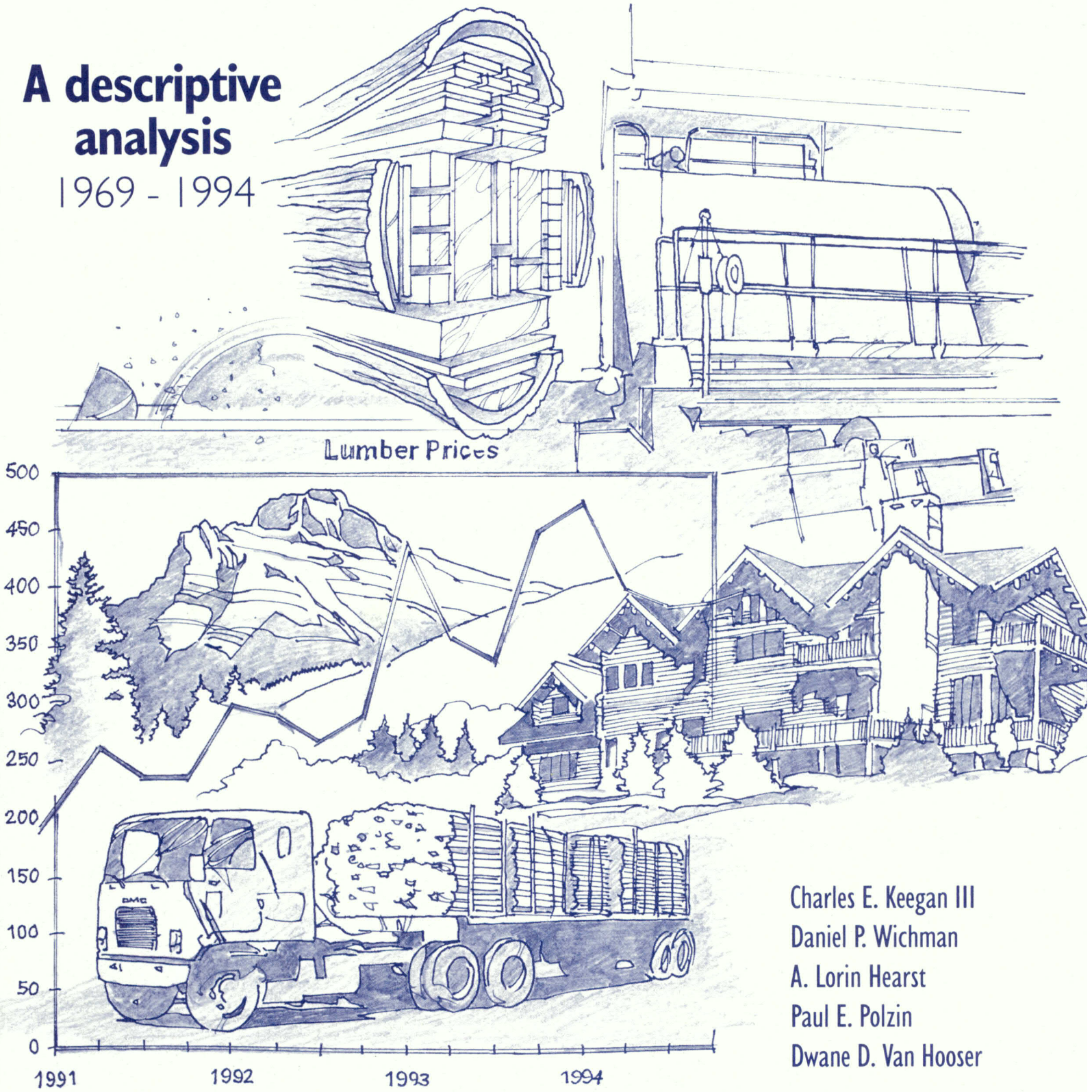
Montana's Forest Products Industry

A descriptive analysis

1969 - 1994



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BACKGROUND

This monograph presents a detailed look at Montana's primary forest products industry. It is based on a census of the industry done to collect information for calendar year 1993 and on earlier censuses that collected information for 1969, 1976, 1981, and 1988. Detailed comparisons are made for these years; other sources have been used to provide information for intervening years and, where possible, to provide information for 1994 and years prior to 1969.

The periodic censuses are a cooperative effort involving the Bureau of Business and Economic Research at The University of Montana and the U.S. Forest Service, Intermountain Research Station, Inventory Monitoring and Evaluation Program in Ogden, Utah. They are the major source of data for an ongoing system designed to provide reliable and consistent information on the operations of the forest products industry for the 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 produced from that timber.

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

- 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
- Beginning and ending inventory levels for raw materials and finished products

Almost all of the firms processing Montana's timber harvest cooperated in the 1993 census. For the few firms who did not respond, estimated log purchases and wood product outputs were made in an attempt to include all of Montana's forest industry. Firms in other states were contacted to determine the volume and type of timber they received from Montana.

The census program collects data every five to seven years on Idaho and Montana's industry, and at longer intervals for the other Rocky Mountain states.

Information collected through the FIDACS is stored at The University of Montana, Bureau of Business and Economic Research. This plus other information is available by request. Individual firm data are confidential and will not be released.

Montana's Forest Products Industry: The Past 25 Years

The past 25 years have seen periods of extreme contrast for Montana's forest products industry. The 1970s saw diversification and strong markets, which led to increases in sales value and employment. Full- and part-time employment increased from about 10,000 workers in 1969 to more than 13,000 workers in the late 1970s. Timber harvest actually declined slightly in the 1970s, but increased employment came about as structural changes during the 1970s led to increased substitution of the more labor-intensive plywood

industry for a portion of the sawmill industry and expansion of sectors using waste wood from sawmills and plywood plants.

Also influencing labor intensity and sales value in the 1970s were the extremely good wood products markets. These very strong markets came to an abrupt halt in late 1979 and the industry entered a six-year period that was, to that time, the most difficult extended operating period since the Great Depression.

That six-year period began with a sharp drop in U.S. housing and construction industries beginning in the last quarter of 1979. Those recession-like conditions in the construction industry ended in the last quarter of 1982. The years 1983 through 1985 saw record levels of wood products consumption in the United States, particularly in 1984 and 1985, but very low prices, due in large part to the very high value of the U.S. dollar and increased imports of Canadian softwood lumber.

Markets improved in the last half of the 1980s with continued high consumption and a lower valued U.S. dollar. Montana's industry responded with record sales and production. Employment, on the other hand, dropped from the peak 1978 level of just under 13,500 workers to an annual average of 11,645 workers in the last half of the 1980s.

The lower employment was due primarily to:

- Increased mechanization and other cost cutting efforts in response to very competitive markets in the 1980s.

- A shift to less labor-intensive manufacturing facilities—stud mills and sawmills for processing small diameter timber.

The decade of the 1990s began with a relatively mild national recession followed by a recovery in 1992 and 1993 but the major factor impacting Montana's and the North American forest products industry was not national economic conditions but rather was limited timber availability both in Montana and throughout the western United States.

Even with the economic recovery, Montana's timber harvest in 1993 and 1994 was about 25 percent below the average annual harvest in the last half of the 1980s. The major factor behind this decline was an approximate 50 percent drop in the harvest from national forests, due to a number of constraints including; threatened and endangered species protection, appeals and litigation of timber sales, cumulative impacts of past harvesting, and constrained Forest Service budgets.

The private harvest in Montana actually increased slightly since the last half of the 1980s in spite of a 30 percent decline in the harvest from the industrial component. The harvest from the industrial forest lands declined because the timber inventory volumes were not adequate to sustain the high harvest levels of the 1980s. However, the harvest on nonindustrial private timberlands doubled in response to an approximate fourfold increase in prices paid for timber on the stump.

Timber harvest throughout the west dropped sharply over this period. Most of the impact was in the northwest; the harvest in Idaho, Oregon, and Washington dropped by one-third or 5 billion board feet from the late 1980s. A modest recovery in the U.S. construction industry coupled with reduced timber availability led to dramatically higher timber and wood products prices.

When measured by sales value, the performance of Montana's forest products industry appears to be a typical recession recovery pattern with a very dramatic upswing in sales. Adjusted for inflation, Montana's 1993 primary wood and paper products industry sales of $1.3 billion represent an industry record-exceeding the previous high (1987) by nearly 15 percent. This record sales value occurred in spite of the limited timber availability and subsequently limited output from Montana mills. Overall,

lumber production was down about 14 percent in 1993 relative to the late 1980s. Sales in 1994 were down slightly but still exceeded any year previous to 1993.

Despite a decrease in harvest of about 25 percent through 1994, there was very little change in Montana' s wood and paper products employment. In 1993, employment at 11,700 workers actually exceeded levels of the late 1980s (average employment of 11,645 from 1985 -1989) and even with several major closures and curtailments, employment in 1994 was 11,091 workers. Employment remained at near late 1980s levels because in 1993 and 1994 there were considerably more workers per unit volume of timber harvested.

This increased labor intensity was due to several factors:

- Very high prices for timber and manufactured wood products providing incentives to use more labor to recover maximum value and to use lower quality timber which requires more effort to harvest and process

- An increase in the volume of timber coming into Montana from other states and from Canada

- A change to logging practices which are more visually and biologically sensitive, making harvesting more labor-intensive

- Growth in some labor-intensive components of the industry such as the log home sector as well as some increased secondary wood products manufacturing

While there was only a very small decline in employment, capacity to process timber fell by 25 percent from record levels in the late 1980s. In addition, the operating conditions in 1993, 1994, and 1995 were very unstable. For example, lumber prices were very high but were also the most volatile on record. Prices declined sharply in the first half of 1995 due to a weak economy in the U.S. and overseas and high imports of Canadian lumber. Timber prices, while down from record levels in 1993 and 1994, are well above the prices of prior years. Timber availability remains uncertain in light of continued harvest declines on the national forests in 1995 and the unknown response of nonindustrial forest land owners to somewhat lower stumpage prices.

HIGHLIGHTS OF THE REPORT

The Forest Products Industry in Montana

- A total of 192 primary forest products plants operated in Montana in 1993, up 13 from 1988. The increase is entirely in the log home sector. In 1993 there were 86 sawmills, four plywood plants, a medium density fiberboard plant, a particleboard plant, a pulp and paper mill, 59 house log and log home plants, 31 post and pole plants, two cedar products plants, a utility pole plant, five wood pellet plants, and an electricity-generating facility.

- In spite of an increase in the number of mills operating in the state, the industry's capacity to process sawtimber has decreased dramatically since the late 1980s with capacity declining 20 percent from 1,561 million board feet (MMBF) Scribner in 1988 to 1,251 MMBF in 1993. Capacity declined even further to 1,180 MMBF in 1994. The reduction was due to a sharp decline in timber available from national forests and industrial private timberlands.

- Even with lower capacity and timber processed in the state, because of record or near record product prices, sales value of Montana's primary wood and paper products were a record $1,336 million in 1993. When adjusted for inflation, this is up almost 15 percent from the previous record in 1987.

- Over 94 percent of sales were from three sectors: sawmills-53 percent, plywood plants-14 percent, and the residue utilizing sector (the kraft pulp and paper mill, the particleboard plant, the medium density fiberboard plant, wood fuel pellet producers, and the electricity generating plant)-27 percent.

- Because of product prices, sawmills and plywood plants combined had an inflation-adjusted sales increase of about 50 percent ($596 million to $892 million) from 1988 to 1993. Due mostly to lower paper prices, the residue-utilizing sector's sales decreased 17 percent from $446 million (1993 dollars) in 1988 to $369 million in 1993.

- Other industry sectors (log home, utility pole, cedar products, and post and pole) experienced a combined inflation-adjusted sales increase of 56 percent between 1988 and 1993. Most of this increase was in the log home sector where sales increased 69 percent.

- 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 1,367 million board feet (MMBF) lumber tally in 1993, over 4 percent of total U.S. output of softwood lumber and about 3 percent of consumption. This is down from the record 1,640 MMBF in 1987.

- Lumber sales were a near record $704 million in 1993, second only to 1973 when inflation-adjusted lumber sales were $743 million.

- Montana's four plywood plants produced 687 million square feet (MMSF) 3/8-inch basis of plywood in 1993, accounting for nearly 3 percent of structural panel production in the U.S. This is down from the record 725 MMSF in 1989.

- Ninety-nine percent of the wood fiber residue generated by Montana's sawmills and plywood plants was utilized in 1993, the highest level of utilization on record. Residue utilization was high because of increased use and low lumber production resulting in low residue volume production.

Timber Harvest and Utilization

- Montana's 1993 timber harvest was one billion board feet, Scribner. This was down 19 percent from the 1988 census year and is 27 percent below the record harvest of 1,376 million board feet (MMBF) in 1987. The reduction can be attributed to an approximate 50 percent decline in the harvest from Montana's national forests and about a 30 percent decline in harvest from industrial private timberlands.

- In spite of the harvest decline from industrial private lands, Montana's private timber harvest in 1993 actually exceeded that of the late 1980s because the harvest from nonindustrial private timberlands doubled in response to an approximate fourfold increase in prices paid for timber on the stump.

- Private timberlands supplied 66 percent of the state's harvested timber in 1993 an increase over 51 percent in 1988. National forests supplied 28 percent of the 1993 harvest, a decline from 40 percent in 1988.

- Ninety percent of the state's 1993 timber harvest came from 22 western counties: the eastern counties are becoming more important, providing 102 MMBF of timber in 1993-40 percent more than the harvest from those counties in 1988, 4 times that of 1981 and 20 times that of 1976.

- Montana mills received 79 MMBF of timber harvested in adjacent states, primarily Idaho, while out-of-state firms processed about 27 MMBF of Montana timber, making Montana a net importer of 52 MMBF of timber in 1993. This is a switch from 1988 when Montana was a net exporter of 33 MMBF of timber.

- About 79 percent of Montana's 1993 timber harvest went to sawmills for processing. Plywood plants received 17 percent, and the pulp and paper industry received almost 3 percent. The remainder of the harvest went to utility pole plants, house log plants, post and pole plants, and cedar products manufacturers.

- Flathead County continues to be the state's leading timber processing county with 274 MMBF of timber processed in 1993. Lincoln County was second with 177 MMBF processed followed by Missoula County with 168 MMBF.

Forest Products and the Montana Economy

- In spite of a 25 percent decline in timber harvest, Montana's forest industry employment of 11,700 in 1993 actually exceeded levels of the late 1980s, because of increased labor intensity. In 1994, Montana's forest products industry employment was about 11,100 workers.

- Earnings by forest industry workers (labor income) totaled $385 million in 1993. This was actually higher than for any year in the late 1980s (as measured in constant 1993 dollars). Forest industry labor income in 1994 of $369 million when adjusted for inflation is equal to the annual average for the last half of the 1980s.

- Measured in terms of labor income, the forest products industry in the 1990s was the third largest basic industry sector in Montana, exceeded only by the federal government (which also is considered basic to the state) and agriculture. The industry accounted for just under 14 percent of the state's economic base as measured by labor income and 10 percent of the state's economic base as measured by employment.

- The industry is concentrated in western Montana where nine contiguous counties account for over 80 percent of the industry's labor income. In this nine-county area, the industry represents 41 percent of the local economic base. This is down from more than 50 percent at its peak in 1978.

- Outside of western Montana there are 10 counties in which more than 5 percent of basic labor income is in forest products and of these, Broadwater and Wheatland have over one third of basic labor income in the forest products industry.

Section 1

Structure of the Industry

The Structure of Montana's Forest Products Industry

Structure and Location

The 1993 census identified 192 active forest products plants in Montana-13 more than in 1988-that produce an array of products including lumber and other sawn products, plywood, pulp and paper, particleboard, medium density fiberboard, house logs, utility poles, posts, small poles, tree props, cedar products, wood pellets, and some byproducts of the pulp and paper industry such as tall oils and turpentine.

The higher number of forest products plants in the 1993 census was due entirely to growth in the log home/house log sector, which increased by 24 plants from 1988 to 1993 (table 1). In contrast, the largest decline was among post and pole plants with six fewer active facilities than in 1988. The number of active sawmills-the largest component of Montana's industry-decreased by one, from 87 to 86. Since 1988, one of three cedar products plants and one of the two utility pole facilities closed. The number of plywood, particleboard, medium density fiberboard, and pulp and paper facilities remained unchanged from 1988. The number of wood fuel pellet facilities decreased by one, and the one wood burning, electricity-generating facility was still operating.

Wood and paper product manufacturing facilities operated in 32 of Montana's 56 counties, however, 159 of the 192 plants were in 16 western and southwestern Montana counties (figure 1). Flathead County contained 32 active timber processing facilities in 1993, more than any other county, followed by Ravalli County with 27 (19 of them log home facilities). Four other counties had more than ten facilities each: Missoula with 20, Gallatin with 14, Lincoln with 14, and Sanders with 11.

Figure 1
Location of Montana's Active Forest Products Plants, 1993

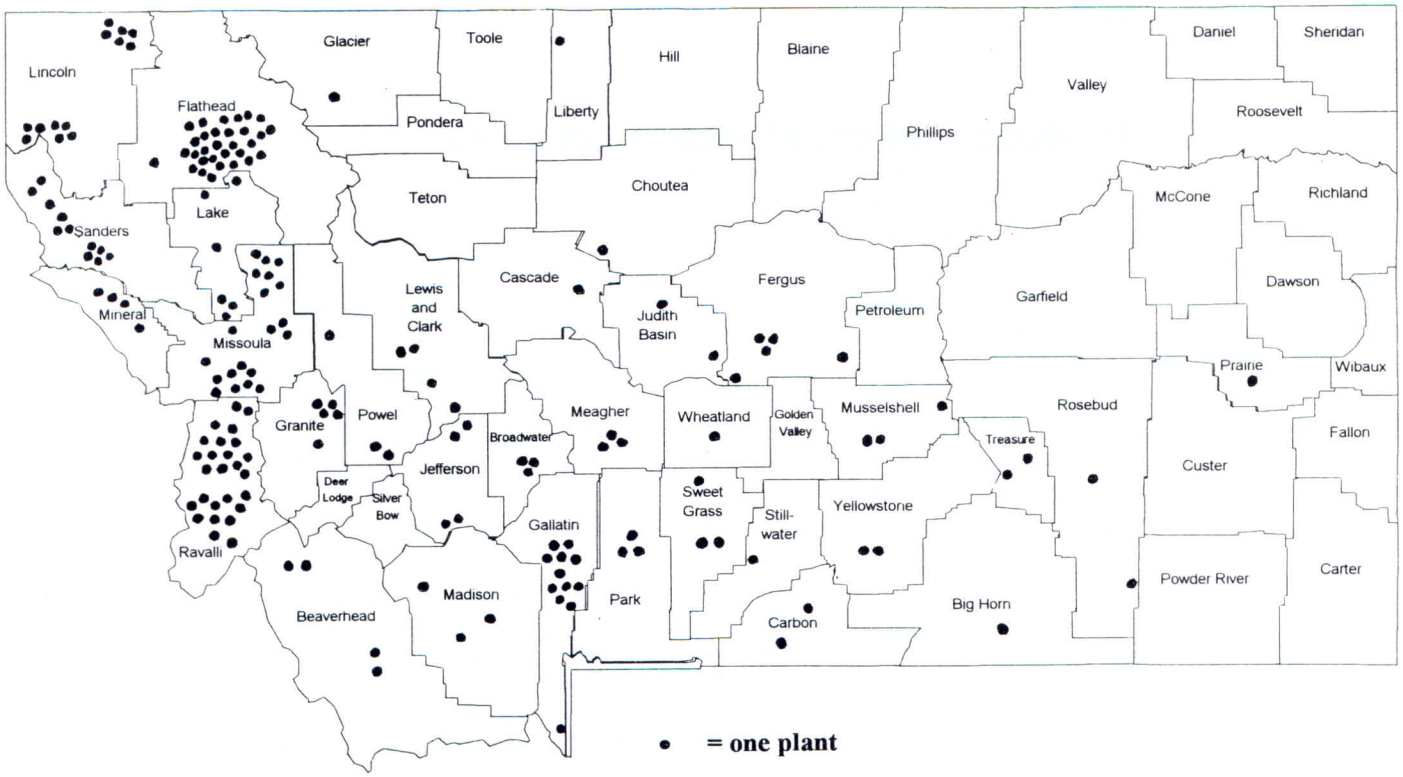


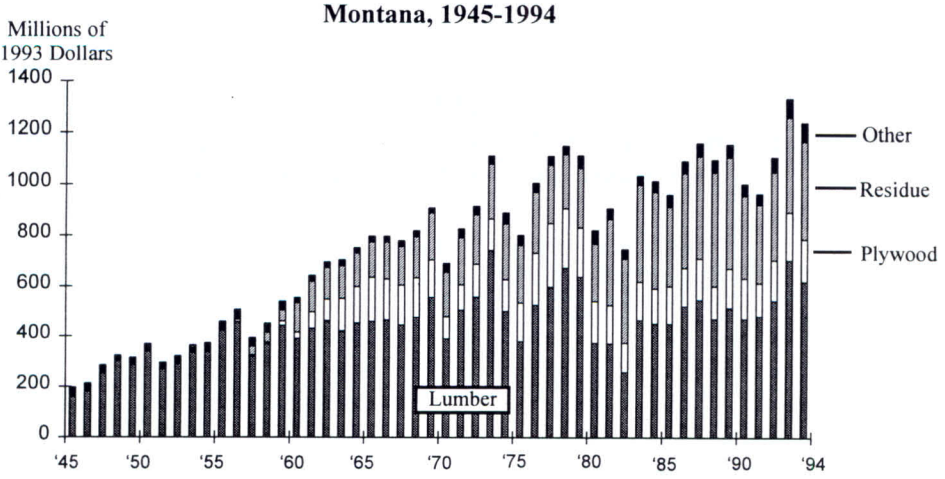
Table 1
Number of Active Primary Forest Products Manufacturing Facilities by County and Product Produced, 1993

County	Lumber	Plywood	Particleboard and Fiberboard	Pulp and Paper	Posts and Poles	Log Homes	Cedar Products	Utility Poles	Other Facilities*	Total
Beaverhead	2	-	-	-	1	1	-	-	-	4
Bighorn	1	-	-	-	-	-	-	-	-	1
Broadwater	2	-	-	-	1	-	-	-	-	3
Carbon	-	-	-	-	-	2	-	-	-	2
Cascade	1	-	-	-	-	-	-	-	-	1
Chouteau	1	-	-	-	-	-	-	-	-	1
Custer	1	-	-	-	-	-	-	-	-	1
Fergus	5	-	-	-	-	-	-	-	-	5
Flathead	17	2	1	-	7	5	-	-	-	32
Gallatin	2	-	-	-	1	10	-	1	-	14
Granite	4	-	-	-	1	-	-	-	-	5
Jefferson	1	-	-	-	2	1	-	-	-	4
Judith Basin	1	-	-	-	1	-	-	-	-	2
Lake	4	-	-	-	1	1	-	-	1	7
Lewis & Clark	2	-	-	-	1	-	-	-	1	4
Liberty	1	-	-	-	-	-	-	-	-	1
Lincoln	5	1	-	-	-	4	1	-	3	14
Madison	1	-	-	-	1	1	-	-	-	3
Meagher	1	-	-	-	1	1	-	-	-	3
Mineral	2	-	-	-	1	1	-	-	-	4
Missoula	7	1	1	1	3	6	1	-	-	20
Musselshell	2	-	-	-	1	-	-	-	-	3
Park	2	-	-	-	1	-	-	-	-	3
Powell	2	-	-	-	-	2	-	-	-	4
Ravalli	3	-	-	-	4	19	-	-	1	27
Rosebud	2	-	-	-	-	-	-	-	-	2
Sanders	7	-	-	-	2	2	-	-	-	11
Stillwater	1	-	-	-	-	-	-	-	-	1
Sweetgrass	2	-	-	-	-	1	-	-	-	3
Treasure	2	-	-	-	-	-	-	-	-	2
Wheatland	2	-	-	-	1	-	-	-	-	3
Yellowstone	-	-	-	-	-	2	-	-	-	2
1993 Total	86	4	2	1	31	59	2	1	6	192
1988 Total	87	4	2	1	37	35	3	2	8	179
1981 Total	142	4	2	1	35	27	8	3	3	225
1976 Total	98	5	2	1	37	19	9	3	1	175

* Other Facilities include wood fuel pellet mills, planing mills, and a wood-fired energy generating facility.

Source: BBER, The University of Montana-Missoula.

Figure 2
Sales Value of Manufactured Wood and Paper Products, Montana, 1945-1994



Sources: Setzer, T.S., 1971. *Estimates of Timber Products Output and Plant Residues, Montana, 1969;* USDA For. Serv., Int. For. and Range Exp. Stn, Res. Note INT-133, Ogden, Utah; Western Wood Products Association, Statistical Yearbook(s) of the Western Lumber Industry, (various years), Portland Oregon; and BBER, The University of Montana-Missoula.

Sales Value of Primary Wood and Paper Products and Changes by Industry Sector, 1945-1994

The periodic censuses, of which 1993 is the most recent, represent the best estimates of sales value for Montana's 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 1994. This section presents the sales value of products manufactured by the primary wood and paper products industry for that period (figure 2) and discusses sales for the years in which a complete census of the forest products industry was done.

In 1993, due to high prices for lumber and other wood products, the total sales value of the output from Montana's primary wood and paper products industry was a record $1,336 million, free on board (f.o.b.), the mills (table 2). This is up 15 percent from the previous record, $1,161 million (1993 dollars) set in 1987. Sales in 1994 were an estimated $1,260 million (1993 dollars).

Growth in Montana's industry following World War II was due first to expansion of the sawmill sector, and second to the start of diversification of products and increased utilization of the available timber resource. Prior to 1956, Montana's industry was dominated by sawmills, which 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 two other major sectors: the plywood sector and the residue-utilizing sector. The major residue-utilizing plants, designed to use what had been waste wood from the production of lumber

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

	Millions of 1993 Dollars				
	1969	1976	1981	1988	1993
Lumber, structural timbers, and railroad ties	$557.7	$506.7	$363.3	$467.8	$703.7
Plywood	$148.2	$199.3	$147.6	$128.4	$188.5
Residue-related products	$185.9	$229.6	$335.4	$446.3	$369.3
House logs	---	$16.3	$16.4	$35.8	$60.6
Posts, small poles, utility poles, and cedar products	$18.2	$15.8	$15.8	$11.8	$13.7
Total	$910.1	$967.7	$878.5	$1,090.2	$1,335.7
	Percent of Total Sales				
Lumber, structural timbers, and railroad ties	61%	52%	41%	43%	53%
Plywood	16%	21%	17%	12%	14%
Residue-related products	20%	24%	38%	41%	27%
House logs	0%	2%	2%	3%	5%
Posts, small poles, utility poles, and cedar products	2%	2%	2%	1%	1%
Total	100%	100%	100%	100%	100%

Sources: Setzer, T.S., 1971. *Estimates of Timber Products Output and Plant Residues, Montana, 1969;* USDA For. Serv., Int. For. and Range Exp. Stn, Res. Note INT-133, Ogden, Utah.; and BBER, The University of Montana-Missoula.

and plywood, were and still are today a pulp and paper mill, a particleboard plant, and a medium-density fiberboard plant. Since 1956, these three sectors (lumber, plywood, and residue-using facilities) have accounted for about 95 percent of the total sales value. During the 1960s and 1970s, the plywood and residue-utilizing sectors' sales value grew in size relative to the sawmill sector's. In the 1980s, sales value of lumber from sawmills contributed less than half the total value for Montana's primary forest products industry.

In 1993, these three major sectors accounted for $1,261 million in sales and 94 percent of industry sales. In spite of lower production, both the sawmill sector and the plywood sector increased their proportionate share of total sales from 1988 to 1993 because of high lumber and plywood prices in 1993 and poor paper product markets that year. While sawmills and plywood plants saw inflation-adjusted sales increase by almost half from $596 to $892 (1993 dollars) between 1988 and 1993, the residue-using sector showed a substantial decline in inflation-adjusted sales from $446 million (1993 dollars) in 1988 to $369 million in 1993.

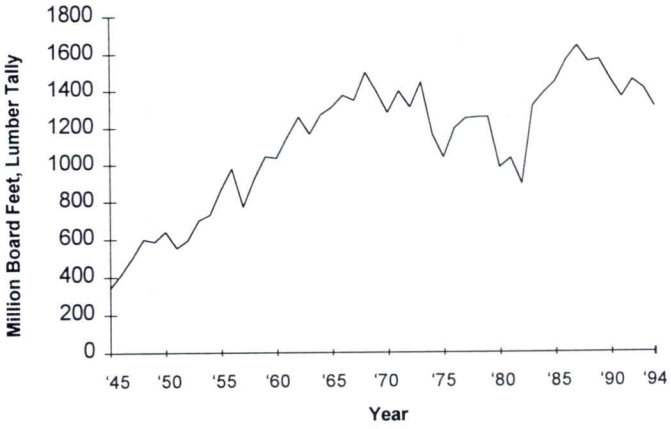
Among the other segments of Montana's industry, the major change has been the continued increase in the size of the log home sector, which showed a 69 percent increase in sales between 1988 and 1993. This increase has been due to higher wood product prices in general, as well as a shift to higher value log homes and resort log buildings. The sales of posts, small poles, utility poles, and cedar products also showed increases between 1988 and 1993-from $12 million to $14 million, a 16 percent jump. The increase is due to higher prices, with these sectors all experiencing declining production from 1988 to 1993. Further detail on the individual sectors is provided in the next few pages.

The Sawmill Sector

Montana's sawmills produced more than 1.3 billion board feet of lumber and other sawn products in 1993, almost all from softwoods. The species most commonly used were Douglas-fir, lodgepole pine, ponderosa pine, Engelmann spruce, western larch, subalpine and grand fir, western hemlock, western redcedar, and western white 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, but about two-thirds of the sawmill output is dimension lumber-generally two inches in thickness (nominal) and most commonly used in construction.

Based on sales value, timber processed, number of facilities, or almost any other type of measure, sawmills remain the largest component of Montana's forest products industry. In 1993, Montana's 86 active sawmills processed about 78 percent of the timber used by the state's industry to produce 1,367 million board feet (MMBF) lumber tally of lumber. This represents over 4 percent of the total U.S. production of softwood lumber and about 3 percent of U.S. consumption. The 1993 lumber sales value of $704 million was near record

Figure 3
Montana Lumber Production, 1945-1994



Source: Western Wood Products Association, Statistical Yearbook(s) of the Western Lumber Industry, (various years), Portland, Oregon.

level, second only to 1973-$743 million 1993 dollars (Western Wood Products Association, 1982).

Recent increases in lumber sales were the result of high lumber prices, rather than increased lumber production. Lumber shipments in 1993 were about 11 percent lower than the 1986-1989 average, but 1993 lumber sales were 38 percent higher than the inflation-adjusted 1986-1989 average. As indicated in the introduction, record prices for lumber and other wood products reflect a reduction in timber harvest, particularly from public lands in the western United States, coupled with a strong national economy.

Changes in Lumber Production: 1945 - 1993

A number of factors have affected Montana's lumber production over the last 50 years. These include: 1) fluctuating markets for lumber and wood products, 2) changes in timber availability, 3) increased recovery of lumber per unit volume of log input, and 4) management decisions by the industry to process more timber into plywood rather than into 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 encouraged increased harvest on private lands too (Flowers et al. 1993).

In particular 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, 1) a nearly 20 percent increase in timber harvest, and 2) increased recovery of lumber per unit volume of timber processed. These two factors more than offset the shift

of timber to the newly developing plywood industry. Plywood plants utilize timber that can be processed by sawmills, and by the late 1960s, plywood plants consumed more than 10 percent of the timber harvest and sawmills 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 and at the same time there were substantial reductions in timber harvest from national forest lands that 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. Five years later however, in 1987, Montana sawmills had 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 volume 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, and in the last half of the 1980s, they had large volumes of unharvested national forest timber under contract. Also, because of improved wood products markets and management decisions by individual companies, industrial timberland owners accelerated the harvest of their timber to record levels in the same period (Flowers et al. 1993). A reduction in lumber production from 1987 to 1993 resulted from a sharp decline in timber availability. Total timber harvest in Montana fell by 25 percent, driven primarily by a 50 percent decline in the national forest timber program relative to the late 1980s. 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 timber harvest from industrial private forest lands also declined because the timber inventory volume was not adequate to sustain the high harvest levels of the late 1980s.

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

Year	Timber Processed (MMBF)[1]	Lumber Production (MMBF)[2]	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

[1]Million board feet, Scribner Decimal C, log scale.
[2]Million board feet, lumber tally.

Source: BBER, The University of Montana-Missoula.

Lumber Overrun

Since the 1976 census, there has been a nearly 30 percent improvement in the volume of lumber recovered per board foot of log volume processed. In 1993, Montana sawmills produced about 1,367 MMBF lumber tally of lumber by processing about 782 MMBF, Scribner Decimal C, of logs for an overrun of 1.75 (table 3). This compares to overruns of 1.30 in 1976, 1.45 in 1981, and 1.58 in 1988. The increased output per unit of input (overrun) is due to many factors:

1) 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. Additional sensing or scanning equipment helps saw the boards to proper widths and lengths, maximizing the recovery of volume or value. Thinner kerf saws reduce the proportion of the log that becomes sawdust.

2)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. To illustrate, stud mills, based primarily on

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

County or County Group	1993 Lumber Production (MMBF)	—Percent of Lumber Production— 1993	1988	1981	1976
Flathead	305	22%	22%	21%	21%
Lincoln	259	19%	22%	18%	18%
Lake/Sanders	158	12%	11%	13%	14%
Missoula	152	11%	10%	20%	20%
Mineral/Granite/Ravalli	174	13%	11%	9%	10%
Beaverhead/Broadwater/ Gallatin/Lewis & Clark/ Madison/Meagher/Park/ Powell	272	20%	20%	19%	17%
Rest of State	47	3%	4%	a	a
State Total	1,367	100%	100%	100%	100%

Source: BBER, The University of Montana-Missoula.

small logs, comprised 18 percent of the timber processed by Montana sawmills in 1976 compared to 53 percent in 1993, and lodgepole pine-a small diameter species-comprised 24 percent of the timber processed by Montana sawmills in 1976 and 31 percent in 1993.

3) High lumber prices in 1993 certainly influenced overrun upward. When lumber markets are good, care is taken to recover even the lowest grades of lumber which can also be converted to wood pulp chips depending on lumber and paper markets.

Geographic Source of Lumber Production

The 1993 proportionate geographic distribution of Montana's lumber production was little changed from 1988. Seventy-seven percent, 1,048 MMBF, of the state's lumber output was produced in Montana's eight western counties—Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders—nearly identical to the 76 percent in 1988 (table 4). Flathead County mills continued to lead the state with lumber production of 305 MMBF, or 22 percent of the state's output, followed by Lincoln County with 259 MMBF (19 percent), and Missoula County with 158 MMBF (12 percent). Lumber production in eight west-central and southwestern Montana counties—Beaverhead, Broadwater, Gallatin, Lewis and Clark, Madison, Meagher, Park, and Powell—was 272 MMBF, 20 percent of Montana's lumber production, unchanged from 20 percent in 1988. The remaining counties in the state produced 47 MMBF, 3 percent of Montana's production, again relatively unchanged from 4 percent in 1988.

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, there were 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.

By 1988, the general trend was toward fewer but larger sawmills; of the 87 mills in 1988 29 produced more than 10 MMBF of lumber. In 1993, there was a decline in the number of large mills (from 29 to 26) and an increase (from 58 to 60) in the number of mills producing less than 10 MMBF of lumber.

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

Table 5
Number of Sawmills by Size of Production, Montana, Selected Years, 1956 - 1993

	Annual Production			
Year	Under 10 MMBF	10 MMBF to 50 MMBF	Over 50 MMBF	Total Number of Mills
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

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

Source: Schweitzer, D.L., R.E. Benson, and R. McConnen, 1975. *A Descriptive Analysis of Montana's Forest Resources*, USDA For. Serv., Int. For. and Range Exp. Stn., Ogden, UT. Res. Bull. INT-11. Setzer, T.S. and A.K. Wilson, 1970. *Timber Products in the Rocky Mountain States, 1966*. USDA For. Serv., Int. For. and Range Exp. Stn., Ogden, UT. BBER, The University of Montana-Missoula.

Table 6
Lumber Output by Size of Mill, Montana Selected Years, 1956 - 1993

	Percent of Production		
Year	Less than 10 MMBF Produced Annually	More than 10 MMBF Produced Annually	Total Lumber Production (MMBF)
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

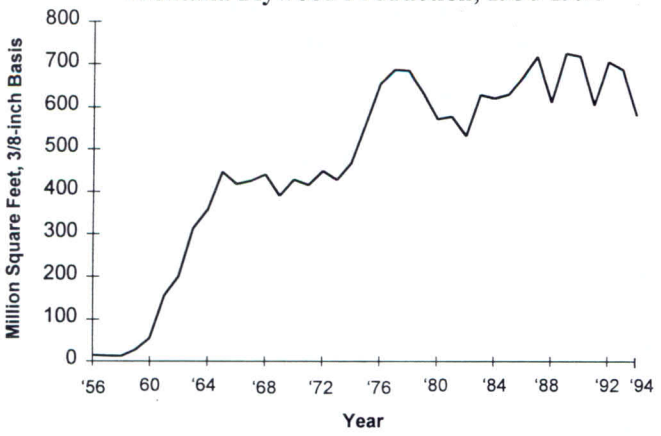
Source: Schweitzer, D.L., R.E. Benson, and R. McConnen, 1975. *A Descriptive Analysis of Montana's Forest Resources*, USDA For. Serv., Int. For. and Range Exp. Stn., Ogden, UT. Res. Bull. INT-11. Setzer, T.S. and A.K. Wilson, 1970. *Timber Products in the Rocky Mountain States, 1966*. USDA For. Serv., Int. For. and Range Exp. Stn., Ogden, UT. BBER, The University of Montana-Missoula.

Table 7
Lumber Production by Size of Mill, Montana, 1993

Size Class	Number of Mills	Volume (MBF)	Percentage of Total	Average per Mill (MBF)
A - over 50 MMBF	12	930,255	68%	77,521
B - 25 to 50 MMBF	6	247,331	18%	41,222
C - 10 to 25 MMBF	8	141,610	10%	17,701
D - 1 to 10 MMBF	9	40,839	3%	4,538
E - under 1 MMBF	51	6,967	1%	137
Total	86	1,367,002	100%	15,895

Source: BBER, The University of Montana-Missoula.

Figure 4
Montana Plywood Production, 1956-1994



Source: American Plywood Association.

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

Year	Timber Processed (MMBF)[1]	Plywood Production (MMSF)[2]	Plywood Recovery
1976	267	642	2.40
1981	224	569	2.54
1988	218	612	2.81
1993	213	687	3.22

[1]Million board feet, Scribner Decimal C, log scale.
[2]Million square feet, 3/8-inch basis.

Source: BBER, The University of Montana-Missoula.

MMBF of lumber annually (table 6). By 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, the expected strong lumber markets in the 1980s, and the development of easy-to-operate portable sawmills encouraged small mills to start operating, and 2) Instead of the expected strong markets, the early 1980s turned out to be a period of very weak lumber markets. A number of mills, which in good market years produced more than 10 MMBF annually, fell below this level in 1981.

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. Mills producing more than 50 MMBF of lumber in 1993 accounted for 68 percent of the state's production, unchanged from 1988 but up from 44 and 42 percent respectively for 1976 and 1981 (table 7).

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. The industrial plywood is touch-sanded and generally plugged, and it is commonly used for manufacturing 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 687 million square feet (MMSF), 3/8-inch basis in 1993, accounting for nearly 3 percent of the structural panel production in the United States that year (American Plywood Association, 1995). These plants shipped 673 MMSF 3/8-inch basis of plywood and veneer, for total sales of $189 million (table 2).

Because of technology that allowed peeling of small diameter timber, Montana's abundant Douglas-fir and western larch timber resource which has excellent qualities for plywood, and strong wood products markets, several companies in Montana made decisions in the 1960s and 1970s to utilize a larger portion of the available timber resource for plywood manufacturing. With this shift, the industry increased plywood output more than sevenfold from 1960 to 1970 based on increased volumes of timber processed and improved recovery of plywood per unit of timber processed (figure 4). 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 1993, production fell because of reduced timber availability. With the downsizing of one of the Montana's four plywood plants in late 1993, 1994 production fell further to an estimated 570 MMSF 3/8-inch basis.

Plywood Recovery

Montana's plywood plants processed 213 MMBF Scribner Decimal C of timber and produced 687 MMSF 3/8-inch basis of plywood in 1993, for a recovery of 3.22 (table 8). The recovery is up more than one-third over 1976 when Montana's plywood industry processed 267 MMBF of timber to produce 642 MMSF 3/8-inch basis of plywood for a recovery of 2.40.

The dramatic increase in recovery has been due to several factors. Technologic improvements in plywood manufacturing —both on the log input end and the plywood output end— have allowed 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 getting more usable product out of each veneer log. In addition, the diameters of logs processed by Montana's plywood industry, as is the case with the sawmill sector, have decreased, and as log diameter decreases, the Scribner Decimal C log rule underestimates by an increasing amount the volume of wood fiber in the log.

Residue-Utilizing Sector

Wood fiber residue from the manufacture of lumber and plywood is the major resource of Montana's residue-utilizing industry. This industry is dominated by three large plants, a kraft pulp and paper mill, a particleboard plant, and a medium-density fiberboard plant. The 1993 census also identified five wood pellet producers and one facility generating electricity for sale.

The residue-utilizing sector of Montana's primary forest products industry has experienced substantial growth since the 1969 survey—1993 sales were $369 million, almost double the sales value for this sector in 1969 (table 2).

Development of the Mill Residue-Utilizing Sector

In 1969, this sector consisted of a kraft pulp and paper mill, a facility selling electricity generated from wood fiber, and the sale of residue to out-of-state users. In the 1970s, this sector grew with the addition of the particleboard and medium-density fiberboard plants constructed early in the decade. Since their original construction, the pulp and paper mill, and particleboard and medium-density fiberboard plants have had capacity expansions.

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 kraft paper (Berg, et al. 1974 and 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 (Miller Freeman 1977 and Miller Freeman 1994b).

The 1993 census identified five wood fuel pellet producers in operation, producing 52,000 tons of fuel pellets for sales of $4.4 million. This is about a tenfold increase over the 1988—5,500 tons and $440,000 in sales. In 1988, there were four active fuel pellet facilities reported, however two were just starting production that year and output at those facilities was minimal. Capacity of the five facilities in 1993 was about 60,000 tons of pellets annually.

The residue-utilizing sector is a significant source of revenue for the lumber and plywood producers. In 1993, the residue sectors in both Montana and surrounding states paid $66 million to Montana sawmills and plywood plants for chips, sawdust, planer shavings, bark, slabs, trim ends, and peeler cores.

Other Manufacturers

Montana also contains many other primary wood products facilities that produce a variety of products. The 1993 census identified 93 other primary wood products facilities–more than earlier censuses — engaged in the manufacturing of log homes, roundwood products such as utility poles, posts, poles and tree props, and cedar products (table 1). As indicated earlier, all of the increase in the number of facilities was in the log home sector.

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 1976. In 1993, the state's 59 log home manufacturers had sales of about $61 million selling 5.5 million lineal feet of house logs (table 2). This compares to 35 manufacturers, sales of $36 million (1993 dollars), and production of 5.5 million lineal feet in 1988; 27 manufacturers, sales of $16 million, and production of 4 million lineal feet in 1981; and 19 manufacturers, sales of $16 million, and production of 3 million lineal feet in 1976. While there was virtually no change in volume of house logs sold between 1988 and 1993, the higher sales in 1993 reflect a shift toward the production of higher value homes and resort buildings.

The popularity of log homes, combined with an abundance of the right kind of timber resource, is the main reason for the continued growth in Montana's log home industry. Demand for the popular log homes has been fueled by such things as the back-to-nature movement, Earth Day, the Walt Disney/Davy Crocket generation reaching the home-buying age, and people wanting second homes and being affluent enough to buy them. For a more detailed discussion of Montana's log home industry see "Montana's Log Home Industry, 1976-1993" in Montana Business Quarterly, Vol. 32, No. 4, available from the Bureau of Business and Economic Research, The University of Montana, Missoula, Montana, 59812.

Cedar Products, Utility Pole, and Post and Pole Producers

Montana has a number of facilities that manufacture cedar products, utility poles, posts, small poles, and tree props. Most of the facilities are small operations—relative to facilities in other industry sectors—employing only a few people. However, these facilities are labor-intensive, employing more people per unit of timber processed than many of the larger facilities such as sawmills and plywood plants. They are also important in many parts of the state, providing products to local markets.

In contrast to the log home industry, Montana's cedar

products, utility pole, and post and pole industries experienced declines in the number of facilities between 1976 and 1993. In 1993, there were 40 such manufacturing facilities, nine fewer than in 1976 (table 1). The largest decrease was among the cedar products manufacturers.

Cedar Products: 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. Since then, one more facility closed, leaving a single active cedar products facility in the state. The cedar products manufacturers cited limited timber availability near their mills, increasing competition with sawmills for a portion of their raw materials, and competition in the marketplace from Canadian cedar products manufacturers as the reason for the recent decline in this sector.

Utility Poles: The state's utility pole sector consisted of one active manufacturer in 1993, a decline from three in 1976 and 1981, and two in 1988. This plant manufactures poles to support power lines and telephone wires. These poles normally average about 35 feet long with a small-end diameter of about 7 inches. Lodgepole pine is the predominant species used.

Industry representatives cited the lack of timber availability as the main reason for the decline, and to a lesser degree, the regulations regarding the treatment of poles with preservatives.

Utility pole manufacturers in this region compete directly with sawmills for the timber resource. Recent declines in timber harvest, combined with good lumber markets, have caused timber prices to rise sharply as sawmills bid higher prices for stumpage. Therefore, utility pole manufacturers must also pay more for timber. At the same time, the Montana utility pole industry competes with manufacturers in the southern U.S. for markets. The southern timber supply has not been as restricted, thus making it difficult for Montana's utility pole business to effectively compete in many markets.

Post and Pole: 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. Another item produced by these manufacturers is tree props used to support grape vines and orchard trees. Lodgepole pine is the major species used to manufacture these products.

The number of facilities manufacturing posts, small poles, and tree props has also declined. The 1993 census identified 31 active facilities in the state, down from 37 in 1988, 35 in 1981, and 37 in 1976 (table 1).

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 from the late 1980s to 1993 created strong competition among Montana's mills, with studmills processing more small diameter timber, thus putting them in direct competition with a portion of the post and pole industry, and the pulp and paper industry increasing its use of roundwood for chips also competing for small diameter lodgepole pine.

Section 2

Harvest & Utilization

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 timber, and movement of timber products.

Based on the census, Montana's 1993 timber harvest was 1,001 million board feet (MMBF) Scribner Decimal C log rule. As indicated in the previous section, there has been a substantial decline in the volume of timber available for harvest in the past five years. Montana's 1993 timber harvest was 20 percent below the 1.2 billion board feet harvested in 1988, and the 1994 harvest of 957 MMBF was down an additional 4 percent (figure 5). The reduction can be attributed to an approximate 50 percent decline in the harvest from Montana's national forests from the last half of the 1980s, due to a number of constraints including threatened and endangered species protection, appeals and litigation of timber sales, cumulative effects of past harvesting, as well as U.S. Forest Service budget levels.

The private harvest in Montana actually increased relative to the late 1980s even with a 25 percent decline in the harvest from industrial private lands. The harvest on the industrial lands declined because the volume of timber was not adequate to sustain the high harvest levels of the 1980s. However, the harvest on nonindustrial private timberlands in Montana doubled in response to an approximate fourfold increase in prices paid for timber on the stump (figure 6).

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.

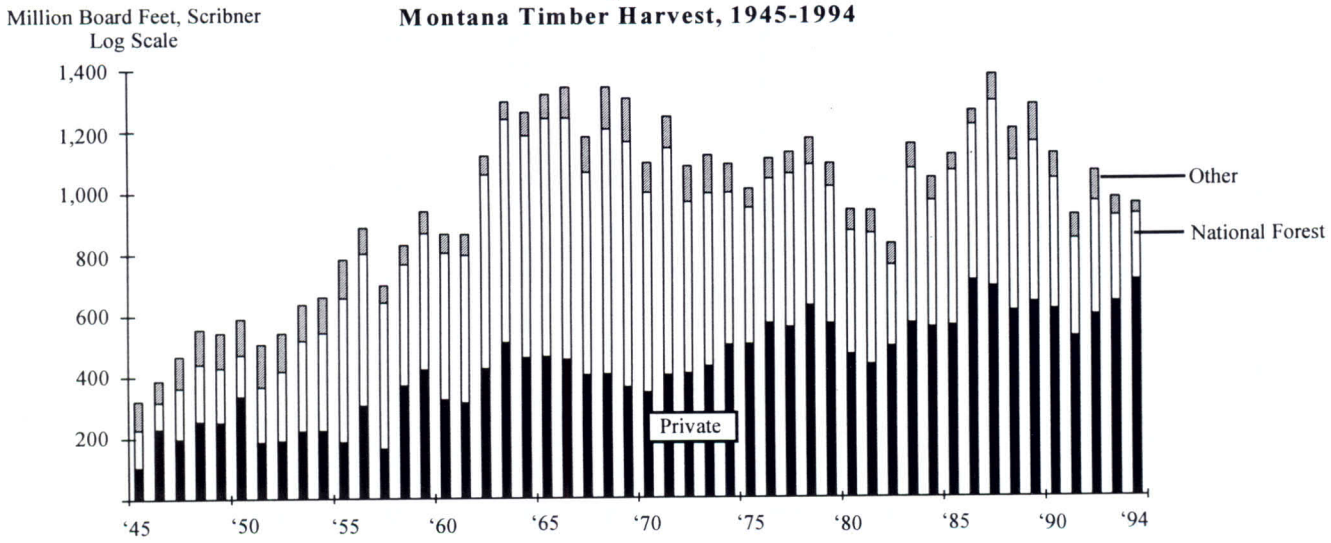
Public, Private and Tribal Timberlands as Sources of Timber Products

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 last fifty 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. Timber inventories were largely untouched 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).

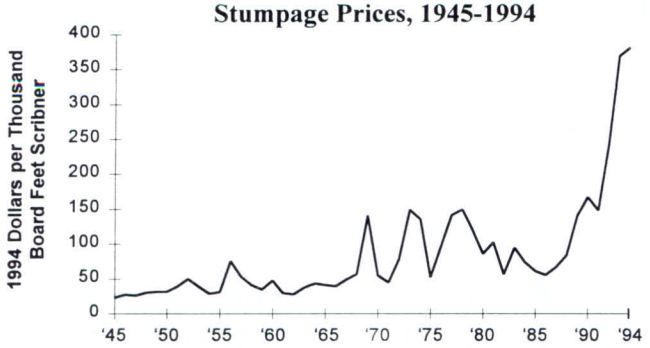
In the five years immediately after 1945, private lands provided 50 percent of the timber harvested in Montana while the national forests supplied about one-third. During the 1950s and 1960s, the national forests became the "dominant player" in Montana's timber markets. From 1950 to 1969 national forest harvest rose from 137 MMBF (23 percent of the harvest) in 1950 to 799 MMBF (61 percent of the harvest) in 1969. This fivefold

Figure 5
Montana Timber Harvest, 1945-1994



Source: USDA For. Serv. Region One, *Timber Harvest Summary*, Missoula, Montana; and BBER, The University of Montana-Missoula.

Figure 6
Montana National Forest Sawtimber WinningBid Stumpage Prices, 1945-1994



Source: USDA For. Serv. Region One, Missoula, Montana; and BBER, The University of Montana-Missoula.

increase from the national forests was responsible for more than doubling Montana's timber harvest from 1950 to 1969.

Nineteen-sixty-nine marked the high point of the national forest harvest in Montana. With increasing emphasis on nontimber resources and numerous pieces of legislation redirecting management emphasis, 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 last half of the 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 — except during 1958 and 1959 when the national forests and private forest lands each provided about 48 percent of Montana's harvest. The remaining harvest came from other public and tribal forest lands. At the same time national forest harvest was declining, private harvest was

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

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

[a]Less than 0.5 MMBF>
Source: BBER, The University of Montana-Missoula.

From 1988 to1993, the harvest in the eastern counties increased by 40 percent to 102 MMBF (10 percent of the state's harvest) vs. 73 MMBF (6 percent of the state's harvest) in 1988. This area has recently become an important source of the state's timber supply. The harvest in 1993 was four times the 1981 harvest and the 1976 census showed only 5 MMBF harvested in these counties—less than one-half of 1 percent of the state's harvest. The regions of western, west-central and southwestern Montana all had declines in harvest from 1988 to 1993, but the proportion of the state total from each area remained about the same.

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, utility poles, posts and small poles, tree stakes and other small roundwood products, as well as cedar product logs used to manufacture shakes, shingles, and split rail cedar fencing,

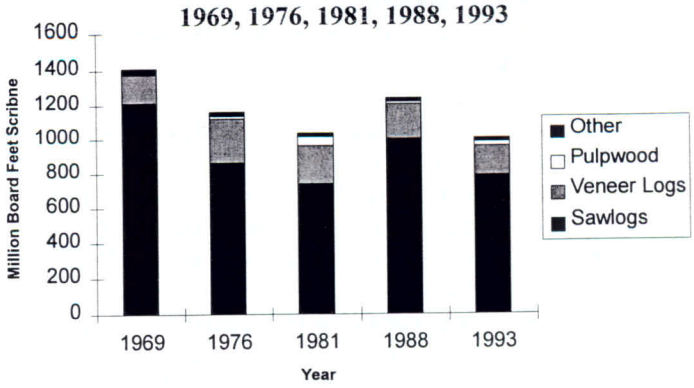
Sawlogs and Veneer Logs: Even though the volume of sawlogs and veneer logs harvested in Montana declined from 1988, their proportion of the total volume was relatively unchanged; sawlogs and veneer logs remain the primary timber products harvested, comprising 96 percent of the 1993 timber harvest (figure 8).

In 1993, Montana timberlands produced 786 MMBF of sawlogs (79 percent of the total timber harvest) and 170 MMBF of veneer logs (17 percent of the total timber harvest). The volume of sawlogs was down from the 1,000 MMBF of sawlogs harvested in 1988, while the harvest of veneer logs dropped from 205 MMBF in 1988.

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 were established in Montana in the late 1950s, resulting in a shift of large volumes of timber—mostly Douglas-fir and western larch—from sawmills to plywood plants, and the plywood industry has grown since then. As the plywood industry grew, the proportion of Montana's harvest that was 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 modest decline in the plywood industry relative to the sawmill industry; the share 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 8).

Roundwood Pulpwood: The most volatile timber product harvested has been pulpwood. In 1969 and 1976, pulpwood

Figure 8
Timber Products Harvested, Montana, 1969, 1976, 1981, 1988, 1993



Source: Setzer, T.S., 1971. Estimates of Timber Products Output and Plant Residues, Montana, 1969; and BBER, The University of Montana-Missoula.

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, and rose to 26 MMBF in 1993.

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 of the nature of the pulp and paper mills in the region—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 needs remain rather constant, except when major changes in production capacity are made. When chips from sawmills and plywood plants are in short supply, the pulp and paper industry has turned to chipping whole logs.

Prior to 1990, sharp declines in lumber and plywood production occurred during recessionary periods such as 1981. In 1993, declines in Montana's lumber and plywood production resulted from the lack of available timber of the kind and quality needed by sawmills and plywood plants. As in previous years, the pulp and paper industry then turned to harvesting pulpwood timber, generally not of a suitable quality for lumber or plywood production, and in abundant supply on private lands.

Other Timber Products: The harvest of all other timber products has remained at about 20 MMBF annually, but the composition by individual products has changed substantially. The harvest of house logs, utility poles, cedar products, and small roundwood products—posts, small poles, and tree props—was about 19 MMBF in 1993, or 2 percent of the state's harvest.

The major change among these other products has been the 60 percent increase in house logs harvested and the near

increasing (due partly to the withdrawal of public timber from the market place and partly 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 have seen continuing decline in timber harvest from national forests in Montana. In 1989, Montana's ten national forests harvested about 520 MMBF, 41 percent of Montana's timber harvest. By 1993, it had dropped to about 280 MMBF, 28 percent of Montana's timber harvest. In 1994, the harvest from Montana national forests was 214 MMBF, the lowest level since 1951.

On the other hand, harvest from Montana's private lands has remained relatively stable over the past decade. The 1993 harvest from private forest landowners was 658 MMBF, 9 percent greater than the average annual private harvest for the previous ten years, and the 1994 harvest from private forest lands was the second highest on record, accounting for 74 percent of the timber harvested in the state.

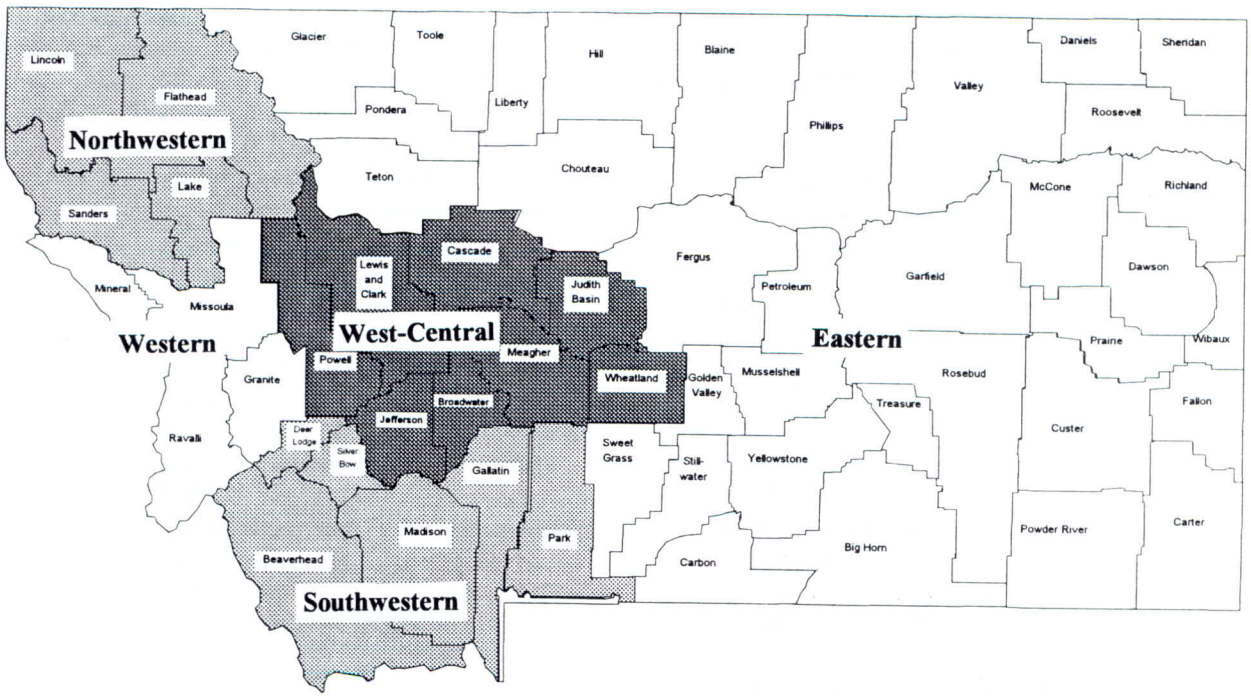
While the volume harvested from private timberlands has not changed substantially from the late 1980s, the share of timber supplied by industrial private forest landowners vs. non-industrial private forest landowners has. During the 1980s, nonindustrial private forest lands supplied 10 to 15 percent of the timber harvested in Montana while industrial forest lands supplied about 40 percent. By 1994, the harvest from nonindustrial forest lands was a record 392 MMBF, (40 percent of the state's timber harvest) while harvest from industrial forest lands (314 MMBF) accounted for just under one-third of the state's total timber harvest. Other public and tribal lands provided less than 5 percent of the total timber harvest in 1994.

Geographic Source of the Harvest

The shift in timber harvest away from the national forests and industrial forest land owners to nonindustrial forest lands caused some measurable shifts in the geographic source of timber harvested in Montana. In particular, there has been a decline in timber harvest from the northwestern and western counties where national forests and industrial forest lands are concentrated, and there has been a substantial increase in the harvest in eastern Montana where nonindustrial private forest lands predominate (figure 7).

The harvest from northwestern Montana forest lands dropped by nearly 30 percent, (200 MMBF) from 725 MMBF in 1988 to 519 MMBF in 1993 (table 9). Within that region, the two major timber-producing counties in the state—Flathead and Lincoln—both showed declines in harvest of more than 35 percent while Lake and Sanders counties actually showed a small increase from 1988. As a result, the four northwestern Montana counties now supply 52 percent of the timber harvested in the state vs. approximately 60 percent in previous census years.

Figure 7
Montana Geographic Regions



disappearance of cedar products as a timber product in Montana.

In 1993, house log harvest was 16 MMBF, up from 14 MMBF in 1988, 11 MMBF in 1981, and 10 MMBF in 1976. This harvest increase is due to growth in the number of house log and log home manufacturers in the state.

Substantial declines have occurred in both utility pole and small post and pole harvest which are combined to avoid disclosing individual company information on the one utility pole manufacturer. Harvest of these products was 3.1 MMBF in 1993, down from 5.2 MMBF in 1988, 7.5 MMBF in 1981, and 4.7 MMBF in 1976.

The harvest of cedar product logs has dropped to nearly zero. In 1976, 4.7 MMBF of cedar product logs — used to make shakes, shingles, and split-rail fencing — were harvested in Montana. The harvest of cedar product logs fell to 2.6 MMBF in 1981 and 0.7 MMBF in 1988 and with the loss of all but two small plants in 1993, the harvest of cedar product logs, that year, was only 0.1 MMBF.

Land Ownership and Type of Product Harvested

In line with the general pattern of the overall timber harvest, the source of sawlogs shifted from public to private lands. In 1993, private lands provided 65 percent of the sawlog harvest (508 MMBF), up from the proportionate harvest in 1976, 1981, and 1988 when private lands provided about 50 percent of the sawlog volume (table 10 and tables A1, A2, and A3 in Appendix A).

For most of 1993 and earlier census years, large industrial timberland companies owned the state's plywood manufacturing facilities and provided most of the veneer logs from their own lands. Industrial private forest lands continued to supply the bulk of the harvest of veneer logs, 65 percent in 1993, down from 86 percent in 1988. Interestingly, in spite of a large overall decline in national forest timber harvest, the volume and share of veneer logs from these lands doubled from 1988 to 1993.

Private timberlands also provided most of the pulpwood harvest from Montana in 1993. Industrial and non-industrial timberlands each furnished about 11 MMBF of pulpwood harvest that year, accounting for a combined 84 percent of the 1993 pulpwood harvest. National forests provided about two-thirds of the remaining 4.2 MMBF of pulpwood harvest. Private lands also provided most of the pulpwood harvest in earlier census years—91 percent in 1988, 88 percent in 1981, and 55 percent in 1976.

National forests provided 67 percent, 13 MMBF, of Montana's harvest of other timber products in 1993, with all public lands providing 69 percent. Non-industrial private lands provided almost all—5.7 MMBF out of 5.8 MMBF—of the remaining harvest of these products. Public lands have provided 60 to 70 percent of the harvest of these products in earlier censuses years.

Table 10
Timber Products Harvested by Ownership Source, Montana, 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
Total	786,259	169,525	25,973	19,472	1,001,229
	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%*
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

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

	Percent of Harvest				
Species	1969	1976	1981	1988	1993
Douglas-fir	26	27	27	27	29
Lodgepole pine	12	21	25	28	26
Ponderosa pine	17	15	12	17	19
Western larch	20	20	16	14	12
Engelmann spruce	15	7	8	7	6
Other species	9	11	12	7	8
Total	100	100	100	100	100

Source: Setzer, T.S. 1971. Estimates of Timber Products Output and Plant Residues, Montana, 1969. USDA For. Serv. Int. For. and Range Exp. Stn., Ogden, UT. Res. Note INT-133. BBER, The Univ. of Montana, Missoula.

Species Composition of the Harvest

There has been very little change in the species composition of Montana's timber harvest since 1988, but substantial changes have occurred in the last 25 years (table 11). Douglas-fir and lodgepole pine remained the major species harvested from Montana timberlands in 1993, accounting for about 29 and 26 percent of the harvest, respectively. 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. In other census years, Douglas-fir was the major timber species harvested, accounting for 27 percent in 1981 and 1976, and 26 percent in 1969.

The major changes in species composition over the last 25 years has been the increase in harvest of lodgepole pine and the decreases in western larch and Engelmann spruce. The 26 percent share of the harvest in 1993 provided by lodgepole pine is more than double the 12 percent recorded in 1969. Improved technology to process smaller diameter timber, as well as the mountain pine beetle epidemic previously mentioned, were responsible for the increased use of that species.

The harvest of western larch declined from 20 percent in 1969 and 1976 to just 12 percent in 1993. Industrial timberlands and the national forests contain the bulk of the western larch inventory and have been the major sources of western larch timber, and as indicated, harvests from these lands have declined sharply in recent years.

Engelmann spruce harvest declined from 15 percent of the total in 1969 to 6 percent in 1993. 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.

After declining from 1969 to 1981, the proportion of ponderosa pine harvested has shown an increase in the last two censuses. The shift in harvest to nonindustrial lands and to eastern Montana counties has been primarily responsible for this increase; the largest concentration of ponderosa pine by ownership is on nonindustrial forest lands where it comprises 25 percent of the timber resource, and geographically two-thirds of the timber in Montana's eastern counties is ponderosa pine (O'Brien and Conner, 1991).

Species Composition by Type of Product

All commercial softwood tree species in Montana were used to produce lumber in 1993. Lodgepole pine comprised 31 percent of the sawlog harvest followed by Douglas-fir at 24 percent, ponderosa pine at 23 percent, western larch at 7 percent, Engelmann spruce at 7 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 90 percent of the veneer log harvest in 1993. Other species used to produce plywood in 1993 included true firs, ponderosa pine, western hemlock, Engelmann spruce, lodgepole pine, and western white pine.

The largest component of pulpwood harvest, ponderosa pine, accounted for 37 percent in 1993. Douglas-fir provided 20 percent and lodgepole pine 16 percent. Other major pulpwood species in 1993 included western larch, true firs, Engelmann spruce, and western hemlock.

The output of other roundwood timber products was predominantly lodgepole pine, which accounted for 71 percent or 14 MMBF in 1993. Engelmann spruce and Douglas-fir each comprised about 13 percent, with small volumes of ponderosa pine, western larch, western redcedar, western white pine, and true firs making up the remainder.

Movement of Timber Products

The concentration of production in large facilities has created large 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. Table 13 shows the flow of timber among Montana and the surrounding states in 1993.

Across State Lines

Primary wood products manufacturers in Montana received 1,053 MMBF of timber for processing in 1993, while the state's timber harvest was 1,001 MMBF, making Montana a net importer of 52 MMBF. This is in contrast to 1988 when Montana was a net exporter of 34 MMBF to other states. In 1981 and 1976, Montana was a net importer of 14 MMBF and 50 MMBF respectively.

The net imports of 52 MMBF resulted from Montana mills receiving about 79 MMBF of timber from surrounding states and Canada, and 27 MMBF of timber harvested in Montana being processed by mills in other states. Idaho was the source of most of Montana's timber imports, accounting for 97 percent of the 79 MMBF imported. Of the remaining 2 MMBF of timber

Table 12
Timber Products Harvested by Species and Product, Montana, 1993

Species	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
	Thousand Board Feet, Scribner				
Douglas-fir	186,682	93,067	5,129	2,432	287,310
Lodgepole pine	243,704	1,681	4,110	13,880	263,375
Ponderosa pine	177,229	3,786	9,702	176	190,893
Western larch	54,341	59,498	2,196	137	116,172
Engelmann spruce	55,490	2,818	1,479	2,625	62,412
True firs	47,744	5,646	1,870	13	55,273
Western redcedar	11,344	-	-	118	11,462
Western white pine	7,629	122	10	91	7,852
Western hemlock	2,088	2,907	1,477	--	6,472
Other species	8	-	-	--	8
Total	786,259	169,525	25,973	19,472	1,001,229
	Percentage of Total				
Douglas-fir	*23.7%*	*54.9%*	*19.7%*	*12.5%*	*28.7%*
Lodgepole pine	*31.0%*	*1.0%*	*15.8%*	*71.3%*	*26.3%*
Ponderosa pine	*22.5%*	*2.2%*	*37.4%*	*0.9%*	*19.1%*
Western larch	*6.9%*	*35.1%*	*8.5%*	*0.7%*	*11.6%*
Engelmann spruce	*7.1%*	*1.7%*	*5.7%*	*13.5%*	*6.2%*
True firs	*6.1%*	*3.3%*	*7.2%*	*0.1%*	*5.5%*
Western redcedar	*1.4%*	*0.0%*	*0.0%*	*0.6%*	*1.1%*
Western white pine	*1.0%*	*0.1%*	*0.0%*	*0.5%*	*0.8%*
Western hemlock	*0.3%*	*1.7%*	*5.7%*	*0.0%*	*0.6%*
Other species	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

Source: BBER, The University of Montana-Missoula.

Table 13
Imports and Exports of Timber Products, Montana, 1993

Timber Products	Imports	Exports	Net Imports Net Exports
	Thousand Board Feet, Scribner		
Sawlogs	42,652	25,998	16,654
Veneer Logs	31,049	150	30,899
Other	5,242	375	4,867
Total	78,943	26,523	52,420

Source: BBER, The University of Montana-Missoula.

imports, about 1 MMBF came from Wyoming and the other 1 MMBF came from Canada, Utah, and Washington.

Mills in Idaho, Oregon, South Dakota, and Wyoming received the 27 MMBF of timber exported from Montana in 1993. Wyoming and Oregon mills accounted for most of the timber exports at about 32 and 31 percent respectively, while Idaho mills accounted for about 19 percent and South Dakota mills accounted for 18 percent.

Sawlogs were the major component of the timber harvest flowing into and out of Montana. Montana sawmills imported 43 MMBF in 1993, while sawmills in other states received 26 MMBF of Montana's sawlog harvest (table 13). Montana's plywood plants received 31 MMBF of veneer logs from other states while plywood plants in other states received less than 0.2 MMBF of Montana's veneer log harvest in 1993. House logs and cedar products accounted for the remaining 5 MMBF of Montana's timber imports and 0.4 MMBF of Montana's timber exports.

Across County Lines

More than 82 percent of the timber delivered to Montana mills was received by processors in eight counties in western and northwestern Montana in 1993 (table 14 and figure 7). Of the 869 MMBF received in those counties in 1993, about 85 percent was harvested from within that same eight-county region and about 48 percent was harvested in the same county where it was

Table 14
Movement of Timber Products by Counties of Origin and Receipt, Montana, 1993
Thousand Board Feet Scribner

	County/Region of Destination									
County/Region of Harvest	Lincoln	Flathead	Lake Mineral Sanders	Missoula	Granite Ravalli	Broadwater Meagher Gallatin, Park	Beaverhead, Fergus Jefferson, Judith Basin Lewis & Clark, Madison Musselshell, Powell Wheatland	Other Counties	Other States	Total Harvest
Lincoln	131,940	60,426	11,787	223	1,657	57	-	-	1,706	207,796
Flathead	21,482	109,185	17,782	1,870	13	-	-	-	-	150,332
Sanders	6,341	26,107	48,944	22,419	50	-	-	-	3,136	106,997
Lake	2,059	28,137	12,592	10,643	13	-	-	-	-	53,444
Northwestern Montana	161,822	223,855	91,105	35,155	1,733	57	-	-	4,842	518,569
Granite	-	1,227	382	4,344	8,375	-	6,271	-	-	20,599
Mineral	-	1,870	20,993	8,835	694	-	20	-	-	32,412
Missoula	-	37,891	18,287	76,535	2,508	448	30	-	-	135,699
Ravalli	-	1,728	1,923	13,031	23,326	-	0	-	-	40,008
Western Montana	-	42,716	41,585	102,745	34,903	448	6,321	-	-	228,718
Lewis & Clark	-	-	-	1,449	3,153	3,058	5,081	-	-	12,741
Meagher	-	-	-	1,476	-	10,539	250	-	-	12,265
Powell	-	6,110	2,813	16,325	3,778	400	13,840	-	-	43,266
Other West-Central Counties	-	-	-	387	2,000	7,400	1,112	104	1,104	12,107
West-Central Montana	-	6,110	2,813	19,637	8,931	21,397	20,283	104	1,104	80,379
Beaverhead	-	-	-	-	900	906	3,228	-	-	5,034
Deerlodge	-	-	-	2,160	2,022	2,029	4,906	-	-	11,117
Gallatin	-	-	-	-	303	28,985	37	175	-	29,500
Park	-	-	-	21	600	10,551	16	-	-	11,188
Madison	-	-	-	-	-	8,698	305	-	200	9,203
Silver Bow	-	-	-	-	-	2,764	2,707	-	-	5,471
Southwestern Montana	-	-	-	2,181	3,825	53,933	11,199	175	200	71,513
Big Horn	-	-	-	326	-	936	-	10,726	766	12,754
Fergus	-	1,003	994	1,734	-	9,097	8,022	2,617	367	23,834
Musselshell	-	-	-	466	-	4,872	2,000	2,606	2,735	12,679
Powder River	-	-	-	-	-	-	-	2,400	8,745	11,145
Rosebud	-	-	-	14	-	791	-	6,503	280	7,588
Sweetgrass	-	-	-	1,144	-	3,738	-	449	349	5,680
Other Central & Eastern Counties	122	955	374	3,994	-	4,526	6,122	5,142	7,135	28,370
Eastern Montana	122	1,958	1,368	7,678	-	23,960	16,144	30,443	20,377	102,050
Other States	6,859	3,000	25,492	33,609	9,308	658	17	-	-	78,943
Total Receipts	168,803	277,639	162,363	201,005	58,700	100,453	53,964	30,722	26,523	1,080,172

Source: BBER, The University of Montana-Missoula.

processed. This is down slightly from 1988 when 90 percent of the timber processed in the eight northwestern and western counties was harvested there and 63 percent was processed in the same county in which it was harvested (table 15). At the same time, there was a 68 percent increase in imports of timber from other states to northwestern and western Montana mills (78 MMBF in 1993 versus 46 MMBF in 1988) and a nearly threefold increase in timber moving from eastern counties into northwestern and western Montana, from 3.8 MMBF in 1988 to 11.1 MMBF in 1993.

The two major timber processing counties in 1993, Flathead and Missoula, received less than 40 percent of their timber from within that same county. On the other hand Lincoln County, which ranked third in volume processed, obtained nearly 80 percent of its timber from Lincoln County timberlands. Among the remaining five northwestern and western Montana counties, Ravalli and Sanders county mills received more than 60 percent of their timber from within that same county. Lake, Granite, and Mineral county mills relied on timber imported from other counties for more than 60 percent of their timber received for processing in 1993.

The mills operating in 22 of the remaining 48 counties received 185 MMBF of timber for processing in 1993 (table 14). Overall, mills in these 22 counties received 34 percent of their timber from timberlands within the same county 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

Table 15
Timber Flows Among Montana Regions, 1988
(MBF Scribner)

Region of Harvest	Region of Destination: Northwestern Montana	Western Montana	West Central Montana	Southwestern Montana	Eastern Montana	Out of State	Total Harvest
Northwest Montana	629,879	43,214	--	375	--	51,565	725,033
Western Montana	30,510	195,736	14,121	340	--	5,147	245,854
West-Central Montana	--	42,386	46,451	13,851	2,040	--	104,728
Southwestern Montana	--	6,281	4,498	77,108	--	155	88,042
Eastern Montana	3,808	--	4,713	4,896	32,743	26,477	72,637
Out of State	24,665	21,803	--	3,062	--	--	49,530
Total Receipts	688,862	309,420	69,783	99,632	34,783	83,344	1,285,824
Northwestern Montana	*91%*	*14%*	*0%*	*0%*	*0%*	*62%*	*56%*
Western Montana	*4%*	*63%*	*20%*	*0%*	*0%*	*6%*	*19%*
West-Central Montana	*0%*	*14%*	*67%*	*14%*	*6%*	*0%*	*8%*
Southwestern Montana	*0%*	*2%*	*6%*	*77%*	*0%*	*0%*	*7%*
Eastern Montana	*1%*	*0%*	*7%*	*5%*	*94%*	*32%*	*6%*
Out of State	*4%*	*7%*	*0%*	*3%*	*0%*	*0%*	*4%*
Total Receipts	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Source: BBER, The University of Montana-Missoula.

board feet Scribner. The conversion factors used to convert Scribner volume to cubic foot volume were derived from census data and are listed below.

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

Product	Board Feet/Cubic Foot
Sawlogs	4.03
Veneer logs	4.67
Pulpwood	3.33
Utility poles, House logs, Cedar products	5.00
Posts and poles	1.00

The following figures refer to Montana's timber harvest and include timber products shipped to out-of-state mills. The 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 1993, Montana's timber harvest was approximately 245 million cubic feet (MMCF), exclusive of bark (figure 9). Of this volume, 195 MMCF went to sawmills, 36 MMCF to the plywood plants, 8 MMCF to pulp and board mills, and 6 MMCF to other primary manufacturers.

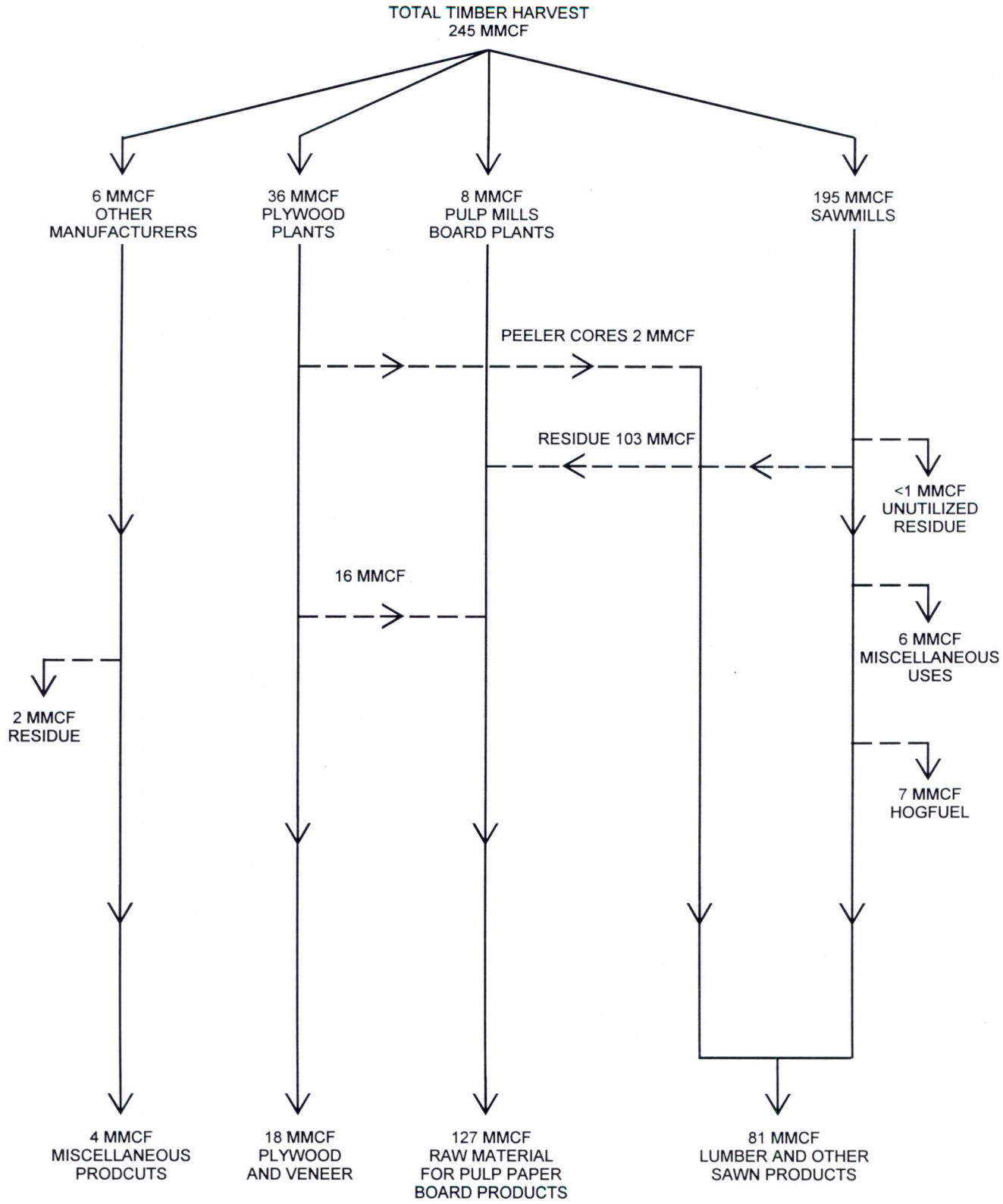
Sawmills received 195 MMCF of harvested timber plus 2 MMCF of peeler cores from plywood plants to manufacture into lumber and landscape timbers. Of this 197 MMBF, only 81 MMCF (41 percent) of this volume actually became lumber or other sawn products and the remaining 116 MMCF of wood fiber became mill residue. About 103 MMCF of sawmill residues were sold to the pulp and paper and particleboard and medium-density fiberboard manufacturers in Montana and other states; 7 MMCF were used as hog fuel; 6 MMCF were used for miscellaneous purposes such as firewood, wood fuel pellets, and livestock bedding; and, less than 1 MMCF remained unused.

Of the 36 MMCF of Montana's timber harvest received by plywood plants, half became plywood and half became residue. Of the 18 MMCF that became residue, about 16 MMCF were chipped for the pulp and paper and board sectors, and 2 MMCF of peeler cores were shipped to sawmills.

About 8 MMCF of Montana's timber harvest was in the form of pulpwood which was chipped and used by the pulp and paper industry. An additional 119 MMCF of Montana's timber harvest was received by the pulp and paper and reconstituted board sectors in the form of mill residue from sawmills and plywood plants. Mill residue from sawmills supplied about 81 percent of the 127 MMCF received by the pulp and paper and reconstituted board sectors and plywood plants provided about 13 percent with timber in round form providing the remaining 6 percent.

Other primary manufacturers received about 6 MMCF of Montana's timber harvest in 1993. The percentage of timber that ends up as a finished product in the log home, post and pole, utility pole, and cedar products sectors varies, but several firms indicated that roughly 60 percent of the timber volume ends up as a finished product and the remainder is residue. However, mills in this sector seldom supplied residue for use in other sectors. Most of the residue from these sectors was used as, firewood, livestock bedding, or remained unused.

Figure 9
Utilization of Montana's Timber Harvest, 1993



Section 3

Private & Public Timberlands

Private and Public Timberlands

Sources of Raw Material for the Industry's Various Sectors

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 52 MMBF of timber in 1993. 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.

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. Detailed comparisons are shown for 1976, 1981, 1988 and 1993. Ownership sources of timber received by Montana's industry sectors are not readily available prior to 1976.

Montana's timber processing mills received 1,053 MMBF, Scribner Decimal C log scale, of timber for processing in 1993. Private timberlands contributed 64 percent (674 MMBF) of the timber, up substantially from the 51 to 54 percent in 1976, 1981, and 1988 (table 16). The increase in private harvest contribution came from non-industrial private lands which provided 33 percent (349 MMBF) of the 1993 mill receipts, up from 17 to 20 percent in earlier censuses. The harvest from industrial private timberlands contributed 31 percent (325 MMBF) of Montana's mill receipts in 1993, down slightly from just over one-third in each of the earlier censuses.

The contribution from public timberlands in Montana was down substantially because of the decline in the national forest timber sales during the early 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. In 1993, just 30 percent (318 MMBF) of the timber received by these mills was from national forests. Other public ownerships, Bureau of Land Management and state lands, contributed about 2 percent (25 MMBF) of Montana's timber receipts in 1993, about on par with earlier censuses. Tribal timberlands contributed just over 3 percent (36 MMBF), little change from 2 to 4 percent in earlier censuses.

Table 16
Source of Timber Products Received by Mills, Montana, 1976, 1981, 1988, and 1993

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

Source: BBER, The University of Montana-Missoula.

Table 17
Ownership Source of Timber Products Delivered to Various Sectors of Montana's Industry, 1993

Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
	Thousand Board Feet, Scribner			
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%

Source: BBER, The University of Montana-Missoula.

Table 18
Ownership Source of Timber Products Delivered to Various Montana Counties, 1993

County or County Group	Ownership Group: Private	National Forest	Other Public	Tribal	Total	Total Timber Received MMBF
	Percent of Receipts					
Lincoln	43%	52%	4%	[a]	100%	168,803
Mineral, Sanders	44%	54%	[a]	2%	100%	105,629
Flathead	67%	24%	3%	6%	100%	277,639
Granite, Lake Missoula	73%	22%	2%	4%	100%	278,883
Beaverhead, Madison Ravalli	44%	54%	2%	0%	100%	39,241
Broadwater, Gallatin, Jefferson, Lewis & Clark, Meagher, Park, Powell	82%	17%	2%	0%	100%	138,416
All Other Counties	76%	4%	2%	18%	100%	45,038
All Montana Counties	64%	30%	2%	3%	100%	1,053,649

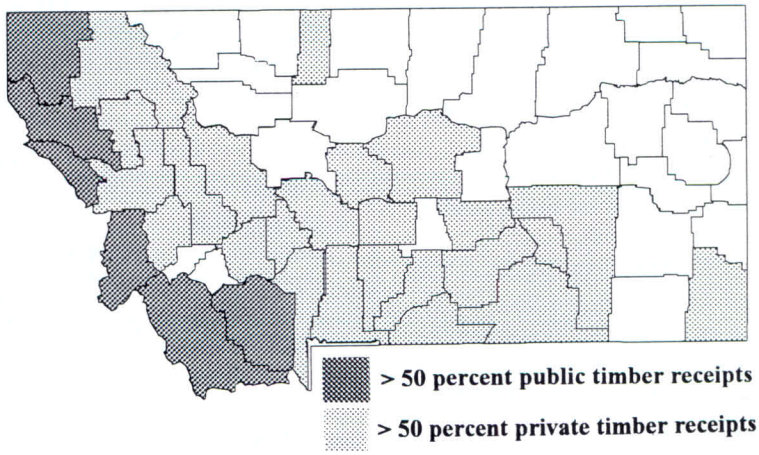
[a]Less than 0.5 percent.

Source: BBER, The University of Montana-Missoula.

Ownership Sources by Industry Sector

Sawmills, plywood plants, and other primary manufacturers depend on timber from the various land ownerships to differing degrees. Montana sawmills received 803 MMBF of sawlogs, 76 percent of the total volume of timber delivered to the state's forest products industry in 1993 (table 17). Sixty-two percent of the timber received by Montana sawmills came from private lands, compared to 46 to 48 percent in earlier censuses (tables A4, A5, and A6 in appendix). Public timberlands provided 34 percent of Montana sawmill timber receipts—32 percent from national forests and 2 percent from other public timberlands. This is down substantially from 49 to 50 percent of sawmill receipts coming from public lands, mostly national forests, in earlier censuses.

Figure 10
Ownership Sources of Timber Delivered to Montana Mills, 1993



Montana plywood plants obtained 148 MMBF (74 percent of their veneer log receipts) from private lands in 1993—59 percent from industrial lands, and 15 percent from non-industrial lands. Montana's four plywood plants were owned by large industrial private timberland companies through most of 1993, and most of the timber received by these facilities came from their forest lands. About 49 MMBF (24 percent) of plywood plant timber receipts came from public lands in 1993, 21 percent from national forests. Tribal timberlands provided 2 percent of veneer log receipts. In earlier census years, private timberlands were also the major source of Montana veneer log receipts.

Other primary manufacturers received 28 MMBF (57 percent of their total timber receipts) from private timberlands and 22 MMBF (43 percent) from public timberlands in 1993. Less than 1 percent was provided from tribal timberlands in 1993. National forests provided the largest share, about 39 percent, nonindustrial private lands provided 35 percent, industrial private timberlands supplied 22 percent, other public lands contributed 4 percent, and tribal lands provided less than 1 percent.

Ownership Sources of Timber by County

Of the 30 Montana counties with mills receiving timber in 1993, 24 received the majority of their timber from private lands and six received the majority of their timber from public lands (table 18 and figure 10). Due to the small number of mills operating in some counties, timber receipts could not be

Table 19
Ownership Source of Timber Products Delivered to Various Montana Counties, 1988

County or County Group	Ownership Group: Private	National Forest	Other Public	Tribal	Total	Total Timber Received MMBF
	Percent of Receipts					
Lincoln	53%	46%	1%	0%	100%	241,243
Mineral, Sanders	23%	69%	4%	3%	100%	100,100
Flathead	48%	47%	4%	1%	100%	306,023
Granite, Lake Missoula	67%	14%	7%	11%	100%	285,686
Beaverhead, Madison Ravalli	20%	69%	11%	0%	100%	87,524
Broadwater, Gallatin, Jefferson, Lewis & Clark, Meagher, Park, Powell	63%	35%	3%	0%	100%	140,630
All Other Counties	59%	15%	3%	24%	100%	41,274
All Montana Counties	52%	40%	5%	4%	100%	1,202,480

Source: BBER, The University of Montana-Missoula.

reported for every county. Counties were, therefore, grouped geographically and by similar timber ownership receipt patterns for discussion purposes.

The counties receiving the majority of their timber from public lands are concentrated in western and southwestern Montana; these include Lincoln county which ranked third in timber processed along with Beaverhead, Madison, Mineral, Sanders and Ravalli counties. Mills in the remainder of the state including the two major processing counties — Flathead and Missoula — received over two-thirds of their timber from private lands in 1993. The most noteworthy changes since 1988 have been in western Montana, with increased private and reduced national forest shares in Flathead, Mineral, Ravalli, and Sanders counties and an increased national forest share in Lincoln County (table 19). Outside of western and southwestern Montana, almost without exception, there was little change in the proportion of timber supplied from private forest lands between 1988 and 1993.

Source of Sawtimber by Size of Mill

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, house log manufacturers, and utility pole producers. The derivation of estimated capacity is discussed in more detail in Section 4.

Table 20
Source of Sawtimber Received by Mills, by Size of Mill, 1993

Capacity to Process Sawtimber	Thousand Board Feet Scribner: Private Timberlands — Industrial	Private Timberlands — Nonindustrial	Tribal Timberlands	Public Timberlands — National Forest	Public Timberlands — Other	All Sources
A - over 40 MMBF	188,914	139,712	11,362	152,472	10,957	503,417
B - 25 to 40 MMBF	121,838	115,736	12,875	112,374	7,797	370,620
C - 10 to 25 MMBF	3,543	60,804	10,757	27,043	1,828	103,975
D - 1 to 10 MMBF	--	14,626	772	18,176	1,900	35,474
E - under 1 MMBF	47	4,848	402	4,413	538	10,248
All Mills	314,342	335,726	36,168	314,478	23,020	1,023,734
A - over 40 MMBF	38%	28%	2%	30%	2%	100%
B - 25 to 40 MMBF	33%	31%	3%	30%	2%	100%
C - 10 to 25 MMBF	3%	58%	10%	26%	2%	100%
D - 1 to 10 MMBF	0%	41%	2%	51%	5%	100%
E - under 1 MMBF	0%	47%	4%	43%	5%	100%
All Mills	31%	33%	4%	31%	2%	100%

Source: BBER, The University of Montana-Missoula.

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 1993, Montana's sawtimber processing mills received 1,024 MMBF of timber for processing. The two categories containing the largest mills were most dependent on private forest lands, and particularly industrial private forest lands. All of the mills owned by industrial timberland companies are in size classes A and B.

Size class A (> 40 MMBF) received 503 MMBF Scribner Decimal C of sawtimber, 49 percent of the sawtimber received by Montana mills in 1993 (table 20). Private forest lands, the major source of timber for these mills, provided two-thirds of that timber — 38 percent from industrial private timberlands and 28 percent from nonindustrial private timberlands. National forests provided most of the remaining timber, 30 percent, and tribal and other public lands each contributed 2 percent.

Size class B (25-40 MMBF) received 371 MMBF, 36 percent of Montana's sawtimber receipts. These mills also depended more on timber from private timberlands (64 percent) than from public lands. National forests furnished 30 percent of their timber needs, tribal lands provided 3 percent and other public lands provided 2 percent.

Size class C (10 to 25 MMBF) received 104 MMBF (10 percent) of Montana's sawtimber receipts in 1993. Nonindustrial private timberlands provided the majority of this —58 percent of the total—followed by national forests at 26 percent. Tribal timberlands provided 10 percent, industrial private lands provided 3 percent, and other public lands provided 2 percent.

Mills in the two smaller size classes were most dependent on the national forests for timber. Mills with capacity to process 1-10 MMBF actually received the majority of their timber from national forests and size class E mills received 43 percent from national forests (table 20).

Section 4

Plant Utilization

Plant Utilization by Montana Wood Products Manufacturers

This section includes estimates of timber processing capacity for Montana's primary forest products manufacturers and the proportion of in-place capacity utilized. This analysis focuses on plants processing sawtimber — sawmills, plywood plants, house log plants, and utility pole plants. Capacity utilization of the non-sawtimber sectors are discussed in less detail.

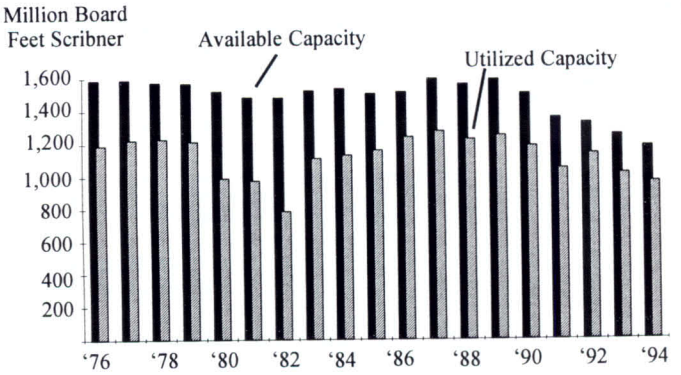
A Definition of Production Capacity

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 reported annual capacity at only one shift per day, for not more than a 240-operating-day year. Montana's four plywood plants reported capacity of three shifts per day for a 230-270-operating-day year. All manufacturers of house logs, utility poles, posts and small poles, and cedar products 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, and plywood capacity was reported in thousands of square feet on a 3/8-inch basis. Utility pole capacity was reported in numbers of pieces of a given size and house log capacity in lineal feet of houselogs. 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 to million board feet of timber Scribner Decimal C log scale 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. Utility pole and house log capacities were adjusted to thousand board feet Scribner by multiplying capacity in the given finished product unit by an average Scribner board foot volume per piece or per lineal foot. See Section 1 for a discussion of the lumber overrun and plywood recovery factors used.

Figure 11
Montana Sawtimber Processing Capacity and Sawtimber Processed 1976 - 1994



Source: BBER, The University of Montana-Missoula.

The Industry's Capacity to Process Sawtimber, 1976 - 1994

This section deals with changes in capacity and the utilization of capacity from 1976 through 1994. Detail of capacity information is not available prior to the 1976 census. Estimates for 1976, 1981, 1988 and 1993 are based on complete censuses of the industry done by the Bureau of Business and Economic Research. For the intervening years, mill capacities and utilization were estimated using annual surveys of major producers done by the Bureau of Business and Economic Research, and information from industry directories and various trade associations.

The capacity to process sawtimber in 1993 was at its lowest level since 1976 and was about 20 percent below levels of the late 1980s. In 1993, Montana's sawtimber using mills had the capacity to process 1,251 MMBF of timber, a 21 percent decline from 1976 and a 17 percent decline from 1988 (table 21 and figure 11). Montana'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 averaged just 1,495 MMBF in the first three years of the 1980s. Timber processing capacity increased as wood product markets improved, with timber processing capacity peaking in 1987 at 1,595 MMBF Scribner. In the early 1990s, Montana's timber processing capacity began to fall; mill closures in late 1993 and in 1994 caused further

Table 21
Sawtimber Processing Capacity and Capacity Utilized, Montana, 1976-1994

MONTANA CAPACITY TO PROCESS SAWTIMBER—MILLION BOARD FEET SCRIBNER
(Includes sawmills, plywood plants, utility pole plants, and house log plants)

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Lincoln	242	230	220	220	210	200	205	230	230	245	245	295	317	330	280	245	215	201	160
Flathead	310	320	330	340	350	360	365	395	365	355	355	355	378	380	380	335	335	310	310
Lake/Mineral/Sanders	189	200	210	220	230	235	240	240	255	230	230	240	239	240	245	205	205	199	200
Missoula	356	350	350	350	290	290	290	280	280	280	280	280	213	220	210	210	210	197	165
Granite/Ravalli	64	65	65	65	65	72	80	70	95	105	105	125	118	125	125	125	125	118	120
Powell, Lewis & Clark Cascade, Judith Basin Jefferson, Broadwater Meagher, Wheatland	150	150	150	150	150	156	135	135	135	115	115	115	115	115	115	95	95	89	90
Deer Lodge, Silver Bow Beaverhead, Madison Gallatin, Park	130	135	135	135	130	120	135	135	135	125	125	125	123	125	95	95	95	92	90
All other counties	148	140	115	90	95	50	30	40	40	50	60	60	58	55	55	45	45	43	45
Total	1,589	1,590	1,575	1,570	1,520	1,483	1,480	1,525	1,535	1,505	1,515	1,595	1,561	1,590	1,505	1,355	1,325	1,251	1,180

SAWTIMBER PROCESSED—MILLION BOARD FEET SCRIBNER
(Includes sawmills, plywood plants, utility pole plants, and house log plants)

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Lincoln	200	200	200	200	150	170	135	210	215	215	235	265	244	303	258	189	214	177	135
Flathead	250	240	240	240	230	220	185	260	255	260	280	290	322	313	296	295	313	274	279
Lake/Mineral/Sanders	170	160	155	155	150	135	95	160	160	140	135	150	169	177	173	153	164	161	142
Missoula	355	360	360	360	300	260	225	270	260	265	280	280	184	197	188	159	190	168	149
Granite/Ravalli	46	41	46	41	36	39	33	38	42	65	79	86	85	80	92	73	72	66	63
Powell, Lewis & Clark Cascade, Judith Basin Jefferson, Broadwater Meagher, Wheatland	83	90	101	103	76	77	65	85	77	77	85	75	70	70	81	76	78	58	75
Deer Lodge, Silver Bow Beaverhead, Madison Gallatin, Park	73	69	65	61	39	69	40	85	113	105	110	110	112	81	75	82	85	79	85
All other counties	13	65	63	55	9	5	7	2	8	33	36	19	40	29	22	20	21	31	36
Total	1,190	1,225	1,230	1,215	990	975	785	1,110	1,130	1,160	1,240	1,275	1,226	1,250	1,185	1,047	1,137	1,016	964

PERCENTAGE OF CAPACITY UTILIZED
(Includes sawmills, plywood plants, utility pole plants, and house log plants)

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Lincoln	83%	87%	91%	91%	71%	85%	66%	91%	93%	88%	96%	90%	77%	92%	92%	77%	100%	88%	84%
Flathead	81%	75%	73%	71%	66%	61%	51%	66%	70%	73%	79%	82%	85%	82%	78%	88%	93%	88%	90%
Lake/Mineral/Sanders	90%	80%	74%	70%	65%	57%	40%	67%	63%	61%	59%	63%	71%	74%	71%	75%	80%	81%	71%
Missoula	100%	103%	103%	103%	103%	90%	78%	96%	93%	95%	100%	100%	86%	90%	90%	76%	90%	85%	90%
Granite/Ravalli	72%	63%	71%	63%	55%	54%	41%	54%	44%	62%	75%	69%	72%	64%	74%	58%	58%	56%	53%
Powell, Lewis & Clark Cascade, Judith Basin Jefferson, Broadwater Meagher, Wheatland	55%	60%	67%	69%	51%	49%	48%	63%	57%	67%	74%	65%	61%	61%	70%	80%	82%	65%	83%
Deer Lodge, Silver Bow Beaverhead, Madison Gallatin, Park	56%	51%	48%	45%	30%	58%	30%	63%	84%	84%	88%	88%	91%	65%	79%	86%	89%	85%	94%
All other counties	9%	46%	55%	62%	10%	10%	23%	5%	20%	66%	60%	32%	69%	53%	40%	44%	47%	72%	80%
Total	75%	77%	78%	77%	65%	66%	53%	73%	74%	77%	82%	80%	79%	79%	79%	77%	86%	81%	82%

Source: BBER, The University of Montana-Missoula.

declines in the state. The 1994 estimated timber processing capacity is 1,180 MMBF, a decrease of about 70 MMBF since 1993. In contrast to declines in the early 1980s, which were caused primarily by poor markets, recent declines came during a period of high product prices and were driven by reduced timber availability.

While the total capacity in the state has declined, the percentage of capacity utilized has actually increased slightly in recent years. In 1993, Montana's sawtimber processing sector utilized 81 percent of it's capacity to process sawtimber, higher than the 1976-1992 average of 75 percent, and up from the average of 80 percent for the 5 years prior to 1993. Capacity utilization since 1976 has ranged from a high of 86 percent in 1992 to a low of 53 percent in 1982 when there was a severe recession.

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 were combined to avoid disclosing individual firm information.

Flathead County mills had the largest capacity to process sawtimber in 1993, 310 MMBF Scribner, about 25 percent of the state's sawtimber processing capacity (table 21). Timber processing capacity in Flathead County has remained remarkably stable since 1976. Lincoln County mills had the capacity to process 201 MMBF in 1993, 16 percent of the state's sawtimber processing capacity followed by Missoula County mills with 197 MMBF (16 percent). Lake, Mineral, and Sanders county mills had the combined capacity to process 199 MMBF (16 percent), while Granite and Ravalli county mills had sawtimber processing capacity of 118 MMBF (10 percent).

While the capacity to process sawtimber statewide decreased about 21 percent from 1976 to 1993, there have been more dramatic shifts within various counties and geographic areas. In particular, the eight western counties with the capacity to process 1,161 MMBF in 1976 had the capacity to process 1,025 MMBF in 1993, a 12 percent decrease for the region. However within the region, Granite and Ravalli county mills showed an 84 percent increase in timber processing capacity between 1976 and 1993, Missoula County mills showed a 45 percent decrease, Lincoln County mills showed a 17 percent decrease, and the combined mills in Lake, Mineral, and Sanders counties showed a 5 percent increase. Flathead County mills had the same capacity to process sawtimber in 1993 as in 1976. The rest of the state showed a decline of 47 percent in timber processing capacity over that time, resulting from several mill closures.

Capacity by Sector

Montana sawmills contained the largest proportion of sawtimber processing capacity, about 964 MMBF Scribner or 77 percent of the total in 1993 (table 22). This capacity is down from earlier censuses when sawmills had capacity to process in excess of 1,200 MMBF. Sawmills used about 81 percent of this capacity processing 783 MMBF in 1993, up from 61 to 80 percent in earlier surveys.

Montana's plywood manufacturers had the capacity to process 220 MMBF Scribner in 1993, also down from earlier surveys (table 22). Montana plywood plants used 97 percent of this capacity, processing 213 MMBF. This is up from 83 percent in 1988 and 93 percent in 1976, but down from 99 percent in 1981. Striking workers at two of the state's plywood plants resulted in low capacity utilization in 1988. The sale of two of the state's plywood plants and subsequent downsizing at one of the plants late in 1993 contributed to reducing capacity utilization.

The annual timber processing capacity of Montana's house log and utility pole sectors increased steadily since 1976, due to the expansion of the log home and house log industry—the number of manufacturers has more than tripled since 1976. Capacity utilization at these facilities is down slightly however with only 32 percent utilized in 1993.

Table 22
Sawtimber Utilized and Estimated Capacity of Sawmills, Plywood Plants, Utility Pole Plants, and House Log Plants, Montana, 1976, 1981, 1988, and 1993

Plant Type	Thousand 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%
Total	1,589	1,190	75%
		1981	
Sawmills	1,207	739	61%
Plywood Plants	226	224	99%
Utility Pole and House Log Plants	50	17	34%
Total	1,483	980	66%
		1988	
Sawmills	1,237	985	80%
Plywood Plants	263	219	83%
Utility Pole and House Log Plants	61	22	36%
Total	1,561	1,226	79%
		1993	
Sawmills	964	783	81%
Plywood Plants	220	213	97%
Utility Pole and House Log Plants	66	21	32%
Total	1,251	1,016	81%

Source: BBER, The University of Montana-Missoula.

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 23 illustrates these size classes and the amount of used and unused capacity. Generally capacity utilization increased as mill size increased. Montana's ten largest mills (size class A)—each with the capacity to process more than 40 MMBF Scribner of timber annually—accounted for about 42 percent (528 MMBF) of the state's 1,251 MMBF of sawtimber processing capacity in 1993. These mills used 94 percent of this capacity, processing 498 MMBF Scribner. The 12 size class B mills reported using only slightly less (87 percent) of their available capacity. Among the remaining mills, capacity utilization dropped sharply to about 50 percent. Interestingly, the smallest mills (under 1 MMBF) used a higher proportion of stated capacity than did mills with capacity to process 1-10 MMBF. This is likely due to the fact that these firms' reported capacity was based on employee potential rather than equipment potential.

Processing Capacity in Post, Small Pole, and Cedar Product Sectors

Processing capacity for the post and small pole, and cedar product sectors is difficult to quantify. 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, a cedar fencing plant's capacity might be increased simply by adding more workers to split rails. A capacity figure based on equipment potential could, therefore, be misleading.

However, estimates of annual timber processing capacity were developed for these two 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 were for an eight-hour shift for not more than a 240-operating-day year. These 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 40 percent of their capacity was utilized in 1993. Post and small pole and cedar products manufacturers reported approximately 8 MMBF of available timber processing capacity, however they only processed about 2.6 MMBF of timber.

Table 23
Sawtimber Utilized and Estimated Capacity of Sawmills, Plywood Plants, Utility Pole, and House Log Plants, by Size of Plant, Montana, 1993

Size Class	Number of Mills in Size Class	MBF, Scribner: Capacity to Process Sawtimber	MBF, Scribner: Volume Processed	Percentage of Total Capacity Utilized	Unutilized Capacity (MBF, Scribner)
A - over 40 MMBF	10	528,018	497,907	94%	30,111
B - 25 to 40 MMBF	12	426,106	372,384	87%	53,722
C - 10 to 25 MMBF	11	187,691	103,796	55%	83,895
D - 1 to 10 MMBF	28	88,602	31,933	36%	56,669
E - under 1 MMBF	88	20,460	10,441	51%	10,019
All Mills	149	1,250,877	1,016,461	81%	234,416

Source: BBER, The University of Montana-Missoula.

Section 5

Wood Products Markets

Markets for Finished Woods Products

All mills summarized their shipments of finished wood products in 1993, providing information on the volume, sales value, and geographic destination (figure 12). 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 1993, Montana's primary forest products mills had total sales of $1,336 million f.o.b. (free on board) the producing mill (table 24). At $493 million and 37 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 34 to 40 percent of total sales (table 25).

The Rocky Mountain states including Montana, were the second largest regional market, generating more than $340 million or 25 percent of the 1993 sales—15 percent in the Rocky Mountain region and 10 percent in Montana (table 24). This is up substantially from 16 percent in 1988 and is higher than any previous census year. The proportion of sales within Montana is double that for 1988 and probably reflects improved economic conditions and increased construction activity within the state (table 25). The Far West states accounted for 15 percent of Montana's primary forest industry sales, down from 1988 and 1981 and equal to 1976.

Proportionate sales to the South and the Northeast at 11 percent and 6 percent respectively in 1993 have been fairly consistent from census to census. Exports to other countries after rising from 2 percent of total in 1976 to 9 percent in 1988 fell to 6 percent of 1993 sales. The decline was in lumber, pulp and paper, and the house log industry, and was due to weak markets in a number of other countries and a relatively strong U.S. economy.

Compared to 1988, all segments of the industry except residue related products had a higher proportion of sales in

Figure 12
Shipment Destination of Montana's Wood Products

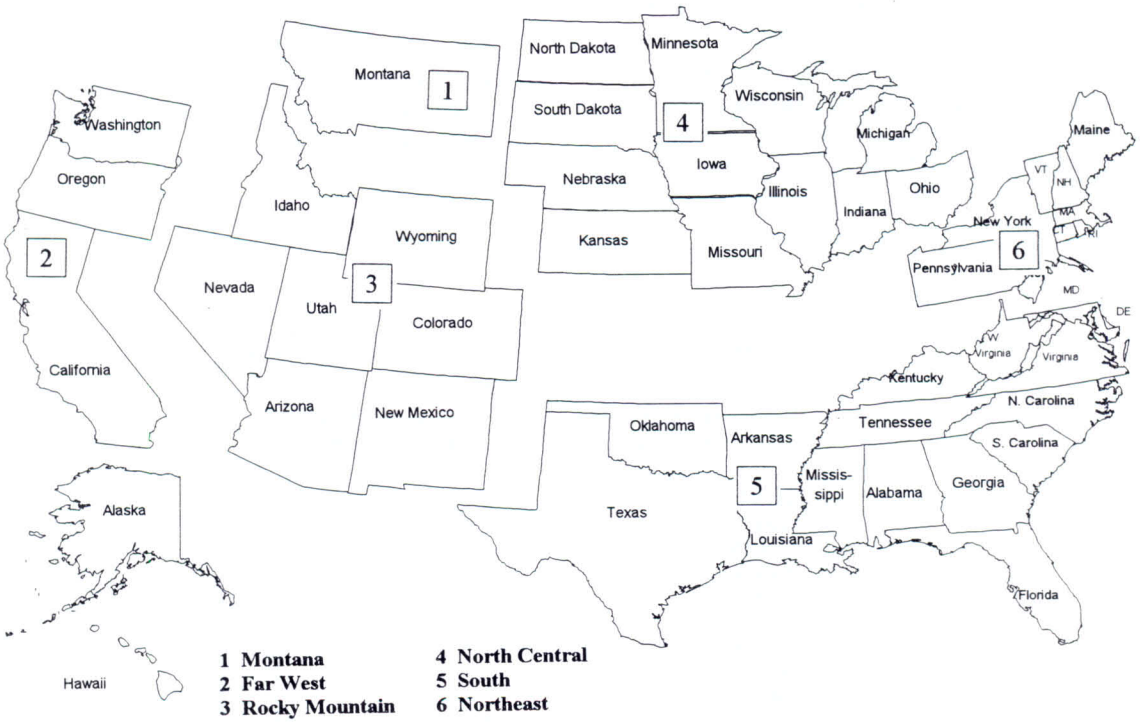


Table 24
Destination of Primary Forest Products Shipments by Value of Shipment, Montana 1993

	Thousand 1993 Dollars									
Product	Montana	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
Pulp, paper, particleboard and fiberboard and other residue-related products	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%
Pulp, paper, particleboard and fiberboard and other residue-related products	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%

Source: BBER, The University of Montana-Missoula.

Montana and the other Rocky Mountain states—again likely due to improved economic conditions in the region (table 24 and table A7, A8, A9 in Appendix A). However, products of the major segments of the industry—lumber, plywood, and the residue related products—were sold primarily outside of Montana and the Rocky Mountain region. These other markets accounted for over 70 percent of lumber sales and more than 80 percent of plywood, paper, and reconstituted board sales. The log home industry and producers of utility poles, posts and cedar products were oriented much more to markets closer to their plants—half of the log home sales and 59 percent of other product sales in Montana or the other Rocky Mountain states (table 24).

Table 25
Percent of Product Sales by Market Region, Montana, 1976, 1981, 1988, and 1993

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

Source: BBER, The University of Montana-Missoula.

Section 6

Wood Residue

Wood Residue from Primary Wood Products Manufacturers In Montana

Wood residue from primary wood products manufacturers (mill residue) is the major source of raw material for Montana's pulp and paper and board industries, and an important source of fuel for major sectors of the wood products industry. Unused wood 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.

Table 26 & 27
Sawmill Residue Factors,
Montana, 1969, 1976, 1981, 1988, and 1993

	Bone Dry Units per MBF Lumber Tally				
Residue Type	1969	1976	1981	1988	1993
Coarse	0.45	0.45	0.47	0.51	0.48
Sawdust	0.29	0.24	0.25	0.22	0.23
Planer Shavings	0.25	0.22	0.22	0.18	0.16
Bark	0.30	0.25	0.23	0.21	0.21

Softwood Plywood Residue Factors,
Montana, 1969, 1976, 1981, 1988, and 1993

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

Source: Setzer, T.S. 1971. Estimates of Timber Products Output and Plant Residues, Montana, 1969. USDA For. Serv. Int. For. and Range Exp. Stn. Ogden, UT. BBER, The University of Montana-Missoula.

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, tree size, and 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, shown in tables 26 and 27, 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 product produced 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 has decreased. As log diameters get smaller, a smaller percentage of the log volume is recoverable for solid lumber products.

Production and Utilization

Because more timber is processed into lumber and because more of the log ends up as residue when lumber is produced, lumber production has been the major source of residue production. However, the highest volume of residue produced for the five census years was in 1969 and it was due in large part to the high residue volume factors for planer shavings, sawdust, and bark (table 28)—lumber production in 1969 was 1,397 MMBF. For the census years after 1969, changes in residue output were due primarily to the substantial differences in lumber production among the 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. Lumber

Table 28
Estimated Volume of Wood Residue Generated by Sawmills and Plywood Plants, Montana, 1969, 1976, 1981, 1988, and 1993

Residue Type and Year	Estimated Volume (Thousand Bone Dry Units) Utilized	Unutilized	Total	Percentage of Total Utilized	Unutilized	Total
Coarse						
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%
Fine *						
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%
Bark						
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%
Total						
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%

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

Source: Setzer, T.S. 1971. Estimates of Timber Products Output and Plant Residues, Montana, 1969. USDA For. Serv. Int. For. and Range Exp. Stn. Ogden, UT.

production in 1993 was 1,367 MMBF and in 1976 1,197 MMBF. 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, in 1993 this use had increased to 99 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 1993, almost all of the 864 thousand bone dry units (MBDUs) of coarse residue was reported used (tables 29 and 30). Over 98 percent was sold to the pulp and paper industry, and 15 MBDUs went to other uses, 13 MBDUs were burned as firewood. Less than 1 MBDU was reported as being unused.

Fine residue (sawdust, planer shavings, and sander dust) accounted for 548 MBDUs in 1993. Of these, 412 MBDUs went to pulp mills and board plants as raw material, and 136 MBDUs went to hogfuel, wood fuel pellet producers, cattle bedding, and other uses, with less than 1 MBDU unused.

Bark totaled 372 MBDUs in 1993. Most bark, 344 MBDUs, was used as hogfuel at manufacturing facilities. A small portion (17 MBDUs) went to other uses including decorative bark, livestock bedding, and mulch, and 11 MBDUs went unused.

In 1993, the manufacturing of utility poles, house logs, cedar products, and posts and small poles generated several types of residue (19 MBDUs). Much of this material, 15 MBDUs, was used for fuelwood, hogfuel, livestock bedding, garden mulch and other purposes, 4 MBDUs were unused.

Revenue from the Sale of Manufacturing Residue

Wood fiber residue sales generated $66 million in revenue for Montana sawmills and plywood plants in 1993, (in addition to the $704 million in lumber sales and $189 million in plywood sales). This is an increase from the $30 million (1993 dollars) of total residue sales reported for 1988.

In 1993, about 88 percent ($58 million) came from sales of chips to the pulp and paper industry. The average sales price for chips in 1993 was $66 per bone-dry unit (BDU) f.o.b. the manufacturers' plant. This compares to $33 per BDU in 1988 and $81 per BDU in 1981 (both in 1993 dollars). The price of chips historically increases in years when there is low lumber production, because of greater competition for chips. This scenario occurred in 1981 and was the primary reason for high chip prices that year. 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. Sawdust, planer shavings, and bark prices ranged from about $2 to more than $15 per BDU f.o.b. manufacturer's plant in 1993.

Table 29
Production and Disposition of Mill Residue by Sawmills and Plywood Plants by Type of Residue Use, Montana, 1993

Residue Type	Total Utilized	Raw Materials Pulp Mills/ Board Plant	Hogfuel	Other Uses	Unutilized	Total
Coarse	864	848	-	15	0	864
Fine	548	412	112	24	0	548
Bark	361	-	344	17	11	372
Total	1,772	1,260	456	56	11	1,783

Table 30
Mill Residue from Lumber and Plywood Plants, Montana, 1993

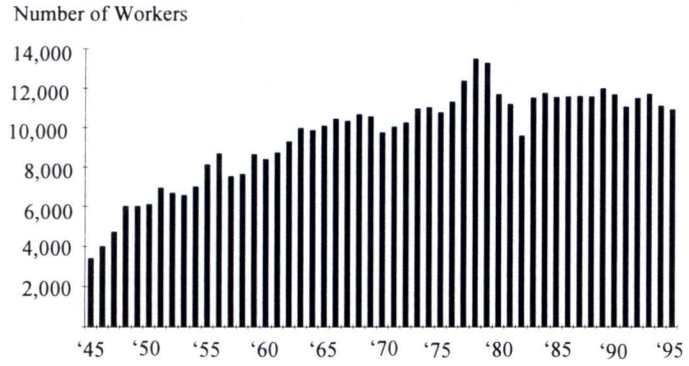
Residue Type	Thousand Bone Dry Units Utilized	Unutilized	Total
Coarse	864	0	864
Fine			
Planer Shavings	220	-	220
Sawdust	314	0	314
Sander Dust	14	-	14
Bark	361	11	372
Total	1,772	11	1,783

Section 7

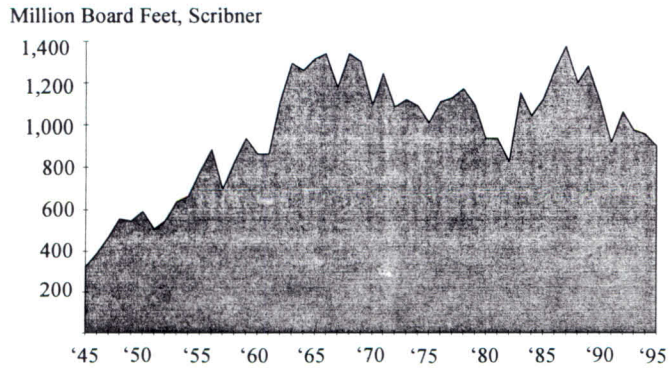
Montana Economy

The Forest Products Industry and the Montana Economy

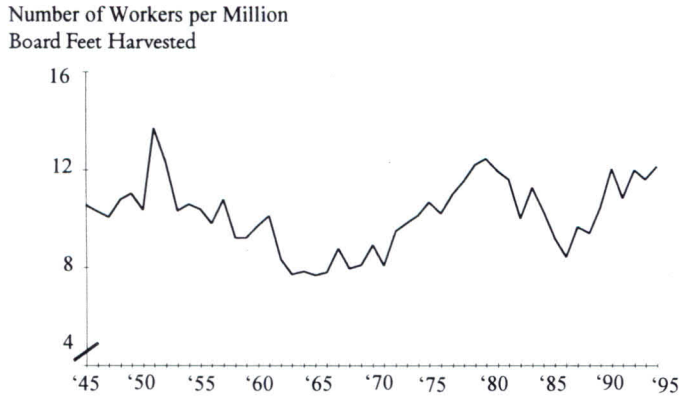
Figures 13, 14 & 15
Montana Forest Industry Employment, 1945-1995



Montana Timber Harvest, 1945-1995



Forest Industry Employment per Million Board Feet of Timber Harvested, 1945-1995



Sources: Bureau of Economic Analysis, U.S. Department of Commerce; and *Economics Montana*, Bureau of Business and Economic Research, The University of Montana-Missoula.

Employment and Labor Income in the Forest Products Industry: 1969-95

Logging, processing logs into lumber and other wood products, processing wood residue from timber processing plants into products such as paper or outputs such as electricity, and private sector timber management services correspond closely to three standard industrial classifications (SIC) as defined by the U.S. Office of Management and Budget—SIC 08, forestry services; SIC 24, lumber and wood products; and SIC 26, pulp, paper and allied products. These three standard industrial classifications will be used to estimate employment and income to workers (labor income) in Montana's forest products industry.

Some workers included in these three SIC categories are not related to Montana's or the region's timber resource. These include a few hundred workers in secondary wood industries often more closely related to local construction activity than to the harvesting and processing of timber in Montana.

On the other hand, not included in these three SIC categories are a number of activities associated with the industry and involving several thousand workers. These other activities include the transport of logs, mill residue, and finished products by truck or rail, and government employees engaged in forest management activities related to timber production. On balance, the three SIC categories (08, 24, and 26) provide a reasonably accurate, consistent, and conservative depiction of employment and income to workers in the forest products industry.

Despite a lower harvest level than the 1960s, the 1970s were a period of substantial increases in forest industry employment—rising from about 10,500 workers in 1969 to almost 13,500 workers in 1978 (figure 13). Timber harvest in 1969 was 1,302 million board feet (MMBF), Scribner vs. 1,171 MMBF in 1978. Total employment increased because the industry was employing more workers per MMBF Scribner of timber harvested and processed as the 1970s progressed (figures 14 and 15).

Employment per MMBF increased because of :

- the expanded use of waste wood from sawmills and plywood plants. This expanded residue use involved the construction of a particleboard plant and a medium density fiberboard plant, and the expansion of the pulp and paper mill;
- the substitution of the more labor-intensive plywood industry for a portion of the sawmill industry;
- expansion of the labor intensive log home industry in Montana;
- increased levels of land management activity, such as thinning;
- very strong markets for wood products in particular in the late 1970s (Flowers et al. 1993, Keegan et al. 1990).

In the early 1980s, the infamous "double dipper" recessions led to substantially lower harvest, output, and employment. Following these recessions, employment rebounded to about 11,600 workers throughout the remainder of the 1980s. Harvest in the last half of the 1980s actually exceeded that of the late 1970s but employment remained below the late 1970s peaks (figure 13 and 14). Automation and mechanization as well as replacement of more labor intensive large log mills by small log mills were primarily responsible for making the industry less labor intensive in the1980s (figure 15).

The first half of the 1990s saw, once again, a more labor-intensive forest products industry and in spite of substantial declines in timber harvest there were only small changes in employment and labor income. With a national recession in 1990-1991, employment fell to 11,000 workers in 1991 and then recovered to 11,700 workers in 1993.

Timber harvest in 1993 was 20 percent below the average annual timber harvest for the last half of the 1980s, but 1993 employment of 11,700 exceeded the average annual figure of 11,640 for 1985-1989. In 1994, harvest relative to the late 1980s was down nearly 25 percent but employment had declined only 5 percent to 11,100 workers. Market conditions weakened in 1995 and estimated forest industry employment was 10,900. Employment did not decrease as much as harvest again because of changes in labor intensity, in this case there was a rise in the number of workers per MMBF of timber harvested (figure 15). The increase in labor intensity was, in turn, due to several factors (Schuster, Keegan and Jackson 1996):

Market conditions and timber quality. Timber stumpage and manufactured wood products prices rose sharply at the same time the timber harvest in Montana declined. This provided incentives to use more labor to maximize product and value recovery and to use lower quality timber, which requires more effort to harvest and process.

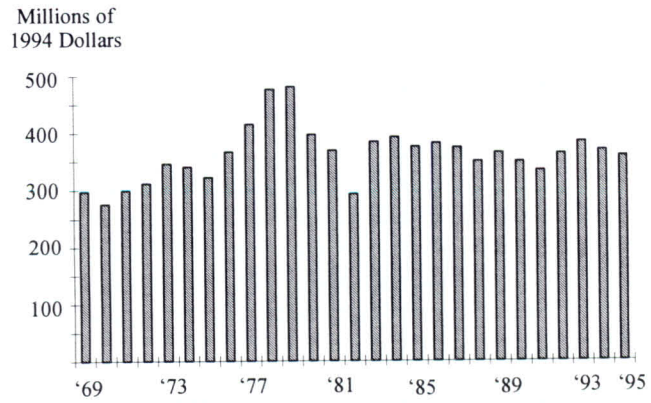
Changes in log flows. In recent years, Montana has became a net importer of logs from other states and from Canada. In 1993 and 1994, Montana mills processed on average 47 MMBF more timber annually than was harvested in the state. This is in contrast to the late 1980s when Montana was a net exporter of timber to other states.

Social concerns. Logging practices were modified to accommodate growing concerns about the visual and biological impacts of harvesting. In most cases, the modifications to logging practices involved increased labor intensity.

Industry structure. Secondary and log home manufacturing have grown significantly, and a larger proportion of the forest products industry employment are now in these labor intensive activities.

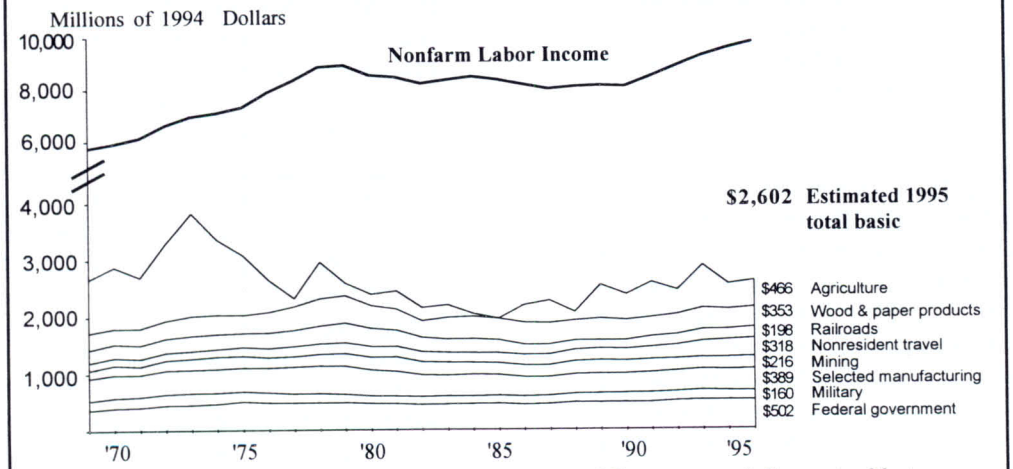
Inflation-adjusted labor income displayed the same general trends as employment, but with somewhat greater vacillations. Specifically, the peak in 1979, and the recession-induced trough

Figure 16
Montana Forest Industry Labor Income, 1969-1995



Sources: Bureau of Economic Analysis, U.S. Department of Commerce; and *Economics Montana*, Bureau of Business and Economic Research, The University of Montana-Missoula.

Figure 17
Nonfarm Labor Income and Labor Income in Basic Industries, Montana



Sources: Bureau of Economic Analysis, U.S. Department of Commerce; and *Economics Montana*, Bureau of Business and Economic Research, The University of Montana-Missoula.

in 1982, were more dramatic in labor income than employment (figures 13 and 16). The recovery pattern was similar to employment—labor income from 1983-1989 averaged $375 million annually (1994 dollars); higher than the average for the1970s but about 20 percent below the peak of $480 million in 1979.

After relative stability through the last half of the 1980s, there was a dip in the early 1990s related to the 1990-1991 recession and developing timber availability constraints. Then with very high prices and increased employment, labor income in 1993 rose to $385 million (1994 dollars) and was actually higher than for any year in the last half of the 1980s. Forest industry labor income in 1994 of $369 million when adjusted for inflation is equal to the annual average for the last half of the 1980s. Estimated labor income in 1995 is $360 million (1994 dollars).

The Montana Economy 1969-1995

Long-term trends in Montana's economy are pictured in figure 17. The top line is nonfarm labor income. Nonfarm labor income measures overall trends in the economy. It is a proxy for Gross State Product (GSP), which is not yet available for the entire period. There were dramatic differences in Montana's overall economic conditions in the last several decades. The 1970s were a period of almost uninterrupted growth. The 1980s had times of significant declines as well as approximate stability. And the early 1990s saw renewed growth.

There are no short and simple explanations for each "blip and squiggle" in 25 years of economic trends, but Montana's basic industries help to identify the major reasons why the decades were so different. The economic base of a state or region consists of industries whose products or services are generally sold in outside markets (or otherwise dependent on outside funds). Sales by basic industries inject new funds into a local economy to the extent they are spent in the area in the form of payrolls, taxes, and the purchase of local goods and services. Therefore, changes in basic industries are usually followed by corresponding changes in the local economy. The most obvious components of Montana's economic base are the natural resource industries, such as agriculture, mining, and forest products. They sell their products outside the state and inject new funds into the local economy as they make wage payments, purchase electricity or other products, and pay taxes. Less conspicuous, but also important, are industries such as nonresident travel and the federal government, which also derive their funds from outside Montana.

The lower portion of figure 17 presents basic industries' labor income, which does not include payments for taxes, utilities, and other purchases. Comparing the trends in the lower portion of the figure with those of nonfarm labor income in the upper portion illustrates the close relationship between the basic industries and the state's overall economic performance. Specifically, the ups and downs in nonfarm basic labor income (the second line from the top in the lower portion of figure 17) correspond generally to those in nonfarm labor income (in the upper portion of the figure 17). The impacts of agriculture on the overall economy are clouded by its volatility and are best measured using data other than labor income—for example, farm and ranch expenditures.

The natural resource extraction and processing industries, including forest products, agriculture, food processing, mining and smelting and refining , still in the 1990s account for approximately 50 percent of Montana's total basic industry labor income. Natural resource extracting and processing industries tend to be capital intensive with very high labor productivity, and they not only have high average wage rates but also often make significant nonwage payments and purchases from other local economic sectors. Therefore labor income data and employment data may understate the true contribution of these industries to the state's economy, and may not promptly reflect changes in output and production. A mill's employment and labor income may not increase or decrease proportionately with each change in output—for example with new technology, a sawmill's lumber output might increase with no change in employment however resulting increased lumber shipments might lead to increases in employment in trucking. Similarly, labor statistics would not reflect mill payments to utilities or taxes paid.

Figure 18 shows average labor income per worker for these natural resource related industries. Many of these— forest products, mining, and smelting and refining—have high labor productivity and capital intensity and high labor income per worker. Statewide average labor income for all workers in Montana was $20,500 in 1994. Forest products labor income per worker averaged $33,300 in 1994; mining averaged $40,800, metals smelting and refining averaged $42,300 and petroleum refining averaged $71,000.

Long-Run Trends in the Montana Economy: the 1970s and 1980s

The 1970s. This was a decade of growth in Montana. The important basic industry trends were:

- Agriculture. The early 1970s were extremely prosperous for Montana farms and ranches. The years 1972, 1973, and 1974 saw the highest three year period level of constant dollar farm labor income since 1929 (when the data starts). There were two factors at work. First the international market was extremely favorable for wheat. There were Russian wheat harvest failures, and the Soviets entered the market late in the season, much to the benefit of the Montana and other northern areas. Second, beef prices reached a high because of the cow/calf cycle.
- Forest Products Industry. Forest industry employment grew by 30 percent in the 1970s; while timber harvest actually declined relative to the 1960s. Structural changes and strong markets lead to a substantially more labor intensive industry.
- Other Basic Industries. Coal mining grew from 150 to almost 600 workers between 1972 and 1976, and then to about 1,000 workers by the end of the decade. Oil and gas extraction rose sharply after 1972, but the peak in this industry wasn't reached until the early 1980s. The only major declines were in metal mining, with a sharp decline in 1974-1977 and again in 1979, primarily at the Anaconda Company in Butte.

The 1980s. This was a decade of disasters with an actual contraction of Montana's economy—overall inflation- adjusted nonfarm labor income in 1990 was about 5.5 percent less than it was in 1980.

The first three years of the 1980s saw the worst postwar recession (actually two recessions), which hit the wood products industry hard. Secondly, there were permanent closures of major operations in other industries, including the Milwaukee Road, the Anaconda refineries in Anaconda and Great Falls, and continued employment declines at the Butte mine, with final shutdown in 1983. Things would have been even worse had it not been for the peak in oil and gas exploration which occurred in 1981.

In mid-decade, the recessions were over and the closures were completed. The wood products industry actually made a respectable cyclic recovery and was in the midst of structural changes adjusting to smaller diameter timber and modernization which increased labor productivity. But now the oil and gas industry was in a steep decline.

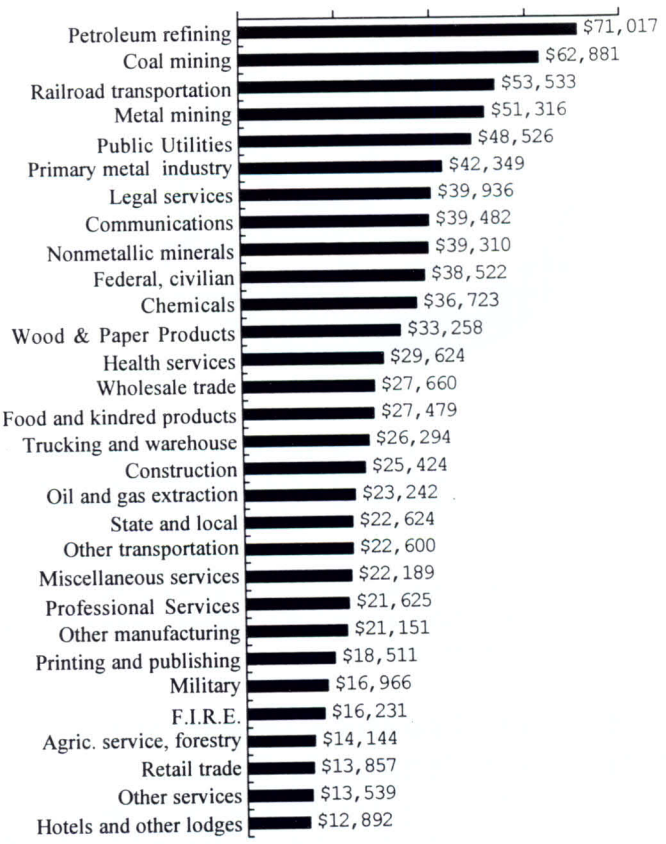
In the late 1980s, most of the basic industries were relatively stable with increases in nonresident travel and nonfuels mineral mining offsetting continuing declines in oil and gas extraction (primarily in eastern Montana) and railroads. During this time a number of new major mines such as the Stillwater Complex and the Pegasus Mine near Helena opened. This was the period when Montana Rail Link took over from the Burlington Northern and significantly reduced railroad employment.

Recent Trends in the Montana Economy: 1990-1995

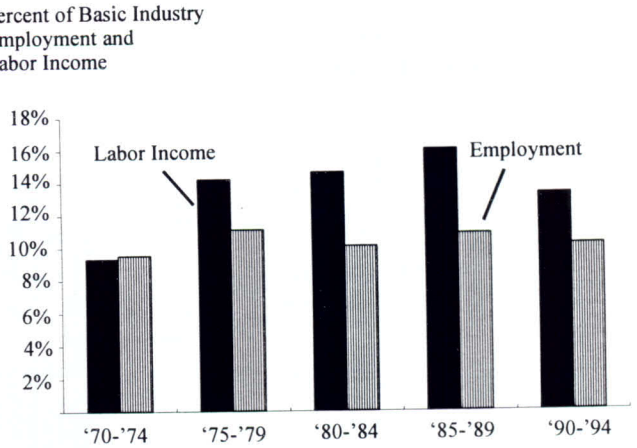
After a decade of declines, droughts, and shutdowns, the Montana economy turned upward in the early 1990s. Not only was there economic growth, but media stories heralded the fact that Montana led all states in terms of increases. To some extent, the economic growth hype was exaggerated because moderate growth in Montana was being compared to a U.S. economy mired in recession. Nevertheless, the increases in the early 1990s did reflect a definite end to the economic disasters of the 1980s. The early 1990s increases can be attributed to several factors:

- Agriculture. Both 1991 and 1993 were very profitable years for agriculture, with 1993 being Montana's best farm year since the early 1970s.
- Construction. Low interest rates and a backlog of projects delayed since the 1980s led to a building boom. In addition, net inmigration, especially in western Montana, added to the demand for housing.
- Manufacturing. 'High tech' and other light manufacturing in particular increased and wood products despite a 25 percent drop in timber harvest saw little change in employment and labor income.
- Federal government. Labor income of Montana's federal employees rose sharply between 1991 and 1994. The increases appear to be caused by increases in average earning (perhaps as employees wind their way through the steps of the federal pay matrix), rather than growing numbers of workers.

Figures 18 & 19
Average Annual Labor Income per Worker for Montana Selected Industries, 1994

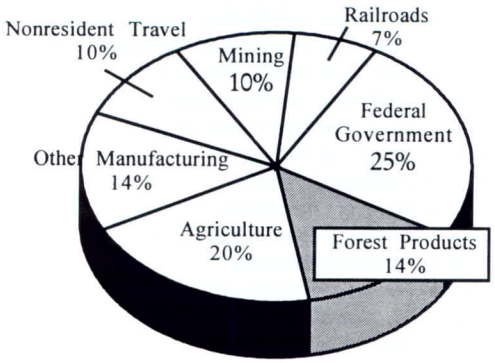


Montana's Forest Products Industry Employment and Labor Income as a Percent of Basic Industry Employment and Labor Income



Sources: Bureau of Economic Analysis, U.S. Department of Commerce; and *Economics Montana*, Bureau of Business and Economic Research, The University of Montana-Missoula.

Figure 20
Make-up of Montana's Economic Base, 1990-1994



Sources: Bureau of Economic Analysis, U.S. Department of Commerce; and *Economics Montana*, Bureau of Business and Economic Research, The University of Montana-Missoula.

- Nonresident travel. This industry grew significantly during the late 1980s and early 1990s, and has continued to grow but at slower rates.

The Forest Products Industry and Montana's Economic Base

Labor income in Montana's basic industries averaged $2.64 billion dollars during the first five years of the 1990s with the forest products industry providing just under 14 percent (figure 19). A five-year average is used to correct for the year-to-year volatility in particular in agriculture. Other important sectors include agriculture (20 percent), nonresident travel (10 percent), mining (10 percent), federal government (25 percent), and other manufacturing (14 percent).

Montana's economic base is sometimes measured using employment rather than labor income. Basic industries with relatively high income per worker (such as forest products) usually account for smaller shares of basic employment than basic labor income. As shown in figure 19, forest products accounted for about 10 percent of the state's basic employment during 1990-1994.

A longer-term perspective of the forest products industry's contribution to the statewide economic base is shown in figure 7. Since 1970, the forest products industry first increased and then declined as a share of Montana's economic base. The industry's labor income rose gradually in the 1970s, and the industries contribution to the state's economic base peaked in the early 1980s, and declined slowly since. The importance rose from 9.3 percent in 1970-74 to 14.2 percent in 1975-1979, to 14.6 percent in 1980-1984, and to 16.0% in 1985-1989. It then dropped to 13.8 percent in 1990-1994.

Using employment, the forest products industry peaked in the late 1970s rather than in the late 1980s in terms of its relative contribution (figure 19). The percentages rose from 9.5 percent in 1970-1974 to 11.1 percent in 1975-1979. It then declined to 10.1 percent in 1980-1984, recovered slightly to 10.8 percent in 1985-1989, only to reverse and decrease to 10.1 percent in 1990-1994.

The Forest Products Industry and Regional Economies in Montana

Forest industry employment is found in 40 of Montana's 56

Figure 21
Forest Industry Employment and Labor Income Concentrations in Montana

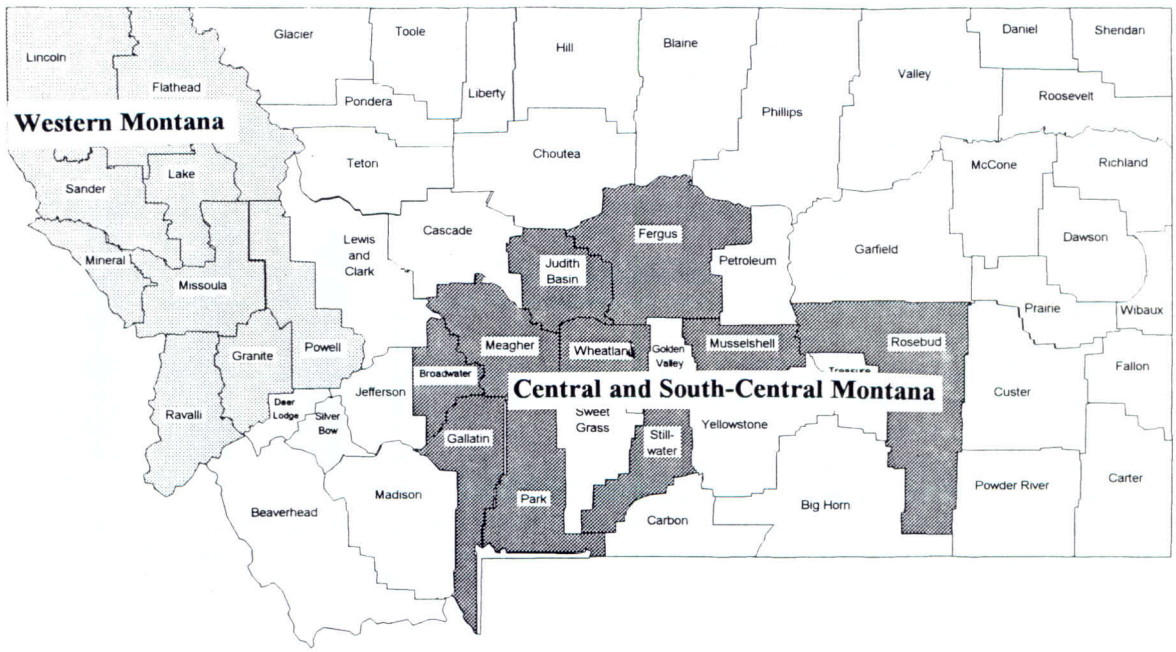
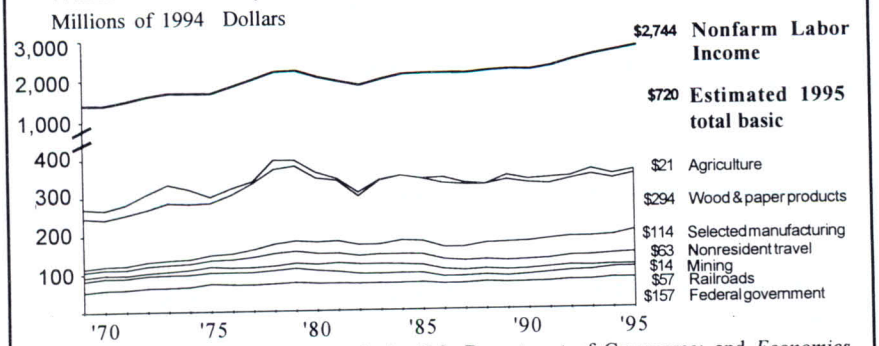


Figure 22
Nonfarm Labor Income and Labor Income in Basic Industries, Western Montana, 1969-1995



Sources: Bureau of Economic Analysis, U.S. Department of Commerce; and *Economics Montana*, Bureau of Business and Economic Research, The University of Montana-Missoula.

counties, however, over 80 percent of the labor income and employment is in nine western counties where it constitutes the major component of the economic base (figure 21). In addition, 10 counties in central and south central Montana have forest products as a measurable component of their economic base.

Western Montana: Figure 22 displays the place of the forest products industry in the western Montana economy. In the last half of the 1970s, 49 percent of western Montana's basic labor income was in forest products, peaking in 1977 at 51 percent. With declines in employment in the 1980s that share fell to about 47 percent in the last half of the 1980s, and with growth in some other sectors of the base in the 1990s forest products accounted for about 44 percent of basic labor income in 1993—the base year for this industry census. Closures and curtailments in the industry since 1993 have been concentrated in the nine western counties and the share of basic labor income provided by the forest products industry declined to an estimated 41 percent in 1995.

Central and South Central Montana: Outside of western Montana there are 10 counties in which more than 5 percent of basic labor is in forest products and of these Broadwater and Wheatland have over one third of basic labor income in the forest products industry (figure 21).

Western Montana Trends. Figure 22 provides a two and a half decade perspective of the trends in Montana's nine western counties, and the corresponding data for the basic industries. As was true statewide, overall nonfarm labor income trends were very different in the 1970s, the 1980s, and early 1990s. For example, the general trend of the 1970s was growth, interrupted only by cyclic slowdowns in the early part of the decade. The 1980s began with precipitous declines associated with the "double dipper" recession, then stability and even a slight upward trend by decade's end. Finally, the western Montana economy turned upward in the early 1990s.

As was true statewide, overall economic conditions in western Montana are mirrored in basic industries, with wood products playing a proportionately greater role. For example, growth in the nine western counties in 1970s corresponds to forest products industry expansions that took place; and the declines and stagnation in the 1980s were strongly influenced by the industry's trends during that decade.

The growth in nonfarm labor income however in the early 1990s is much more dramatic than the increase in the basic industries. This is due to a number of factors:

1. Construction labor income is a component of nonfarm labor income but is not included as a basic industry. The early 1990s boom was particularly strong in western Montana, where government buildings (at The University of Montana-Missoula, for example), the influx of retirees/migrants, and projects delayed from the 1980s fueled construction activity.
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 services firms not only for lawyers and accountants but also for production workers has increased.

This means some employment and labor income formerly reported in basic industries now is reported in derivative service sectors.

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APPENDIX A

Table A1
Timber Products Harvested by Ownership Source, Montana, 1988

Origin	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
	Thousand Board Feet, Scribner				
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
Total	1,000,052	205,293	10,866	20,083	1,236,294
	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%	0.4%	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%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Bureau of Business and Economic Research, The University of Montana

Table A2
Timber Products Harvested by Ownership Source, Montana, 1981

Origin	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
	Thousand Board Feet, Scribner				
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	1,296	38,797
Total	736,499	222,876	53,097	22,605	1,035,077
	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%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

[a] Less than 1 MMBF.
Source: Bureau of Business and Economic Research, The University of Montana

Table A3
Timber Products Harvested by Ownership Source, Montana, 1976

Origin	Sawlogs	Veneer Logs	Pulpwood	Other Roundwood Products	All Products
	Thousand Board Feet, Scribner				
Private Timberlands	427,973	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%

[a] Not disclosed.
Source: Bureau of Business and Economic Research, The University of Montana

Table A4
Ownership Source of Timber Products Delivered to Various Sectors of Montana's Industry, 1988

Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
	Thousand Board Feet, Scribner			
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%

Source: Bureau of Business and Economic Research, The University of Montana

Table A5
Ownership Source of Timber Products Delivered to Various Sectors of Montana's Industry, 1981

Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
	Thousand Board Feet, Scribner			
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%

Source: Bureau of Business and Economic Research, The University of Montana

Table A6
Ownership Source of Timber Products Delivered to Various Sectors of Montana's Industry, 1976

Origin	Sawmills	Plywood Plants	Other Primary Manufacturers	All Facilities
	Thousand Board Feet, Scribner			
Private Timberlands	429,444	175,469	18,014	622,927
Industrial	259,589	145,012	12,659	417,260
Nonindustrial	169,855	30,457	5,355	205,667
Tribal Timberlands	27,923	9,823	280	38,026
Public Timberlands	440,654	82,294	26,738	549,686
National Forest	420,670	81,222	26,165	528,057
Other	19,984	1,072	573	21,629
Total	898,021	267,586	45,032	1,210,639
	Percentage of Total			
Private Timberlands	47.8%	65.6%	40.0%	51.5%
Industrial	28.9%	54.2%	28.1%	34.5%
Nonindustrial	18.9%	11.4%	11.9%	17.0%
Tribal Timberlands	3.1%	3.7%	0.6%	3.1%
Public Timberlands	49.1%	30.8%	59.4%	45.4%
National Forest	46.8%	30.4%	58.1%	43.6%
Other	2.2%	0.4%	1.3%	1.8%
Total	100.0%	100.0%	100.0%	100.0%

Source: Bureau of Business and Economic Research, The University of Montana

Table A7
Destination of Primary Forest Products Shipments by Value of Shipment, Montana 1988

	Montana	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
Pulp, paper, particleboard and fiber board and other 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%
Pulp, paper, particleboard and fiber board and other residue related products										
House logs	2%	12%	28%	33%	4%	2%	— 19% —		0%	100%
Posts, small poles, and utility poles	13%	19%	15%	19%	14%	12%	0%	7%	0%	100%
Cedar products	40%	13%	28%	18%	0%	0%	0%	—a	0%	100%
All products	23%	2%	2%	40%	17%	16%	0%	0%	0%	100%
	5%	11%	17%	40%	10%	7%	— 9% —		1%	100%

Source: Bureau of Business and Economic Research, The University of Montana.

Table A8
Destination of Primary Forest Products Shipments by Value of Shipment, Montana 1981

	Montana	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
Pulp, paper, particleboard and fiber board and other residue related products	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%
Pulp, paper, particleboard and fiber board and other residue related products	—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%

Source: Bureau of Business and Economic Research, The University of Montana.

Table A9
Destination of Primary Forest Products Shipments by Value of Shipment, Montana 1976

	Montana	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
Pulp, paper, particleboard and fiber board and other residue related products	—a	—a	—a	—a	—a	—a	—a	—a	—a	—a
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%
Pulp, paper, particleboard and fiber board and other residue related products	—a	—a	—a	—a	—a	—a	—a	—a	—a	—a
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%

[a]Not disclosed.
Source: Bureau of Business and Economic Research, The University of Montana.