

**Wisconsin Department of Natural Resources**

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**Economic Contribution Of Forest Products Industry To Wisconsin Economy, 2021  
(Based On 2018 IMPLAN Data)**

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# 1 Introduction

Wisconsin has more than 17 million acres of forest land, covering 41% of the state’s total area (Miles, 2020). Of the 17 million acres, timberland accounts for about 97% or 16 million acres. Private landowners are the largest group, accounting for about 70% of forestland, 21% is owned by state and local government, and 9% is national forest and other federal forestland (Figure 1). The Northwest has the largest percent (31%) of total forestland, of which 58% is privately owned, whereas the Southeast has the least (8%), of which 85% is privately owned (Counties included in each region are presented in Figure 8).

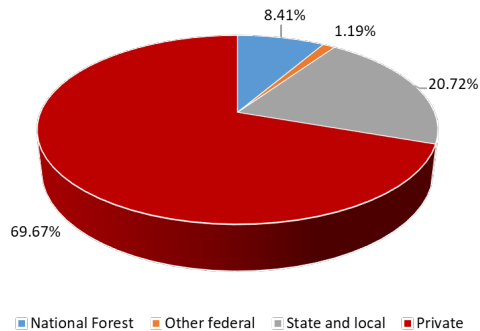


Figure 1: Wisconsin forestland ownership by percent, 2018 (Source: FIA).

In 2018, the net growth of the merchantable bole of growing-stock trees on forestland was over 580 million cubic feet, whereas the average annual removal volume was only 295 million cubic feet, suggesting more volume of wood could be sustainably harvested. The portion to total removals from hardwoods was 219 million cubic feet (74%) and from softwoods was 75 million cubic feet (26%). Net growth of the merchantable bole of growing stock trees on forestland has been over 550 million cubic feet annually for the last decade, whereas 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)

	2006	2009	2012	2015	2018
Forestland in million acres	16.27	16.74	17.07	17.07	17.02
Timberland in million acres	15.82	16.21	16.53	16.52	16.45
Net growth of merchantable bole volume of growing stock, in million cubic feet, on forest land	582.72	544.57	561.53	586.24	580.61
Softwood net growth, in million cubic feet	180.02	168.10	194.52	204.76	190.77
Hardwood net growth, in million cubic feet	402.71	376.47	367.01	381.48	389.84
Average annual removals of merchantable bole volume of growing stock, in million cubic feet, on forest land	318.18	304.26	301.29	305.27	294.60
Softwood removals in million cubic feet	73.04	69.38	72.99	77.74	75.13
Hardwood removals in million cubic feet	245.14	234.88	228.30	227.53	219.47
Growth-to-removal ratio, total	1.83	1.79	1.86	1.92	1.97
Softwood, growth-to-removal ratio	2.46	2.42	2.66	2.63	2.54
Hardwood, growth-to-removal ratio	1.64	1.60	1.61	1.68	1.78

Growth-to-removal ratio is one of the indicators 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, while 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 2006, 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 2). Similarly, for hardwoods, the ratios have been above 1.6, indicating less than 60% of annual hardwood growth has been removed. In total, a substantial portion of annual growth could be sustainably harvested for potential resource utilization that could help in supporting local economies. It is important to note that care must be taken to consider specific species growth-to-removal ratios so that individual species are not over utilized.

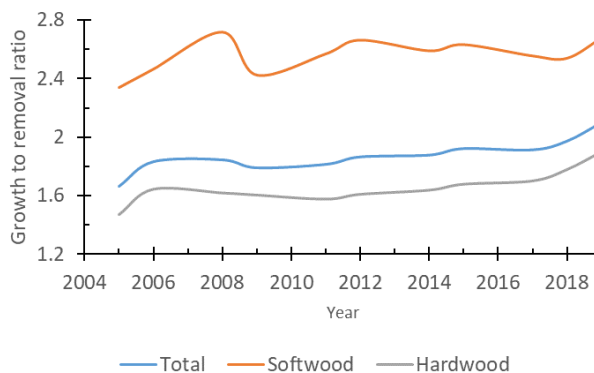


Figure 2: Average annual net growth of merchantable bole volume of growing stock to removal ratio for hardwood and softwood (Source: FIA).

In 2018, designated County Forests, State Forests, and other DNR-owned state lands generated about \$57 million worth of timber revenue (County and State Forest Timber Sales, 2018). Of this total, timber sales from the County Forests accounted for over 80% of total sales. Compared to 2017, timber sales from the State Forests, other DNR-owned state lands, and County Forests increased by 13%. Sales from the County Forests increased by about 21%, whereas timber sales from the State Forests and other DNR-owned state lands decreased by about 11%. The trend of timber sales has been linearly increasing since the 1990s (Figure 3).

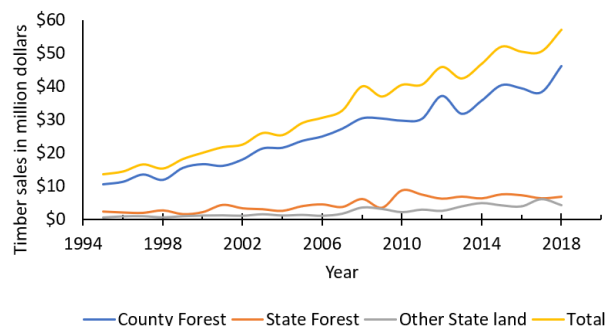


Figure 3: Timber sales trend from County forest, State forest, and other State land (Source: Completed public forest timber sales CY 1995-2018, WI-DNR).

The forest sector makes a considerable contribution to 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 2017, the forest products manufacturers jobs represented 12% of total manufacturing jobs (Dahal, 2020). Nationwide, Wisconsin’s forest products industry ranked second in terms of total employment and total employee compensation and third in terms of total value-added (Pelkki and Sherman, 2020). 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 an important role in the state economy.

This study uses the most recent data available (2018) to report on the Wisconsin forest sector’s economic 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

The 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 2018 IMPLAN data, the most recent available, and were reported in 2018 dollars.<sup>1</sup> 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 the 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 level. The database used by IMPLAN is compiled from 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 2018 IMPLAN data summarizes the economy in 546 sectors nationally and Wisconsin’s economy was represented by 505 sectors. 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 (Table Appendix 8). 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 of the major forest products industry sectors and the forest products industry as a whole. The economic contributions of the industry are measured by four statistics: employment – the number of full and part-time jobs; labor income – sum of employee compensation and proprietary income; output – 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 (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 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 due to the fact that the indirect effect of one industry may be counted as direct effect by a supporting industry which can result in double counting some

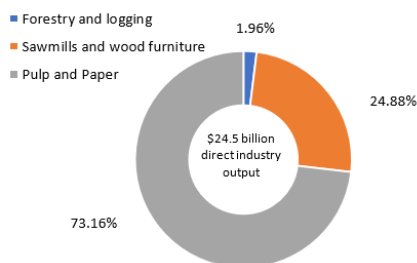


Figure 4: Forest products industry direct gross output share, 2018.

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

jobs/output. Therefore, 28 forestry related sectors were aggregated into a single forest products industry, and the economic contribution of the industry as a whole is presented in Table Appendix 5. Aggregating forest-related sectors will internalize the indirect and induced effects and other forest-related sectors and thus provide a more precise estimate of the economic contribution of the industry. The forest products industry directly produced \$24.5 billion of gross output in 2018, 3.8% of the total industry output (Table Appendix 1). The industry directly employed 63,893 workers, 1.7% 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 \$66,000 compared to \$56,000 for the state average, \$10,000 more than state average. Value-added accounted for 28.9%, or \$7.1 billion, of the industry output. Figure 4 represents forest products gross output share by each category. The pulp and paper sector accounted for over 70% of total forest products industry output, whereas the forestry and logging sector represented the least (2%).

Figure 5 shows the direct economic contribution of each 28 forestry-related sectors included in the forest products industry. The size of the bubble represents direct gross output, the x-axis represents value-added and the y-axis represents employment numbers. Figure 5 illustrates that most of the forest products industry economic contributions were made by the pulp and paper industry, specifically paper mills, paper board container manufacturing, and paper bag and coated and treated paper manufacturing. Total jobs generated by these sectors were 22,614, accounting for 75.9% of pulp and paper industry jobs and 35.4% of forest products industry jobs (Table Appendix 7). Primary and secondary forest products manufacturing jobs represented 11.8% of total manufacturing jobs in the State (Table Appendix 1)

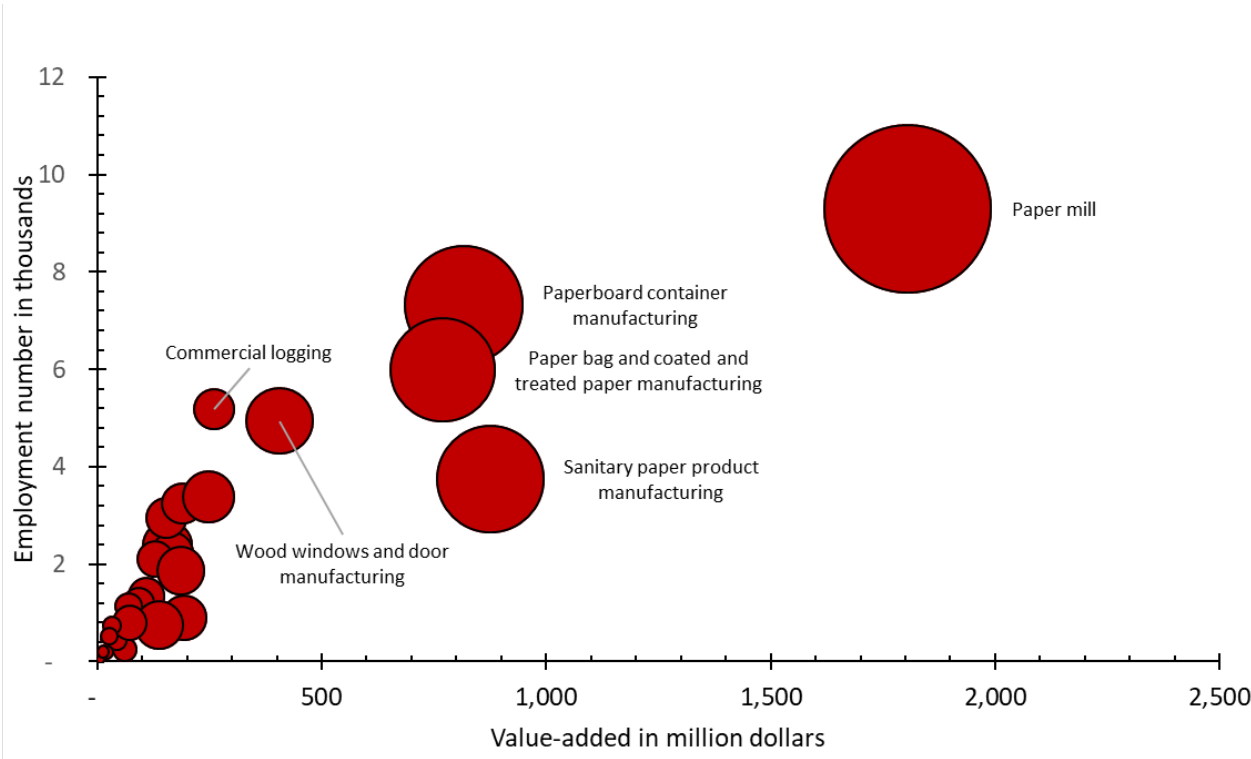


Figure 5: Direct economic contributions of the Wisconsin forest products industry by sector, 2018.

The Wisconsin forest products industry commodities were also exported abroad as well as to other regions of the U.S. In 2018, over \$1.3 billion of forestry commodities were exported to foreign countries, 5.5% of the forest products industry direct output, whereas around \$17 billion worth of commodities were

exported domestically (Table 2). Figure 6 shows the top 10 forestry commodities that were exported to foreign countries. Paper bags and coated and treated paper products alone accounted for 23.8% of total forestry commodities exported to foreign countries. In total, pulp and paper products were the largest forest products exported, shipping \$1.1 billion worth to foreign countries and \$12.9 billion domestically. In terms of imports, Wisconsin made over \$7.6 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.

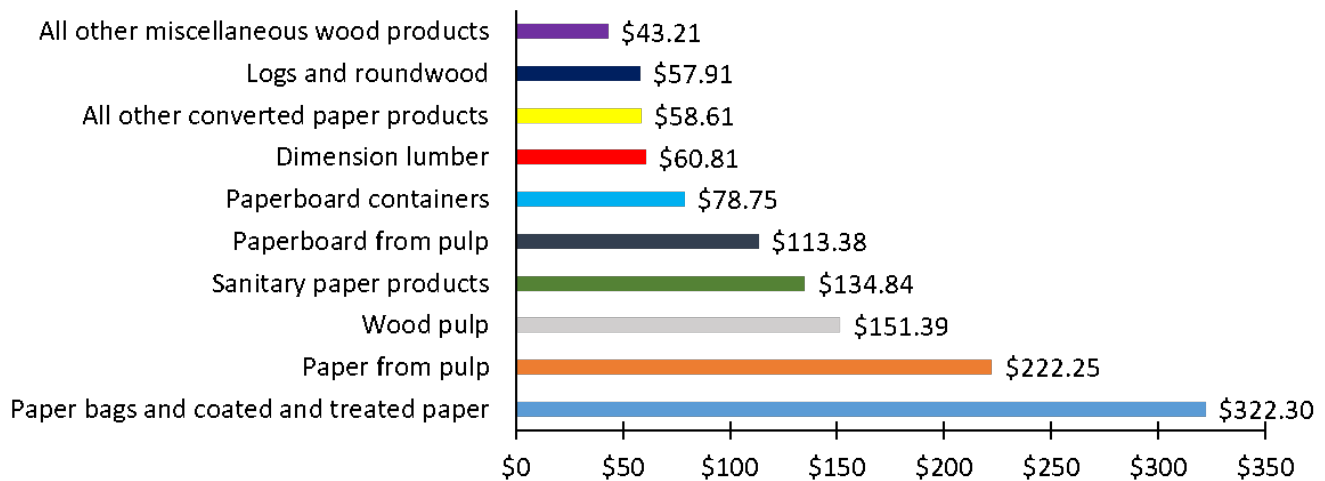


Figure 6: Top ten value of Wisconsin forest products foreign exports, 2018 (in million dollars).

Table 2: Forest products industry commodity trade (2018 dollars)

Sectors	Export \$MM			Import \$MM		
	Foreign exort	Domestic ex- port	Total export	Intermediate import	Institutional import	Total import
Forestry and log- ging	61.89	20.93	82.82	147.00	6.36	153.35
Sawmills and wood products	207.23	4,082.75	4,289.98	2,112.85	904.56	3,017.42
Pulp and paper products	1,083.44	12,870.07	13,953.50	4,157.84	334.83	4,492.67
Forest products (Total)	1,352.55	16,973.75	18,326.31	6,417.69	1,245.75	7,663.44

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 140,000 jobs, 3.8% of state employment, with an annual payroll of \$8.6 billion (Table 3). The industry total contribution was \$38.0 billion in gross output and related value-added was \$14.4 billion or 37.7% of the industry output. Every job in the forest products industry sector supported an additional 1.23 jobs in the 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 and support and

waste management and remediation services; accommodation and food services; other services (except public administration); and professional, scientific, and technical services (Table Appendix 5). Total job contributions in these sectors were about 60,000, accounting for 73.9% 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 the 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; healthcare and social services; finance and insurance; and manufacturing (Table Appendix 5). Total industry output generated in these sectors were over \$8 billion accounting for 60.6% of additional industry output.

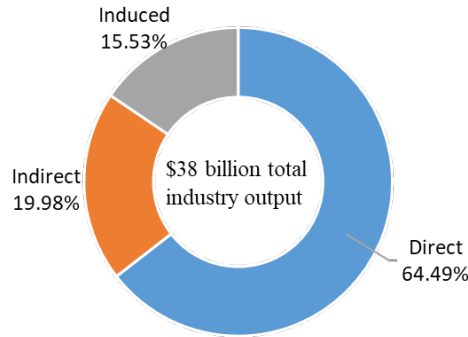


Figure 7: Top ten value of Wisconsin forest products foreign exports, 2018 (in million dollars).

Table 3: Economic contribution of the forest products sector on Wisconsin economy (2018 dollars)

Effects	Employment	Labor Income \$mm	Gross Output \$MM	Value-added \$MM
Direct	63,893	4,238.25	24,535.97	7,084.07
Indirect	37,939	2,447.73	7,599.69	3,894.83
Induced	40,688	1,900.22	5,909.54	3,371.88
Total	142,520	8,586.20	38,045.20	14,350.78
Multiplier	2.23	2.03	1.55	2.03

Wisconsin’s forest products industry contributed \$2.8 billion of total taxes – \$1.0 billion in state and local taxes and \$1.8 billion in federal tax (Table 4 and 5, respectively). Total tax contributions made by each forest products industry sector are presented Table 4 and 5.

Table 4: Total State and Local Government, Non-Education Taxes (\$MM) generated by the industry (2018 dollars)

Description	Forestry and logging	Sawmills and wood products	Pulp and paper	Forest products industry
Corporate Profit Tax	0.61	13.09	34.63	47.29
Tax on Production and imports <sup>1</sup>	23.51	189.60	542.36	727.15
Personal Tax <sup>2</sup>	11.68	73.47	158.65	231.09
Security Tax <sup>3</sup>	0.01	0.07	0.16	0.23
Total	35.86	277.29	738.58	1,009.56

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

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

<sup>3</sup>Includes employee contribution, employer contribution.

Table 5: Federal, Non-defense Taxes (\$MM) generated by the industry (2018 dollars)

Description	Forestry and logging	Sawmills and wood products	Pulp and paper	Forest products industry
Corporate Profit Tax	1.41	30.24	80.01	109.27
Tax on Production and imports <sup>1</sup>	2.90	23.38	66.87	89.65
Personal Tax	30.68	193.01	416.77	607.06
Security Tax <sup>2</sup>	31.98	308.65	667.72	969.32
Total	66.96	555.28	1,231.37	1,775.31

<sup>1</sup>Includes excise taxes, custom duty, and non-taxes.

<sup>2</sup>Includes employee contribution, employer contribution.

## 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 is comprised of three sub-sectors – forestry, forest products and timber tract production; commercial logging; and support activities for forestry (Table Appendix 8). 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 for the purpose of selling standing timber and growing trees for reforestation and or gathering 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 comprises 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 5,937 individuals and paid \$295.25 million in labor income (Table 6). Average annual labor income for the sector was \$50,000 compared to \$56,000 for the statewide average. The industry output and value-added were \$480.3 million and \$297.6 million, respectively. Total contributions, including direct, indirect and induced, made by the forestry and logging sector amounted to 8,824 jobs, \$416.9 million in labor income, \$857.2 million in gross output, and \$507.1 million in value-added (Table 6).

Table 6: Economic contribution of the forestry and logging sector on Wisconsin economy (2018 dollars)

Effects	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Direct	5,937	295.25	480.33	297.62
Indirect	891	28.47	87.02	44.50
Induced	1,996	93.22	289.81	164.93
Total	8,824	416.94	857.16	507.05
Multiplier	1.49	1.41	1.78	1.70

Every job in the forestry and logging sector generated an additional 0.5 job 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 agriculture, forestry, fish and hunting; health care and social services; retail trade; other services (except public administration); and accommodation and food services. The forestry and logging sector contributed more than 250 jobs to each of these sectors (Table Appendix 2). In total, the forestry and logging sector contributed 2,887 additional jobs to other sectors of economy. Similarly, every dollar of the industry output generated an additional \$0.80 in other sectors of the economy. The forestry and logging sector generated additional \$376.8 million industry output (Table 6).

In terms of taxes, the forestry and logging sector contributed \$35.9 million in state and local taxes (Table 4) and \$67.0 million in federal taxes (Table 5), a total of \$102.8 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 planing, 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 (Table Appendix 8).

The sawmills and wood products sector directly employed 28,156 jobs and paid \$1.4 billion in labor income (Table 7). Average annual income was 48,000;8,000 lower than the state average. The industry gross output and value-added were \$6.1 billion and \$2.1 billion, respectively. Total contributions made by the sawmills and wood products sector amounted to 54,089 jobs, \$2.7 billion in labor income, \$10.1 billion in gross output, and \$4.3 billion in value-added (Table 7).

Table 7: Economic contribution of the sawmills and wood products sector on Wisconsin economy (2018 dollars)

Effects	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Direct	28,156	1,355.24	6,104.02	2,116.35
Indirect	12,990	770.29	2,162.80	1,123.59
Induced	12,943	604.80	1,882.97	1,072.83
Total	54,089	2,730.33	10,149.79	4,312.77
Multiplier	1.92	2.01	1.66	2.04

Every job in the sawmills and wood products sector generated an additional 0.9 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; forestry and logging; wholesale trade; retail trade; transportation and warehousing; and accommodation and food services. Each of these sectors employed more than 2,000 jobs tied to the sawmill and wood products industry (Table Appendix 3). In total, the sawmills and wood products sector generated an additional 28,109 jobs to other sectors of economy. Similarly, every dollar of the industry output generated an additional \$0.70 in other sectors of the economy. The sawmills and wood products sector generated an additional \$4.5 billion in industry output (Table 7).

The sawmills and wood products sector generated \$277.3 million in state and local taxes (Table 4) and \$555.3 million in federal taxes (Table 5), for a total of \$832.6 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 (Table Appendix 8).

The pulp and paper products sector was the largest forest products industry sector in Wisconsin. The majority (46.6%) of the forest sector workers (29,800 individuals) were employed in the pulp and paper industry. The industry paid \$2.6 billion in labor income (Table 8). Average annual income for the sector was \$87,000; \$31,000 higher than the state average. Direct industry gross output and value-added were \$18 billion and \$4.7 billion, respectively. The total economic contribution made by pulp and paper sector amounted to 89,292 jobs, \$5.9 billion in labor income, \$28.2 billion in gross output and \$10.1 billion in value-added (Table 8).

Table 8: Economic contribution of the pulp and paper products sector on Wisconsin economy (2018 dollars)

Effects	Employment	Labor Income \$MM	Gross Output \$MM	Value-added \$MM
Direct	29,800	2,587.76	17,951.62	4,670.10
Indirect	31,492	2,001.63	6,179.60	3,139.94
Induced	28,000	1,307.58	4,066.05	2,319.16
Total	89,292	5,896.97	28,197.26	10,129.20
Multiplier	3.00	2.28	1.57	2.17

Every job in the pulp and paper sector generated an additional 2 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; administrative and support and waste management and remediation services; retail trade; accommodation and food services; transportation and warehousing; and retail trade. Each of these sectors employed more than 5,000 jobs tied to the pulp and paper sector. (Table Appendix 4). In total, the pulp and paper sector generated an additional 59,492 jobs to other sectors of the economy. Similarly, every dollar of the industry output generated an additional \$0.60 in other sectors of the economy. Additional industry output generated by the pulp and paper sector was \$10.2 billion (Table 8).

The pulp and paper sector generated \$738.6 million of state and local taxes (Table 4) and \$1.2 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 for each region.

In terms of direct effect, the Southeast had the greatest economic contributions. This region accounted for 57.3%, \$14.1 billion, of forest products industry direct gross output (Figure 9) and employed around 50% of forestry workers (31,098), mainly from the pulp and paper industry (21,057 workers). The forest products industry ranked 3rd in terms of industry output in this region. Including direct, indirect, and induced effects, the forest products industry in this region produced \$21.9 billion in gross output, \$8.3 billion in value-added, and employed 76,181 individuals. The forest products industry played an important role in the local economies of some southeastern counties. Brown County accounted 12.8% of the state forest products industry jobs and produced 17.5% of the state gross output. Winnebago and Outagamie together contributed 15.8% of the state forestry-related jobs and produced 22.6% of the state forest industry gross output.

Central Wisconsin shared 22.7% of direct forest products industry output (\$5.6 billion) (Figure 9) and employed 21.8% workers (13,921). The forest products industry ranked 2nd and 1st in terms of number of employees and industry output in the region respectively. Central Wisconsin counties like Marathon and Wood together accounted for 11.8% of the state direct forestry jobs and produced 13.6% of the state forest industry gross output. Northeast, Northwest and Southwest shared 6.7%, 6.6%, and 6.7% of the direct forest products industry output and directly employed 18,874 workers in total, mainly from sawmills and wood products (13,810) (Table Appendix 6).

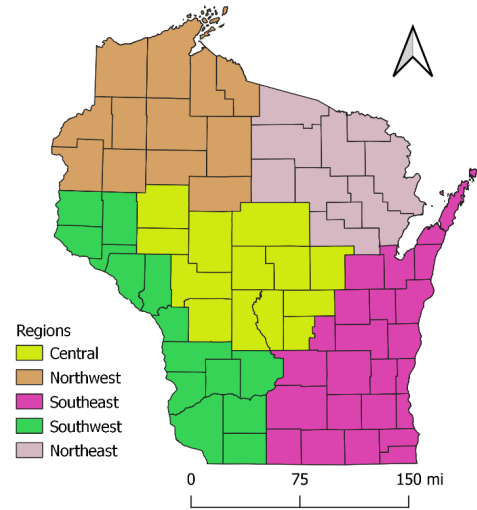


Figure 8: Regions in Wisconsin.

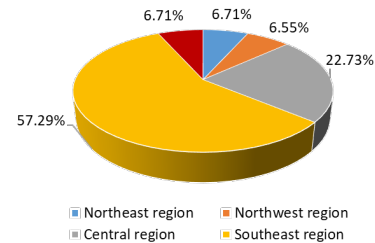


Figure 9: Percent share to the forest products industry direct output by each region.

### 3.4 Forest products industry economic contribution to county economy

The forest products industry plays an important role in county economies. In terms of forest products industry direct jobs, Brown (8,166), Winnebago (5,946), Marathon (4,316), Outagamie (4,179) and Trempealeau (3,349) were the top five counties in the State (Figure 10). Likewise, in terms of direct output, Brown (\$4.3 billion), Winnebago (\$3.6 billion), Outagamie (\$2.0 billion), Wood (\$1.7 billion) and Marathon (\$1.6 billion) were the top five counties (Figure 11).

The forest products industry was the number one employer in 10 counties, namely Winnebago (5,946), Marathon (4,316), Trempealeau (3,349), Lincoln (1,165), Taylor (1,071), Rusk (920), Sawyer (801), Price (774), Florence (303) and Iron (226). Similarly, the forest products industry was the number-one industry in terms of industry output in 16 counties, namely Brown (\$4.3 billion), Winnebago (\$3.6 billion), Outagamie (\$2.0 billion), Wood (1.7 billion), Trempealeau (\$700.6 million), Waupaca (\$529.0 million), Chippewa (\$450.1 million), Marinette (\$423.1 million), Oneida (\$328.1 million), Price (\$322.8 million), Sawyer (\$322.0 million), Rusk (\$221.2 million), Ashland (132.5 million), Adams (\$110.7 million), Florence (\$63.9 million) and Iron (\$39.0 million).

Brown county ranked first in terms of pulp and paper industry direct jobs (5,967) whereas Trempealeau ranked first in terms of sawmills and wood products industry direct jobs (3,276).

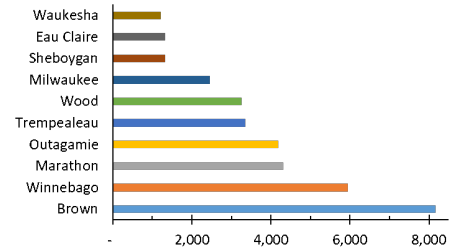


Figure 10: Top 10 counties that generated forest products industry direct jobs

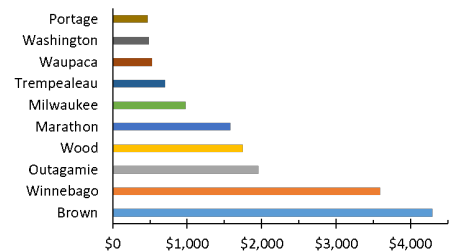


Figure 11: Top 10 counties that generated forest products industry direct gross output (in million dollars)

## 4 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 11.8% of the total manufacturing jobs in the State. In 2018, Wisconsin's forest products industry directly contributed \$24.5 billion in industry output and generated over 63,000 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 140,000 jobs and \$38.0 billion of gross output. There are abundant forest resources in Wisconsin that are underutilized. Sustainable harvesting and the use of underutilized biomass can contribute to the economic and environmental sustainability of the forest products industry.

## References

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## 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 (2018 dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Forestry and logging	5,937	295.25	480.33	297.62
Sawmills and wood furniture	28,156	1,355.24	6,104.02	2,116.35
Pulp and Paper	29,800	2,587.76	17,951.61	4,670.10
<b>Forest Products Industry (Total)</b>	<b>63,893</b>	<b>4,238.25</b>	<b>24,535.97</b>	<b>7,084.07</b>
Ag, Forestry, Fish, and Hunting	95,003	2,382.19	12,014.23	4,196.38
Mining	5,979	327.39	1,856.26	1,154.63
Utilities	10,998	1,669.98	12,797.76	5,616.95
Construction	197,963	12,667.06	29,504.34	15,553.15
Manufacturing	433,560	32,087.27	179,951.44	53,728.87
Wholesale trade	136,543	11,223.92	39,312.78	21,519.10
Retail trade	335,541	10,408.33	28,878.60	16,421.63
Transportation and warehousing	146,183	8,724.21	20,675.94	11,136.43
Information	51,963	4,429.61	20,544.44	10,691.61
Finance and Insurance	185,300	13,064.74	57,763.89	27,052.68
Real estate and rental and leasing	136,846	3,584.04	58,046.85	39,086.32
Professional, scientific, and technical services	209,312	15,441.26	33,023.98	19,576.50
Management of companies and Enterprises	70,770	8,252.51	14,084.05	9,619.74
Administrative and support and waste management and remediation services	180,654	6,947.94	14,684.05	8,520.79
Educational services	53,345	2,143.00	3,691.13	2,416.92
Health care and social services	432,211	26,307.62	49,376.23	29,964.25
Arts, entertainment, and recreation	71,458	1,632.65	4,402.74	2,422.85
Accommodation and food services	290,370	6,582.55	18,612.22	9,737.58
Other services (except public administration)	227,538	9,459.38	18,731.88	10,624.79
Public administration	393,074	26,669.93	35,751.02	33,445.77
<b>Total</b>	<b>3,728,502</b>	<b>208,243.80</b>	<b>678,239.78</b>	<b>339,571.01</b>

Table Appendix 2: Total effect of the forestry and logging sector on Wisconsin economy (2018 dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
<b>Forestry and logging</b>	<b>5,937</b>	<b>295.25</b>	<b>480.33</b>	<b>297.62</b>
Sawmills and wood furniture	2	0.10	0.42	0.15
Pulp and Paper	2	0.14	0.95	0.25
Ag, Forestry, Fish, and Hunting	518	5.13	17.18	7.42
Mining	0	0.02	0.11	0.06
Utilities	6	0.87	6.61	2.91
Construction	17	1.07	3.49	1.47
Manufacturing	28	1.85	12.12	3.41
Wholesale trade	147	11.55	39.89	22.10
Retail trade	328	10.10	26.96	15.34
Transportation and warehousing	118	7.20	16.80	9.00
Information	36	3.01	14.56	7.44
Finance and Insurance	149	9.76	40.11	17.88
Real estate and retail and leasing	118	3.23	58.10	39.87
Professional, scientific, and technical services	109	7.60	15.87	9.69
Management of companies and Enterprises	30	3.48	5.94	4.06
Administrative and support and waste management and remediation services	127	4.90	10.29	5.97
Educational services	58	2.35	3.98	2.62
Health care and social services	453	28.36	53.44	32.41
Arts, entertainment, and recreation	70	1.47	4.26	2.29
Accommodation and food services	264	5.44	16.04	8.05
Other services (except public administration)	296	13.21	26.02	15.23
Public administration	11	0.85	3.69	1.82
<b>Total</b>	<b>8,824</b>	<b>416.94</b>	<b>857.16</b>	<b>507.05</b>

Table Appendix 3: Total effect of the sawmills and wood furniture sector on Wisconsin economy (2018 dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Forestry and logging	2,652	129.29	206.02	127.94
<b>Sawmills and wood furniture</b>	<b>28,156</b>	<b>1,355.24</b>	<b>6,104.02</b>	<b>2,116.35</b>
Pulp and Paper	86	7.17	44.90	10.78
Ag, Forestry, Fish, and Hunting	299	3.83	14.71	5.97
Mining	5	0.23	1.51	0.87
Utilities	135	20.33	161.28	70.33
Construction	202	12.78	40.64	17.24
Manufacturing	667	44.90	230.62	84.48
Wholesale trade	2,475	198.18	630.34	340.48
Retail trade	2,415	75.63	202.29	116.03
Transportation and warehousing	2,176	140.47	340.21	175.24
Information	412	34.43	165.66	80.72
Finance and Insurance	1,227	82.43	332.27	149.29
Real estate and rental and leasing	1,133	29.91	447.44	288.29
Professional, scientific, and technical services	1,640	112.83	230.89	141.94
Management of companies and Enterprises	572	66.71	113.86	77.77
Administrative and support and waste management and remediation services	1,946	73.17	153.96	88.57
Educational services	366	14.65	24.98	16.38
Health care and social services	2,943	184.47	347.27	210.71
Arts, entertainment, and recreation	579	11.18	31.69	17.20
Accommodation and food services	2,018	41.56	122.39	61.48
Other services (except public administration)	1,857	81.31	160.82	93.59
Public administration	128	9.63	42.03	21.12
Total	54,089	2,730.33	10,149.79	4,312.77



Table Appendix 4: Total effect of the pulp and paper sector on Wisconsin economy (2018 dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Forestry and logging	2,571	125.26	199.12	123.80
Sawmills and wood furniture	974	40.19	227.75	70.47
<b>Pulp and Paper</b>	<b>29,800</b>	<b>2,587.76</b>	<b>17,951.62</b>	<b>4,670.10</b>
Ag, Forestry, Fish, and Hunting	422	6.98	28.93	11.81
Mining	21	1.07	7.87	4.93
Utilities	584	86.93	679.91	296.38
Construction	601	38.29	120.79	51.33
Manufacturing	2,584	185.20	842.78	290.52
Wholesale trade	6,105	499.09	1,671.71	921.67
Retail trade	5,200	163.65	438.31	251.22
Transportation and warehousing	5,263	358.03	901.16	467.18
Information	896	74.58	359.85	175.67
Finance and Insurance	2,753	184.46	751.38	339.06
Real estate and rental and leasing	2,553	69.05	1,009.49	650.51
Professional, scientific, and technical services	3,672	258.74	526.49	325.18
Management of companies and Enterprises	2,042	238.16	406.46	277.62
Administrative and support and waste management and remediation services	5,444	199.26	410.19	239.19
Educational services	801	32.09	54.76	35.91
Health care and social services	6,366	399.00	751.10	455.75
Arts, entertainment, and recreation	1,288	24.63	69.97	37.89
Accommodation and food services	4,455	91.75	269.97	135.69
Other services (except public administration)	4,565	207.89	408.78	242.32
Public administration	332	24.90	108.89	55.03
Total	89,292	5,896.97	28,197.26	10,129.20

Table Appendix 5: Total effect of the forest products industry on Wisconsin economy (2018 dollars)

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
<b>Forestry and logging</b>	<b>5,937</b>	<b>295.25</b>	<b>480.33</b>	<b>297.62</b>
<b>Sawmills and wood furniture</b>	<b>28,156</b>	<b>1,355.24</b>	<b>6,104.02</b>	<b>2,116.35</b>
<b>Pulp and Paper</b>	<b>29,800</b>	<b>2,587.76</b>	<b>17,951.62</b>	<b>4,670.1</b>
Ag, Forestry, Fish, and Hunting	802	11.58	46.33	18.90
Mining	25	1.29	9.33	5.78
Utilities	713	106.39	834.23	363.68
Construction	797	50.66	160.16	68.03
Manufacturing	3,232	228.81	1,067.46	372.79
Wholesale trade	8,467	688.36	2,273.70	1,247.10
Retail trade	7,576	238.01	637.18	365.29
Transportation and warehousing	7,364	493.47	1,229.02	636.04
Information	1,297	108.07	520.94	254.21
Finance and Insurance	3,955	265.20	1,076.82	485.23
Real estate and rental and leasing	3,659	98.25	1,448.31	933.65
Professional, scientific, and technical services	5,264	368.12	750.33	462.75
Management of companies and Enterprises	2,592	302.25	515.84	352.33
Administrative and support and waste management and remediation services	7,323	270.02	559.23	324.90
Educational services	1,162	46.54	79.38	52.05
Health care and social services	9,266	580.73	1,093.21	663.32
Arts, entertainment, and recreation	1,853	35.59	101.05	54.75
Accommodation and food services	6,432	132.49	389.92	195.94
Other services (except public administration)	6,392	287.83	566.89	334.32
Public administration	457	34.30	149.90	75.65
<b>Total</b>	<b>142,520</b>	<b>8,586.20</b>	<b>38,045.20</b>	<b>14,350.78</b>

Table Appendix 6: Wisconsin's regional economic contribution of forest products industry reported in 2018 dollars

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
<b>Northeast region</b>				
Direct effect	5,008	270.18	1,646.39	476.98
Indirect effect	1,608	76.46	250.01	118.38
Induced effect	1,498	51.72	184.49	98.36
Total effect	8,114	398.36	2,080.89	693.72
<b>Northwest region</b>				
Direct effect	6,330	333.80	1,607.28	545.05
Indirect effect	1,665	80.11	291.81	132.28
Induced effect	1,870	62.83	232.04	122.52
Total effect	9,865	476.74	2,131.13	799.84
<b>Central region</b>				
Direct effect	13,921	900.01	5,578.09	1,538.09
Indirect effect	6,719	371.85	1,220.68	597.05
Induced effect	6,183	252.82	830.48	460.58
Total effect	26,823	1,524.68	7,629.25	2,595.72
<b>Southeast region</b>				
Direct effect	31,098	2,331.96	14,057.64	3,963.94
Indirect effect	21,651	1,463.15	4,411.76	2,312.76
Induced effect	23,432	1,144.96	3,449.92	2,003.73
Total effect	76,181	4,940.07	21,919.31	8,280.42
<b>Southwest Region</b>				
Direct effect	7,537	402.30	1,646.58	560.02
Indirect effect	2,019	101.69	322.75	158.53
Induced effect	2,261	86.17	294.10	166.03
Total effect	11,817	590.17	2,263.43	884.59

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

Table Appendix 7: Direct economic contribution of related forest products sector in 2018 dollars

Sectors	Employment	Labor Income \$MM	Gross Output \$MM	Value- added \$MM
Forestry, forest products, and timber tract production	278	18.28	26.01	20.58
Commercial logging	5,185	256.80	434.97	261.25
Support activities for agriculture and forestry	474	20.17	19.36	15.79
<b>Forestry and logging industry (total)</b>	<b>5,937</b>	<b>295.25</b>	<b>480.33</b>	<b>297.62</b>
Sawmills	2,391	92.61	637.44	156.50
Wood preservation	249	15.45	166.14	61.89
Veneer and plywood manufacturing	1,347	65.10	363.40	109.34
Engineered wood member and truss manufacturing	1,195	59.72	270.61	92.92
Reconstituted wood product manufacturing	895	64.70	533.10	193.45
Wood windows and door manufacturing	4,937	258.06	1,141.82	406.01
Cut stock, resawing lumber, and planing	427	19.72	107.40	43.50
Other millwork, including flooring	2,226	96.51	456.17	167.44
Wood container and pallet manufacturing	2,955	115.94	441.49	154.10
Manufactured home (mobile home) manufacturing	194	9.77	51.83	20.51
Prefabricated wood building manufacturing	1,144	57.10	193.12	69.88
All other miscellaneous wood product manufacturing	2,104	87.09	364.22	129.25
Wood kitchen cabinet and countertop manufacturing	3,244	145.70	445.05	190.03
Upholstered household furniture manufacturing	3,377	200.85	712.30	248.61
Nonupholstered wood household furniture manufacturing	745	28.79	93.56	32.33
Wood office furniture manufacturing	205	10.56	44.52	14.06
Custom architectural woodwork and millwork	520	27.57	81.84	26.52
<b>Sawmills and wood products industry (total)</b>	<b>28,156</b>	<b>1,355.24</b>	<b>6,104.02</b>	<b>2,116.35</b>
Pulp mills	35	4.48	24.56	6.08
Paper mills	9,304	874.50	7,105.89	1,804.93
Paperboard mills	750	70.14	619.18	137.00
Paperboard container manufacturing	7,319	598.43	3,546.42	817.14
Paper bag and coated and treated paper manufacturing	5,991	497.57	2,796.08	770.19
Stationery product manufacturing	799	56.71	315.15	73.33
Sanitary paper product manufacturing	3,742	346.10	2,934.13	875.38
All other converted paper product manufacturing	1,860	139.83	610.22	186.04
<b>Pulp and paper industry (total)</b>	<b>29,800</b>	<b>2,587.76</b>	<b>17,951.61</b>	<b>4,670.10</b>
<b>Forest products industry (total)</b>	<b>63,893</b>	<b>4,238.25</b>	<b>24,535.97</b>	<b>7,084.07</b>

Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Forestry and logging	Forestry, forest products, and timber tract production (15); Commercial logging (16); Support activities for forestry (19) *
Sawmills and wood products	Sawmills (132); Wood preservation (133); Veneer and plywood manufacturing (134); Engineered wood member and truss manufacturing (135); Reconstituted wood product manufacturing (136); Wood windows and door manufacturing (137); Cut stock, resawing lumber, and planning (138); Other millwork, including flooring (139); Wood container and pallet manufacturing (140); Manufactured home (mobile home) manufacturing (141); Prefabricated wood building manufacturing (142); All other miscellaneous wood product manufacturing (143); Wood kitchen cabinet and countertop manufacturing (365); Upholstered household furniture manufacturing (366); Nonupholstered wood household furniture manufacturing (367); Wood office furniture manufacturing (370); Custom architectural woodwork and millwork (371)
Pulp and paper	Pulp mills (144); Paper mills (145); Paperboard mills (146); Paperboard container manufacturing (147); Paper bag and coated and treated paper manufacturing (148); Stationary product manufacturing (149); Sanitary paper product manufacturing (150); All other converted paper product manufacturing (151)
Agriculture, Forestry, Fish, and Hunting [NAICS 11]	Oilseed farming (1); Grain farming (2); Vegetable and melon farming (3); Fruit farming (4); Tree nut farming (5); Greenhouse, nursery, and floriculture production (6); Tobacco farming (7); Cotton farming (8); Sugarcane and sugar beet farming (9); All other crop farming (10); Beef cattle ranching and farming, including feedlots and dual-purpose ranching and farming (11); Dairy cattle and milk production (12); Poultry and egg production (13); Animal production, except cattle and poultry and eggs (14); Commercial fishing (17); Commercial hunting and trapping (18); Support activities for agriculture (19)*
Mining [NAICS 21]	Oil and gas extraction (20); Coal mining (21); Copper, nickel, lead, and zinc mining (22); Iron ore mining (23); Gold ore mining (24); Silver ore mining (25); Uranium-radium-vanadium ore mining (26); Other metal ore mining (27); Stone mining and quarrying (28); Sand and gravel mining (29); Other clay, ceramic, refractory minerals mining (30); Potash, soda, and borate mineral mining (31); Phosphate rock mining (32); Other chemical and fertilizer mineral mining (33); Other nonmetallic minerals (34); Drilling oil and gas wells (35); Support activities for oil and gas operations (36); Metal mining services (37); Other nonmetallic minerals services (38)
Utilities [NAICS 22]	Electric power generation – Hydroelectric (39); Electric power generation – Fossil fuel (40); Electric power generation – Nuclear (41); Electric power generation – Solar (42); Electric power generation – Wind (43); Electric power generation – Geothermal (44); Electric power generation – Biomass (45); Electric power generation – All other (46); Electric power transmission and distribution (47); Natural gas distribution (48); Water, sewage and other systems (49); Federal electric utilities (527); State government electric utilities (530); Local government electric utilities (533)

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Construction [NAICS 23]	Construction of new health care structures (50); Construction of new manufacturing structure (51); Construction of new power and communication structure (52); Construction of new educational and vocational structure (53); Construction of new highway and streets (54); Construction of new commercial structures, including farm structure (55); Construction of other new nonresidential structures (56); Construction of new single-family residential structures (57); Construction of new multifamily residential structures (58); Construction of other new residential structures (59); Maintenance and repair construction of nonresidential structures (60); Maintenance and repair construction of residential structures (61); Maintenance and repair construction of highways, streets, bridges, and tunnels (62)
Manufacturing [NAICS 31-33]	Dog and cat food manufacturing (63); Other animal food manufacturing (64); Flour milling (65); Rice milling (66); Malt manufacturing (67); Wet corn milling (68); Soybean and other oilseed processing (69); Fats and oils refining and blending (70); Breakfast cereal manufacturing (71); Beet sugar manufacturing (72); Sugar cane mills and refining (73); Nonchocolate confectionery manufacturing (74); Chocolate and confectionery manufacturing from cacao beans (75); Confectionery manufacturing from purchased chocolate (76); Frozen fruits, juices and vegetables manufacturing (77); Frozen specialties manufacturing (78); Canned fruits and vegetables manufacturing (79); Canned specialties (80); Dehydrated food products manufacturing (81); Fluid milk manufacturing (82); Creamery butter manufacturing (83); Cheese manufacturing (84); Dry, condensed, and evaporated dairy product manufacturing (85); Ice cream and frozen dessert manufacturing (86); Animal, except poultry, slaughtering (87); Meat processed and carcasses (88); Rendering and meat byproduct processing (89); Poultry processing (90); Seafood product preparation and packaging (91); Bread and bakery product, except frozen, manufacturing (92); Frozen cakes and other pastries manufacturing (93); Cookie and cracker manufacturing (94); Dry pasta, mixes, and dough manufacturing (95); Tortilla manufacturing (96); Roasted nuts and peanut butter manufacturing (97); Other snack food manufacturing (98); Coffee and tea manufacturing (99); Flavoring syrup and concentrate manufacturing (100); Mayonnaise, dressing, and sauce manufacturing (101); Spice and extract manufacturing (102); All other food manufacturing (103); Bottled and canned soft drinks and water (104); ); manufactured ice (105); Breweries (106); Wineries (107); Distilleries (108); Tobacco product manufacturing (109); Fiber, yarn, and thread mills (110); Broadwoven fabric mills (111); Narrow fabric mills and schiffli machine embroidery (112); Nonwoven fabric mills (113); Knit fabric mills (114); Textile and fabric finishing mills (115); Fabric coating mills (116); Carpet and rug mills (117); Curtain and linen mills (118); Textile bag and canvas mills (119); Rope, cordage, twine, tire cord and tire fabric mills (120);

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Manufacturing [NAICS 31-33]	<p>Other textile product mills (121); Hosiery and sock mills (122); Other apparel knitting mills (123); Cut and sew apparel contractors (124); Men’s and boys’ cut and sew apparel manufacturing (125); Women’s and girls’ cut and sew apparel manufacturing (126); Other cut and sew apparel manufacturing (127); Apparel accessories and other apparel manufacturing (128); Leather and hide tanning and finishing (129); Footwear manufacturing (130); Other leather and allied product manufacturing (131); Printing (152); Support activities for printing (153); Petroleum refineries (154); Asphalt paving mixture and block manufacturing (155); Asphalt shingle and coating materials manufacturing (156); Petroleum lubricating oil and grease manufacturing (157); All other petroleum and coal products manufacturing (158); Petrochemical manufacturing (159); Industrial gas manufacturing (160); Synthetic dye and pigment manufacturing (161); Other basic inorganic chemical manufacturing (162); Other basic organic chemical manufacturing (163); Plastics material and resin manufacturing (164); Synthetic rubber manufacturing (165); Artificial and synthetic fibers and filaments manufacturing (166); Nitrogen fertilizer manufacturing (167); Phosphatic fertilizer manufacturing (168); Fertilizer mixing (169); Pesticide and other agricultural chemical manufacturing (170); Medicinal and botanical manufacturing (171); Pharmaceutical preparation manufacturing (172); In-vitro diagnostic substance manufacturing (173); Biological product (except diagnostic) manufacturing (174); Paint and coating manufacturing (175); Adhesive manufacturing (176); Soap and other detergent manufacturing (177); Polish and other sanitation good manufacturing (178); Surface active agent manufacturing (179); Toilet preparation manufacturing (180); Printing ink manufacturing (181); Explosives manufacturing (182); Custom compounding of purchased resins (183); Photographic film and chemical manufacturing (184); Other miscellaneous chemical product manufacturing (185); Plastics packaging materials and unlaminated film and sheet manufacturing (186); Unlaminated plastics profile shape manufacturing (187); Plastics pipe and pipe fitting manufacturing (188); Laminated plastics plate, sheet (except packaging), and shape manufacturing (189); Polystyrene foam product manufacturing (190); Urethane and other foam product (except polystyrene) manufacturing (191); Plastics bottle manufacturing (192); Other plastics product manufacturing (193); Tire manufacturing (194); Rubber and plastics hoses and belting manufacturing (195); Other rubber product manufacturing (196); Pottery, ceramics, and plumbing fixture manufacturing (197); Brick, tile, and other structural clay product manufacturing (198); Flat glass manufacturing (199); Other pressed and blown glass and glassware manufacturing (200); Glass container manufacturing (201); Glass product manufacturing made of purchased glass (202); Cement manufacturing (203); Ready-mix concrete manufacturing (204); Concrete block and brick manufacturing (205); Concrete pipe manufacturing (206); Other concrete product manufacturing (207); Lime manufacturing (208); Gypsum product manufacturing (209); Abrasive product manufacturing (210); Cut stone and stone product manufacturing (211);</p>

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Manufacturing [NAICS 31-33]	<p>Ground or treated mineral and earth manufacturing (212); Mineral wool manufacturing (213); Miscellaneous nonmetallic mineral product manufacturing (214); Iron and steel mills and ferroalloy manufacturing (215); Iron, steel pipe and tube manufacturing from purchased steel (216); Rolled steel shape manufacturing (217); Steel wire manufacturing (218); Alumina refining and primary aluminum production (219); Secondary smelting and alloying of aluminum (220); Aluminum sheet, plate, and foil manufacturing (221); Other aluminum rolling, drawing and extruding (222); Nonferrous metal (except aluminum) smelting and refining (223); Copper rolling, drawing, extruding and alloying (224); Nonferrous metal, except copper and aluminum, shaping (225); Secondary processing of other nonferrous metals (226); Ferrous metal foundries (227); Nonferrous metal foundries (228); Iron and steel forging (229); Nonferrous forging (230); Custom roll forming (231); Crown and closure manufacturing and metal stamping (232); Cutlery, utensil, pot, and pan manufacturing (233); Handtool manufacturing (234); Prefabricated metal building and components manufacturing (235); Fabricated structure metal manufacturing (236); Plate work manufacturing (237); Metal window and door manufacturing (238); Sheet metal work manufacturing (239); Ornamental and architectural metal work manufacturing (240); Power boiler and heat exchanger manufacturing (241); Metal tank (heavy gauge) manufacturing (242); Metal can manufacturing (243); Metal barrels, drums and pails manufacturing (244); Hardware manufacturing (245); Spring and wire product manufacturing (246); Machine shops (247); Turned product and screw, nut, and bolt manufacturing (248); Metal heat treating (249); Metal coating and nonprecious engraving (250); Electroplating, anodizing, and coloring metal (251); Valve and fittings, other than plumbing, manufacturing (252); Plumbing fixture fitting and trim manufacturing (253); Ball and roller bearing manufacturing (254); Small arms ammunition manufacturing (255); Ammunition, except for small arm, manufacturing (256); Small arms, ordnance, and accessories manufacturing (257); Fabricated pipe and pipe fitting manufacturing (258); Other fabricated metal manufacturing (259); Farm machinery and equipment manufacturing (260); Lawn and garden equipment manufacturing (261); Construction machinery manufacturing (262); Mining machinery and equipment manufacturing (263); Oil and gas field machinery and equipment (264); Food product machinery manufacturing (265); Semiconductor machinery manufacturing (266); Sawmills, woodworking, and paper machinery (267); Printing machinery and equipment manufacturing (268); All other industrial machinery manufacturing (269); Optical instrument and lens manufacturing (270); Photographic and photocopying equipment manufacturing (271); Other commercial and service industry machinery manufacturing (272); Air purification and ventilation equipment manufacturing (273); Heating equipment (except warm air furnaces) manufacturing (274); Air conditioning, refrigeration, and warm air heating equipment manufacturing (275);</p>

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Manufacturing [NAICS 31-33]	Industrial mold manufacturing (276); Special tool, die, jig, and fixture manufacturing (277); Cutting tool and machine tool accessory manufacturing (278); Machine tool manufacturing (279); Rolling mill and other metalworking machinery manufacturing (280); Turbine and turbine generator set units manufacturing (281); Speed changer, industrial high-speed drive, and gear manufacturing (282); Mechanical power transmission equipment manufacturing (283); Other engine equipment manufacturing (284); Pump and pumping equipment manufacturing (285); Air and gas compressor manufacturing (286); Elevator and moving stairway manufacturing (287); Conveyor and conveying equipment manufacturing (288); Overhead cranes, hoists, and monorail systems manufacturing (289); Industrial truck, trailer, and stacker manufacturing (290); Power-driven handtool manufacturing (291); Welding and soldering equipment manufacturing (292); Packaging machinery manufacturing (293); Industrial process furnace and oven manufacturing (294); Fluid power cylinder and actuator manufacturing (295); Fluid power pump and motor manufacturing (296); Scales, balances, and miscellaneous general purpose machinery manufacturing (297); Electronic computer manufacturing (298); Computer storage device manufacturing (299); Computer terminals and other computer peripheral equipment manufacturing (300); Telephone apparatus manufacturing (301); Broadcast and wireless communications equipment manufacturing (302); Other communications equipment manufacturing (303); Audio and video equipment manufacturing (304); Printed circuit assembly (electronic assembly) manufacturing (305); Bare printed circuit board manufacturing (306); Semiconductor and related device manufacturing (307); Capacitor, resistor, coil, transformer, and other inductor manufacturing (308); Electronic connector manufacturing (309); Other electronic component manufacturing (310); Electromedical and electrotherapeutic apparatus manufacturing (311); Search, detection, and navigation instruments manufacturing (312); Automatic environmental control manufacturing (313); Industrial process variable instruments manufacturing (314); Totalizing fluid meters and counting devices manufacturing (315); Electricity and signal testing instruments manufacturing (316); Analytical laboratory instrument manufacturing (317); Irradiation apparatus manufacturing (318); Watch, clock, and other measuring and controlling device manufacturing (319); Blank magnetic and optical recording media manufacturing (320); Software and other prerecorded and record producing (321); Electric lamp bulb and part manufacturing (322); Lighting fixture manufacturing (323); Small electrical appliance manufacturing (324); Household cooking appliance manufacturing (325); Household refrigerator and home freezer manufacturing (326); Household laundry equipment manufacturing (327); Other major household appliance manufacturing (328); Power, distribution, and specialty transformer manufacturing (329); Motor and generator manufacturing (330);

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Manufacturing [NAICS 31-33]	Switchgear and switchboard apparatus manufacturing (331); Relay and industrial control manufacturing (332); Storage battery manufacturing (333); Primary battery manufacturing (334); Fiber optic manufacturing (335); Other communication and energy wire manufacturing (336); Wiring device manufacturing (337); Carbon and graphite product manufacturing (338); All other miscellaneous electrical equipment and component manufacturing (339); Automobile manufacturing (340); Light truck and utility vehicle manufacturing (341); Heavy duty truck manufacturing (342); Motor vehicle body manufacturing (343); Truck trailer manufacturing (344); Motor home manufacturing (345); Travel trailer and camper manufacturing (346); Motor vehicle gasoline engine and engine parts manufacturing (347); Motor vehicle electrical and electronic equipment manufacturing (348); Motor vehicle transmission and power train parts manufacturing (349); Motor vehicle seating and interior trim manufacturing (350); Motor vehicle metal stamping (351); Other motor vehicle parts manufacturing (352); Motor vehicle steering, suspension component (except spring), and brake systems manufacturing (353); Aircraft manufacturing (354); Aircraft engine and engine parts manufacturing (355); Other aircraft parts and auxiliary equipment manufacturing (356); Guided missile and space vehicle manufacturing (357); Propulsion units and parts for space vehicles and guided missiles manufacturing (358); Railroad rolling stock manufacturing (359); Ship building and repairing (360); Boat building (361); Motorcycle, bicycle, and parts manufacturing (362); Military armored vehicle, tank, and tank component manufacturing (363); All other transportation equipment manufacturing (364); Other household nonupholstered furniture manufacturing (368); Institutional furniture manufacturing (369); Office furniture, except, wood, manufacturing (372); Showcase, partition, shelving, and locker manufacturing (373); Mattress manufacturing (374); Blind and shade manufacturing (375); Surgical and medical instrument manufacturing (376); Surgical appliance and supplies manufacturing (377); Dental equipment and supplies manufacturing (378); Ophthalmic goods manufacturing (379); Dental laboratories (380); Jewelry and silverware manufacturing (381); Sporting and athletic goods manufacturing (382); Doll, toy, and game manufacturing (383); Office supplies (except paper) manufacturing (384); Sign manufacturing (385); Gasket, packing, and sealing device manufacturing (386); Musical instrument manufacturing (387); Fasteners, buttons, needles, and pins manufacturing (388); Broom, brush, needles, and pins manufacturing (389); Burial casket manufacturing (390); All other miscellaneous manufacturing (391)

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Wholesale trade [NAICS 42]	Wholesale - Motor vehicle and motor vehicle parts and supplies (392); Wholesale - Professional and commercial equipment and supplies (393); Wholesale - Household appliances and electrical and electronic goods (394); Wholesale - Machinery, equipment, and supplies (395); Wholesale - Other durable goods merchant wholesalers (396); Wholesale - Drugs and druggists' sundries(397); Wholesale - Grocery and related product wholesalers (398); Wholesale - Petroleum and petroleum products (399); Wholesale - Other nondurable goods merchant wholesalers (400); Wholesale - Wholesale electronic markets and agents and brokers (401)
Retail trade [NAICS 44-45]	Retail Stores - Motor vehicle and parts (402); Retail - Furniture and home furnishings stores (403); Retail - Electronics and appliances stores (404); Retail - Building material and garden supplies stores (405); Retail - Food and beverage stores (406); Retail - Health and personal care stores (407); Retail - Gasoline stores (408); Retail - Clothing and clothing accessories stores (409); Retail - Sporting goods, hobby, musical instrument and book (410); Retail - General merchandise stores (411); Retail - Miscellaneous store retailers (412); Retail - Nonstore retailers (413)
Transportation and warehousing [NAICS 48-49]	Air transportation (414); Rail transportation (415); Water transportation (416); Truck transportation (417); Transit and ground passenger transportation (418); Pipeline transportation (419); Scenic and sightseeing transportation and support activities for transportation (420); Couriers and messengers (421); Warehousing and store (422); Postal Service (526); State government passenger transit (529); Local government passenger transit (532)
Information [NAICS 51]	Newspaper publishers (423); Periodical publishers (424); Book publishers (425); Directory, mailing list, and other publishers (426); Greeting card publishing (427); Software publishers (428); Motion picture and video industries (429); Sound recording industries (430); Radio and television broadcasting (431); Cable and other subscription programming (432); Wired telecommunication carriers (433); Wired telecommunication carriers (except satellite) (434); Satellite, telecommunications resellers, and all other telecommunications (435); Data processing, hosting, and related services (436); News syndicates, libraries, archives and all other information services (437); Internet publishing and broadcasting and web service portals (438)
Finance and Insurance [NAICS 52]	Nondepository credit intermediation and related activities (439); Securities and commodity contracts intermediation and brokerage (440); Monetary authorities and depository credit intermediation (441); Other financial investment activities (442); Direct life insurance carriers (443); Insurance carriers, except direct life (444); Insurance agencies, brokerages, and related activities (445); Funds, trusts, and other financial vehicles (446)

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Real estate and rental and leasing [NAICS 53]	Other real estate (447); Tenant-occupied housing (448); Owner-occupied dwellings (449); Automotive equipment rental and leasing (450); General and consumer goods rental except video tapes and discs (451); Video tape and disc rental (452); Commercial and industrial machinery and equipment rental and leasing (453); Lessors of nonfinancial intangible assets (454)
Professional, Scientific, and Technical Services [NAICS 54]	Legal services (455); Accounting, tax preparation, bookkeeping, and payroll services (456); Architectural, engineering, and related services (457); Specialized design services (458); Custom computer programming services (459); Computer systems design services (460); Other computer related services, including facilities management (461); Management consulting services (462); Environmental and other technical consulting services (463); Scientific research and development services (464); Advertising, public relations, and related services (465); Photographic services (466); Veterinary services (467); Marketing research and all other miscellaneous professional, scientific, and technical services (468)
Management of companies and enterprises [NAICS 55]	Management of companies and enterprises (469)
Administrative and support and waste management and remediation services [NAICS 56]	Office administrative services (470); Facilities support services (471); Employment services (472); Business support services (473); Travel arrangement and reservation services (474); Investigation and security services (475); Services to buildings (476); Landscape and horticulture services (477); Other support services (478); Waste management and remediation services (479)
Educational services [NAICS 61]	Elementary and secondary schools (480); Junior colleges, colleges, universities, and professional schools (481); Other educational services (482);
Health care and social assistance [NAICS 62]	Offices of physicians (483); Offices of dentists (484); Offices of other health practitioners (485); Outpatient care centers (486); Medical and diagnostic laboratories (487); Home health care services (488); Other ambulatory health care services (489); Hospitals (490); Nursing and community care facilities (491); Residential mental retardation, mental health, substance abuse and other facilities (492); Individual and family services (493); Child day care services (494); Community food, housing, and other relief services, including rehabilitation services (495)
Arts, entertainment, and recreation [NAICS 71]	Performing arts companies (496); Commercial Sports Except Racing (497); Racing and Track Operation (498); Independent artists, writers, and performers (499); Promoters of performing arts and sports and agents for public figures (500); Museums, historical sites, zoos, and parks (501); Amusement parks and arcades (502); Gambling industries (except casino hotels) (503); Other amusement and recreation industries (504); Fitness and recreational sports centers (505); Bowling centers (506)

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Table Appendix 8: Aggregation Scheme of Commercial sectors (two-digits NAICS code) used for IMPLAN Input-output, 2018 (Continued)

Aggregated Sectors	Original IMPLAN Sectors (number in parenthesis is IMPLAN code)
Accommodation and food services [NAICS 72]	Hotels and motels, including casino hotels (507); Other accommodations (508); Full-service restaurants (509); Limited-service restaurants (510); All other food services and drinking places (511)
Other services (except public administration) [NAICS 81]	Automotive repair and maintenance, except car washes (512); Car washes (513); Electronic and precision equipment repair and maintenance (514); Commercial and industrial machinery and equipment repair and maintenance (515); Personal and household goods repair and maintenance (516); Personal care services (517); Death care services (518); Dry-cleaning and laundry services (519); Other personal services (520); Religious organizations (521); Grantmaking, giving, and social advocacy organizations (522); Business and professional associations (523); Labor and civic organizations (524); Private household (525)
Public administration [NAICS 92]	Other federal government enterprises (528); Other state government enterprises (531); Other local government enterprises (534); Employment and payroll of state govt, education (539); Employment and payroll of state govt, hospitals and health services (540); Employment and payroll of state govt, other services (541); Employment and payroll of local govt, education (542); Employment and payroll of local govt, hospitals and health services (543); Employment and payroll of local govt, other services (544); Employment and payroll of federal govt, military (545); Employment and payroll of federal govt, non-military (546)
Non NAICS	Not an industry (used and secondhand goods) (535); Not an industry (scrap) (536); Not an industry (rest of the world adjustment) (537); Not an industry (noncomparable imports) (538)

\*Partial IMPLAN sector. IMPLAN Sector 19 was separated between support activities for forestry and support activities for agriculture based on employment ratio obtained from U.S. Bureau of Labor Statistics.