



Wisconsin Department of Natural Resources

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**Economic Contribution Of Forest Products Industry To Wisconsin Economy, 2022
(Based On 2019 IMPLAN Data)**

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1. Introduction

Wisconsin has about 17 million acres of forest land, covering over 40% of the state's total area (FIA, 2021). Of the 17 million acres, timberland accounts for about 97% or 16 million acres.

Private landowners are the largest group, accounting for almost 70% of forestland, 21% is owned by state and local government, and just under 9% is national forest and other federal

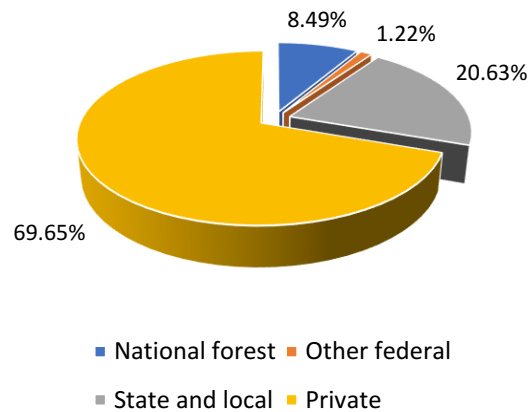


Figure 1. Wisconsin forestland ownership by percent, 2019 (Source: FIA)

forestland (Figure 1). The Northwest has the largest percent (34%) of total forestland, of which 59% is privately owned, whereas the Southeast has the least (8%), of which 86% is privately owned (Counties included in each region are presented in Figure 8 on page 14).

The most abundant forest type groups are hardwood forest types. Oak/hickory (26%), Maple/beechn/birch (23%) and Aspen/birch (17%) comprise more than 65% of the Wisconsin forestland (Figure 2). The Aspen/birch group has been steadily declining over the past few decades. Between 2003 and 2019, Aspen/birch lost around 10% of forest acres.

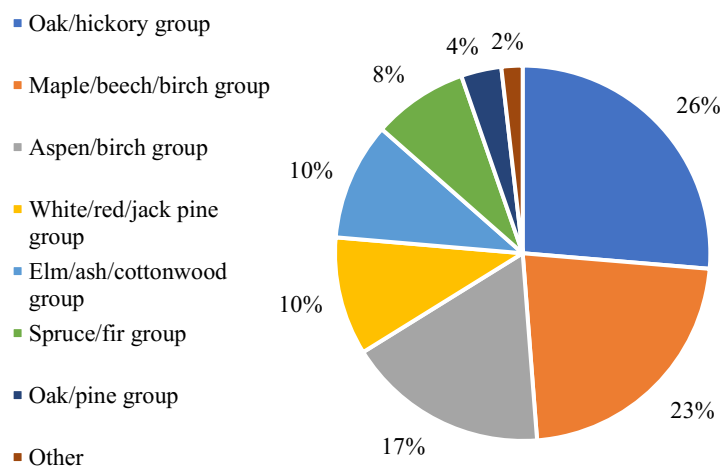


Figure 2. Percentage of forestland area by forest type, 2019 (Source: FIA)

In 2019, the net annual growth of growing-stock trees on forestland was over 582 million cubic feet. In contrast, the average annual removal volume was only 278 million cubic feet, suggesting more volume of wood could be sustainably harvested. The total removals from hardwoods were

207 million cubic feet (75%) and from softwoods were 71 million cubic feet (25%). This net growth on forestland has been about 550 million cubic feet annually for the last decade, whereas the average removal volume has been about 300 million cubic feet (Table 1).

Table 1. Forestland area, timberland area, net growth volume and average annual removal volume for Wisconsin (FIA report)

	2007	2010	2013	2016	2019
Forestland in million acres	16.41	16.87	17.10	17.06	16.96
Timberland in million acres	15.92	16.33	16.55	16.51	16.39
Net growth of merchantable bole volume of growing stock, in million cubic feet, on forestland	568.88	544.13	566.62	581.70	582.19
Softwood net growth, in million cubic feet	175.17	177.06	198.38	197.71	189.17
Hardwood net growth, in million cubic feet	393.71	367.07	368.25	383.99	393.02
Average annual removals of merchantable bole volume of growing stock, in million cubic feet, on forestland	317.28	300.51	313.22	302.59	277.80
Softwood removals in million cubic feet	69.32	68.28	78.50	75.92	70.65
Hardwood removals in million cubic feet	247.96	232.24	234.72	226.67	207.16
Growth-to-removal ratio, total	1.79	1.81	1.81	1.92	2.10
Softwood, growth-to-removal ratio	2.53	2.59	2.53	2.60	2.68
Hardwood, growth-to-removal ratio	1.59	1.58	1.57	1.69	1.90

The growth-to-removal ratio is one indicator used to measure the sustainability of forest management. Ratios of less than one suggest an unsustainable situation over the long term because of over-harvesting and other removals. In contrast, ratios greater than one suggest more volume could be sustainably removed. For softwood, average annual growth-to-removal ratios have been above 2.4 since 2007, indicating that less than 40% of the annual softwood growth has been removed, and a substantial portion of softwoods may be available annually for potential utilization (Figure 3). Similarly, for hardwoods, the ratios have been above

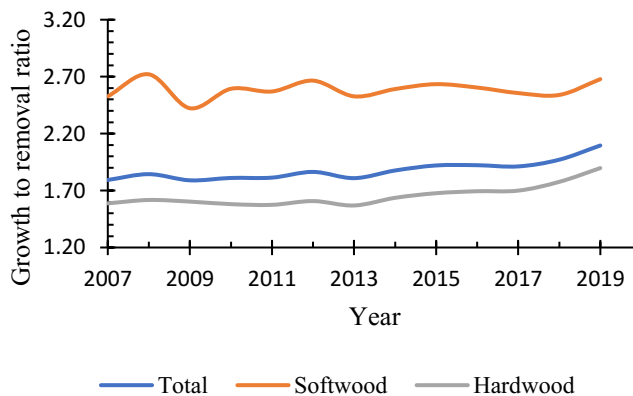


Figure 3. Average annual net growth of merchantable bole volume of growing stock to removal ratio for hardwood and softwood (Source: FIA).

1.6, indicating that less than 60% of annual hardwood growth has been removed. A substantial portion of annual growth could be sustainably harvested for potential resource utilization that could help support local economies. The growth-to-removal ratios of specific species need to be considered so that individual species are not over-utilized.

In 2019, designated county forests, state forests and other DNR-owned state lands generated over \$57 million worth of timber revenue (County and State Forest Timber Sales, 2022). Of this total, timber sales from county forests accounted for over 75% of total sales. Compared to 2018, overall timber sales from state forests, other DNR-owned state lands and county forests remained relatively flat. Sales from county forests decreased by about 3%, whereas timber sales from state forests increased by 13% and other DNR-owned state lands increased by about 25%. The trend of timber sales has been linearly increasing since the 1990s (Figure 4).

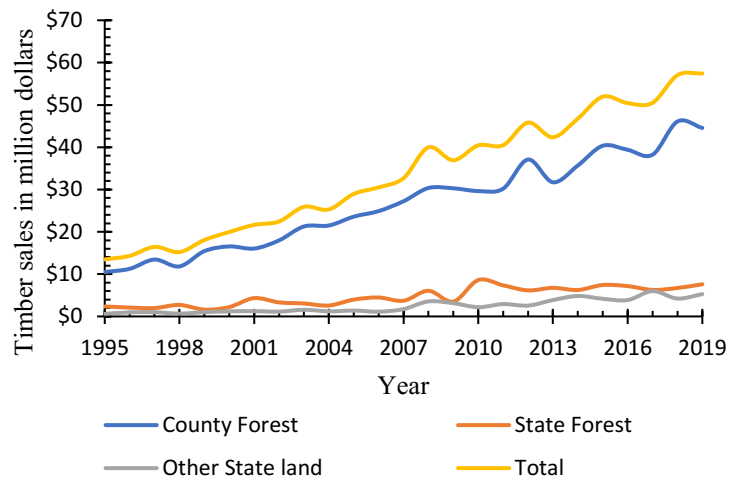


Figure 4. Timber sales trends from county forests, state forests and other state lands (Source: Completed public forest timber sales CY 1995-2019, WI DNR).

Throughout Wisconsin’s history, forests have played a significant role in supporting local, county, state and regional economies. The forest products industry has continued to be one of the leading manufacturing sectors in the state for decades. In 2018, forest products manufacturers’ jobs represented 12% of total manufacturing jobs (Dahal, 2021). Nationwide, Wisconsin’s forest products industry ranked second in terms of total employment and total employee compensation and third in total value-added (Pelkki and Sherman, 2019). Wisconsin’s pulp and paper mills ranked first in terms of total jobs and total value-added in the nation (Jolley et al., 2020). Thus, the forest products industry plays a vital role in the state economy.

This study uses the most recent data (2019) to report on the Wisconsin forest sector's contributions to county, regional and state economies. Economic contributions were reported for the forest products industry as a whole and individually for its three main components: forestry and logging, sawmills and wood products, and pulp and paper. The contributions are further divided to capture variations across regions and counties.

2. Methods and Data

Impact Analysis for Planning (IMPLAN) data and software were used to construct an input-output model of Wisconsin's economy. Economic contributions of the forest products industry were estimated using 2019 IMPLAN data, the most recent available, and were reported in 2019 dollars¹. *Economic contribution* is defined as modeling economic activity of existing industry to estimate indirect and induced effect from the current level of output (direct effect). IMPLAN is a computerized input-output modeling system originally developed by the USDA Forest Service and is currently maintained by IMPLAN Group LLC. IMPLAN is a flexible model where analysts can change production functions, trade flows and other data (MIG, 2004). IMPLAN data are available at national, state, county and zip code levels. The database used by IMPLAN is compiled from the U.S. Bureau of Economic Analysis, U.S. Department of Agriculture, U.S. Bureau of Labor Statistics and U.S. Census Bureau (Cheney, 2019).

The 2019 IMPLAN data summarizes the economy in 546 sectors nationally, and 505 sectors represented Wisconsin's economy. For reporting purposes, these sectors were aggregated into 23 sectors based on the two-digit North American Industrial Classification System (NAICS) code, including the three forestry and forest products-related sectors (See Dahal, 2021 for detail classification). The 23-sector aggregation scheme consists of forestry and logging, sawmills and wood products, pulp and paper, and 20 non-forestry-related sectors. The three major forest products industry sectors are comprised of 28 IMPLAN sectors grouped into their respective categories based on similar types of economic activity. This study estimated the economic contribution of each major forest products industry sector and the forest products industry as a

¹ Estimates reported in this study may be different from other similar studies because of the different methodologies used in estimating the forest products industry economic contribution and selection of sectors not included as forestry-related in this study.

whole. Four statistics measure the economic contributions of the industry: employment – the number of full and part-time jobs; labor income – the sum of employee compensation and proprietary income; output – the total value of production by the industry in a given year; and value-added – which includes employee compensation, proprietary income, property income and indirect business taxes. In addition, economic contributions are estimated in terms of direct effects (an industry's own production), indirect effects (inter-industry purchase in response to original industry demand), and induced effects (household spending from consumption of goods and services using income generated from direct and indirect effects). Total effects are the sum of direct, indirect and induced effects. The study also estimated the total tax contributions of the forest products industry.

3. Results

3.1. Statewide Contributions

The Wisconsin economy, including the forest products industry, is presented in Table Appendix 1, which reports the direct economic effects of the industry. Table Appendices 2 through 4 present the economic contributions of each forest products sector and reports the direct effects of the sector of interest and the resultant indirect and induced effects occurring in other sectors of the state economy. The total effects are reported in the table row titled “Total.” Summing the effects of the individual forest products industry overestimates the economic contributions because the indirect effect of one industry may be counted as a direct effect by a supporting industry which can result in double counting some jobs/output. Therefore, 28 forestry-related sectors were aggregated into a single forest products industry, and the industry's economic contribution as a whole is presented in Table Appendix 5.

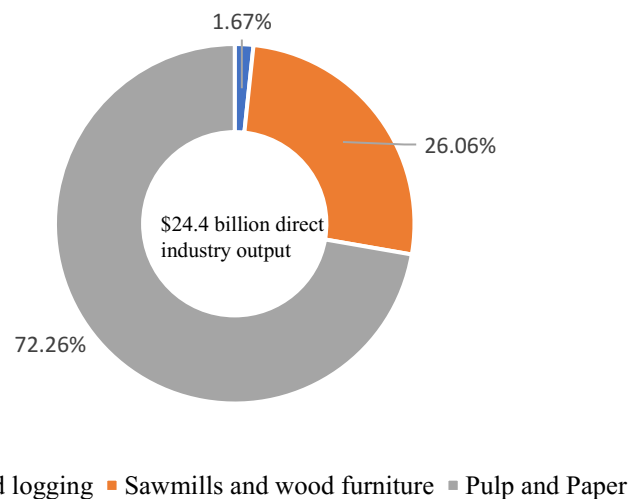


Figure 5. Forest products industry direct gross output share, 2019

Aggregating forest-related sectors will internalize the indirect and induced effects and other forest-related sectors, thus providing a more precise estimate of the industry's economic contribution.

The forest products industry directly produced \$24.4 billion of gross output in 2019, 3.5% of the total industry output (Table Appendix 1). The industry directly employed 61,291 workers, 1.6% of the state's total jobs and paid \$4.2 billion in labor income, including wages, benefits, taxes paid to governments on behalf of employees and proprietor income. The industry's average annual labor income was \$69,000 compared to \$57,000 for the state average. Value-added accounted for 28.2%, or \$6.9 billion, of the industry output. Figure 5 represents forest products' gross output share by each category. The pulp and paper sector accounted for over 70% of the total forest products industry output, whereas the forestry and logging sector represented the least (2%).

Figure 6 shows the direct economic contribution of each 28 forestry-related sectors in the forest products industry. The bubble size represents direct gross output, the x-axis represents value-added and the y-axis represents employment numbers. Figure 5 illustrates that the pulp and paper industry made most of the forest products industry economic contributions, specifically paper mills, paper board container manufacturing, and paper bag and coated and treated paper manufacturing. The total jobs generated by these sectors were 22,269, accounting for 75.9% of pulp and paper industry jobs and 36.3% of forest products industry jobs (Table Appendix 7). Primary and secondary forest products manufacturing jobs represented 11.4% of total manufacturing jobs in the state (Table Appendix 1).

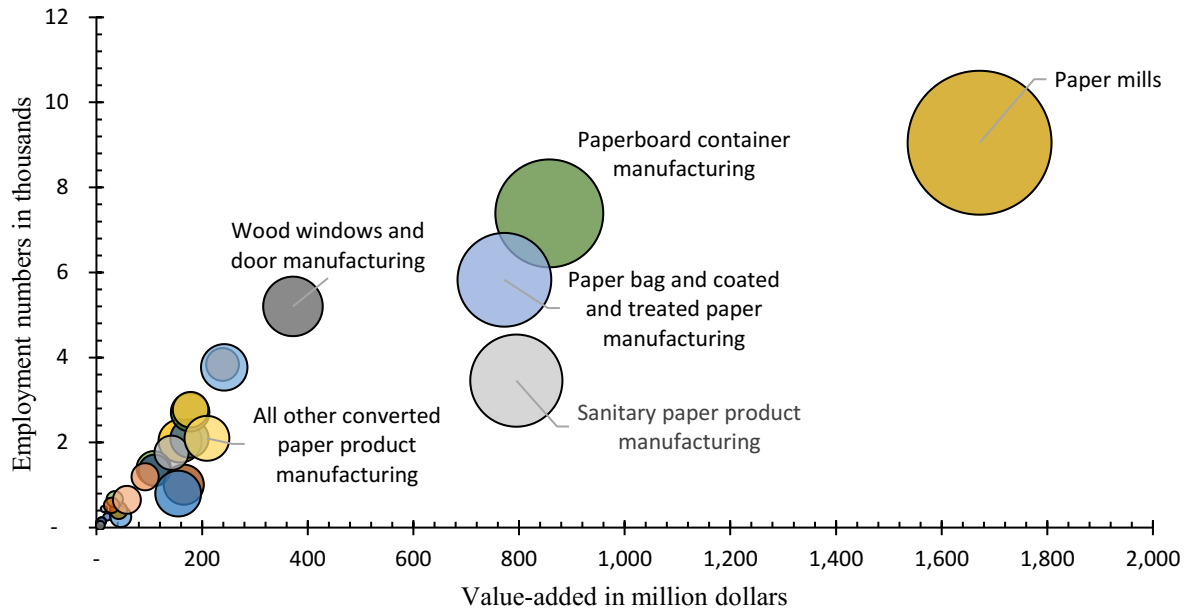


Figure 6. Direct economic contributions of the Wisconsin forest products industry by sector, 2019

The Wisconsin forest products industry commodities were also exported abroad as well as to other regions of the U.S. In 2019, almost \$1.3 billion of forestry commodities were exported to foreign countries, 5.2% of the forest products industry direct output, whereas around \$17 billion worth of commodities were exported domestically (Table 2). Figure 7 shows the top 10 forestry commodities exported to foreign countries. Paper bags and coated and treated paper products alone accounted for 24.5% of total forestry commodities exported to foreign countries. In total, pulp and paper products were the largest forest products exported, shipping \$1.0 billion worth to foreign countries and \$12.7 billion domestically. In terms of imports, Wisconsin made over \$8.0 billion worth of forestry commodity imports (both foreign and domestic). Thus, Wisconsin exports a greater value than it imports, suggesting a trade surplus in the forestry sector.

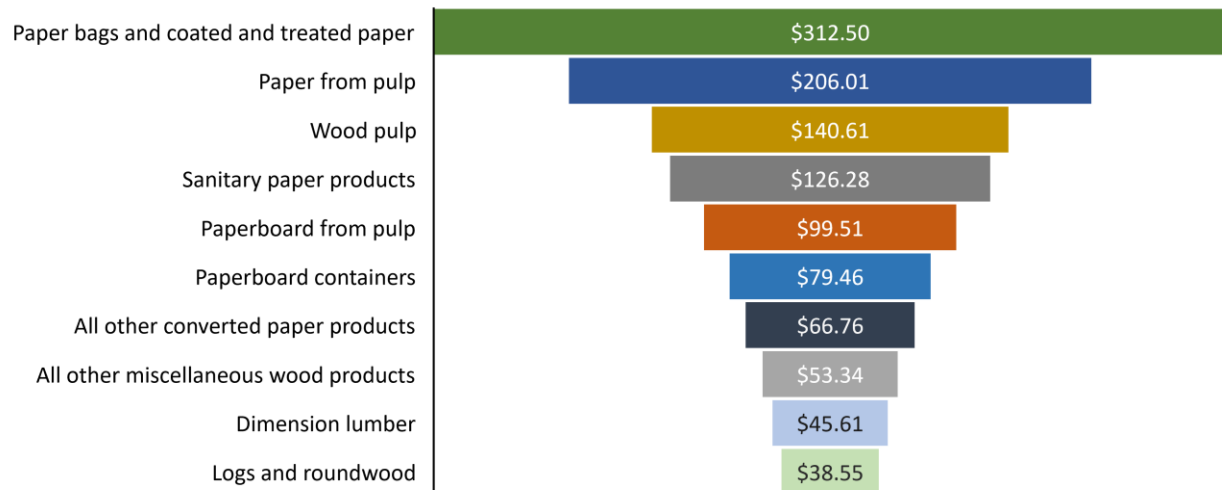


Figure 7. Top 10 value of Wisconsin forest products foreign exports, 2019 (in million dollars)

Table 2. Forest products industry commodity trade (2019 in million dollars)

Sectors	Export			Import		
	Foreign export (\$MM)	Domestic export (\$MM)	Total export (\$MM)	Intermediate import (\$MM)	Institutional import (\$MM)	Total import (\$MM)
Forestry and logging	41.98	24.38	66.35	132.09	3.07	135.16
Sawmills and wood products	198.82	4,307.08	4,505.89	2,186.44	889.11	3,075.56
Pulp and paper products	1,032.52	12,719.89	13,752.41	4,432.68	321.62	4,754.29
Forest products industry	1,273.31	17,051.34	18,324.66	6,751.21	1,213.80	7,965.01

The contributions of the forest products industry are transferred to other sectors of the economy through indirect and induced effects. Including direct, indirect and induced (total contribution), the forest products industry accounted for over 135,000 jobs, 3.6% of state employment, with an annual payroll of \$8.6 billion (Table 3). The industry's total contribution was \$38.0 billion in gross output, and related value-added was \$14.2 billion or 37.3% of the industry output. Every 100 jobs in the forest products industry sector supported an additional 123 jobs in other sectors of the economy. Sectors that benefited the most from the forest products industry in terms of employment were health care and social services, wholesale trade, retail trade, transportation and warehousing, administrative, support, waste management and remediation services, accommodation and food services, and other services (except public administration) (Table

Appendix 5). Total job contributions in these sectors were about 50,000, accounting for 67.8% of additional jobs (indirect and induced) tied to the forest products industry.

Similarly, every dollar of output in the forest products industry generated an additional \$0.55 in other sectors of the economy. Sectors that benefited the most from the forest products industry in terms of industry output were wholesale trade, real estate and rental and leasing, transportation and warehousing, manufacturing, finance and insurance, and healthcare and social services (Table Appendix 5). Total industry output generated in these sectors was over \$8 billion accounting for 60.2% of additional industry output.

Table 3. Economic contribution of the forest products sector on Wisconsin economy (2019 in million dollars)

Effects	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Direct	61,291	4,240.77	24,414.89	6,891.24
Indirect	36,983	2,472.87	7,720.17	3,946.46
Induced	38,575	1,859.28	5,794.32	3,321.72
Total	136,849	8,572.92	37,929.39	14,159.42
Multiplier	2.23	2.02	1.55	2.05

Wisconsin's forest products industry contributed \$2.9 billion in total taxes – \$1.1 billion in state and local taxes and \$1.8 billion in federal tax (Table 4 and 5, respectively). Total tax contributions of each forest products industry sector are presented in Tables 4 and 5.

Table 4. Total state and local government, non-education taxes (\$MM) generated by the industry (2019 in million dollars)

Description	Forestry and logging	Sawmills and wood products	Pulp and paper	Forest products industry
Corporate Profit Tax	0.47	17.18	43.98	60.62
Tax on Production and imports ¹	22.52	204.85	554.05	753.95
Personal Tax ²	12.47	80.11	164.98	244.08
Security Tax ³	0.01	0.12	0.26	0.38
Total	35.47	302.28	763.27	1,059.03

¹Includes sales tax, property tax, motor vehicle license, severance tax, other taxes and S/L non-taxes

²Includes income tax, non-taxes (fines-fees), motor vehicle license, property taxes and other taxes (fish/hunt).

³Includes employee and employer contributions.

Table 5. Federal, non-defense taxes (\$MM) generated by the industry (2019 in million dollars)

Description	Forestry and logging	Sawmills and wood products	Pulp and paper	Forest products industry
Corporate Profit Tax	1.17	42.55	108.91	150.11
Tax on Production and Imports ¹	1.70	15.43	41.73	56.79
Personal Tax	35.11	214.65	441.61	653.78
Security Tax ²	30.26	313.60	650.25	957.48
Total	68.23	586.22	1,242.51	1,818.16

¹Includes excise taxes, custom duty and non-taxes.

²Includes employee and employer contributions.

3.2. Sub-industry Contributions

Economic contributions varied across sub-industries in the Wisconsin forest sector. Economic contributions for each forest products industry are discussed below.

3.2.1. Forestry and Logging

This sector comprises three sub-sectors – forestry, forest products and timber tract production, commercial logging, and support activities for forestry (See Dahal, 2021). According to the North American Industrial Classification System (NAICS) definition, forestry, forest products and timber tract production industry are engaged in the operation of timber tracts to sell standing timber and growing trees for reforestation and or gather forest products (such as gums, barks, balsam needles, rhizomes, fibers, Spanish moss, ginseng and truffles). Logging is the first step in the timber supply chain, providing raw materials to other sectors of the economy. NAICS defines logging as the industry primarily engaged in cutting timber, cutting and transporting timber, and producing wood chips in the field. The support activities for forestry comprise establishments primarily engaged in performing support roles tied to timber production, wood technology, forestry economics and marketing, and forest protection.

The forestry and logging sector directly employed 4,528 individuals and paid \$292.96 million in labor income (Table 6). The average annual labor income for the sector was about \$65,000 compared to \$57,000 for the state average. The industry output and value-added were \$407.93 million and \$272.78 million, respectively. Total contributions, including direct, indirect and

induced, made by the forestry and logging sector amounted to 7,025 jobs, \$400.91 million in labor income, \$744.33 million in gross output and \$462.32 million in value-added (Table 6).

Table 6. The economic contribution of the forestry and logging sector on the Wisconsin economy (2019 in million dollars)

Effects	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Direct	4,528	292.96	407.93	272.78
Indirect	656	19.11	59.66	31.32
Induced	1,842	88.84	276.75	158.23
Total	7,025	400.91	744.33	462.32
Multiplier	1.55	1.37	1.82	1.69

Every 100 jobs in the forestry and logging sector generated an additional 55 jobs in other sectors of the economy (Table 6). In terms of employment, the sectors that benefited the most from the forestry and logging sector were health care and social services, agriculture, forestry, fish and hunting, retail trade, other services (except public administration), and accommodation and food services. The forestry and logging sector contributed more than 200 jobs to each of these sectors (Table Appendix 2). In total, the forestry and logging sector contributed about 2,500 additional jobs to other sectors of the economy. Similarly, every dollar of the industry output generated an additional \$0.82 in other sectors of the economy. The forestry and logging sector generated an additional \$336.41 million in industry output (Table 6).

In terms of taxes, the forestry and logging sector contributed \$35.47 million in state and local taxes (Table 4) and \$68.23 million in federal taxes (Table 5), a total of \$103.70 million.

3.2.2. Sawmills and Wood Products

This sector is comprised of 17 sub-sectors – sawmills, wood preservation, veneer and plywood manufacturing, engineered wood member and truss manufacturing, wood windows and door manufacturing, cut stock, resawing lumber, and planning, other millwork, including flooring, wood container and pallet manufacturing, manufactured home (mobile home) manufacturing, prefabricated wood building manufacturing, all other miscellaneous wood product manufacturing, wood kitchen cabinet and countertop manufacturing, upholstered household

furniture manufacturing, non-upholstered household furniture manufacturing, wood office furniture manufacturing, and custom architectural woodwork and millwork (See Dahal, 2021).

The sawmills and wood products sector directly employed 27,435 jobs and paid \$1.4 billion in labor income (Table 7). The average annual income was \$50,000, \$7,000 lower than the state average. The industry gross output and value-added were \$6.36 billion and \$2.09 billion, respectively. Total contributions made by the sawmills and wood products sector amounted to 52,991 jobs, \$2.81 billion in labor income, \$10.57 billion in gross output and \$4.39 billion in value-added (Table 7).

Table 7. Economic contribution of the sawmills and wood products sector on Wisconsin economy (2019 in million dollars)

Effects	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Direct	27,435	1,378.74	6,363.65	2,093.29
Indirect	12,886	822.64	2,298.48	1,201.94
Induced	12,670	611.12	1,906.52	1,091.32
Total	52,991	2,812.50	10,568.65	4,386.55
Multiplier	1.93	2.04	1.66	2.10

Every 100 jobs in the sawmills and wood products sector generated an additional 93 jobs in other sectors of the economy. In terms of employment, the sectors that benefited the most from the sawmills and wood products included health care and social assistance, wholesale trade, transportation and warehousing, retail trade, and forestry and logging. These sectors employed more than 2,000 jobs in the sawmill and wood products industry (Table Appendix 3). In total, the sawmills and wood products sector generated an additional 25,556 jobs in other sectors of the economy. Similarly, every dollar of the industry output generated an additional \$0.66 in other sectors of the economy. The sawmills and wood products sector generated an additional \$4.2 billion in industry output (Table 7).

The sawmills and wood products sector generated \$302.28 million in state and local taxes (Table 4) and \$586.22 million in federal taxes (Table 5), for a total of \$888.50 million.

3.2.3. Pulp and Paper

The pulp and paper sector includes eight sub-sectors – pulp mills, paper mills, paperboard mills, paperboard container manufacturing, paper bag and coated and treated paper manufacturing, stationery product manufacturing, sanitary paper product manufacturing and all other converted paper product manufacturing (See Dahal, 2021).

The pulp and paper products sector was Wisconsin's largest forest products industry. The majority (47.85%) of the forest sector workers (29,000 individuals) were employed in the pulp and paper industry. The industry paid \$2.57 billion in labor income (Table 8). The average annual income for the sector was \$87,000, \$30,000 higher than the state average. Direct industry gross output and value-added were \$17.64 billion and \$4.52 billion, respectively. The total economic contribution made by the pulp and paper sector amounted to 84,817 jobs, \$5.8 billion in labor income, \$27.65 billion in gross output and \$9.86 billion in value-added (Table 8).

Table 8. Economic contribution of the pulp and paper products sector on Wisconsin economy (2019 in million dollars)

Effects	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Direct	29,329	2,569.07	17,643.32	4,525.17
Indirect	29,334	1,970.89	6,079.92	3,085.11
Induced	26,155	1,260.68	3,928.60	2,251.14
Total	84,817	5,800.63	27,651.83	9,861.43
Multiplier	2.89	2.26	1.57	2.18

Every 100 jobs in the pulp and paper sector generated an additional 189 jobs in other sectors of the economy. The sectors that most benefited from the pulp and paper sector in terms of employment were health care and social assistance, wholesale trade, transportation and warehousing, administrative, support, waste management and remediation services, retail trade, other services (except public administration) and accommodation and food services. Each of these sectors employed more than 4,000 jobs tied to the pulp and paper sector. (Table Appendix 4). In total, the pulp and paper sector generated an additional 55,489 jobs in other sectors of the economy. Similarly, every dollar of the industry output generated an additional \$0.57 in other sectors of the economy. Additional industry output generated by the pulp and paper sector was \$10.0 billion (Table 8).

The pulp and paper sector generated \$763.27 million of state and local taxes (Table 4) and \$1.24 billion of federal taxes (Table 5), a total of about \$2.0 billion.

3.3. Regional Contributions

The economic contributions of the forest products industry varied substantially across the state's five regions: Northeast, Northwest, Central, Southwest and Southeast (Figure 8). Table Appendix 6 presents the direct, indirect, induced and total economic contributions of each region.

In terms of direct effect, the Southeast had the greatest economic contributions. This region accounted for 57.10%, \$13.94 billion, of the forest products industry direct gross output (Figure 9) and employed around 50% of forestry workers (29,784), mainly from the pulp and paper industry (20,635 workers). The forest products industry ranked fifth in terms of industry output in this region. Including direct, indirect and induced effects, the forest products industry in this region produced \$21.68 billion in gross output and \$8.14 billion in value-added and employed 72,293 individuals. The forest products industry played an important role in the local economies of some southeastern counties. Brown County accounted for 12.26% of the state forest products industry jobs and produced 16.35% of the state gross output. Winnebago and Outagamie together contributed 15.64% of the state forestry-related jobs and produced 21.79% of the state forest industry gross output.

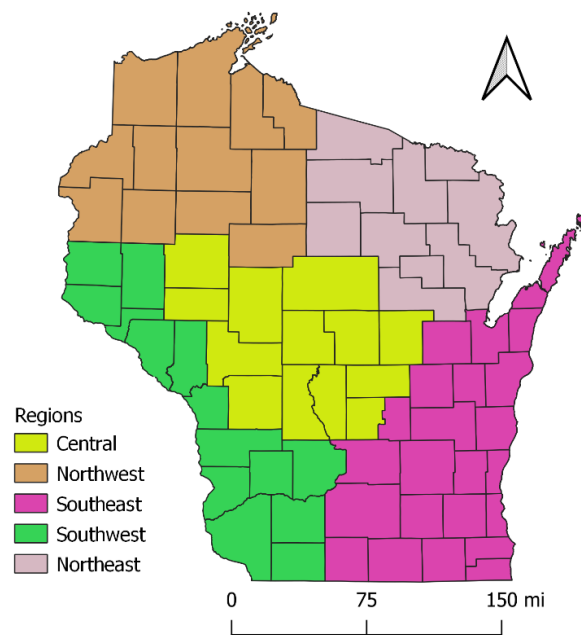


Figure 9. Regions in Wisconsin

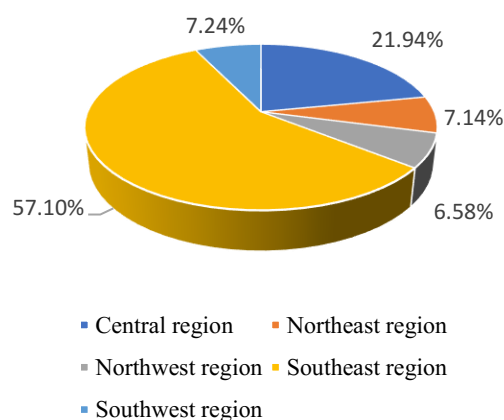


Figure 8. Percent share of the forest products industry direct output by region

Central Wisconsin shared 21.94% of direct forest products industry output (\$5.36 billion) (Figure 9) and employed 21.02% of workers (12,883). The forest products industry ranked second and first in terms of the number of employees and industry output in the region, respectively. Central Wisconsin counties like Marathon and Wood accounted for 11.64% of the state’s direct forestry jobs and produced 12.98% of the state forest industry gross output. Southwest, Northeast and Northwest shared 7.24%, 7.14% and 6.58% of the direct forest products industry output and directly employed 18,624 workers in total, mainly from sawmills and wood products (13,534) (Table Appendix 6).

3.4. Forest products industry economic contribution to the county economy

The forest products industry plays an important role in county economies. In terms of forest products industry direct jobs, Brown (7,512), Winnebago (5,579), Marathon (4,079), Outagamie (4,009) and Trempealeau (3,690) were the top five counties in the state (Figure 10). Likewise, in terms of direct output, Brown (\$4.0 billion), Winnebago (\$3.39 billion), Outagamie (\$1.93 billion), Wood (\$1.67 billion) and Marathon (\$1.50 billion) were the top five counties (Figure 11).

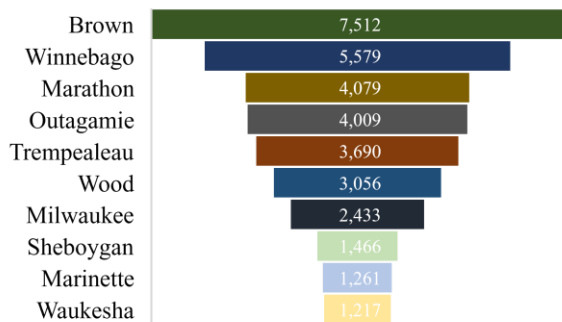


Figure 10. Top 10 counties that generated forest products industry direct jobs

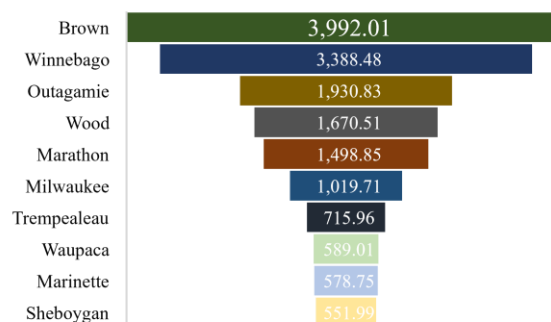


Figure 11. Top 10 counties that generated forest products industry direct gross output (in million dollars)

The forest products industry was the number one employer in 11 counties, namely Winnebago (5,579), Marathon (4,079), Trempealeau (3,690), Marinette (1,261), Taylor (1,018), Lincoln (988), Rusk (871), Price (838), Oneida (451), Florence (266) and Iron (193). Similarly, the forest

products industry was the number-one industry in terms of industry output in 15 counties, namely Brown (\$3.99 billion), Outagamie (\$1.93 billion), Wood (\$1.63 billion), Trempealeau (\$715.96 million), Waupaca (\$589.01 million), Marinette (\$578.75 million), Chippewa (\$444.76 million), Price (\$295.01 million), Sawyer (\$282.69 million), Dunn (\$279.65 million), Rusk (\$247.87 million), Oneida (\$240.19 million), Ashland (\$132.5 million), Florence (\$62.64 million) and Iron (\$42.09 million).

Brown County ranked first in pulp and paper industry direct jobs (5,581), whereas Trempealeau ranked first in sawmills and wood products industry direct jobs (3,577).

4. Employment Trends in the Forest Products Industry

Employment trends provide critical economic information for policymakers, agencies and other stakeholders to the strengthening economic health of the forest products sector. Wisconsin's forest products industry lost significant jobs during the Great Recession (20% job loss) and slowly started to rebound after 2012 (Figure 11). Compared to 2018, Wisconsin lost 4% (over 2,500 jobs) of its forest products employment in 2019. In contrast, forest products industry output only decreased by 0.49% between 2018 and 2019. Most job losses during this period occurred in the commercial logging sector (over 1,300 jobs). In the fourth quarter of 2018, Wisconsin had 269 logging establishments which decreased to 251 in the first quarter of 2019 (BLS, 2022), suggesting a substantial loss in logging establishments (6.69%). These job losses within the commercial logging sector correlate with a decrease in harvesting during this timeframe. Between 2018 and 2019, Wisconsin harvested around 20 million cubic feet less than in 2018 (FIA, 2021). Also, wood-consuming mill closures such as Park Falls Pulp and Paper mill (closed in 2019) may have impacted the logging industry to some extent.

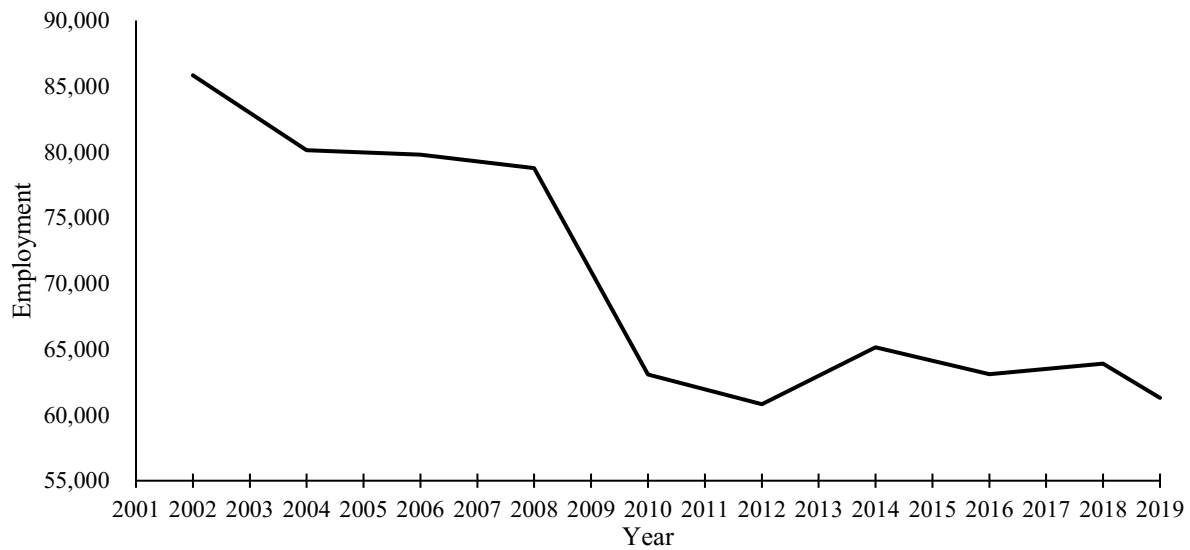


Figure 101. Forest products industry full-and part-time employment, 2002-2019 (Data source: IMPLAN)

5. Conclusion

Wisconsin's forest products industry plays a vital role in the state economy. During the past decade, the forest products industry has remained one of the leading manufacturing sectors in the state. The forest products manufacturing jobs represented 11.4% of the total manufacturing jobs in the state. In 2019, Wisconsin's forest products industry directly contributed \$24.4 billion in industry output and generated over 61,000 jobs, with an annual payroll of \$4.2 billion. The economic contributions of the forest products industry also transferred to other sectors of the economy through indirect (inter-industry purchase) and induced effects (household spending). Including direct, indirect and induced effects, the forest products industry supported over 135,000 jobs and about \$38.0 billion of gross output. There are abundant forest resources in Wisconsin that are underutilized. Sustainable harvesting and underutilized biomass can contribute to the economic and environmental sustainability of the forest products industry.

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7. Glossary

- Employment:** Full-and part-time employees and self-employed individuals.
- Labor income:** Sum of employee compensation and proprietor income.
- Industry output:** Total value of production by the industry in the given year.
- Value-added:** Sum of employee compensation, proprietor income, other property income and taxes on production and imports less subsidies.
- Direct effect:** Industry's own production.
- Indirect effect:** Inter-industry purchase in response to direct effect.
- Induced effect:** Household spending from consumption of goods and services using incomes generated from direct and indirect effect.
- Total effect:** Sum of direct, indirect and induced effect.

Table Appendix 1. Direct effect of the industry on Wisconsin economy (2019 in million dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Forestry and logging	4,528	292.96	407.93	272.78
Sawmills and wood furniture	27,435	1,378.74	6,363.65	2,093.29
Pulp and Paper	29,329	2,569.07	17,643.32	4,525.17
Forest Products Industry (Total)	61,291	4,240.77	24,414.89	6,891.24
Ag, Forestry, Fish and Hunting	96,072	1,581.31	12,085.25	4,557.14
Mining	5,560	278.09	2,599.79	1,484.78
Utilities	9,820	1,742.46	12,214.24	5,524.95
Construction	198,669	13,061.69	29,574.61	16,351.55
Manufacturing	442,123	33,674.07	191,296.44	56,280.49
Wholesale trade	132,627	11,354.76	38,330.14	20,741.19
Retail trade	330,393	10,446.86	29,830.16	16,584.94
Transportation and warehousing	165,331	8,995.23	20,462.68	11,432.17
Information	52,685	4,810.16	22,112.35	11,659.55
Finance and insurance	184,379	13,800.98	59,723.16	28,611.03
Real estate and rental and leasing	140,052	3,447.42	59,611.72	40,169.74
Professional, scientific and technical services	216,312	16,312.54	34,561.51	20,640.53
Management of companies and enterprises	67,961	8,268.96	15,890.36	9,697.60
Administrative, support and waste management, and remediation services	178,657	7,180.83	15,279.12	8,627.44
Educational services	50,671	2,216.01	3,833.25	2,633.39
Health care and social services	437,036	27,538.70	51,029.63	31,290.35
Arts, entertainment and recreation	71,778	1,694.65	4,531.95	2,458.12
Accommodation and food services	296,842	6,871.39	19,805.71	10,505.43
Other services (except public administration)	229,009	9,842.46	19,620.51	11,104.78
Public administration	392,607	27,917.75	35,913.79	33,530.87
Total	3,759,876	215,277.09	702,721.27	350,777.27

Table Appendix 2. Total effect of the forestry and logging sector on Wisconsin economy (2019 in million dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Forestry and logging	4,528	292.96	407.93	272.78
Sawmills and wood furniture	2	0.09	0.38	0.13
Pulp and Paper	1	0.12	0.81	0.21
Ag, Forestry, Fish and Hunting	417	3.51	13.89	6.98
Mining	0	0.01	0.20	0.07
Utilities	5	0.82	5.62	2.57
Construction	15	0.94	3.03	1.35
Manufacturing	24	1.62	9.94	2.87
Wholesale trade	106	8.62	29.47	16.07
Retail trade	297	9.33	25.70	14.31
Transportation and warehousing	109	5.96	13.36	7.44
Information	33	2.90	13.84	7.26
Finance and Insurance	131	9.36	38.21	17.51
Real estate and rental and leasing	102	2.65	53.50	37.42
Professional, scientific and technical services	90	6.51	14.07	8.54
Management of companies and Enterprises	25	3.01	5.79	3.53
Administrative, support, waste management and remediation services	109	4.38	9.26	5.23
Educational services	51	2.24	3.80	2.63
Health care and social services	422	27.37	51.00	31.19
Arts, entertainment and recreation	64	1.45	4.05	2.17
Accommodation and food services	237	5.04	15.07	7.72
Other services (except public administration)	247	11.19	22.14	12.83
Public administration	10	0.81	3.27	1.52
Total	7,025	400.91	744.33	462.32

Table Appendix 3. Total effect of the sawmills and wood furniture sector on Wisconsin economy (2019 in million dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Sawmills and wood furniture	27,435	1,378.74	6,363.65	2,093.29
Forestry and logging	2,219	138.56	190.22	126.86
Pulp and Paper	79	6.73	42.92	10.23
Ag, Forestry, Fish and Hunting	275	2.92	13.54	6.53
Mining	9	0.20	3.58	1.06
Utilities	131	23.48	164.92	74.86
Construction	194	12.61	40.50	18.04
Manufacturing	704	48.55	243.21	91.90
Wholesale trade	2,526	207.33	660.16	351.21
Retail trade	2,331	74.52	205.49	115.43
Transportation and warehousing	2,523	152.38	353.22	190.95
Information	420	37.92	185.72	89.06
Finance and Insurance	1,206	86.99	348.45	160.97
Real estate and rental and leasing	1,158	29.01	463.21	301.57
Professional, scientific and technical services	1,542	112.19	242.06	146.60
Management of companies and Enterprises	591	71.90	138.18	84.33
Administrative, support, waste management and remediation services	1,936	76.73	167.30	92.58
Educational services	339	14.81	25.34	17.42
Health care and social services	2,911	188.83	351.42	215.05
Arts, entertainment and recreation	516	11.93	33.43	18.37
Accommodation and food services	1,997	42.57	126.97	65.14
Other services (except public administration)	1,815	83.15	162.95	95.25
Public administration	135	10.45	42.21	19.84
Total	52,991	2,812.50	10,568.65	4,386.55

Table Appendix 4. Total effect of the pulp and paper sector on Wisconsin economy (2019 dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Pulp and Paper	29,329	2,569.07	17,643.32	4,525.17
Forestry and logging	1,914	118.80	162.59	108.59
Sawmills and wood furniture	770	35.38	200.87	61.08
Ag, Forestry, Fish and Hunting	406	5.33	31.38	14.49
Mining	35	0.85	15.30	5.37
Utilities	509	90.45	629.84	286.60
Construction	542	35.41	113.81	50.74
Manufacturing	2,492	182.94	856.51	290.19
Wholesale trade	5,749	487.76	1,588.86	865.44
Retail trade	4,807	154.54	426.61	239.62
Transportation and warehousing	5,629	358.82	866.57	474.50
Information	859	77.41	379.29	183.62
Finance and Insurance	2,520	183.41	744.43	344.79
Real estate and rental and leasing	2,477	64.12	993.23	648.88
Professional, scientific and technical services	3,353	246.85	520.29	317.87
Management of companies and Enterprises	1,920	233.62	448.94	273.98
Administrative, support, waste management and remediation services	4,920	191.23	418.86	232.22
Educational services	708	30.91	52.96	36.40
Health care and social services	6,010	389.86	725.52	443.99
Arts, entertainment and recreation	1,079	24.99	70.21	38.63
Accommodation and food services	4,188	89.29	266.09	136.60
Other services (except public administration)	4,276	204.22	393.64	234.19
Public administration	327	25.38	102.72	48.45
Total	84,817	5,800.63	27,651.83	9,861.43

Table Appendix 5. Total effect of the forest products industry on Wisconsin economy
(2019 in million dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Forestry and logging	4,528	292.96	407.93	272.78
Sawmills and wood furniture	27,435	1,378.74	6,363.65	2,093.29
Pulp and Paper	29,329	2,569.07	17,643.32	4,525.17
Ag, Forestry, Fish and Hunting	735	8.68	46.74	21.87
Mining	44	1.04	18.76	6.41
Utilities	636	113.04	788.51	358.63
Construction	731	47.66	153.15	68.26
Manufacturing	3,179	230.24	1,093.87	379.90
Wholesale trade	8,170	686.64	2,222.08	1,202.57
Retail trade	7,102	227.89	628.86	353.23
Transportation and warehousing	8,073	506.26	1,208.23	659.13
Information	1,269	114.37	560.23	270.47
Finance and Insurance	3,702	268.72	1,086.11	502.60
Real estate and rental and leasing	3,608	92.45	1,447.76	945.17
Professional, scientific and technical services	4,850	355.74	755.46	460.26
Management of companies and Enterprises	2,490	302.98	582.24	355.33
Administrative, support, waste management and remediation services	6,797	265.72	581.25	322.08
Educational services	1,043	45.52	77.95	53.59
Health care and social services	8,880	576.05	1,072.04	656.03
Arts, entertainment and recreation	1,586	36.70	103.01	56.65
Accommodation and food services	6,147	131.06	390.65	200.51
Other services (except public administration)	6,059	285.80	553.58	327.64
Public administration	459	35.60	144.00	67.85
Total	136,849	8,572.92	37,929.39	14,159.42

Table Appendix 6. Wisconsin's regional economic contribution of the forest products industry (2019 in million dollars)

	Employment Number	Labor Income \$MM	Industry Output \$MM	Value-added \$MM
Northeast Region				
Direct effect	4,719	276.01	1,743.66	479.83
Indirect effect	1,586	85.79	272.26	131.15
Induced effect	1,306	47.11	170.52	90.97
Total effect	7,611	408.91	2,186.44	701.95
Northwest Region				
Direct effect	5,824	318.21	1,607.15	501.28
Indirect effect	1,696	82.21	295.33	134.83
Induced effect	1,564	54.99	203.21	106.89
Total effect	9,085	455.41	2,105.69	743.00
Central Region				
Direct effect	12,883	855.42	5,356.78	1,441.23
Indirect effect	6,575	373.83	1,249.93	602.46
Induced effect	5,304	221.21	731.84	406.54
Total effect	24,761	1,450.46	7,338.55	2,450.23
Southeast Region				
Direct effect	29,784	2,335.86	13,940.42	3,891.21
Indirect effect	20,827	1,456.13	4,424.98	2,309.54
Induced effect	21,682	1,095.59	3,318.13	1,936.03
Total effect	72,293	4,887.57	21,683.53	8,136.77
Southwest Region				
Direct effect	8,081	455.28	1,766.87	577.69
Indirect effect	2,044	109.61	350.83	174.76
Induced effect	2,092	81.67	284.35	159.11
Total effect	12,217	646.57	2,402.05	911.55

Note: The sum of individual total economic contributions of regions does not equal the state's economic contributions because of leakages (payments for goods and services imported from outside the individual region).

Table Appendix 7. Direct economic contribution of related forest products sector (2019 in million dollars)

Description	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Forestry, forest products, and timber tract production	253	18.24	24.45	20.00
Commercial logging	3,836	256.76	365.68	238.73
Support activities for forestry	439	17.96	17.80	14.05
Forestry and logging industry	4,528	293	408	273
Sawmills	2,037	91.75	622.23	158.39
Wood preservation	258	14.64	156.74	46.05
Veneer and plywood manufacturing	1,396	63.10	397.55	108.48
Engineered wood member and truss manufacturing	1,347	68.16	336.92	110.02
Reconstituted wood product manufacturing	1,010	63.42	538.66	165.27
Wood windows and door manufacturing	5,202	251.65	1,165.03	372.00
Cut stock, resawing lumber, and planning	404	20.46	108.83	42.09
Other millwork, including flooring	2,095	99.67	493.30	176.18
Wood container and pallet manufacturing	2,712	119.70	498.96	177.36
Manufactured home (mobile home) manufacturing	147	7.43	28.08	9.79
Prefabricated wood building manufacturing	1,196	62.06	255.84	92.19
All other miscellaneous wood product manufacturing	1,760	85.52	398.17	142.16
Wood kitchen cabinet and countertop manufacturing	2,773	139.37	426.91	178.19
Upholstered household furniture manufacturing	3,769	223.67	717.62	241.92
Non-upholstered wood household furniture manufacturing	665	29.99	98.98	34.62
Wood office furniture manufacturing	141	7.69	31.73	9.92
Custom architectural woodwork and millwork	524	30.46	88.09	28.67
Sawmills and wood products industry	27,435	1,379	6,364	2,093
Pulp mills	50	4.92	34.19	7.24
Paper mills	9,051	858.17	6,630.81	1,671.86
Paperboard mills	800	79.22	697.22	154.77
Paperboard container manufacturing	7,390	619.86	3,749.25	857.31
Paper bag and coated and treated paper manufacturing	5,828	480.71	2,841.96	772.29
Stationery product manufacturing	653	42.92	269.47	57.62
Sanitary paper product manufacturing	3,456	324.55	2,748.83	794.93
All other converted paper product manufacturing	2,100	158.72	671.59	209.16
Pulp and paper industry	29,329	2,569	17,643	4,525
Forest products industry	61,291	4,241	24,415	6,891

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