Total						
	Sawlogs	Veneer Logs	Pulpwood	Posts and Poles	House Logs	Other	All Products
Private Timberlands	69.2%	86.0%	42.2%	71.4%	49.1%	96.6%	71.0%
Industrial	35.9%	72.7%	8.1%	0.0%	0.0%	0.0%	40.8%
Nonindustrial	33.2%	13.3%	34.1%	71.4%	49.1%	96.6%	30.2%
Tribal Timberlands	3.0%	2.2%	0.0%	3.5%	0.3%	0.0%	2.7%
Public Timberlands	27.8%	11.7%	57.8%	25.2%	50.4%	3.4%	26.3%
National Forest	22.8%	9.8%	54.3%	24.9%	49.2%	3.4%	22.0%
Other	5.0%	1.9%	3.5%	0.3%	1.2%	0.0%	4.3%
Unspecified	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

have high fixed costs, complex continuous chemical processes, and markets that are generally less volatile than lumber and plywood, they have historically operated more consistently than have sawmills. For this reason, the wood fiber need remains rather constant, except when major changes in production capacity are made. If chips from sawmills and plywood plants were in short supply, the pulp and paper industry turned to making chips from roundwood pulpwood.

Prior to 1990, sharp declines in lumber and plywood production occurred during recessionary periods such as 1981. Declines in Montana's lumber and plywood production in 1993 resulted from a lack of available timber of the kind and quality needed by sawmills and plywood plants. As in previous down years, the pulp and paper industry increased its use of roundwood pulpwood, which is timber generally not of a suitable quality for lumber or plywood production. Even though 1998 saw relatively weak paper markets and some actual curtailments at the state's only pulp and paper mill, pulpwood harvest was higher than all but one previous census year (Figure 7).

**Other Timber Products:** The harvest of all other timber products has slowly declined over the past 30 years from 26 MMBF in 1969 to less than 17 MMBF in 1998, and the composition by individual products has changed substantially. The major change among these other products has been the increase in house logs harvested, and the near disappearance of utility poles and cedar products.

In 1993, house log harvest was 16 MMBF, up from 14 MMBF in 1988, 11 MMBF in 1981, and 10 MMBF in 1976. In 1998, the census recorded a decline in house log harvest to 11.6 MMBF. It should be noted that the

total volume of house logs processed was 22.4 MMBF, with almost two-thirds of the volume coming from out-of-state and several million board feet imported from as far away as Alaska. This increase is due to growth in the number of house log and log home manufacturers in the state.

The 1998 harvest of post and small pole material was up slightly to 3.2 MMBF from 3.1 MMBF in 1993, but down from 5.2 MMBF in 1988, 7.5 MMBF in 1981, and 4.7 MMBF in 1976. The harvest of other products increased from under 200 MBF in 1993 to over 1.7 MMBF in 1998.

### Land Ownership and Type of Product Harvested

In line with the general pattern of the overall timber harvest, the source of sawlogs continues to shift from public to private lands. In 1998, private lands provided 617 MMBF (71 percent) of the sawlog harvest, up from 1976, 1981, 1988, and 1993 levels, when private lands provided about 50 percent of the sawlog volume (Table 10 and Tables A1, A2, A3 and A4 in Appendix A).

Historically, about two-thirds of the timber harvested for plywood came from industrial lands. Industrial private forest lands continued to supply an increasing percentage of veneer logs—73 percent in 1998, up from 65 percent in 1993.

Public timberlands provided 58 percent of the pulpwood harvest from Montana in 1998 (Table 10). However, this is anything but typical. Private lands were the principle providers of the pulpwood harvest in 1993 and 1981, providing 84 percent and 88 percent, respectively. In 1998, only 42 percent was provided by private timberlands.

**Table 11**  
**Timber Products Harvested by Species, 1969, 1976, 1981, 1988, 1993, and 1998**

Species	Percentage of Total					
	1969	1976	1981	1988	1993	1998
Douglas-fir	26	27	27	27	29	34
Lodgepole pine	12	21	25	28	26	25
Ponderosa pine	17	15	12	17	19	15
Western larch	20	20	16	14	12	10
Engelmann spruce	15	7	8	7	6	8
Other species	9	11	12	7	8	7
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Source: BBER, various years; Setzer, T.S., 1971, *Estimates of Timber Products Output and Plant Residues, Montana, 1969*.

### Species Composition of the Harvest

Douglas-fir and lodgepole pine remained the major species harvested from Montana timberlands in 1998, with Douglas-fir increasing from about 27 percent of the harvest over the past three decades to 34 percent (Table 11). Lodgepole pine accounted for about 25 percent of the 1998 harvest. In 1988, Douglas-fir was second behind lodgepole pine, due primarily to large volumes of lodgepole pine timber offered for sale on the national forests in response to a mountain pine beetle epidemic.

Looking longer term, there have been substantial changes in the species composition of Montana's timber harvest (Table 11). The major changes in species composition over the last three decades have been the increase in harvest of lodgepole pine and the decreases in western larch. However, the proportion of ponderosa pine harvested has remained fairly consistent, averaging about 16 percent over the last three decades.

Lodgepole pine's 25 percent share of the harvest in 1998 is more than double the 12 percent recorded in 1969. Improved technology to process smaller diameter timber and the mountain pine beetle epidemic in this species were responsible for the increased use of lodgepole pine. The harvest of western larch, on the other hand, declined from 20 percent in 1969 and 1976 to just 10 percent in 1998. Industrial timberlands and the national forests contain the bulk of the western larch inventory and have been the major sources of western larch timber; harvests from these lands have declined in recent years.

Engelmann spruce volume declined from 15 percent of the harvest in 1969 to a relatively stable 6 to 8 percent in all subsequent censuses. Two factors are generally believed to be responsible for the decrease: a reduction in the high harvest rates in the late 1950s and into the 1960s due to an insect epidemic in the species, and a shift—especially on public lands—away from harvesting timber in riparian areas where spruce is most commonly found.

### Species Composition by Type of Product

All commercial softwood tree species in Montana were used to produce lumber in 1998. Douglas-fir comprised 30 percent of the sawlog harvest followed by lodgepole pine at 29 percent, ponderosa pine at 18 percent, Engelmann spruce at 10 percent, western larch at 6 percent, and true firs at 6 percent (Table 12).

The veneer log harvest, in comparison, was composed primarily of Douglas-fir and western larch. These two species, accounted for 88 percent of the veneer log harvest in 1998. Other species used to produce plywood in 1998 included true firs, ponderosa pine, Engelmann spruce, and lodgepole pine.

The 1998 pulpwood harvest was predominantly Douglas-fir, ponderosa pine, and lodgepole pine, with each species accounting for 21 to 25 percent of the pulpwood harvest. Other pulpwood species in 1998 included western larch, true firs, and Engelmann spruce, each accounting for 10 percent of the harvest.

The output of other roundwood timber products was dominated by lodgepole pine, which comprised 69 percent of the 1998 harvest. Western larch comprised about 12 percent and Engelmann spruce 9 percent, with small volumes of Douglas-fir, true firs, ponderosa pine, white pine, and western red cedars making up the remainder (Table 12).

### Movement of Timber Products

The concentration of production in large conversion facilities has created manufacturing centers that must draw from large geographic areas to supply their timber needs. As a result, large volumes of timber cross county and state lines.

### Across State Lines

Primary wood products manufacturers in Montana received about 962 MMBF of timber for processing in 1998, while the state's timber harvest was 869 MMBF, making Montana a net importer of about 93 MMBF (Table 13). This is the highest level of imports into Montana recorded for any of the industry census years and is up from 52 MMBF in 1993. Montana's industry is typically a net importer of timber. The previous censuses indicated that Montana imported 52 MMBF, 14 MMBF, and 50 MMBF in 1993, 1981, and 1976 respectively. In 1988, Montana exported 34 MMBF, mostly to Idaho mills.

The 1998 net imports of 92.6 MMBF resulted from Montana mills receiving about 130 MMBF of timber from surrounding states and Canada and exporting 37.4 MMBF of timber harvested in Montana for processing by mills in other states. As in the past, Idaho was the most common source of Montana's timber imports, accounting for 70 percent (91 MMBF) of the total. However, more timber was imported from greater distances than in the past, another indication of the tight and competitive log market in 1998. Washington State provided 19 MMBF (15 percent) and Canada provided 16 MMBF (13 percent). Alaska, Oregon, Utah, and Wyoming collectively supplied the remaining 4 MMBF (2 percent) of timber imports.

Mills in Colorado, Idaho, Minnesota, South Dakota, Washington, and Wyoming received the 37.4 MMBF of timber exported from Montana in 1998. Idaho and Wyoming mills accounted for most of the timber exports at about 42 and 36 percent, respectively. South Dakota mills accounted for about 13 percent, and Washington, Minnesota, and Colorado mills accounted for 8 percent.

**Table 12**  
**Timber Products Harvested by Species and Product, 1998**

Species	Thousand Board Feet, Scribner						All Products
	Sawlogs	Veneer Logs	Pulpwood	Posts and Poles	House Logs	Other Products	
Douglas-fir	196,709	93,257	7,959	80	653	4	298,662
Lodgepole pine	195,703	327	7,330	3,089	8,158	201	214,808
Ponderosa pine	119,564	5,926	6,834	9	123	4	132,460
Western larch	39,667	42,504	3,403	6	831	1,069	87,480
Engelmann spruce	66,189	2,184	3,389	-	1,438	1	73,201
True firs	42,029	10,752	3,389	-	314	-	56,484
Western redcedar	2,543	-	-	2	11	496	3,052
Western white pine	1,701	-	-	-	59	-	1,760
Western hemlock	1,446	-	-	-	-	-	1,446
Other species	56	-	-	-	-	-	56
<b>Total</b>	<b>665,607</b>	<b>154,950</b>	<b>32,304</b>	<b>3,186</b>	<b>11,587</b>	<b>1,775</b>	<b>869,409</b>
Percentage of Total							
Douglas-fir	29.6%	60.2%	24.6%	2.5%	5.6%	0.2%	34.4%
Lodgepole pine	29.4%	0.2%	22.7%	97.0%	70.4%	11.3%	24.7%
Ponderosa pine	18.0%	3.8%	21.2%	0.3%	1.1%	0.2%	15.2%
Western larch	6.0%	27.4%	10.5%	0.2%	7.2%	60.2%	10.1%
Engelmann spruce	9.9%	1.4%	10.5%	0.0%	12.4%	0.1%	8.4%
True firs	6.3%	6.9%	10.5%	0.0%	2.7%	0.0%	6.5%
Western redcedar	0.4%	0.0%	0.0%	0.1%	0.1%	27.9%	0.4%
Western white pine	0.3%	0.0%	0.0%	0.0%	0.5%	0.0%	0.2%
Western hemlock	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Other species	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

**Table 13**  
**Imports and Exports of Timber Products, 1998**

—Thousand Board Feet, Scribner—

Timber Products	Imports	Exports	Net Imports (Net Exports)
Sawlogs	62,525	33,169	29,356
Veneer Logs	52,335	1,000	51,335
Other	15,142	3,239	11,903
Total	130,002	37,408	92,594

Sawlogs were the major component of the timber harvest flowing into and out of the state. Montana sawmills imported 62.5 MMBF in 1998, while sawmills in other states received 33 MMBF of Montana's sawlog harvest (Table 13). Montana's plywood plants received 52 MMBF of veneer logs from other states, while plywood plants in other states received 1 MMBF of Montana's veneer log harvest in 1998. Fourteen MMBF of house logs were imported into the state while less than 3 MMBF were exported.

### Across County Lines

In 1998, processors in eight counties in western and northwestern Montana received more than 80 percent of the timber delivered to Montana mills (Table 14). Of the 780 MMBF received in those counties, about 80 percent was harvested from within that same eight-county region, and about 45 percent was harvested in the same county in which it was processed. Since 1981, the trend has been to haul more and more timber from farther away to supply the needs of these mills. In 1981, 95 percent of the timber processed in the eight northwestern and western counties was harvested there with 90 and 85 percent processed locally in 1988 and 1993, respectively. The past percentage of timber harvested and processed in the same county was 71 percent, 63 percent, and 48 percent in 1981, 1988, and 1993, respectively. At the same time, there was a 68 percent increase in imports of timber from other states to northwestern and western Montana mills from 1988 to 1993 and another 29 percent increase in 1998 (101 MMBF in 1998, 78 MMBF in 1993, and 46 MMBF in 1988).

The two major timber-processing counties—Flathead and Missoula—received less than 32 percent and 23 percent, respectively, of their timber from within that same county. Lincoln County, which ranks third in

volume processed, obtained 46 percent of its timber from Lincoln County timberlands, down from 80 percent in 1993. Mills operating in the remaining Montana counties received 189 MMBF of timber for processing in 1998 (Table 14). Overall, mills in these 22 counties received about 34 percent of their timber from timberlands within the same county where the mill was located.

### End Uses of Montana Timber

This section traces the flow of Montana's timber harvest through the various manufacturing sectors. Since both mill residue from manufacturing facilities and timber products are presented, volumes are expressed in cubic feet rather than in board feet Scribner. The conversion factors used to convert Scribner volume to cubic foot volume are listed below.

#### Conversion Factors Used to Convert Scribner Dec. C Log Rule to Cubic Feet

Product	Board Feet/Cubic Foot
Sawlogs	3.8
Veneer logs	5.3
Pulpwood	3.3
Utility poles, house logs, cedar products	5.0
Posts and poles	1.0

The following volumes refer to Montana's timber harvest and include timber products shipped to out-of-state mills. These volume figures do not include timber that was harvested in other states and processed in Montana. Figures for the pulp and board sector were combined to avoid disclosing information on individual firms.

In 1998, Montana's timber harvest was approximately 220 million cubic feet (MMCF), exclusive of bark (Figure 8). Of this volume, 175 MMCF (80 percent) went to

**Table 14**  
**Movement of Timber Products by Counties of Origin and Receipt, 1998 (Thousand Board Feet, Scribner)**

County of Origin	County of Destination									Total
	LI	FH	LA, MI, SA	MS	GR, RA	BV <sup>1</sup> , ME, GA, PA	JB <sup>3</sup> , LC, MA, MU, PO, WL <sup>4</sup>	Other Counties	(Exports) Other States	
Lincoln (LI)	62,628	60,721	12,819	13,760	1,098	325	16	-	1,326	152,693
Flathead (FH)	41,396	92,938	832	805	150	75	11,515	70	193	147,974
Sanders (SA)	5,479	24,104	38,824	3,500	250	30	-	-	3,700	75,887
Lake (LA)	1,129	24,689	6,072	6,383	90	24	-	-	-	38,387
Northwest Montana	110,632	202,452	58,547	24,448	1,588	454	11,531	70	5,219	414,941
Granite (GR)	-	1,002	1,269	11,770	2,317	-	12,809	-	2,100	31,267
Mineral (MI)	-	2,434	12,654	906	-	-	-	-	4,000	19,994
Missoula (MS)	479	47,274	37,758	35,891	2,966	-	267	-	4,000	128,635
Ravalli (RA)	-	1,548	1,886	3,150	16,334	-	-	-	30	22,948
Western Montana	479	52,258	53,567	51,717	21,617	-	13,076	-	10,130	202,844
Lewis & Clark (LC)	-	701	147	12,355	1,880	12,250	2,274	32	500	30,139
Meagher (ME)	-	-	-	8,551	-	16,632	244	1,433	-	26,860
Powell (PO)	-	9,997	1,777	7,956	6,470	1,750	21,741	-	250	49,941
Other West-Central Counties	-	-	-	6,372	2,530	16,307	1,115	625	2,198	29,147
West-Central Montana	-	10,698	1,924	35,234	10,880	46,939	25,374	2,090	2,948	136,087
Beaverhead (BV)	-	-	-	2	1,650	228	462	2	20	2,364
Deerlodge	-	-	-	-	2,631	5,000	217	-	-	7,848
Gallatin (GA)	-	-	-	-	25	4,191	146	40	-	4,402
Park (PA)	-	2	-	30	168	5,461	13	40	-	5,714
Madison (MA)	-	-	-	-	140	8,611	313	-	2,350	11,414
Silver Bow	-	-	-	-	-	750	88	-	-	838
Southwest Montana	-	2	-	32	4,614	24,241	1,239	82	2,370	32,580
Big Horn	-	-	-	-	-	2,000	-	4,352	5,630	11,982
Fergus (FE)	-	525	-	1,761	-	3,040	3,865	-	-	9,191
Musselshell (MU)	-	525	-	619	-	1,672	3,599	41	-	6,456
Powder River	-	-	-	-	-	4,000	-	-	4,262	8,262
Rosebud	-	-	-	-	-	-	325	9,780	983	11,088
Sweetgrass	-	-	-	-	-	4,736	-	221	-	4,957
Other Central & Eastern Counties	-	863	-	420	24	9,500	875	3,383	5,866	20,931
Central & Eastern Montana	-	1,913	-	2,800	24	24,948	8,664	17,777	16,741	72,867
Unknown Montana Counties	-	9,000	-	1,011	80	-	-	-	-	10,091
Other States	13,028	16,610	8,671	42,605	20,233	10,187	2,153	2	-	113,489
Canada	12,000	119	-	670	3,655	25	-	45	-	16,514
Total	136,139	293,052	122,709	158,517	62,691	106,794	62,037	20,066	37,408	999,413

Note: 1 - Broadwater, 2 - Jefferson, 3 - Judith Basin, 4 - Wheatland.

## Harvest

sawmills, 29 MMCF (13 percent) to the plywood plants, 7 MMCF (3 percent) to pulp and board mills, and 9 MMCF (4 percent) to other primary manufacturers.

Of the 175 MMCF of timber delivered to sawmills, only 71 MMCF (40 percent) of this volume actually became lumber or other sawn products. The remaining 104 MMCF of wood fiber became mill residue. About 99 MMCF of sawmill residue were sold to pulp and paper, particleboard and medium-density fiberboard manufacturers in Montana and other states; 2 MMCF were used as hog fuel; 2 MMCF were used for miscellaneous purposes such as firewood, wood fuel pellets, and livestock bedding; and, less than 2 MMCF remained unused.

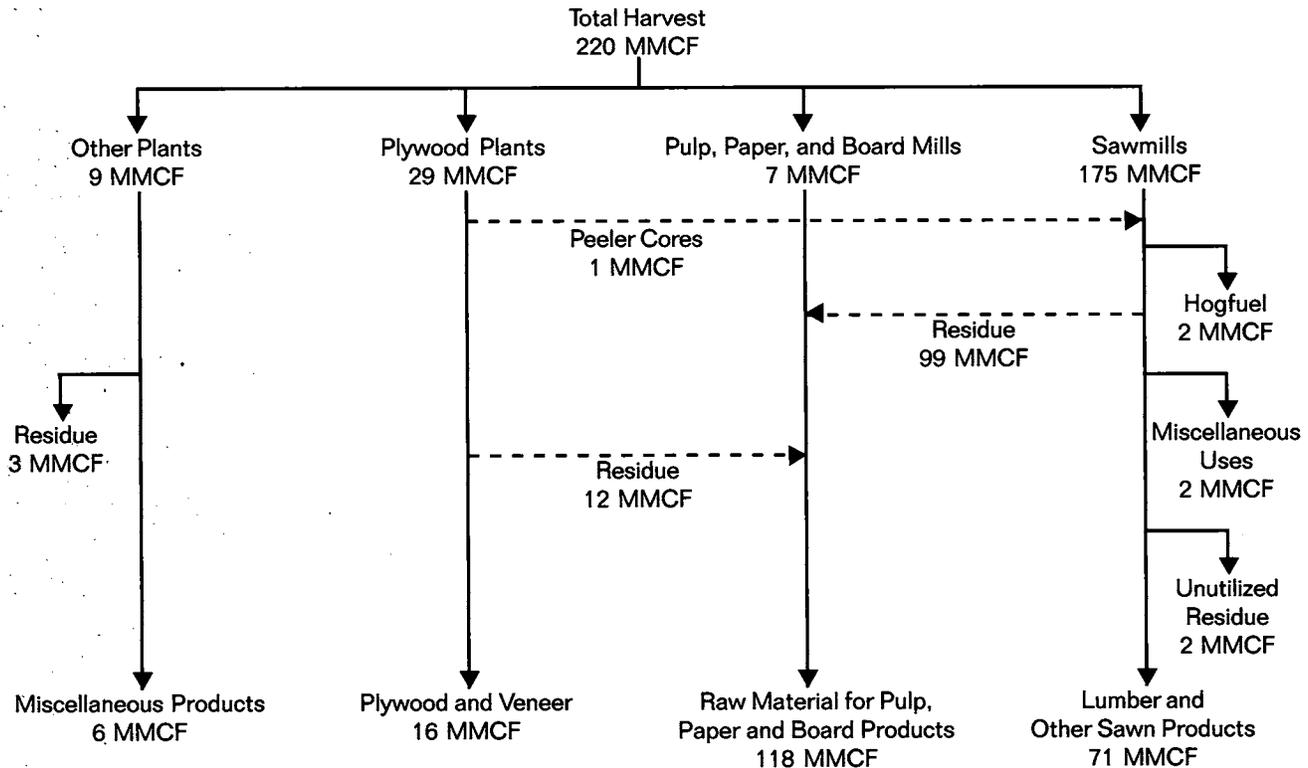
Of the 29 MMCF of Montana's timber harvest received by plywood plants, 54 percent became plywood and 46 percent (13 MMCF) became residue. Of the 13 MMCF that became residue, almost all were peeler cores that were chipped for pulp and paper or further processed by sawmills into lumber or landscaping timbers.

Almost 7 MMCF of Montana's timber harvest was in

the form of pulpwood that was chipped and used by the pulp and paper industry. Again, an additional 111 MMCF of Montana's timber harvest was sent to the pulp and paper and reconstituted board sectors in the form of mill residue from Montana's sawmills and plywood plants. Mill residue from sawmills supplied about 84 percent of the 118 MMCF received by the pulp and paper and reconstituted board mills, and plywood plants provided about 10 percent, with timber in round form providing the remaining 6 percent.

Other primary manufacturers received about 9 MMCF of Montana's timber harvest in 1998. The percentage of timber that ends up as a finished product used to manufacture these other products (i.e. log homes, post and poles, and cedar products) varies substantially. On average, roughly 60 percent of the timber volume ends up as a finished product, and the remainder is residue. However, mills in these sectors seldom supply residue for use in other sectors. Most of the residue from these sectors is used as firewood, livestock bedding, or remains unused.

**Figure 8**  
**Utilization of Montana's Timber Harvest, 1998**



## Private and Public Timberlands as Sources of Raw Material for the Various Sectors of Montana's Forest Products Industry

This section presents a detailed analysis of land ownerships supplying timber to Montana's forest products manufacturers. Section 2 dealt primarily with the harvest of timber from Montana timberlands and the movement and use of that timber. This section focuses on the timber that Montana's forest products manufacturers received for processing. The characteristics of the timber received by Montana mills differs somewhat from the timber harvested in the state because, as indicated in table 13, Montana was a net importer of 92 MMBF of timber in 1998. Figures in this section refer to all timber received by Montana mills for processing, including timber harvested in other states. These figures do not

include timber harvested from Montana timberlands and processed by mills in other states. Historic figures are also provided, and comparisons are shown for 1976, 1981, 1988, 1993, and 1998. Appendix A (Tables A5-A8) provides additional detail for previous census years.

The objectives of this section are to:

- 1) describe the dependency on timber from various land ownerships, by industry sector,
- 2) detail the ownership sources of timber received by mills in geographic regions of the state, and
- 3) examine ownership sources of sawtimber received by mills of different sizes.

**Table 15**  
**Source of Timber Products Received by Mills, 1976, 1981, 1988, 1993, and 1998**

Ownership	Thousand Board Feet, Scribner				
	1976	1981	1988	1993	1998
Private Timberlands	623,207	562,209	620,318	674,322	667,147
Industrial	417,260	352,004	409,405	325,125	410,261
Nonindustrial	205,947	210,205	210,913	349,197	256,886
Tribal Timberlands	37,746	22,854	47,178	36,214	23,604
Public Timberlands	549,686	464,447	534,984	343,113	260,020
National Forest	528,057	425,650	479,877	318,160	214,988
Other	21,629	38,797	55,107	24,953	11,231
<b>Total</b>	<b>1,210,639</b>	<b>1,049,510</b>	<b>1,202,480</b>	<b>1,053,649</b>	<b>962,002</b>
Ownership	Percentage of Total				
	1976	1981	1988	1993	1998
Private Timberlands	51.5%	53.6%	51.6%	64.0%	69.3%
Industrial	34.5%	33.5%	34.0%	30.9%	42.6%
Nonindustrial	17.0%	20.0%	17.5%	33.1%	26.7%
Tribal Timberlands	3.1%	2.2%	3.9%	3.4%	2.5%
Public Timberlands	45.4%	44.3%	44.5%	32.6%	27.0%
National Forest	43.6%	40.6%	39.9%	30.2%	22.3%
Other	1.8%	3.7%	4.6%	2.4%	1.2%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

## Sources

Montana's timber processing mills received about 962 MMBF Scribner Decimal C log scale of timber for processing in 1998, down almost 9 percent from 1993 (Table 15). Private timberlands contributed 69 percent (667 MMBF) of the timber, the highest recorded volume since the start of these censuses and probably the highest recorded since at least World War II. In 1998, the majority (61 percent) of the private timberland harvest came from industrial timberlands. This was also the case in 1976, 1981, and 1988 when 67, 63, and 66 percent came from industrial timberlands, respectively. Through the 1990s, mills aggressively pursued the non-industrial timberland owners in an attempt to offset the reduced timber harvest from national forest lands. The impact was especially obvious in 1993, with high wood products prices and a non-industrial private forest timber resource that historically was harvested at only a fraction of growth. In 1998, substantially lower prices

and perhaps limited non-industrial private forest inventories in parts of the state have caused a relative decline in non-industrial private timber use.

The contribution from Montana's public timberlands was down substantially because of the continued decline in the national forest timber sales during the 1990s. In the 1976, 1981, and 1988 census years, the national forests' share ranged from 40 to 44 percent of the timber received by the state's mills (Table 15). In 1993, 30 percent of the timber received by these mills was from national forests. By 1998, only 22 percent (215 MMBF) came from national forests. Other public ownerships, Bureau of Land Management, and state lands contributed almost 5 percent (45 MMBF) of Montana's timber receipts in 1998, up somewhat from earlier censuses. Tribal timberlands contributed less than 3 percent (24 MMBF), little change from the 2 to 4 percent in earlier censuses.

**Table 16**  
**Ownership Source of Timber Products Delivered to Various Sectors**  
**of Montana's Industry, 1998**

Origin	Thousand Board Feet, Scribner				
	Sawmills	Plywood Plants	Log Home Manufacturers	Other Primary Facilities	All Facilities
Private Timberlands	463,488	179,941	5,904	17,814	667,147
Industrial	251,001	156,640	-	2,620	410,261
Nonindustrial	212,487	23,301	5,904	15,194	256,886
Tribal Timberlands	19,980	3,480	34	110	23,604
Public Timberlands	205,493	22,863	12,121	19,543	260,020
National Forest	167,780	17,066	11,746	18,396	214,988
Other	37,713	5,797	375	1,147	45,032
Unknown	6,000	-	5,231	-	11,231
<b>Total</b>	<b>694,961</b>	<b>206,284</b>	<b>23,290</b>	<b>37,467</b>	<b>962,002</b>
Origin	Percentage of Total				
	Sawmills	Plywood Plants	Log Home Manufacturers	Other Primary Facilities	All Facilities
Private Timberlands	66.7%	87.2%	25.3%	47.5%	69.3%
Industrial	36.1%	75.9%	0.0%	7.0%	42.6%
Nonindustrial	30.6%	11.3%	25.3%	40.6%	26.7%
Tribal Timberlands	2.9%	1.7%	0.1%	0.3%	2.5%
Public Timberlands	29.6%	11.1%	52.0%	52.2%	27.0%
National Forest	24.1%	8.3%	50.4%	49.1%	22.3%
Other	5.4%	2.8%	1.6%	3.1%	4.7%
Unknown	0.9%	0.0%	22.5%	0.0%	1.2%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Two-thirds of timber delivered to Montana sawmills originated on private timberland (36 percent industrial and 31 percent non-industrial), and nearly a quarter came from national forests (Table 16). The majority (76 percent) of timber harvested for plywood production originated on industry land, with 11 percent from non-industrial private land and 11 percent from all public sources combined. Half of the timber delivered to the house log industry came from U.S. Forest Service land, while 25 percent came from non-industrial private land, and 23 percent from Canada and unspecified sources.

### Ownership Sources of Timber by County

Of the 33 Montana counties with mills receiving timber in 1998, 30 received the majority of their timber from private lands, and three received the majority of

their timber from public lands (Table 17). Due to the small number of mills operating in some counties, timber receipts could not be reported for every county. Counties were, therefore, grouped geographically and by similar timber ownership receipt patterns for discussion purposes.

In 1993, the counties receiving the majority of their timber from public lands were concentrated in western and southwestern Montana. These counties include Lincoln, which ranked third in percent of timber processed, along with Beaverhead, Madison, Mineral, Sanders and Ravalli counties. In 1998, only the mills in the counties of the southwest region (i.e., Beaverhead, Madison, and Ravalli) continued to receive the majority of their receipts (65 percent) from public lands (Table 18). In all other regions private lands provided the majority of the timber.

**Table 17**  
**Ownership Source of Timber Products Delivered to Various Counties, 1998**

County or County Group	Ownership Group					Total Timber Received
	Private	National Forest	Other Public	Tribal	Canadian or Unspecified	
	Receipts (MBF)					
Lincoln	87,036	41,211	1,392	500	6,000	136,139
Mineral, Sanders	37,307	29,527	1,549	5,873	-	74,255
Flathead	240,483	37,893	8,823	5,714	139	293,052
Granite, Lake, Missoula	165,334	40,656	17,613	2,244	715	226,562
Beaverhead, Madison, Ravalli	10,484	28,716	510	24	4,287	44,021
Broadwater, Gallatin, Jefferson, Lewis & Clark, Meagher, Park, Powell	109,148	35,684	14,550	-	45	159,427
All Other Counties	17,356	1,301	595	9,250	45	28,546
All Montana Counties	667,147	214,988	45,032	23,604	11,231	962,002

## Sources

### Source of Sawtimber by Mill Size

To examine the relationship between mill size and sawtimber source, mills were grouped into size classes based on reported annual capacity to process sawtimber. Sawtimber processing mills include sawmills, plywood plants, and house log manufacturers. The derivation of estimated capacity is discussed in more detail in Section 4.

The size classes are:

Size Class	Annual Capacity to Process Sawtimber (MMBF, Scribner)
A	Over 40 MMBF
B	Over 25 to 40 MMBF
C	Over 10 to 25 MMBF
D	Over 1 to 10 MMBF
E	1 MMBF and below

In 1998, Montana's sawtimber processing mills received just under 925 MMBF of timber for processing. Large mills were most dependent on private forest lands. Size class A (> 40 MMBF) received 617 MMBF Scribner Decimal C of sawtimber, 67 percent of the sawtimber received by Montana mills in 1998 (Table 19). Private forest lands, the major source of timber for these mills, provided almost three-quarters of that timber—55 percent from industrial private timberlands and 19 percent from non-industrial private timberlands. National forests provided 20 percent, while tribal, other public lands, and Canadian or unspecified ownerships contributed the remaining 6 percent.

Size class B (25 to 40 MMBF) received 196 MMBF, 21 percent of Montana's sawtimber receipts. These mills also depended more on timber from private timberlands (69 percent) than from public lands. National forests furnished 26 percent of their timber needs, tribal lands provided less than 1 percent, and other public lands provided 5 percent.

**Table 18**  
**Ownership Source of Timber Products Delivered to Various Counties, 1998**

County or County Group	Ownership Group					Total	Total Timber Received (MMBF)
	Private	National Forest	Other Public	Tribal	Canadian or Unspecified		
	Percent of Receipts						
Lincoln	63.9%	30.3%	1.0%	0.4%	4.4%	100%	136,139
Mineral, Sanders	50.2%	39.8%	2.1%	7.9%	-	100%	74,255
Flathead	82.1%	12.9%	3.0%	1.9%	0.0%	100%	293,052
Granite, Lake, Missoula	73.0%	17.9%	7.8%	1.0%	0.3%	100%	226,562
Beaverhead, Madison, Ravalli	23.8%	65.2%	1.2%	0.1%	9.7%	100%	44,021
Broadwater, Gallatin, Jefferson, Lewis & Clark, Meagher, Park, Powell	68.5%	22.4%	9.1%	-	0.0%	100%	159,427
All Other Counties	60.8%	4.6%	2.1%	32.4%	0.2%	100%	28,546
All Montana Counties	69.3%	22.3%	4.7%	2.5%	1.2%	100%	962,002

Size class C (10 to 25 MMBF) received 61 MMBF (7 percent) of Montana's sawtimber receipts in 1998. Sawtimber supply for these mills was divided nearly evenly among non-industrial private (25 percent), tribal (21 percent), and national forest and industrial private (each with 19 percent). The remaining 15 percent of sawtimber came from other public lands.

Mills in the two smallest size classes were most dependent on non-industrial private forests for timber. Mills with capacity to process 1 to 10 MMBF actually

received 63 percent of their timber from non-industrial private forests and 24 percent from national forests. Size class E mills received 48 percent from non-industrial private forests and 31 percent from national forests (Table 19). Canada or unspecified sources supplied less than 3 MMBF to each of the two smallest mill size classes' timber supply, while tribal and other public sources combined provided only 6 percent of the timber for each size class.

**Table 19**  
**Source of Sawtimber Received by Mills, by Size of Mill, 1998**

Capacity to Process Sawtimber	Thousand Board Feet, Scribner						All Sources
	Private Timberlands		Public Timberlands				
	Industrial	Nonindustrial	Tribal Timberlands	National Forest	Other Public Lands	Canada or Unspecified	
A - over 40 MMBF	339,564	118,780	8,271	120,801	23,353	6,000	616,769
B - 25 to 40 MMBF	56,377	77,947	1,376	50,503	9,444	-	195,647
C - 10 to 25 MMBF	11,700	15,500	13,024	11,662	9,149	-	61,035
D - 1 to 10 MMBF	-	20,897	814	8,012	998	2,350	33,071
E - under 1 MMBF	-	8,568	9	5,614	941	2,881	18,013
All Mills	407,641	241,692	23,494	196,592	43,885	11,231	924,535

# Plant Utilization by Primary Wood Products Manufacturers in Montana

This section includes estimates of timber processing capacity and utilization for Montana's primary forest products manufacturers. This analysis focuses on plants processing sawtimber; in recent years this has included sawmills, plywood plants, and log home/house log plants. Prior to 1995, utility pole plants operated in Montana and were also included. Capacity utilization of the non-sawtimber sectors is discussed in less detail. Capacity figures have been updated through 2000 based on publicly reported changes in operation and annual surveys conducted by the Bureau of Business and Economic Research.

## A Definition of Production Capacity

The respondent mills were asked for their production capacity, both the estimated eight-hour shift and annual capacity, given sufficient supplies of raw materials and firm market demand for their products. Most of the larger sawmills—those with lumber production over 10 MMBF—estimated annual capacity equal to two eight or nine-hour shifts daily for a 220-260-operating-day year. Some of the larger sawmills expressed capacity in ten-hour shifts up to 120 hours per week. The smaller sawmills, as well as the log home plants, reported annual capacity at only one shift per day, for not more than a 240-operating-day year. The state's four plywood plants reported capacity of three shifts per day for a 230-270-operating-day year. All other manufacturers reported annual capacity based on one eight-hour shift for not more than a 240-operating-day year.

## Capacity in Units of Raw Material for the Sawtimber Processing Sector

Sawmill capacity was reported in thousand board feet, lumber tally. Plywood capacity was reported in thousands of square feet on a 3/8-inch basis and log home capacity was reported in lineal feet of house logs. To combine the capacity figures for the state's sawtimber users and to estimate the industry's total capacity to process sawtimber, capacity is expressed in units of raw material input (million board feet of timber Scribner Decimal C) and called processing capacity. Sawmill capacity figures were adjusted by dividing production capacity in lumber tally by each mill's lumber recovery per board foot Scribner of timber processed. Plywood

capacity figures were adjusted to million board feet Scribner by dividing production capacity in square feet of 3/8-inch plywood by each mill's plywood recovery figure. Log home capacities were adjusted to thousand board feet Scribner by multiplying capacity in lineal feet by an average Scribner board foot volume per piece or per lineal foot. See Section 1 for a more detailed discussion of the lumber overrun and plywood recovery factors used.

## The Industry's Capacity to Process Sawtimber, 1976-2000

This section deals with changes in capacity and the utilization of capacity from 1976 through 2000. Detailed capacity information is not available prior to 1976. Estimates for 1976, 1981, 1988, 1993, and 1998 are based on complete censuses of the industry conducted by the Bureau of Business and Economic Research (Tables 20 and 21). For the intervening years, mill capacities and utilization were estimated using several sources: the Bureau's annual surveys of major producers, information from industry directories, and various trade associations and publications.

The state's sawtimber processing capacity was stable in the last half of the 1970s, with timber processing capacity averaging about 1,580 MMBF Scribner. The severe national recession, starting in late 1979, was responsible for several mill closures in the state, and timber processing capacity declined slightly to 1,480 MMBF in 1982. Timber processing capacity then increased as wood product markets improved, peaking in 1987 at 1,595 MMBF Scribner and finishing the decade at 1,590 MMBF. In the 1990s, Montana's timber processing capacity declined substantially. The capacity to process sawtimber in 1998 was 1,091 MMBF, down by 31 percent from 1989. Capacity declined further to 1,035 MMBF in the year 2000 (Table 20 and Figure 9).

The declines in the early 1980s were due primarily to very poor markets. The increases in the last half of that decade were due to improved markets, as well as the adaptation of new equipment and technology, which led to larger mills and expanded capacity. The declines in the 1990s came during a period of high product prices and were driven primarily by reduced timber availability. Several years in particular (1993, 1994, 1996, 1997, and 1999) saw very high prices for lumber, but capacity

declined each year through the 1990s. As indicated earlier, harvest declined through the 1990s, and the 1999 harvest was down more than 30 percent compared to the late 1980s, with offerings from federal lands in Montana down by more than 70 percent.

Capacity utilization since 1976 has ranged from a high of 88 percent in 1999 to a low of 53 percent in 1982 when there was a severe recession (Table 20). While the total capacity in the state has declined, the percentage of capacity utilized has increased in recent years. In 1998, Montana's sawtimber processing sector utilized 87 percent of capacity, higher than the 1976-1992 average of 75 percent and up from the average of 82 percent for the five years prior to 1998.

### **Sawtimber Processing Capacity by County or County Group**

Production capacity and utilization of capacity has varied greatly from county to county since 1976. The following discussion focuses on timber processing capacity and trends in Montana's major timber processing counties and county groups. Several counties have been combined to avoid disclosing individual firm information.

Flathead County mills had the largest capacity to process sawtimber, 265 MMBF Scribner, about 25 percent of the state's sawtimber processing capacity in 2000 (Table 20). The Missoula, Granite, and Ravalli county group had the capacity to process 215 MMBF in 2000, 20 percent of the state's capacity. Other major processing centers are in Lincoln County where mills had 140 MMBF of capacity and Lake, Mineral, and Sanders county mills with a combined capacity to process 160 MMBF.

All regions of the state have shown declines in capacity, some more dramatic than others. Timber processing capacity in Flathead County remained remarkably stable from 1976 into the early 1990s; however, mill closures led to a decline of about 30 percent during the 1990s. Flathead County remains the major processing center in the state, using approximately 235 MMBF of timber in 2000. In recent years, Flathead County mills have operated very close to stated capacity—in excess of 90 percent.

The largest declines in capacity in the last 25 years have been in the Missoula, Granite, and Ravalli county region where capacity has decreased by almost 200 MMBF (48 percent of 1987 levels). In recent years, the mills in that region processed 210 MMBF and used 83 percent of capacity. Since 1976, the south central and southwestern counties have shown 27 and 20 percent declines in capacity, respectively, but these counties have had almost no decline in volume timber processed. The counties of north central and eastern Montana, represented as "all other counties" in Table 20, have lost

80 percent of their processing capacity since 1976. Timber processed in these counties has also declined, with much of the harvest in this region flowing to mills in other parts of Montana and Wyoming.

### **Capacity by Sector**

Complete data on capacity by sector are available only for the years in which a census was done. Sawmills have the largest proportion of sawtimber processing capacity—about 844 MMBF Scribner or 77 percent of the total in 1998 (Table 21). However, this capacity is down 30 percent from 1976 and down 12 percent from 1993. Sawmills used about 86 percent of their capacity, processing 725 MMBF in 1998, up from 61 to 81 percent in earlier surveys.

The state's plywood manufacturers had the capacity to process 212 MMBF Scribner in 1998, also down from earlier surveys (Table 21). Montana plywood plants used 94 percent of this capacity, processing 199 MMBF. This is down from 97 percent in 1993 and 99 percent in 1981, but up from 83 percent in 1988. Striking workers at two of the state's plywood plants resulted in low capacity utilization in 1988.

The annual timber processing capacity of the house log sector has increased steadily since 1976. However, the closure of the state's only utility pole plant caused a sharp decline in capacity among these other users of sawtimber, from 66 MMBF in 1993 to 35 MMBF in 1998. The capacity utilization at these facilities historically has been low, with average utilization at only 34 percent from 1981 to 1993. However, in 1998, utilization was 63 percent of capacity, the highest since records have been kept. This upward adjustment of utilized capacity reflects both the decreased total capacity from the utility pole plant closure and improved efficiencies at log home manufacturers in Montana.

### **Sawtimber Processing Capacity by Size of Mill**

Mills in the sawtimber processing sectors were classified by size based on reported annual capacity to process sawtimber (Table 22). Generally, capacity utilization increased as mill size increased. Montana's 14 largest mills (size class A)—each with the capacity to process more than 40 MMBF Scribner of timber annually—accounted for about 68 percent (744 MMBF) of the state's 1,091 MMBF of sawtimber processing capacity in 1998. These mills used 90 percent of this capacity, processing 673 MMBF Scribner (Table 22). The six size class B mills and three class C mills also reported using most of their available capacity, 86 and 95 percent, respectively. Among the size class D mills, however, capacity utilization dropped sharply to about 55 percent, and the 103 smallest mills reported using only 47 percent of their capacity.

# Utilization

**Table 20**  
**Sawtimber Processing Capacity and Capacity Utilized, 1976-2000**

County or County Group	Capacity to Process Sawtimber, Million Board Feet Scribner*												
	'76	'77	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	'88
Lincoln	242	230	220	220	210	200	205	230	230	245	245	295	317
Flathead	310	320	330	340	350	360	365	395	365	355	355	355	378
Lake/Mineral/Sanders	189	200	210	220	230	235	240	240	255	230	230	240	239
Missoula/Granite/Ravalli	420	415	415	415	355	362	370	350	375	385	385	405	331
Powell/Lewis & Clark/ Cascade/Judith Basin/ Jefferson/Broadwater/ Meagher/Wheatland	150	150	150	150	150	156	135	135	135	115	115	115	115
Deer Lodge/Silver Bow/ Beaverhead/Madison/ Gallatin/Park	130	135	135	135	130	120	135	135	135	125	125	125	123
All Other Counties	148	140	115	90	95	50	30	40	40	50	60	60	58
<b>Total</b>	<b>1589</b>	<b>1590</b>	<b>1575</b>	<b>1570</b>	<b>1520</b>	<b>1483</b>	<b>1480</b>	<b>1525</b>	<b>1535</b>	<b>1505</b>	<b>1515</b>	<b>1595</b>	<b>1561</b>

County or County Group	Percentage of Capacity Utilized*												
	'76	'77	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	'88
Lincoln	83%	87%	91%	91%	71%	85%	66%	91%	93%	88%	96%	90%	77%
Flathead	81%	75%	73%	71%	66%	61%	51%	66%	70%	73%	79%	82%	85%
Lake/Mineral/Sanders	90%	80%	74%	70%	65%	57%	40%	67%	63%	61%	59%	63%	71%
Missoula/Granite/Ravalli	95%	97%	98%	97%	95%	83%	70%	88%	81%	86%	93%	90%	81%
Powell/Lewis & Clark/ Cascade/Judith Basin/ Jefferson/Broadwater/ Meagher/Wheatland	55%	60%	67%	69%	51%	49%	48%	63%	57%	67%	74%	65%	61%
Deer Lodge/Silver Bow/ Beaverhead/Madison/ Gallatin/Park	56%	51%	48%	45%	30%	58%	30%	63%	84%	84%	88%	88%	91%
All Other Counties	9%	46%	55%	62%	10%	10%	23%	5%	20%	66%	60%	32%	69%
<b>Total</b>	<b>75%</b>	<b>77%</b>	<b>78%</b>	<b>77%</b>	<b>65%</b>	<b>66%</b>	<b>53%</b>	<b>73%</b>	<b>74%</b>	<b>77%</b>	<b>82%</b>	<b>80%</b>	<b>79%</b>

Note: \* - Includes sawmills, plywood plants, utility pole plants, and house log plants.

**Table 20**  
**(continued)**

County or County Group	Capacity to Process Sawtimber, Million Board Feet Scribner*											
	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00
Lincoln	330	280	245	215	201	200	180	160	160	150	150	140
Flathead	380	380	335	335	310	310	310	300	300	290	290	265
Lake/Mineral/Sanders	240	245	205	205	199	200	200	162	166	166	160	160
Missoula/Granite/Ravalli	345	335	335	335	316	285	260	240	240	236	215	215
Powell/Lewis & Clark/ Cascade/Judith Basin/ Jefferson/Broadwater/ Meagher/Wheatland	115	115	95	95	89.3	90	110	120	110	110	110	110
Deer Lodge/Silver Bow/ Beaverhead/Madison/ Gallatin/Park	125	95	95	95	92	90	95	100	100	105	115	115
All Other Counties	55	55	45	45	43	45	45	45	35	34	30	30
<b>Total</b>	<b>1590</b>	<b>1505</b>	<b>1355</b>	<b>1325</b>	<b>1251</b>	<b>1220</b>	<b>1200</b>	<b>1127</b>	<b>1111</b>	<b>1091</b>	<b>1070</b>	<b>1035</b>
County or County Group	Percentage of Capacity Utilized*											
	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00
Lincoln	92%	92%	77%	100%	88%	68%	76%	88%	87%	91%	93%	93%
Flathead	82%	78%	88%	93%	88%	90%	88%	92%	94%	97%	97%	94%
Lake/Mineral/Sanders	74%	71%	75%	80%	81%	71%	68%	85%	84%	82%	88%	84%
Missoula/Granite/Ravalli	80%	84%	69%	78%	74%	74%	76%	82%	82%	84%	83%	83%
Powell/Lewis & Clark/ Cascade/Judith Basin/ Jefferson/Broadwater/ Meagher/Wheatland	61%	70%	80%	82%	65%	83%	73%	68%	78%	82%	82%	82%
Deer Lodge/Silver Bow/ Beaverhead/Madison/ Gallatin/Park	65%	79%	86%	89%	85%	94%	88%	80%	80%	74%	76%	76%
All Other Counties	53%	40%	44%	47%	72%	80%	71%	69%	94%	76%	67%	67%
<b>Total</b>	<b>79%</b>	<b>79%</b>	<b>77%</b>	<b>86%</b>	<b>81%</b>	<b>79%</b>	<b>78%</b>	<b>84%</b>	<b>86%</b>	<b>87%</b>	<b>88%</b>	<b>86%</b>

## Utilization

### Processing Capacity in Post, Small Pole, and Cedar Products Sectors

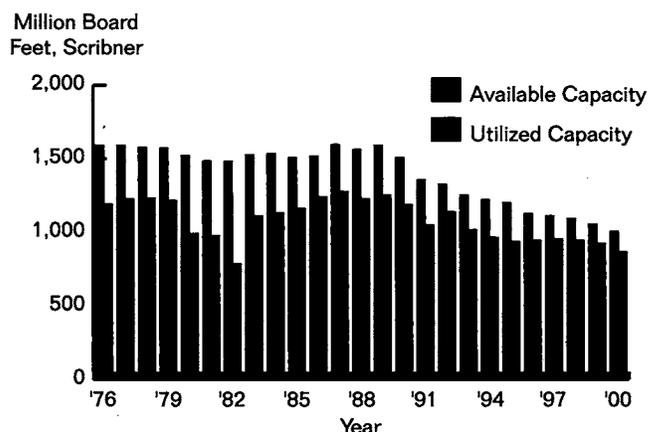
Processing capacity for the post and small pole and cedar product sectors is difficult to quantify. As was the case with small sawtimber processors, many of the firms are small "family-type" operations and their annual capacity is influenced as much by the operator as by the facility. The operators often harvest their own timber, further limiting manufacturing time. These plants are usually seasonal operations and very labor-intensive, further complicating production capacity estimates. For example, simply adding more workers to split rails might increase a cedar fencing plant's capacity. A capacity figure based on equipment potential could, therefore, be misleading.

However, estimates of annual timber processing capacity were developed for the post-and-pole and cedar products sectors. Post and small pole manufacturers made estimates of their production capacity in number of pieces of a specified size, and in virtually all cases these were for an eight-hour shift for not more than a 240-operating-day year. Production capacities were converted to cubic feet and then to thousand board feet Scribner using 1 cubic foot per board foot and called timber processing capacity. The cedar products manufacturers reported capacity and volume processed in thousand board feet (MBF) Scribner log scale. The two sectors reported that approximately 42 percent of their capacity was utilized in 1998. Post and small pole and cedar products manufacturers reported approximately 11 MMBF of available timber processing capacity, however they only processed about 4.6 MMBF of timber.

**Table 21**  
**Sawtimber Utilized and Estimated Capacity of Sawmills, Plywood Plants, Utility Pole Plants and House Log Plants, 1976, 1981, 1988, 1993, and 1998**

Plant Type	— Million Board Feet, Scribner —		
	Capacity to Process Sawtimber	Volume Processed	Percentage of Capacity Utilized
1976			
Sawmills	1,259	905	72%
Plywood Plants	289	269	93%
Utility Pole and House Log Plants	41	16	39%
<b>Total</b>	<b>1,589</b>	<b>1,190</b>	<b>75%</b>
1981			
Sawmills	1,207	739	61%
Plywood Plants	226	224	99%
Utility Pole and House Log Plants	50	17	34%
<b>Total</b>	<b>1,483</b>	<b>980</b>	<b>66%</b>
1988			
Sawmills	1,237	985	80%
Plywood Plants	263	219	83%
Utility Pole and House Log Plants	61	22	36%
<b>Total</b>	<b>1,561</b>	<b>1,226</b>	<b>79%</b>
1993			
Sawmills	964	783	81%
Plywood Plants	220	213	97%
Utility Pole and House Log Plants	66	21	32%
<b>Total</b>	<b>1,251</b>	<b>1,016</b>	<b>81%</b>
1998			
Sawmills	844	725	86%
Plywood Plants	212	199	94%
Utility Pole and House Log Plants	35	22	63%
<b>Total</b>	<b>1,091</b>	<b>946</b>	<b>87%</b>

**Figure 9  
Montana Sawtimber Processing Capacity  
and Sawtimber Processed, 1976-2000**



**Table 22  
Sawtimber Utilized and Estimated Capacity of Sawmills, Plywood  
Plants, Utility and House Log Plants by Size of Plant, 1998**

Size Class	Number of Mills in Size Class	Capacity to Process Sawtimber*	Volume Processed*	Percentage of Total Capacity Utilized	Unutilized Capacity*
A - over 40 MMBF	14	743,913	672,699	90%	71,214
B - 25 to 40 MMBF	6	212,778	181,974	86%	30,804
C - 10 to 25 MMBF	3	48,419	46,141	95%	2,278
D - 1 to 10 MMBF	26	56,525	31,110	55%	25,415
E - under 1 MMBF	103	29,988	14,234	47%	15,754
All Mills	152	1,091,623	946,158	87%	145,465

Note: \* - MBF, Scribner.

# Markets for Finished Wood Products

All mills summarized their shipments of finished wood products in 1998, providing information on the volume, sales value, and geographic destination (Figure 10). Mills usually distributed their products in two ways: 1) through their own retail and wholesale outlets; or 2) through independent wholesalers and selling agents. Because of subsequent wholesaling transactions, the geographic destination reported below may not precisely reflect the final delivery points of shipments.

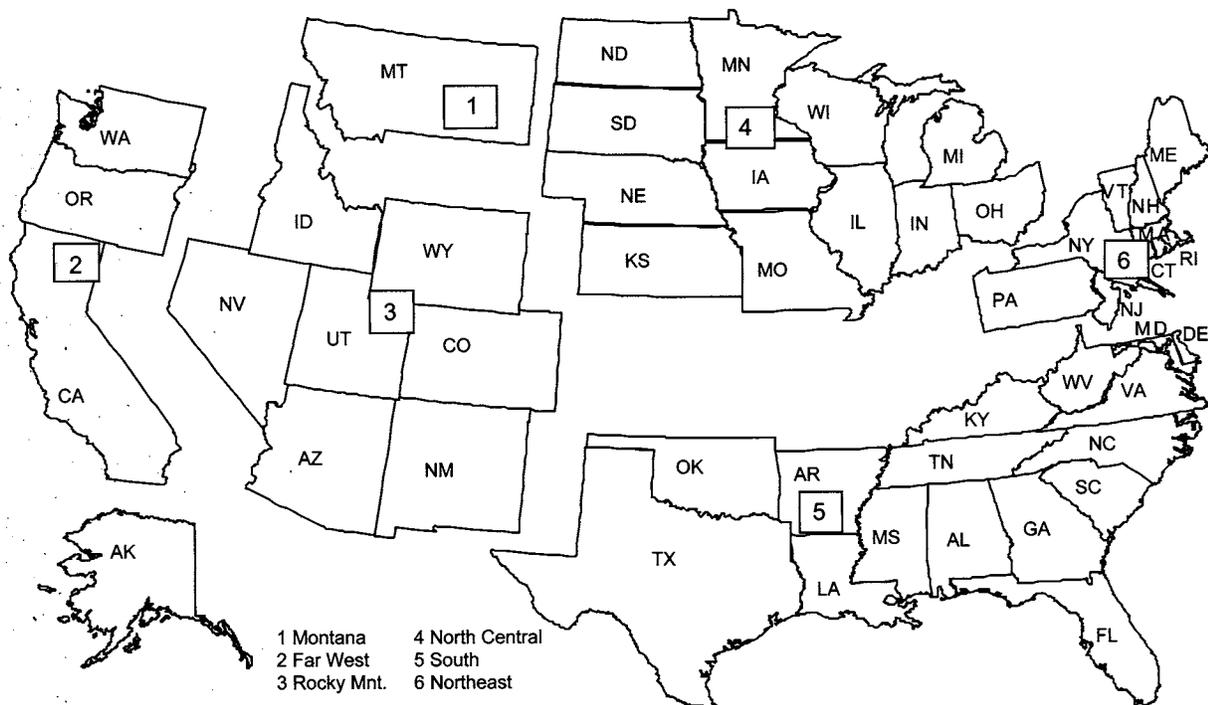
In 1998, Montana's primary forest products mills had total sales of \$1.158 billion FOB (free on board) the producing mill (Table 23). At \$328 million and 28 percent of total sales, the North Central states continue as Montana's major market for wood and paper products. Based on the previous censuses, this region has

been the major destination for Montana's wood and paper products industry, accounting for 28 to 40 percent of total sales (Table 24).

The Rocky Mountain states, including Montana, were the second largest regional market, generating more than \$286 million or 25 percent of the 1998 sales—13 percent in the Rocky Mountain region and 12 percent in Montana (Table 23). Sales within Montana have continued to improve since the low in 1988 (Table 24), a reflection of improved economic conditions and increased construction activity within the state.

The Far West states accounted for 19 percent of Montana's primary forest industry sales, down from 1981, but an increase compared to all other census years (Table 24).

**Figure 10**  
**Shipment Destination of Montana's Wood Products**



**Table 23**  
**Destination of Primary Forest Products Shipments by Value of Shipment, 1998**

Thousand 1998 U.S. Dollars										
Product	Montana	Rocky Mountain	Far West	North Central	South	Northeast	Canada	Pacific Rim Countries	Other Exports	All Destinations
Lumber and other sawn products	\$77,629	\$77,868	\$54,351	\$145,841	\$107,045	\$22,005	\$152	\$788	\$712	\$486,391
Plywood	\$18,037	\$14,347	\$33,074	\$79,571	\$27,343	\$31,606	\$3,716	\$0	\$0	\$207,694
Pulp, paper, particle-board and fiberboard and other residue-related products	\$7,632	\$29,638	\$107,322	\$86,808	\$39,804	\$38,125	\$40,994	\$0	\$0	\$350,323
House logs	\$23,942	\$28,860	\$20,443	\$13,513	\$5,319	\$7,227	\$0	\$363	\$279	\$99,946
Posts, small poles, utility poles, and cedar products	\$6,452	\$2,444	\$2,577	\$2,277	\$84	\$247	\$0	\$39	\$0	\$14,120
All products	\$133,692	\$153,157	\$217,767	\$328,010	\$179,595	\$99,210	\$44,862	\$1,190	\$991	\$1,158,474

**Table 24**  
**Percent of Product Sales by Market Region, 1976, 1981, 1988, 1993, and 1998**

Market Areas	1976	1981	1988	1993	1998
North Central	40	34	40	37	28
Far West	15	22	17	15	19
South	9	10	10	11	16
Rocky Mountain	12	14	11	15	13
Montana	10	7	5	10	12
Northeast	7	6	7	6	9
Export	2	3	9	6	4
Unknown	5	4	1	0	0
Total	100	100	100	100	100

Sales to the South continued to increase from 9 to 11 percent in past surveys to a high of 16 percent in 1998. The amount of sales to the Northeast saw a similar increase, from about 6 percent in previous years to 9 percent in 1998. After rising from 2 percent of the total in 1976 to 9 percent in 1988, exports to other countries fell to 6 percent of 1993 sales and to 4 percent of 1998 sales. The continued decline was due primarily to weak markets in a number of other countries and a relatively strong U.S. dollar. See Appendix A (Tables A9, A10, A11, and A12) for details on previous years.

# Wood Residue from Primary Wood Products Manufacturers in Montana

Wood residue from primary wood products manufacturers is the major source of raw material for Montana's pulp and paper and board industries; it is also an important source of fuel for major sectors of the wood products industry. Unused wood residue, or mill residue, creates difficult and expensive disposal problems. The sawmill and plywood sectors generate more than 95 percent of the mill residue in Montana. This section details the volumes and uses of mill residue generated by these plants.

There are basically three types of wood residue generated at sawmills and plywood plants: 1) coarse or chippable residue consisting of slabs, edgings, and trim from lumber manufacturing; log ends from sawmills and plywood plants; pieces of veneer not suitable for manufacturing plywood; and peeler cores from plywood plants not sawn into other products; 2) fine residue consisting of planer shavings and sawdust from sawmills and sander dust from plywood plants; and 3) bark from sawmills and plywood plants.

## The Supply of Mill Residue

The volume of mill residue produced annually is the result of lumber and plywood production levels and the amount of residue generated per unit of lumber and plywood produced. As discussed earlier in this report, the volume of lumber and plywood produced is influenced primarily by market conditions, technology, and timber availability. The amount of residue generated per

board foot of lumber and/or square foot of plywood produced has also changed over time due to improved milling technology, changes in species and tree size, merchantability of timber, and market conditions.

## Residue Volume Factors

Residue factors, indicating volumes of residue produced per thousand board feet of lumber and per thousand square feet of plywood produced, have been developed. Volumes of residue are reported in bone-dry units (2,400 lbs. oven-dry weight). These factors (Tables 25 and 26) represent statewide averages for sawmills and plywood plants.

Over time, there have been changes in residue volume factors, some rather substantial. The largest changes have been decreases in residue recovery of sawdust and planer shavings, due mainly to: 1) improved sawing accuracy and sawing technology, and 2) the shift by sawmills to the production of more dimension lumber (2" to 5" nominal thickness) instead of boards (less than 2" nominal thickness). Bark production has also decreased per unit of finished product primarily because of increased recovery of lumber or plywood per unit of timber input. The volume of chips per unit of output has remained relatively constant, even with improved recovery technologies, because diameters of processed logs have decreased, and as log diameters get smaller, less of the log volume is recoverable for solid lumber products.

**Table 25**  
**Sawmill Residue Factors, 1969, 1976, 1981,**  
**1988, 1993, and 1998**

— Bone Dry Units per MBF Lumber Tally —

Residue Type	1969	1976	1981	1988	1993	1998
Coarse	0.45	0.45	0.47	0.51	0.48	0.49
Sawdust	0.29	0.24	0.25	0.22	0.23	0.22
Planer Shavings	0.25	0.22	0.22	0.18	0.16	0.17
Bark	0.30	0.25	0.23	0.21	0.21	0.19

**Table 26**  
**Softwood Plywood Residue Factors, 1969,**  
**1976, 1981, 1988, 1993, and 1998**

Residue Type	Bone Dry Units per MSF Plywood Produced					
	1969	1976	1981	1988	1993	1998
Coarse	0.25	0.25	0.29	0.24	0.26	0.25
Sander Dust	0.02	0.02	0.02	0.02	0.02	0.02
Bark	0.18	0.15	0.13	0.12	0.12	0.11

**Table 27**  
**Estimated Volume of Wood Residue Generated by Sawmills**  
**and Plywood Plants, 1969, 1976, 1981, 1988, 1993, and 1998**

Residue Type and Year	Estimated Volume (Thousand Bone Dry Units)			Percentage of Total		
	Utilized	Unutilized	Total	Utilized	Unutilized	Total
<b>Coarse</b>						
1969	689	107	796	87%	13%	100%
1976	658	32	690	95%	5%	100%
1981	809	8	817	99%	1%	100%
1988	873	28	901	97%	3%	100%
1993	864	a	864	100%	0%	100%
1998	795	7	802	99%	1%	100%
<b>Fine *</b>						
1969	443	297	740	60%	40%	100%
1976	453	87	540	84%	16%	100%
1981	399	28	427	93%	7%	100%
1988	501	75	576	87%	13%	100%
1993	548	a	548	100%	0%	100%
1998	482	18	500	96%	4%	100%
<b>Bark</b>						
1969	137	355	492	28%	72%	100%
1976	296	104	400	74%	26%	100%
1981	286	35	321	89%	11%	100%
1988	375	61	436	86%	14%	100%
1993	361	11	372	97%	3%	100%
1998	308	9	317	97%	3%	100%
<b>Total</b>						
1969	1,269	759	2,028	63%	37%	100%
1976	1,407	223	1,630	86%	14%	100%
1981	1,494	71	1,565	95%	5%	100%
1988	1,749	164	1,913	91%	9%	100%
1993	1,772	11	1,783	99%	1%	100%
1998	1,585	34	1,619	98%	2%	100%

Note: \* - Fine residue material includes sawdust, planer shavings and plywood sander dust.

a: Less than 0.5 percent.

Source: Setzer, T.S, 1971, *Estimates of Timber Products Output and Plant Residues, Montana, 1969.*

## Production and Utilization

Total residue output in 1998 was 1,619 MBDU, the lowest among census years since 1981 (Table 27). The highest volume of residue produced for the six census years was in 1969, due in large part to high residue factors for planer shavings, sawdust, and bark (Table 25) and the relatively large volume of lumber (1,397 MMBF) produced that year. Changes in residue output among census years are due primarily to the substantial differences in lumber production reported for those years. The highest residue volumes after 1969 were in 1988 when lumber production was 1,558 MMBF; the lowest residue volumes were in 1981 with low lumber production of 1,071 MMBF brought on by weak wood products markets. Changes in plywood production have had some impact on residue volume, but it has been much less significant than changes in lumber production.

The utilization of mill residue has increased dramatically since 1969, due to the expansion of the pulp and paper mill, the start-up of the particleboard and medium-density fiberboard plants, and increased use of residue for industrial fuel. In 1969, 63 percent of the wood residue was used; by 1993 this use had increased to 99 percent, and in 1998 utilization was 98 percent.

Coarse residue has been the largest component of residue generated and utilized; it is the major source of raw material for the pulp and paper industry in the region and has the highest value. In 1998, nearly all (99.17 percent) of the 801,531 bone dry units (BDU) of coarse residue was reported used (Table 28). Almost 98 percent was sold to the pulp and paper industry, less than 1 percent was burned as hogfuel, just over 1 percent went to other uses, and less than 1 percent was reported unused.

**Table 28**  
**Production and Disposition of Mill Residue by Sawmills and Plywood Plants by Type of Residue Use, 1998**

Bone Dry Units						
Residue Type	Total Utilized	Raw Materials Pulp Mills/ Board Plants	Hogfuel	Other Uses	Unutilized	Total
Coarse	794,850	784,133	880	9,837	6,681	801,531
Fine	482,385	447,751	22,989	11,645	17,911	500,296
Bark	308,302	-	267,490	40,892	9,058	317,440
Total	1,585,617	1,231,884	291,359	62,374	33,650	1,619,267

Residue Type	Total Utilized	Raw Materials Pulp Mills/ Board Plants	Hogfuel	Other Uses	Unutilized	Total
Coarse	99.17%	97.83%	0.11%	1.23%	0.83%	100.00%
Fine	96.42%	89.5%	4.60%	2.33%	3.58%	100.00%
Bark	97.15%	0.00%	84.26%	12.88%	2.85%	100.00%
Total	97.92%	86.08%	17.99%	3.85%	2.08%	100.00%

Fine residue (sawdust, planer shavings, and sander dust) accounted for 500 MBDU in 1998. Of these, 448 MBDU went to pulp mills and board plants as raw material, 35 MBDU went to hogfuel, wood fuel pellet producers, cattle bedding, and other uses, while less than 18 MBDU was unused (Table 28). Sawdust and planer shavings constituted 470 MBDU (98 percent) of fine residues, while sander dust accounted for only 12 MBDU (Table 29).

Bark totaled 317 MBDU in 1998. Most bark (267 MBDU) was used as hogfuel at manufacturing facilities. Nearly 39 MBDU were used for miscellaneous products including decorative bark, livestock bedding, and mulch. Only 30 MBDU of bark went unused.

In 1998, as in 1993, the manufacturing of house logs, cedar products, and posts and small poles generated several types of residue. Much of this material—15 MBDU—was used for fuelwood, hogfuel, livestock bedding, garden mulch and other purposes, while 4 MBDU were unused.

## Revenue from the Sale of Manufacturing Residue

In 1998, wood fiber residue sales generated \$72 million for Montana sawmills and plywood plants, in addition to the \$486 million in lumber sales and \$208 million in plywood sales. This is an increase from \$40 million and \$66 million (1998 dollars) of total residue sales reported for 1988 and 1993, respectively. In 1998, about 68 percent (\$49 million) came from sales of chips to the pulp and paper industry. The average sales price for chips in 1998 was \$60 per bone-dry unit (BDU) FOB the manufacturers' plant. This compares to \$72 per BDU in 1993 and \$44 per BDU in 1988 (both in 1998 dollars). Historically, the price of chips increases in years when there is low lumber production, because of greater competition for chips. In 1993, chip production from sawmills and plywood plants was lower than 1988, and competition for chips from pulp mills in other states helped to drive chip prices up. Chip prices slipped slightly in 1998, due in part to curtailments at the state's only pulp and paper mill.

**Table 29**  
**Mill Residue From Lumber and Plywood Plants, 1998**

— Thousand Bone Dry Units —

Residue Type	Utilized	Unutilized	Total
Coarse	795	7	802
Fine			
Planer Shavings	213	-	213
Sawdust	257	18	275
Sander Dust	12	-	12
Bark	308	9	317
Total	1,585	34	1,619

# The Forest Products Industry and the Montana Economy

To estimate employment and labor income in Montana's forest products industries, we use three standard industrial classifications (SIC) that closely correspond to the industry. The three classifications, as defined by the U.S. Office of Management and Budget, are: (SIC) 08-Forestry, (SIC) 24-Lumber and Wood Products, Except Furniture, and (SIC) 26-Paper and Allied Products. Employment and labor income data for this section come from the U.S. Department of Commerce, Regional Economic Information System.

Though these industrial classifications give a conservative representation of forest industry employment and labor income, the correspondence is not exact. A number of forest products activities involving several thousand workers are not included in these categories including log hauling by independent truckers; truck or rail transport of logs, wood fiber, or finished products; and forest management activities by government employees. Conversely, some workers in the secondary industry are included in these categories that are not related to Montana's or the region's timber resources, such as truss or mobile home manufacturers whose activities are more closely related to the region's construction activity.

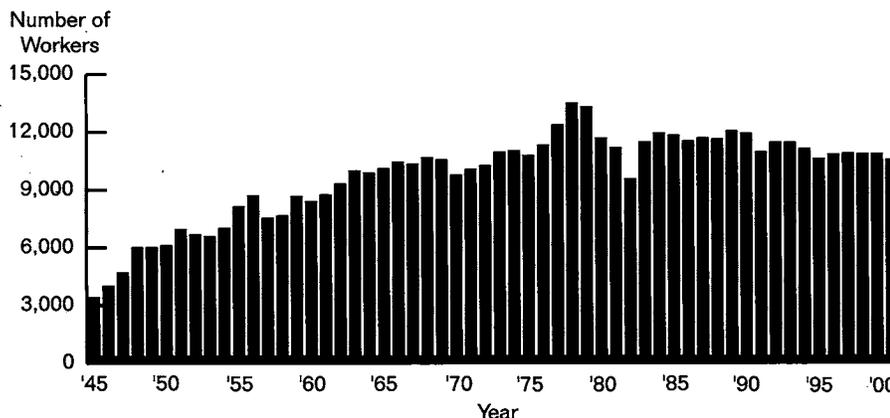
## Employment and Labor Income in the Forest Products Industry, 1969-2000

The 1970s was a period of increased employment and labor income for the forest products industry in Montana. In 1969, Montana's forest products industry employed about 10,000 workers (Figure 11). By the late 1970s, employment had increased to more than 13,000 workers despite a 16 percent decrease in the timber harvest from the 1969 level of 1,302 MMBF to 1,090 MMBF in 1979 (Figure 12).

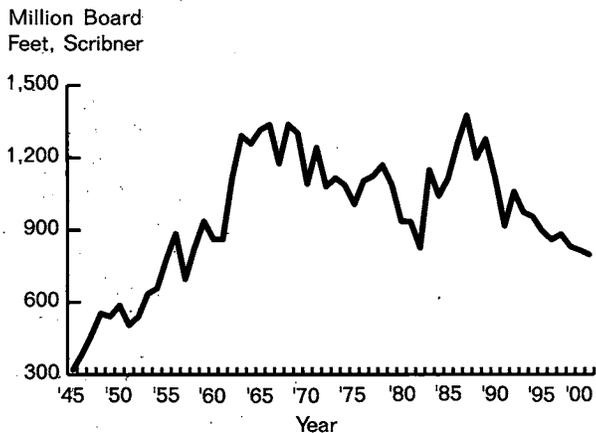
The rise in employment can be attributed to an increase in the number of workers per MMBF Scribner of timber harvested and processed during this period (Figure 13). Factors contributing to the increase in labor intensity were as follows (Keegen et al. 1995):

- The use of residues from sawmills and plywood plants increased due to the construction of a particleboard plant and a medium-density fiberboard plant, as well as the expansion of the pulp and paper mill.
- Labor-intensive industries such as plywood and log homes expanded.

**Figure 11**  
**Montana Forest Industry Employment, 1945-2000**



**Figure 12**  
**Montana Timber Harvest, 1945-2000**



- Land management activities such as thinning increased.
- Wood products markets were very strong, particularly in the late 1970s.

The strong markets of the late 1970s collapsed as the new decade ensued with a sharp drop in the U.S. housing and construction industries due to the "double dipper" recessions of the early '80s. The forest products industry entered a bleak period that lasted about six years. Employment fell to less than 9,500 workers in 1982 as harvest and production levels fell.

By 1983, conditions in the construction and housing industries had improved, with near-record levels of forest products consumption from 1983-1985. Nevertheless, prices remained low due in large part to the very high value of the U.S. dollar and increased imports of Canadian softwood lumber. In the last half of the 1980s, markets began to improve as consumption of domestic timber products remained high and the value of the U.S. dollar fell. Harvest levels in Montana began to rise in 1983 and continued upward into the last half of the 1980s. In 1987, harvest levels were higher than those of the late 1960s and early 1970s.

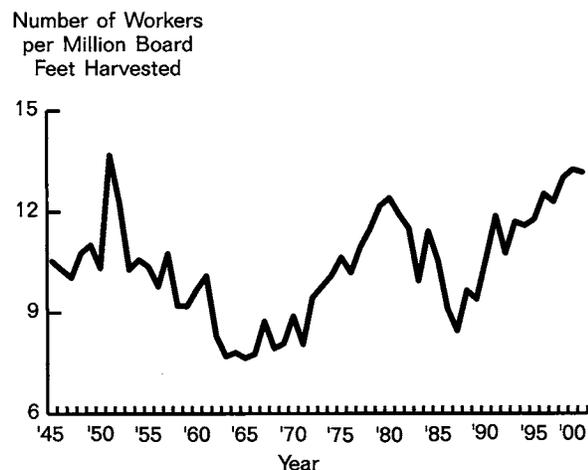
Employment, however, did not increase commensurately. From its peak in 1978 of about 13,500 workers, the annual average for the last half of the 1980s was 11,645 workers. This decrease in employment was due largely to cost-cutting efforts, such as increased mechanization, in response to competitive market conditions, as well as a shift to less labor-intensive manufacturing facilities, such as stud mills and sawmills for processing small diameter timber.

In contrast to the 1980s, Montana's forest products industry became more labor intensive during the 1990s. During the last half of the 1980s, employment averaged 9.5 workers per MMBF Scribner harvested. However, beginning in 1990, labor intensity began to increase. By the end of the decade, employment was approaching 13 workers per MMBF Scribner harvested, with a ten-year average of nearly 12 workers per MMBF. This increase in labor intensity was the result of several factors:

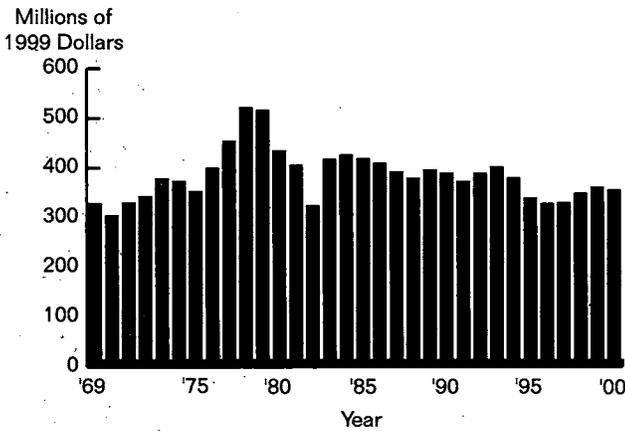
- very high prices for much of the period made it economically feasible to use more labor to recover maximum value from the timber and also to use lower-quality timber, which requires more labor to harvest and process,
- increased use of raw timber from other states and Canada,
- more labor-intensive harvesting practices due to environmental and aesthetic considerations,
- growth in more labor-intensive sectors such as log home and secondary wood products manufacturing.

The increase in labor intensity in Montana's forest products industry helped to mitigate the decline in employment in the 1990s that occurred as a result of volatile markets and limited timber availability. A national recession in 1990 and 1991 as a result of the Gulf War brought about the lowest constant dollar lumber prices in at least 30 years, and employment in Montana's mills decreased to less than 11,000 workers.

**Figure 13**  
**Forest Industry Employment per Million Board Feet of Timber Harvest, 1945-2000**



**Figure 14**  
**Montana Forest Industry Labor Income, 1969-2000**



Even as the economy began to recover, however, Montana's timber harvest continued to decline due to sharply reduced national forest timber sales. By 1993 and 1994, Montana's timber harvest had dropped 25 percent from the average annual harvest of the last half of the 1980s. However, due to increases in labor intensity and a strong market, employment levels in 1993 rivaled those of the late 1980s at around 11,500 workers despite the falling harvest levels.

In 1995, lumber prices fell due to a slowdown in U.S. and international economies, as well as to rising imports of Canadian lumber. Montana's timber harvest continued to decline in the last half of the 1990s, averaging 859 MMBF, a 31 percent decrease from the average for 1985-1989. As prices and harvest levels fell, so did employment at Montana's mills. In 1995, employment fell by nearly 1,000 workers to 10,600 workers as mills closed or curtailed operations.

As the U.S. economy recovered in 1996, lumber prices rebounded and employment in Montana's forest products industry increased 200 workers from the 1995 level of 10,600. By the first half of 1997, lumber prices were again at or near record high levels, only to drop sharply in the last half of the year due to the worsening Asian economic crisis. Employment in Montana's forest products industry in 1997, however, increased above 1996 levels to 10,900 workers. The increases in 1996 and 1997 were also due in part to temporary legislation that exempted certain federal salvage timber sales from some environmental review procedures, thereby temporarily increasing federal harvest levels.

By 1998, the Asian crisis had expanded, and lumber prices continued to fall. However, Montana's forest products industry fared better than expected because of mild winter and spring weather that allowed above normal levels of logging. Production increased slightly compared to 1997, with employment levels remaining essentially unchanged. Favorable conditions continued in 1999, with a stronger than expected U.S. economy and some improvement in the global economy. This led to lumber and plywood prices in 1999 that were 10 to 20 percent higher than in 1998. Nonetheless, continued impacts from limited timber availability led to mill closures in 1999, and forest industry employment declined to approximately 10,800 workers.

Throughout the 1990s, the more labor-intensive nature of the forest products industry brought about declines in employment that were much smaller—in percentage terms—than the declines in timber harvest. From the late 1980s to the last half of the 1990s, employment fell by approximately 8 percent, while harvest levels fell more than 30 percent.

The year 2000 started out well for the forest products industry, with relatively high lumber prices during the first two months of the year. However, lumber prices fell sharply in mid-March and remained low for the rest of 2000 due to a combination of factors, including rising inventories due to unfulfilled strong market expectations, higher interest rates and a weaker U.S. economy, along with a strong U.S. dollar. In addition to the weaker market situation, Montana's forest products industry, already struggling with limited timber availability, was hit with a severe summer wildfire season and skyrocketing electricity prices. Wildfires caused forest closures for four to six weeks in 2000, forcing some mills to temporarily cut back production in an effort to stretch log inventories. The closures also forced loggers out of work for much of the third quarter, normally one of their busiest seasons.

Furthermore, unprecedented increases in electricity rates for mills purchasing their electricity on the spot market led to additional curtailments at Smurfit-Stone Container Corporation's linerboard plant in Frenchtown and the Louisiana Pacific particleboard plant in Missoula. Coupled with the permanent closure in July of the American Timber Co. sawmill in Olney, these curtailments resulted in a decrease of about 300 workers from 1999.

Over the past 30 years, labor income, when adjusted for inflation (1999 dollars), has followed the same general trend as employment although the changes from year to year tended to be greater (Figure 14). Often, 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 labor income due to shortened workweeks or temporary

curtailments may be much larger than changes in employment; the employees are still there but their income is lower.

For instance, both labor income and employment peaked in 1978. However, labor income increased 15 percent from its 1977 level of \$453 million to \$521 million, while employment increased 9 percent, from 12,365 workers in 1977 to 13,494 workers in 1978. After increasing throughout most of the 1970s, labor income fell during the recessions of the early 1980s, reaching a low in 1982 of \$324 million. For the remainder of the 1980s and through 1993, labor income remained relatively stable, averaging \$400 million per year. In 1994, it began to drop. Over the next six years, labor income averaged \$348 million per year, a 12 percent drop from the late 1980s and early 1990s, with the lowest level occurring in 1996 when labor income fell to \$327 million. However, employment declined by a much lower percentage—8 percent. From 1997 to 1999, labor income rose slightly, but labor income fell from roughly \$361 million in 1999 to an estimated \$355 million in 2000. This drop was largely a result of reductions in the number of hours worked due to the temporary curtailments caused by the summer's wildfires, low lumber prices, and limited timber availability.

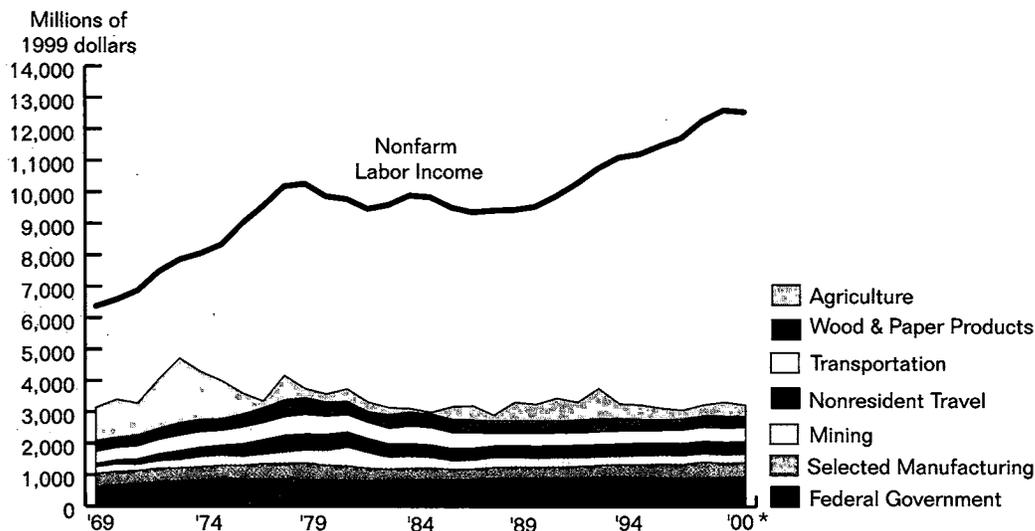
### Basic Industries and Trends in the State Economy

The economic base of a region consists of industries that are dependent on factors external to the local economy. These "basic" industries are important to a

local economy because they have the potential to inject new funds into a local economy by way of payrolls, taxes, and purchases of local goods and services. They also tend to be more insulated from local economic fluctuations since their products or services are generally sold in outside markets or they are otherwise dependent on outside funds. Examples of traditional basic industries include most manufacturing and natural resource industries such as agriculture, mining, and forest products that produce goods for export outside the local economy. Also included are industries such as the federal government, which collects taxes to pay its expenditures, and tourism, which is associated with nonresidents of the area.

It should be noted, however, that the designation of what constitutes a basic industry is not static. In some areas, certain service industries, as well as some construction activity, also inject outside funds into an economy and can be considered basic industries. However, the amount of such activity that is basic vs. non-basic, or derivative, can be difficult to ascertain without looking at individual firms and may change substantially from year to year. Therefore, for consistency we define Montana's basic industries as wood and paper products manufacturing, other manufacturing industries (with the exception of printing and publishing; and stone, clay, and glass), railroad and truck transportation, nonresident travel, the federal government (including military and civilian personnel), mining, and agriculture. While we use farm labor income to explain trends in the agricultural sector, it is probably not the best source of industry trends due to its volatility.

**Figure 15**  
**Nonfarm Labor Income and Labor Income in Basic Industries, 1969-2000\***



Note: \* - Values for 2000 are estimates made by the Bureau of Business and Economic Research.

Looking at the changes that have occurred in basic industry labor income over a period can allow us to identify trends in the economic base of a region. Additionally, nonfarm labor income is used to show overall trends in Montana's economy, not just in the basic industries. Gross State Product (GSP) is also a widely used measure for assessing changes occurring in an economy over time, but it is not yet available for the entire time period. We choose to use labor income as our measure because it accounts for more changes in labor conditions (such as variations in income per worker and hours worked), and it is highly correlated with GSP.

Long-term trends in Montana's overall economy are illustrated by looking at the changes that have occurred in labor income for Montana's basic industries and total nonfarm labor income from 1969 through 2000 (2000 values have been estimated by the Bureau) (Figure 15). During the 1970s, Montana experienced a period of significant economic growth. Nonfarm labor income climbed steadily with only a slight slowdown corresponding to the recession in 1974-1975, increasing more than 50 percent over the course of the decade. Most of Montana's basic industries grew substantially during this time with only minor fluctuations, with the exception of agriculture.

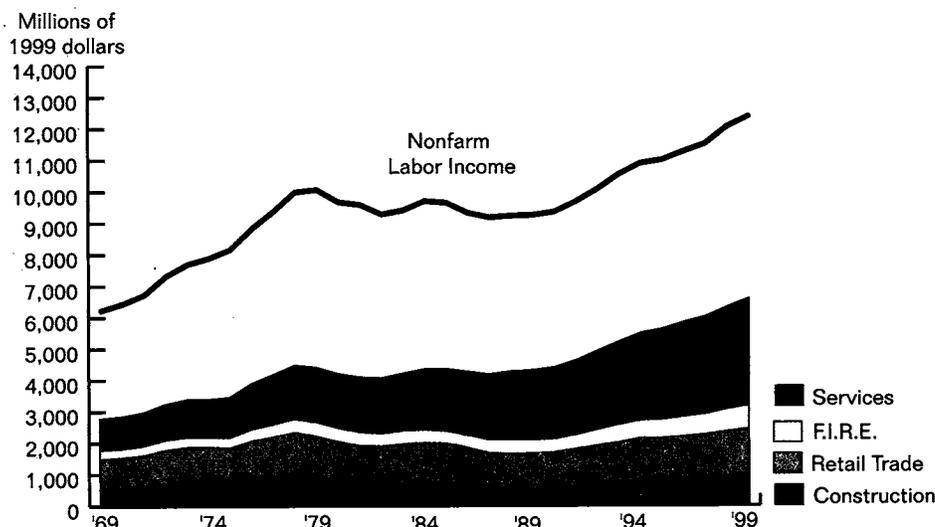
The 1980s were a period of little or no economic growth for Montana. The first part of the 1980s saw a decline in nonfarm labor income, with a trough occurring in 1982 corresponding to the recession of 1981-1982. Montana's economy picked up once the recession ended in 1983, only to fall again in 1985 and 1986. For the remainder of the 1980s, Montana's economy slowly improved, though nonfarm labor income in 1989 was

about 4 percent less than in 1980. The poor performance of Montana's economy during the 1980s was seen in almost all basic industries. Transportation, nonresident travel, mining, and agriculture declined throughout most of the 1980s. Wood products and other manufacturing industries had ups and downs, with the downs coinciding with the recessions of the early 1980s. The only sector to increase throughout the period was the federal government.

The 1990s once again saw significant growth in Montana's economy. Nonfarm labor income increased 30 percent from 1990 to 2000. For Montana's basic industries, growth was varied. The volatility of the agricultural sector continued throughout the 1990s. Labor income in the wood products sector remained steady until 1994 when it began to drop, ending up 12 percent lower in 2000 than in 1990. Labor income in the mining sector also declined by nearly 8 percent. The downturns in some of the basic sectors were largely offset by increases in the other sectors. Nonresident travel and federal labor income increased by approximately 5 percent each, while transportation labor income increased about 10 percent. The largest growth during this period occurred in basic manufacturing industries, excluding wood, with labor income in this sector increasing by over 30 percent from 1990 to 2000.

Looking back at the 1970s, the economic growth in the state was largely reflected in Montana's basic industries (Figure 15). With the exception of agriculture, all basic sectors increased substantially during this time. However, by the 1990s the situation had changed, and the economic growth of the last decade seems not as clearly connected with activity in the traditional basic

**Figure 16**  
**Nonfarm Labor Income and Labor Income in Selected Derivative Industries, 1969-1999**



industries. Although changes in basic activity almost always have measurable impacts on the derivative sector, there may be changes in the derivative industries that are not associated with corresponding changes in the basic industries. These factors help explain the 30 percent increase in nonfarm labor income that occurred from 1990 to 1999 while labor income in Montana's basic industries grew by only 2 percent. Among these factors are:

1. Construction labor income is included in nonfarm labor income but is not included as a basic industry. A large construction boom occurred in the 1990s particularly in Western Montana (Figure 16). Much of this construction activity may be basic, such as federal highway funding or second-home construction by non-residents. Also, some of it may be associated with basic industries, such as plant construction or expansion. Moreover, construction was abnormally low in the 1980s due to the weak economy and, therefore, there may have been some catch-up construction in the 1990s.
2. Structural changes are causing growth associated with, but not immediately identified with, changes in basic industries. For example, the use of business and temporary service firms not only for lawyers and accountants but also for production workers has increased. This means that some employment and labor income formerly reported in basic industries is now reported in derivative service sectors.
3. Looking at some of the other components of nonfarm labor income (Figure 16), large increases in labor income also occurred in other derivative industries, such as retail trade; finance, insurance, and real estate (F.I.R.E); and services. Our analysis of the economic base is done on an industry basis; consequently, there are firms in the economy that are classified as derivative but that would likely be

included in the economic base if looked at on a firm-by-firm basis. Therefore, the difficulties in measuring the components of the economy which are basic vs. derivative may make the magnitude of economic activity in the basic industries appear smaller than it is in reality, and conversely, the derivative sector seem larger.

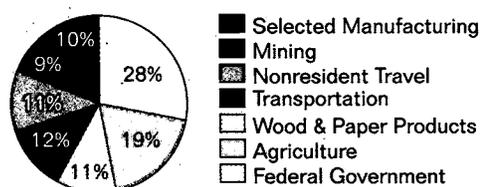
4. Changes in the spending habits of the population can also cause increases in certain derivative industries. For example, as the population ages, a higher proportion of income is spent on health care.

### The Forest Products Industry and Montana's Economic Base

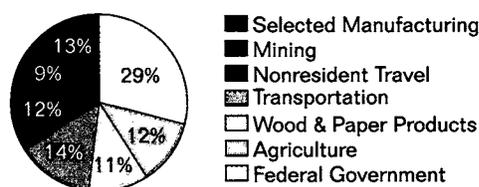
Labor income in Montana's basic industries averaged \$3.2 billion during the five-year period from 1996-2000, with the forest products industry accounting for roughly 11 percent, or approximately \$355 million. The importance of Montana's forest products industry to the economic base, however, has changed over the years. Five-year averages of labor income are used in order to compensate for year-to-year variations, particularly in agriculture. From 1970-1974, the forest products industry accounted for 9.3 percent of Montana's basic labor income. This steadily increased, reaching a high in 1985-1989 of 16 percent. Since that time, the share of Montana's forest products industry in the economic base has fallen, to approximately 11 percent in both 1990-1994 and 1994-1999.

Figures 17 and 18 show the change in Montana's economic base over the ten years from 1990-1999. For the first half, the federal government accounted for the largest share of Montana's basic labor income at 28 percent. Next came agriculture at 19 percent, transportation at 12 percent, and wood and paper products, and nonresident travel at 11 percent. For the second half of the decade, the largest share of basic labor income was still held by the federal government at 29 percent,

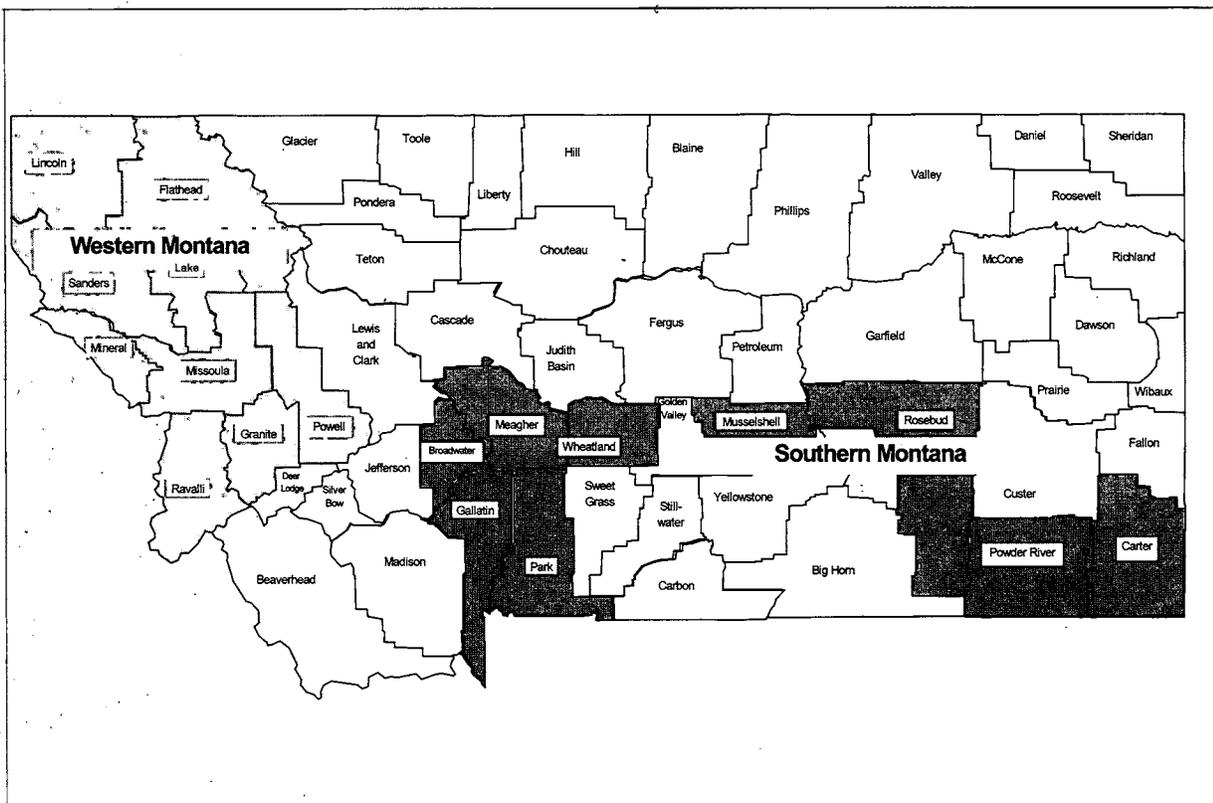
**Figure 17**  
Industry Share of Basic Labor Income, 1990-1994



**Figure 18**  
Industry Share of Basic Labor Income, 1995-1999



**Figure 19  
Forest Industry Employment and Labor Income Concentrations in Montana**



followed by transportation at 14 percent, and manufacturing (not including wood product manufacturing) at 13 percent. Agriculture's share had fallen to 12 percent, the same as nonresident travel, while forest products stayed at its previous level of 11 percent. Four of Montana's basic industries increased their share of basic labor income during this time. These were (in order of growth): selected manufacturing, transportation, nonresident travel, and the federal government. Agriculture declined, while wood and paper products and mining remained the same.

**The Forest Products Industry and Regional Economies in Montana**

Though forest industry employment is found in 37 of Montana's 56 counties, more than 80 percent of labor income and employment is found in nine western Montana counties where it constitutes a major component of the economic base (Figure 19). In addition, the forest products industry accounts for a measurable part of the economic base of another nine counties in the southern part of Montana.

**South-Central and Eastern Montana:** Although the forest products industry is heavily concentrated in the western counties, it also comprises at least 5 percent of the basic labor income of nine counties in South-Central and Eastern Montana (Figure 19). Three of these counties—Broadwater, Wheatland, and Carter—all have over 20 percent of their basic labor income coming from the forest products industry.

**Western Montana:** The share of Western Montana's basic labor income provided by the forest products industry has ranged from a high of 51 percent in the later part of the 1970s to a low of roughly 35 percent at the close of the century (Figure 20). Much of the decline has occurred in the 1990s due to curtailments and closures, which have been concentrated in the Western Montana counties.

The general trend of the 1970s was rapid growth, with only a slight interruption in 1973 and 1974. The 1980s began with the infamous "double dipper" recession, followed by a stable economy and some growth toward the end of the decade. Finally, as was the case statewide, the 1990s were again a period of rapid growth.

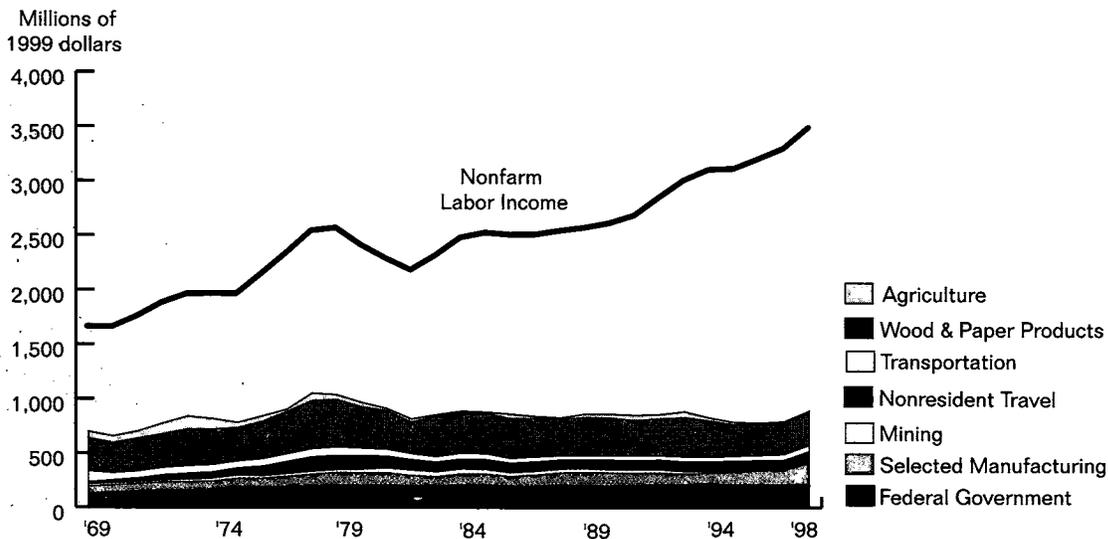
However, in the economy of Western Montana, the forest products industry plays a greater role than it does for the state as a whole because of the concentration of the industry in that region. Until about 1985, economic conditions in the nine western counties largely mirrored what was occurring in the forest products industry at the time. During periods when the forest products industry was expanding, the economic base of these counties was growing. Likewise, during periods of decline in the forest products industry, the economic base shrunk.

However, after 1985, even though there was little growth in the economic base of Western Montana, nonfarm labor income grew steadily and substantially. The same divergence of nonfarm labor income and basic labor income that was discussed earlier in reference to all of Montana can also be seen when focusing just on Western Montana. Nonfarm labor income grew by more than 36 percent from 1985 to 1998 (the most current year for which we have county level data). As with the state as a whole, this is due in large part to a construction boom in the early 1990s, which was mainly concentrated in western Montana, and substantial growth in the

trade and services sectors, which grew 70 percent in terms of labor income over this 15-year period.

As with the rest of Montana, basic industry labor income in Western Montana was virtually unchanged in 1998 as compared to 1985, as increases in some sectors were largely offset by decreases in others. However, at least some of the growth in the services industry, particularly in sectors such as business services and health services, as well as in the construction industry, is really basic rather than derivative and if classified as such would increase the basic industry numbers. This would tend to reduce the proportionate share of traditional basic industries such as forest products. On the other hand, portions of other components of the economic base, such as transportation, are directly associated with the forest products industry and, if counted as such, would tend to increase forest products share of the economic base. On balance, therefore, a reasonable estimate of the share of Western Montana's basic labor income provided by the forest products industry would be somewhere between 25 and 35 percent.

**Figure 20**  
**Nonfarm Labor Income and Labor Income in Basic Industries, Western Montana, 1969-1998**



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# Appendix

**Table A1**  
**Timber Products Harvested by Ownership Source, 1993**

Thousand Board Feet, Scribner					
Origin	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
Private Timberlands	507,982	122,462	21,697	5,805	657,946
Industrial	183,751	110,275	10,704	124	304,854
Nonindustrial	324,231	12,187	10,993	5,681	353,092
Tribal Timberlands	31,726	4,268	--	220	36,214
Public Timberlands	246,551	42,795	4,276	13,447	307,069
National Forest	229,551	37,066	2,625	13,082	282,324
Other	17,000	5,729	1,651	365	24,745
<b>Total</b>	<b>786,259</b>	<b>169,525</b>	<b>25,973</b>	<b>19,472</b>	<b>1,001,229</b>
Percentage of Total					
Private Timberlands	64.6%	72.2%	83.5%	29.8%	65.7%
Industrial	23.4%	65.0%	41.2%	0.6%	30.4%
Nonindustrial	41.2%	7.2%	42.3%	29.2%	35.3%
Tribal Timberlands	4.0%	2.5%	0.0%	1.1%	3.6%
Public Timberlands	31.4%	25.2%	16.5%	69.1%	30.7%
National Forest	29.2%	21.9%	10.1%	67.2%	28.2%
Other	2.2%	3.4%	6.4%	1.9%	2.5%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

**Table A2 and A3  
Timber Products Harvested by Ownership Source, 1988**

— Thousand Board Feet, Scribner —

Origin	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
Private Timberlands	449,412	173,300	4,866	5,656	633,234
Industrial	223,460	172,479	1,166	748	397,853
Nonindustrial	225,952	821	3,700	4,908	235,381
Tribal Timberlands	47,460	3,791	5,000	501	56,752
Public Timberlands	503,180	28,202	1,000	13,926	546,308
National Forest	464,997	17,606	1,000	13,200	496,803
Other	38,183	10,596	--	726	49,505
<b>Total</b>	<b>1,000,052</b>	<b>205,293</b>	<b>10,866</b>	<b>20,083</b>	<b>1,236,294</b>

— Percentage of Total —

Private Timberlands	44.9%	84.4%	44.8%	28.2%	51.2%
Industrial	22.3%	84.0%	10.7%	3.7%	32.2%
Nonindustrial	22.6%	40.0%	34.1%	24.4%	19.0%
Tribal Timberlands	4.7%	1.8%	46.0%	2.5%	4.6%
Public Timberlands	50.3%	13.7%	9.2%	69.3%	44.2%
National Forest	46.5%	8.6%	9.2%	65.7%	40.2%
Other	3.8%	5.2%	0.0%	3.6%	4.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

**Timber Products Harvested by Ownership Source, 1981**

— Thousand Board Feet, Scribner —

Origin	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
Private Timberlands	357,564	148,131	46,708	8,156	560,559
Industrial	189,225	125,550	a	a	351,744
Nonindustrial	168,339	22,581	a	a	208,815
Tribal Timberlands	22,854	-	-	-	22,854
Public Timberlands	356,081	74,745	6,389	14,449	451,664
National Forest	322,895	70,541	6,278	13,153	412,867
Other	33,186	4,204	111	1,269	38,797
<b>Total</b>	<b>736,499</b>	<b>222,876</b>	<b>53,097</b>	<b>22,605</b>	<b>1,035,077</b>

— Percentage of Total —

Private Timberlands	48.5%	66.5%	88.0%	36.1%	54.2%
Industrial	25.7%	56.3%	a	a	34.0%
Nonindustrial	22.9%	10.1%	a	a	20.2%
Tribal Timberlands	3.1%	0.0%	0.0%	0.0%	2.2%
Public Timberlands	48.3%	33.5%	12.0%	63.9%	43.6%
National Forest	43.8%	31.7%	11.8%	58.2%	39.9%
Other	4.5%	1.9%	0.2%	5.7%	3.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Note: a = less than 1 MMBF

**Table A4 and A5**  
**Timber Products Harvested by Ownership Source, 1976**

Thousand Board Feet, Scribner					
Origin	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
Private Timberlands	427,937	171,148	14,213	6,400	619,734
Industrial	238,277	141,441	a	a	397,604
Nonindustrial	189,696	29,707	a	a	222,130
Tribal Timberlands	27,820	9,581	251	22	37,674
Public Timberlands	404,529	75,071	11,028	12,398	503,026
National Forest	386,137	73,518	11,028	12,358	483,041
Other	18,392	1,553	-	40	19,985
Total	860,322	255,800	25,492	18,820	1,160,434
Percentage of Total					
Private Timberlands	49.7%	66.9%	55.8%	34.0%	53.4%
Industrial	27.7%	55.3%	a	a	34.3%
Nonindustrial	22.0%	11.6%	a	a	19.1%
Tribal Timberlands	3.2%	3.7%	1.0%	0.1%	3.2%
Public Timberlands	47.0%	29.3%	43.3%	65.9%	43.3%
National Forest	44.9%	28.7%	43.3%	65.7%	41.6%
Other	2.1%	0.6%	0.0%	0.2%	1.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: a - not disclosed.

**Ownership Source of Timber Products Delivered to Various Sectors of Industry, 1993**

Thousand Board Feet, Scribner				
Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
Private Timberlands	498,127	147,631	28,564	674,322
Industrial	195,816	118,481	10,828	325,125
Nonindustrial	302,311	29,150	17,736	349,197
Tribal Timberlands	31,726	4,268	220	36,214
Public Timberlands	273,060	48,525	21,528	343,113
National Forest	255,852	42,796	19,512	318,160
Other	17,208	5,729	2,016	24,953
Total	802,913	200,424	50,312	1,053,649
Percentage of Total				
Private Timberlands	62.0%	73.7%	56.8%	64.0%
Industrial	24.4%	59.1%	21.5%	30.9%
Nonindustrial	37.7%	14.5%	35.3%	33.1%
Tribal Timberlands	4.0%	2.1%	0.4%	3.4%
Public Timberlands	34.0%	24.2%	42.8%	32.6%
National Forest	31.9%	21.4%	38.8%	30.2%
Other	2.1%	2.9%	4.0%	2.4%
Total	100.0%	100.0%	100.0%	100.0%

## Appendix

**Table A6 and A7**  
**Ownership Source of Timber Products Delivered to Various**  
**Sectors of Industry, 1988**

Thousand Board Feet, Scribner				
Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
Private Timberlands	436,143	173,300	10,875	620,318
Industrial	234,550	172,479	2,376	409,405
Nonindustrial	201,593	821	8,499	210,913
Tribal Timberlands	37,886	3,791	5,501	47,178
Public Timberlands	479,303	34,482	21,199	534,984
National Forest	441,135	23,886	14,856	479,877
Other	38,168	10,596	6,343	55,107
Total	953,332	211,573	37,575	1,202,480
Percentage of Total				
Private Timberlands	45.7%	81.9%	28.9%	51.6%
Industrial	24.6%	81.5%	6.3%	34.0%
Nonindustrial	21.1%	0.4%	22.6%	17.5%
Tribal Timberlands	4.0%	1.8%	14.6%	3.9%
Public Timberlands	50.3%	16.3%	56.4%	44.5%
National Forest	46.3%	11.3%	39.5%	39.9%
Other	4.0%	5.0%	16.9%	4.6%
Total	100.0%	100.0%	100.0%	100.0%

**Ownership Source of Timber Products Delivered to Various**  
**Sectors of Industry, 1981**

Thousand Board Feet, Scribner				
Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
Private Timberlands	356,409	148,131	57,669	562,209
Industrial	189,225	125,550	37,229	352,004
Nonindustrial	167,184	22,581	20,440	210,205
Tribal Timberlands	22,854	-	425	23,279
Public Timberlands	361,262	78,417	24,343	464,022
National Forest	328,076	74,213	23,361	425,650
Other	33,186	4,204	982	38,372
Total	740,525	226,548	82,437	1,049,510
Percentage of Total				
Private Timberlands	48.1%	65.4%	70.0%	53.6%
Industrial	25.6%	55.4%	45.2%	33.5%
Nonindustrial	22.6%	10.0%	24.8%	20.0%
Tribal Timberlands	3.1%	0.0%	0.5%	2.2%
Public Timberlands	48.8%	34.6%	29.5%	44.2%
National Forest	44.3%	32.8%	28.3%	40.6%
Other	4.5%	1.9%	1.2%	3.7%
Total	100.0%	100.0%	100.0%	100.0%

**Table A8**  
**Ownership Source of Timber Products Delivered to Various**  
**Sectors of Industry, 1976**

Thousand Board Feet, Scribner				
Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
Private Timberlands	356,409	148,131	57,669	562,209
Industrial	189,225	125,550	37,229	352,004
Nonindustrial	167,184	22,581	20,440	210,205
Tribal Timberlands	22,854	-	425	23,279
Public Timberlands	361,262	78,417	24,343	464,022
National Forest	328,076	74,213	23,361	425,650
Other	33,186	4,204	982	38,372
<b>Total</b>	<b>740,525</b>	<b>226,548</b>	<b>82,437</b>	<b>1,049,510</b>
Percentage of Total				
Private Timberlands	48.1%	65.4%	70.0%	53.6%
Industrial	25.6%	55.4%	45.2%	33.5%
Nonindustrial	22.6%	10.0%	24.8%	20.0%
Tribal Timberlands	3.1%	0.0%	0.5%	2.2%
Public Timberlands	48.8%	34.6%	29.5%	44.2%
National Forest	44.3%	32.8%	28.3%	40.6%
Other	4.5%	1.9%	1.2%	3.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

## Appendix

**Table A9**  
**Destination of Primary Forest Products Shipments by Value of Shipment, 1993**

Thousand 1993 Dollars										
Product	MT	Rocky Mountain	Far West	North Central	South	Northeast	Canada	Pacific Rim Countries	Other Exports	All Destinations
Lumber and Other Sawn Products	97,366	106,278	50,072	280,295	115,116	45,415	1,074	5,150	2,926	703,692
Plywood	17,567	14,782	23,037	91,490	12,345	26,919	2,317	-	-	188,457
Residue-Related Products <sup>a</sup>	4,609	61,397	117,368	108,415	16,502	1,705	17,604	35,192	6,362	369,154
House Logs	12,681	17,692	9,243	10,074	4,890	3,652	22	2,315	25	60,594
Posts, Small Poles, Utility Poles and Cedar Products	6,763	1,276	1,414	2,301	1,686	-	193	18	-	13,651
All Products	138,986	201,425	201,134	492,575	150,539	77,691	21,210	42,675	9,313	1,335,548
Lumber and Other Sawn Products	14%	15%	7%	40%	16%	6%	0%	1%	0%	100%
Plywood	9%	8%	12%	49%	7%	14%	1%	0%	0%	100%
Residue-Related Products <sup>a</sup>	1%	17%	32%	29%	4%	0%	5%	10%	2%	100%
House Logs	21%	29%	15%	17%	8%	6%	0%	4%	0%	100%
Posts, Small Poles, Utility Poles and Cedar Products	50%	9%	10%	17%	12%	0%	1%	0%	0%	100%
All Products	10%	15%	15%	37%	11%	6%	2%	3%	1%	100%

Note: a - pulp, paper, particleboard and fiberboard and other residue-related products.

**Table A10**  
**Destination of Primary Forest Products Shipments by Value of Shipment, 1988**

Product	MT	Rocky Mountain	Far West	North Central	South	Northeast	Canada	Other Exports	Unknown	All Destinations
Lumber and Other Sawn Products	25,357	33,891	40,341	170,510	62,542	37,746	3,288	2,899	8,451	385,025
Plywood	4,268	10,197	4,489	61,111	7,518	17,669	382	23	8	105,665
Residue-Related Products*	6,659	43,610	103,320	120,322	14,021	7,405	71,185	-	-	366,522
House Logs	3,748	5,755	4,432	5,638	4,270	3,608	-	2,091	-	29,542
Posts, Small Poles, and Utility Poles	3,899	1,306	2,765	1,776	0	0	-	17	-	9,763
Cedar Products	266	26	18	461	199	186	-	-	-	1,156
All Products	44,197	94,785	155,365	359,818	88,550	66,614	79,885	8,459	-	897,673
Lumber and Other Sawn Products	7%	9%	10%	44%	16%	10%	1%	1%	2%	100%
Plywood	4%	10%	4%	58%	7%	17%	a	a	a	100%
Residue-Related Products*	2%	12%	28%	33%	4%	2%	19%	0%	0%	100%
House Logs	13%	19%	15%	19%	14%	12%	0%	7%	0%	100%
Posts, Small Poles, and Utility Poles	40%	13%	28%	18%	0%	0%	0%	a	0%	100%
Cedar Products	23%	2%	2%	40%	17%	16%	0%	0%	0%	100%
All Products	5%	11%	17%	40%	10%	7%	9%	1%	0%	100%

Note: a - pulp, paper, particleboard and fiberboard and other residue-related products.

## Appendix

**Table A11**  
**Destination of Primary Forest Products Shipments by Value of Shipment, 1981**

Product	MT	Rocky Mountain	Far West	North Central	South	Northeast	Canada	Unknown	All Destinations
Lumber and Other Sawn Products	31,223	33,104	17,868	76,027	24,204	11,071	4,651	22,066	220,214
Plywood	3,489	11,426	16,275	33,241	8,474	13,962	6,905	-	93,772
Residue-Related Products <sup>a</sup>	1,019	28,484	85,582	72,605	15,983	6,888	3,198	-	213,759
House Logs	1,387	1,645	1,428	2,672	399	100	-	100	7,731
Posts, Small Poles, and Utility Poles	2,152	556	1,029	860	-	-	146	715	5,458
Cedar Products	223	878	100	1,376	823	527	-	-	3,927
All Other Products	1,637	2,054	421	4,016	4,680	3,392	317	24	16,541
All Products	41,130	78,147	122,703	190,797	54,563	35,940	15,217	22,905	561,402
Lumber and Other Sawn Products	14%	15%	8%	35%	11%	5%	2%	10%	100%
Plywood	4%	12%	17%	35%	9%	15%	7%	a	100%
Residue-Related Products <sup>a</sup>	a	13%	40%	34%	7%	3%	1%	0%	100%
House Logs	18%	21%	18%	35%	5%	1%	0%	1%	100%
Posts, Small Poles, and Utility Poles	39%	10%	19%	16%	0%	0%	3%	13%	100%
Cedar Products	6%	22%	3%	35%	21%	13%	0%	0%	100%
All Other Products	10%	12%	3%	24%	28%	21%	2%	a	100%
All Products	7%	14%	22%	34%	10%	6%	3%	4%	100%

Note: a - pulp, paper, particleboard and fiberboard and other residue-related products.

**Table A12**  
**Destination of Primary Forest Products Shipments by Value of Shipment, 1976**

Product	MT	Rocky Mountain	Far West	North Central	South	Northeast	Canada	Other Exports	Unknown	All Destinations
Lumber and Other Sawn Products	26,480	21,130	5,727	92,447	19,211	12,784	2,270	406	17,572	198,027
Plywood	6,638	12,128	12,336	31,235	6,678	11,629	2,017	2,764	0	85,425
Residue-Related Products <sup>a</sup>	b	b	b	b	b	b	b	b	b	b
House Logs	1,607	1,517	1,134	470	597	15	0	0	0	5,340
Posts and Poles	3,886	963	42	1,609	0	0	139	86	5	6,730
All Other Products	84	681	182	579	309	0	0	35	150	2,020
Lumber and Other Sawn Products	13%	11%	3%	47%	10%	6%	1%	b	9%	100%
Plywood	8%	14%	14%	37%	8%	14%	2%	3%	0%	100%
Residue-Related Products <sup>a</sup>	b	b	b	b	b	b	b	b	b	b
House Logs	30%	28%	21%	9%	11%	0%	0%	0%	0%	100%
Posts and Poles	58%	14%	1%	24%	0%	0%	2%	1%	0%	100%
All Other Products	4%	34%	9%	29%	15%	0%	0%	2%	7%	100%

Note: a - pulp, paper, particleboard and fiberboard and other residue-related products.  
 b - not disclosed.

