

Forest Products Industries' Economic Contributions: Indiana

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Foreword

This report provides an assessment of broad forest conditions and economic contributions of forest products industries to the state of Indiana. Indiana has a substantial and sustainable forest resource base providing materials for wood-using industries, environmental services, and quality-of-life benefits. Indiana is renowned for producing high-quality hardwood timber for products such as lumber and veneer. The hardwood industry is a significant sector within Indiana's agricultural economy. Not only is Indiana known for producing high-quality timber, but the secondary manufacturing industry also adds tremendous value to both timber and the broader economy.

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Executive Summary

This report assesses broad forest conditions and economic contributions of Indiana's forest products industries. It is one of 20 coordinated and comparable state reports in the northeastern and midwestern United States that provides an improved assessment of forests and the economies they support. Forest data come from the U.S. Forest Service's Forest Inventory and Analysis website, and economic data come from the 2017 edition of Impact Analysis for Planning (IMPLAN), a commercially available economic input-output (IO) model widely used by government, academia, and businesses.

Indiana boasts 4.9 million acres of forest land that cover 21.6 percent of its land base, with most of this forest land able to produce commercial timber. The majority, 84 percent, is privately owned, while state and local governments own approximately 8 percent, and the federal government owns about 8 percent.

Forest Industries

This report presents seven forest products industries, which are based on 32 economic sectors in IMPLAN, 30 of which are present in Indiana:

- Forestry
- Logging
- Primary solid wood products
- Secondary solid wood products
- Wood furniture
- Pulp, paper, and paperboard mills
- Secondary paperboard and other paper products

In 2017, Indiana's forest products industries provided direct employment to more than 50,000 people, leading to \$12.9 billion in output. That same year, labor income was \$3.1 billion and value-added was \$4.0 billion. In total contributions, these industries supported 96,444 jobs, \$5.5 billion in labor income, \$8.0 billion in value-added, and \$19.9 billion in output.

Among the top sectors (excluding forest products sectors) impacted by forest products industries were wholesale trade, restaurants, trucking, hospitals, and real estate. This group of sectors reflects spending by forest products companies, their suppliers, and individuals.

Leading Forest Products Industry Groups

Among the seven industry groups, the leading industries' rank in terms of direct jobs, value-added, and direct output varied by chosen measure:

- Wood furniture had the highest number of direct jobs (22,062), the highest value-added (\$1.6 billion), and the second highest direct output (\$4.0 billion).
- Secondary solid wood products had the second highest number of direct jobs (12,572), the third highest value-added (\$851.3 million), and the third highest direct output (\$2.6 billion).
- Secondary paperboard and other paper products had the third highest number of direct jobs (8,995), the second highest value-added (\$951.5 million), and highest direct output (\$4.1 billion).
- Primary solid wood products had the fourth highest number of direct jobs (3,485), the sixth highest value-added (\$204.0 million), and the fourth highest direct output (\$997.9 million).

Leading Individual Forest Products Sectors

Among the 32 forest products sectors (only 30 of which were present in Indiana), the top four, by measure in order from highest to fourth highest of direct contributions, were:

- Employment—Wood kitchen cabinet and countertop manufacturing, paperboard container manufacturing, wood office furniture manufacturing, and wood container and pallet manufacturing were the top four sectors and had a combined total of 23,738 direct jobs, which was 47.4 percent of direct employment.
- Labor income—Wood kitchen cabinet and countertop manufacturing, paperboard container manufacturing, wood office furniture manufacturing, and mobile home manufacturing had the highest labor income, totaling \$1.5 billion, which was 48.6 percent of direct labor income.
- Value-added—Wood kitchen cabinet and countertop manufacturing, paperboard container manufacturing, wood office furniture manufacturing, and mobile home manufacturing had the highest value-added, totaling \$1.9 billion, which was 48.0 percent of direct value-added.
- Output—Paperboard container manufacturing, wood kitchen cabinet and countertop manufacturing, paperboard mills, and paper bag and coated and treated paper manufacturing were the top four sectors in output, totaling \$6.3 billion, which was 49.3 percent of direct output.

Indiana's Forest Products Industries Compared to Other Indiana Industries

The forest products industries provide more direct labor income and output than commercial fishing, hunting, and trapping; mining and oil and gas production; and agricultural production industries (plant crop and animal). Overall, the forest products industries accounted for almost 10 percent of the nonfood manufacturing jobs in Indiana. Nearly 9 percent of Indiana's 540,660 direct manufacturing jobs in 2017 were in the forest products industries.

Indiana’s Forest Products Industries Compared to Those of Michigan, Ohio, Pennsylvania, and Wisconsin

Forest products industries in five midwestern and northeastern states (Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin) employed over 281,600 workers and accounted for almost \$89.0 billion in direct output. Pennsylvania had the most direct employment among these states and Wisconsin had the largest direct output. Indiana had the fourth largest forest products industry contributions in terms of output among these five states.

Glossary

The following technical terms are used throughout this report when discussing forestry and economic contributions.

Forestry Terms

Average annual harvest removals: The average annual merchantable volume of growing-stock trees that were live at the time of the previous inventory and were either cut and removed by direct human activity related to harvesting or died as a result of silvicultural or land-clearing activity by the time of the current inventory.

Average annual mortality: The average annual merchantable volume of growing-stock trees that were live at the time of the previous inventory and are dead in the current inventory.

Average annual net growth: The average annual change in merchantable volume of growing-stock trees, after deducting mortality volume, between inventories.

Forest land: Land that is at least 10 percent stocked by trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Forest land includes transition zones, such as areas between heavily forested and nonforested lands that have at least 10 percent canopy cover with live tally trees, or recently had at least 10 percent canopy cover by live tally trees based on the presence of stumps, snags or other evidence, and forest areas adjacent to urban and built-up lands, including pinyon-juniper and chaparral areas in the western U.S. and afforested areas. The minimum area for classification of forest land is one acre and 120 feet wide measured stem-to-stem from the outermost edge. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest land if less than 120 feet wide.

Growing stock: Live trees of commercial species that meet minimum merchantability standards and only includes trees at least 5 inches in diameter at breast height. In general, these trees have at least one solid eight-foot section, are reasonably free of form defect on the merchantable bole, and at least 34 percent or more of the volume is merchantable. Excludes rough or rotten cull trees.

Timberland: A subset of forest land that produces or can produce crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as timberland can produce at least 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.)

Economic Contribution Terms

Direct effects/contributions: The economic activities (e.g., output, employment, labor income, and value-added) associated with an industry or sector in the study area. These can describe the current economic sectors or changes to those sectors.

Employment: The number of full- and part-time jobs associated with an industry.

Indirect effects/contributions: The impact of local industries purchasing goods and services from other industries, leading to others' outputs, employment, and labor income. This report uses "indirect effects" to refer to the combination of indirect and induced effects.

Induced effects/contributions: The impact of labor income (employee compensation and proprietor income) via goods and services purchased due to the direct and indirect spending by industries. For this report, induced effects are included with indirect effects and referred to as indirect effects.

Labor income: The dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.

Output: The dollar measure of production within an area; it is also viewed as sales.

Social Accounting Matrix (SAM) multipliers: These multipliers are derived by dividing the sum of direct, indirect, and induced effects by the direct effects. The social accounts include payments made between households, households and government, and more. These are available for output, employment, labor income, and value-added and are used to assess effects of changes in industry activity (i.e., "ripple effects").

Total effects/contributions: The sum of direct, indirect, and induced effects.

Value-added (also known as gross state product, or GSP): The sum of labor income, other property income (e.g., rents and profits), and indirect business taxes (e.g., excise and sales taxes). It is the difference between an industry's total output and the cost of its intermediate inputs. The sum of value-added for all economic sectors within the region equals the total GSP.

Introduction

Forest products industries are an integral component of Indiana’s economy. They provide jobs, raw materials, and finished goods that generate additional economic activity throughout the state, region, and nation. This report compares the contributions of Indiana’s forest products industries with those of adjacent states. It is one of 20 reports in the Northeast and Midwestern area of the United States that broadly assesses forests and their economic contributions. The interactions of these 20 states are covered in a regional report. In total, these documents provide a consistent reporting format, compiled using identical methods, across the northeastern and midwestern United States. Previous state-level reports in this area were not comparable because they used different methods and data.

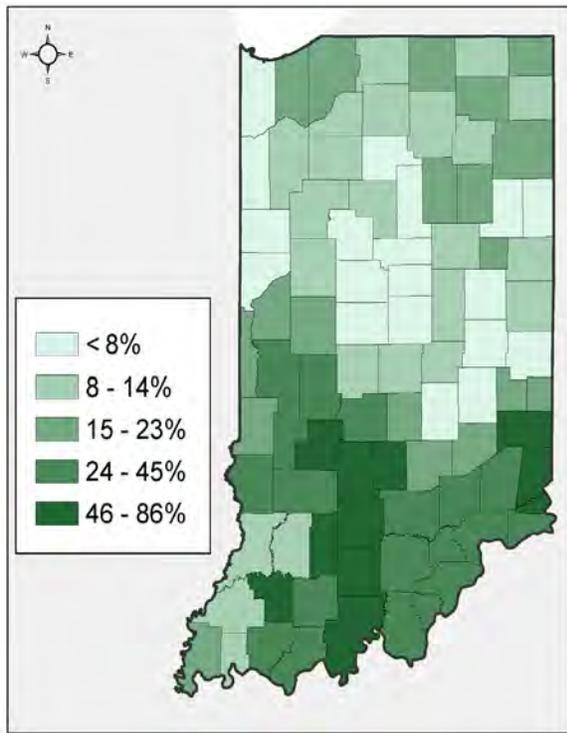
To help quantify these relationships and consistently document the industries’ contributions, the Forest Markets & Utilization Committee of the Northeast-Midwest State Foresters Alliance secured federal grant funds to conduct an analysis of 20 midwestern- and northeastern–area states as well as Nebraska. As part of this work, the same project team that completed the individual state reports—comprising members of the Michigan Department of Natural Resources, Public Sector Consultants, Michigan State University forestry economics professor emeritus Larry Leefers, and state forestry experts—published a 20-state report summarizing the economic contributions of forest products industries at a regional level. The U.S. Forest Service funded this work through a 2017 Landscape Scale Restoration grant.

Much of the data used in this report were derived from the U.S. Forest Service Forest Inventory and Analysis database and from IMPLAN, a widely used economic modeling system. These data and related information are presented in four major sections: Forest Resources of Indiana, Forest Products Industries, Economic Contributions of Indiana’s Forest Products Industries, and Summary. Due to rounding, some figures in the following tables may not sum to the exact total indicated. The appendices present the economic methods and detailed economic sector data used for this report.

Forest Resources of Indiana

There are an estimated 2.2 billion live trees in Indiana and over 4.9 million acres of forest land. Exhibit 1 shows the percent of forest land coverage by county.

Exhibit 1. Indiana’s Forest Land by County, 2017



Source: U.S. Forest Service Forest Inventory and Analysis Program

Forest land accounts for 21.6 percent of the Indiana’s total land area (Exhibit 2). Forested area has increased about 1.2 percent (58,000 acres) since 2012. Timberland accounts for almost 97 percent of the forest land, and the remaining 3 percent is reserved or unproductive.¹

Exhibit 2. Indiana Land Area by Land Use Type, 2017

Land Use Type	Acres	Percentage
Forest land	4,913,335	21.6%
Nonforest land	17,885,658	78.4%
Total	22,798,993	100.0%

Source: U.S. Forest Service

¹ Forest land subcategories include timberland, which is forested land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation, and reserved forest land, which is land that is withdrawn from timber utilization by statute or administrative regulation.

Most of Indiana’s forest land—84.4 percent—is privately owned, while state and local governments account for 7.9 percent and federal government owns 7.7 percent (Exhibit 3). Private landowners’ objectives are varied with most owning forest land for aesthetics, recreation, and hunting. According to the 2018 *Indiana Hardwood Assessment*, owning forest land for timber production is becoming increasingly less of an objective for private landowners. There are several state and federal programs designed to encourage the active management of private forest lands. State and national forests are actively managed in many areas, while resource protection is emphasized in others. Active timber management provides raw material for Indiana’s forest products industries.

Exhibit 3. Forest Land by Ownership Group in Indiana, in Acres (2017)

Ownership Group	Acres	Percentage
National Forest	195,849	4.0%
Other federal	182,065	3.7%
State and local governments	388,466	7.9%
Private	4,146,957	84.4%
Total	4,913,337	100.0%

Indiana’s major forest types include oak/hickory, elm/ash/cottonwood, and maple/beech/birch. Other forest types include oak/pine, oak/gum/cypress, and white/red/jack pine (Exhibit 4). Since 2012, the net volume of trees increased 5.3 percent to nearly 10.9 billion cubic feet. Yellow poplar is the tree species with the greatest standing volume, followed by sugar maple, white oak, and black oak.

Exhibit 4. Forest Land Area by Forest Type Group in Indiana (2017)

Forest type group	Acres	Percentage
Oak/hickory	3,534,242	71.9%
Elm/ash/cottonwood	628,675	12.8%
Maple/beech/birch	379,596	7.7%
Oak/pine	150,017	3.1%
Oak/gum/cypress	67,823	1.4%
White/red/jack pine	40,389	0.8%
Other forest group types	112,594	2.3%
Total	4,913,336	100.0%

The estimated volume of standing timber suitable for forest products (i.e., the marketable volume of growing stock) was about 9.8 billion cubic feet (Exhibit 5). Average annual net growth exceeded annual harvest removals by a ratio of 2.5 to 1. That is, for every cubic foot of harvesting that takes place 2.5 cubic feet of timber grows after accounting for mortality. Average annual harvest removals of growing stock were 77.5 million cubic feet.

Exhibit 2. Characteristics of Growing Stock in Indiana, 2017 (in millions of cubic feet)

Measure	Total	National Forest	Other Federal	State and Local Government	Private
Net volume	9,817.5	461.1	402.8	834.9	8,119.1
Average annual net growth	194.9	4.9	6.6	12.0	171.4
Average annual harvest removals	77.5	0.4	1.6	1.9	73.7
Average annual mortality	116.2	6.0	4.1	12.3	93.7

Note: Net volume is merchantable volume, in cubic feet, of growing-stock trees for timber species (trees where diameter is measured at breast height) from a 1-foot stump to a minimum 4-inch top diameter, or to where the central stem breaks into limbs all of which are less than 4.0 inches in diameter. Volume loss due to rotten, missing, and form cull has been deducted. Growing stock is defined as live trees of commercial species that meet minimum merchantability standards and only includes trees at least 5 inches in diameter at breast height. Net growth is the average annual change (gross growth minus mortality) in merchantable volume, in cubic feet, of growing-stock trees on forestland. Harvest removals are the average annual merchantable volume, in cubic feet, of growing-stock trees at the time of removal from forest land. Annual mortality is the average annual merchantable volume, in cubic feet, of growing-stock trees at the time of mortality on forest land.

Forest Products Industries

Because of the state’s high-quality hardwood forests, Indiana is ranked first nationally in the production of office furniture and hardwood veneer; second in wood kitchen cabinets and countertops and manufactured homes; third in engineered wood products; fourth in prefabricated wood buildings; and fifth in upholstered household furniture.

Contribution analysis focuses on industries’ role in an economy. The first step is often defining the region (e.g., a state). One of the next steps is to define exactly which economic sectors comprise the focus industries. To analyze the contributions of the forest industries, representatives from the U.S. Forest Service’s northeastern and midwestern states and Nebraska selected 32 sectors by consensus for inclusion in the analysis. A description of the methods and data is presented in Appendix A. To concisely describe and communicate the economic contribution of the forest products industries, these 32 sectors were aggregated into seven broad groups (Appendix B):

- Forestry
- Logging

- Primary solid wood products
- Secondary solid wood products
- Wood furniture
- Pulp, paper, and paperboard mills
- Secondary paperboard and other paper products

In total, these sectors cover forest-specific manufacturing activities, including the conversion of trees into primary products and the manufacture of products used by other sectors and households. Primary industries (e.g., sawmills, reconstituted wood products [such as oriented strand board], and power plants) use wood directly from the forest, including roundwood, chips, veneer, or similar forms. Secondary industries (e.g., trusses and furniture) use one or more primary forest products (e.g., lumber and paperboard) in their manufacturing processes. Value is added as the timber is processed through primary and secondary manufacturers. Several sectors included wood and non-wood products (e.g., institutional furniture manufacturing). Therefore, output and other measures were reduced to better reflect the wood-only component by using published government data or surveys (Gibson, Leefers, and Poudel 2020).

This report used IMPLAN to estimate economic contributions of the forest products industries. IMPLAN is a widely used input-output model that comprises economic data and software. IO models characterize financial linkages among and between sectors, households, and institutions. Within these models, various sectors have production functions that show the value of inputs used in production of outputs or commodities. Indiana's economy was represented by 493 sectors in 2017, the most recent year available for IMPLAN data at the time of the analysis. These sectors are based on the North American Industrial Classification System (NAICS).

IMPLAN models can be constructed for different geographic areas. State data were used in this report, but given IMPLAN's structure, substate and multistate analyses can be developed.

Economic Contributions of Indiana's Forest Products Industries

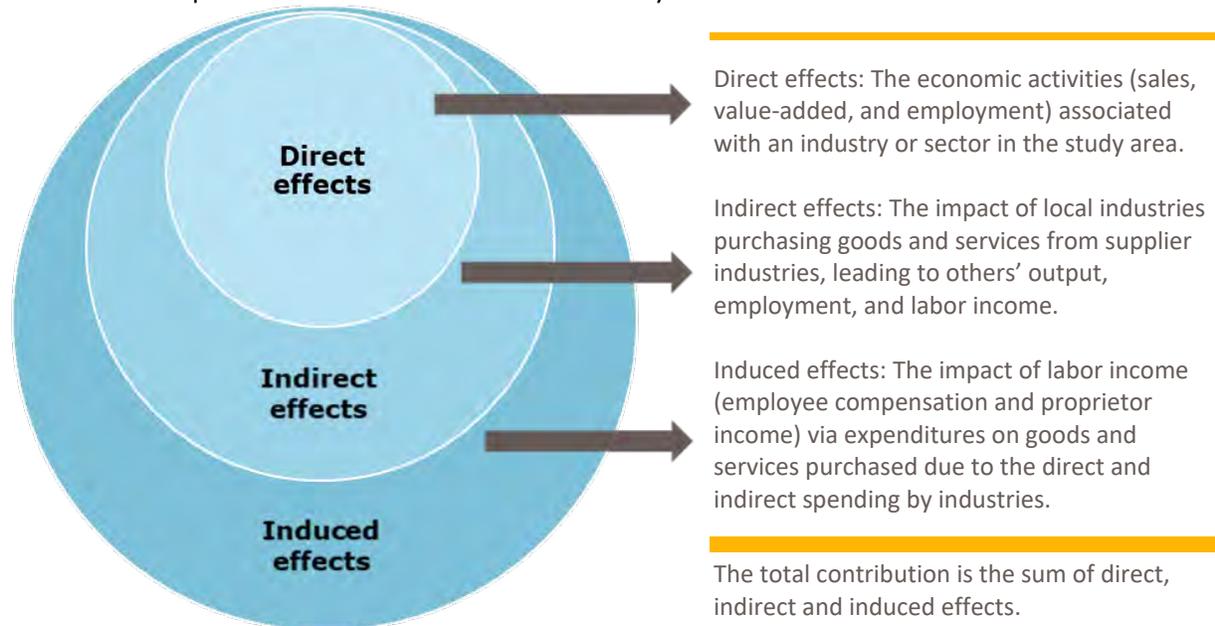
This section of the report includes four major subsections: Economic Contributions Defined, Economic Contribution Results, Importance of the Forest Products Industries in Context, and Supplemental Economic Contribution Information.

Economic Contributions Defined

Input-Output Analysis and IMPLAN

Forest products industries influence the economy in three ways: direct effects (when industries sell commodities in response to demand), indirect effects (as suppliers to directly impacted sectors), and induced effects (household spending by employees in directly and indirectly impacted sectors) (Exhibit 6). The total economic contribution is the value of production required to meet all the needs stemming from the initial activity—in this case, forest product–related purchases.

Exhibit 3. Concept of Total Economic Contribution Analysis



IO modeling using IMPLAN software and data is a conventional approach for documenting forest products industries' economic contributions. This analysis used the matrix inversion approach with external IMPLAN model adjustment as a primary method for estimating economic contributions of forest products industries in Indiana (Gibson, Leefers, and Poudel 2020). Major economic indicators generated by IMPLAN include employment (full- and part-time jobs), labor income, total output, and value-added.

Interaction Between State and Regional Analyses

IMPLAN models are based on interactions across the economy. One important aspect of these interactions is whether commodities are sourced locally or imported. In smaller areas (e.g., counties), fewer commodities are sourced locally. As a result, leakages occur when purchases are made—that is, fewer dollars stay in the local economy.

Larger economies have fewer leakages and more commodities are sourced locally. For example, an examination of the logging industries (IMPLAN sector 16) in Illinois and Indiana reveals that the direct employment for 2017 was 705 and 1,422 jobs, respectively. Summing the individual state's total employment contributions (direct, indirect, and induced) yields 2,975 jobs. However, if the states are combined as one region, the total employment contribution increases to 3,039. This increase reflects less leakage and more local purchases.

The regional analysis highlights the larger role of forest products industries in the region's economy. The larger role is due to trade, but IMPLAN does not explicitly show trade with specific states, only overall imports and exports. Consequently, the state-level analyses underestimate the actual contributions from a regional perspective.

Economic Contribution Results

This section presents direct and total contributions for all forest products industries, direct and total contributions by forest product industry groups (e.g., logging, furniture, etc.), the top forest products sectors, and the top nonforest products sectors affected by the forest products industries. Finally, this section compares forest industries in nearby states, other natural resources industries, and manufacturing industries within the state.

Forests and forest products industries are central for the transition to a greener and more sustainable economy. A green goods and services economy relies on the sustainable use of natural resources, and Indiana's forest products industries are tightly bound to forests and the goods and ecosystem services that they provide (e.g., wildlife habitat, watershed protection, carbon sequestration, etc.).

Direct and Total Contributions by Forest Products Industries

Contribution analysis provides a means to assess the role various industries play in a state's economy. Most state economies are large relative to any particular industry or group of industries, and the forest products industries are no exception.

In 2017, the Indiana's population was estimated at 6.7 million people, with total employment of 3.9 million. The gross state product (GSP), also known as value-added, was \$368.0 billion from 493 economic sectors (of the possible 536 in the U.S.). The GSP's largest component was labor income, which was \$213.8 billion.

Indiana forest products industries’ total economic contribution in terms of output was \$19.9 billion, based on a direct output of \$12.9 billion (Exhibit 7). Over 50,000 direct jobs were associated with this level of economic activity, and the total number of jobs supported was 96,444. Direct labor income, which includes employee compensation and proprietor income, was \$3.1 billion, or \$62,382 per job. Total labor income—which includes income paid directly to industry employees and proprietors, their suppliers, and the other industries they support—totaled \$5.5 billion. Direct value-added for forest products industries was \$4.0 billion: 1.1 percent of Indiana’s total GSP. The percentage doubles to 2.2 percent when considering total value-added effects. These percentages hold for other economic measures (e.g., jobs) as well.

For each direct job in the forest products industries, 0.9 additional jobs were supported. For every \$1 million in direct labor income, an additional \$0.8 million in indirect and induced labor income was supported.

Exhibit 7. Economic Contribution of the Forest Products Industries in Indiana, 2017 Dollars

Effect	Employment	Labor Income (Thousands of Dollars)	Value-added* (Thousands of Dollars)	Output (Thousands of Dollars)
Direct	50,093	\$3,124,900	\$4,046,325	\$12,883,498
Total	96,444	\$5,522,457	\$7,982,412	\$19,935,504

* Value-added in IMPLAN is equivalent to GSP.

Direct and Total Contributions by Forest Product Industry Groups

As previously noted, the 32 IMPLAN forest products sectors were combined into seven industry groups (Appendix B). In Indiana, wood furniture was the largest of the seven industry groups in direct employment, labor income, and value-added, and the second largest in output. Secondary paperboard and other paper products was the third largest group in direct employment, the second largest in labor income and value-added, and the largest group in output. Forestry, which includes maple syrup production, timber tract operations, and forestry support activities, was the smallest group for all metrics.

Two groups—secondary paperboard and other paper products and wood furniture—accounted for nearly two-thirds of forest product industries’ output. Approximately two-thirds of forest products industries employment was in the wood furniture and secondary solid wood products groups.

Exhibit 8. Direct Economic Contributions in Indiana, Industry Groups, 2017

Industry Group	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forestry	356	\$28,709	\$27,144	\$30,689
Logging	1,422	\$104,973	\$210,647	\$241,876
Primary solid wood products	3,485	\$178,792	\$204,039	\$997,860
Secondary solid wood products	12,572	\$705,322	\$851,261	\$2,596,710
Wood furniture	22,062	\$1,234,184	\$1,595,826	\$3,984,937
Pulp, paper, and paperboard mills	1,202	\$126,277	\$205,947	\$969,400
Secondary paperboard and other paper products	8,995	\$746,643	\$951,460	\$4,062,026
Total	50,093	\$3,124,900	\$4,046,325	\$12,883,498

Exhibit 9. Total Economic Contributions in Indiana, Industry Groups, 2017

Industry Group*	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forestry	459	\$32,814	\$36,557	\$48,777
Logging	799	\$51,670	\$99,073	\$126,089
Primary solid wood products	6,516	\$353,846	\$524,099	\$1,385,539
Secondary solid wood products	23,096	\$1,249,624	\$1,746,748	\$4,221,926
Wood furniture	39,071	\$2,096,970	\$2,998,828	\$6,584,917
Pulp, paper, and paperboard mills	4,852	\$328,148	\$544,240	\$1,573,646
Secondary paperboard and other paper products	21,651	\$1,409,386	\$2,032,867	\$5,994,610
Total	96,444	\$5,522,457	\$7,982,412	\$19,935,504

*Forestry and Logging are reported in this table, but most of their contributions are as indirect inputs or intermediate inputs that are used in the production in the other five industry groups. Note: Column totals in this exhibit and total contributions in Exhibit 8 are not identical due to rounding errors of less than 0.1 percent.

For the following sector-specific discussions, refer to Exhibit 8 for direct contribution details and Exhibit 9 for total contribution details. See Appendix C for detailed economic measures for industry groups and their component sectors.

Forestry

The forestry group includes timber tract operations, establishments primarily engaged in the operation of timber tracts for the purpose of selling standing timber, and support activities for forestry such as estimating timber; forest firefighting; forest pest control; treating burned forests from the air for reforestation or on an emergency basis; and consulting on wood attributes and reforestation related to timber production, wood technology, forestry economics and marketing, and forest protection.

Out of seven industry groups, forestry was the smallest in terms of direct employment in 2017. Direct contributions were \$30.7 million in output, 356 jobs, \$28.7 million in labor income, and \$27.1 million value-added. In most cases, value-added is greater than labor income, one of the value-added components. However, this is often not the case for agricultural sectors because of farm subsidies, which appear as negative taxes (see IMPLAN Sector 19, support activities for agriculture and forestry) and thus to the smaller value-added. Total contributions are based, in part, on backward linkages to suppliers. Total contributions for forestry can be lower than direct contributions (i.e., initial IMPLAN levels) because many of the contributions are inputs into other industries. For example, nearly one-fifth (19 percent) of forestry jobs are counted as contributions in other industries, mostly logging and primary solid wood products (e.g., sawmills). Hence, the total contributions displayed in Exhibit 9 underrepresent the industry's broader contributions. In other words, reporting total contributions for forestry is somewhat misleading because much of the forestry total contribution effects are hidden in the total contributions of other industries. The same holds true for logging in the section below.

Logging

The logging industry group contains establishments primarily engaged in one or more of the following: cutting timber, cutting and transporting timber, and producing wood chips in the field. Logging was the third smallest in terms of direct employment. The direct contributions of logging were \$241.9 million in output, 1,422 jobs, \$105.0 million in labor income, and \$210.6 million in value-added. Most logging activity is an input into production in other industries, especially for manufacturing primary solid wood products (e.g., lumber), paper, and paperboard. In Indiana, 63 percent of logging jobs are included in the total contributions of other industries. As with forestry, logging's total contributions are underrepresented due to their inclusion in other industries.

Primary Solid Wood Products

The primary solid wood products industry group was the fourth largest group in terms of direct employment in Indiana. Primary solid wood products sectors include wood-based electric power generation, sawmills, wood preservation, veneer and plywood manufacturing, and reconstituted and wood product manufacturing industries. The direct contributions of the group were \$997.9 million in output, 3,485 jobs, \$178.8 million in labor income, and \$204.0 million in value-added. Total contributions for primary solid wood products, including direct, indirect, and induced effects, were \$1.4 billion in output, 6,516 jobs, \$353.8 million in labor income, and \$524.1 million in value-added. Many

primary solid wood products (e.g., lumber and panels) are inputs in other industries; those inputs are counted in other industries' total contributions.

Secondary Solid Wood Products

Secondary solid wood products was the second largest group in terms of direct employment in Indiana. The group contains engineered wood member and truss manufacturing; wood windows and doors 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; and all other miscellaneous wood product manufacturing. Direct contributions of this group were \$2.6 billion in output, 12,572 jobs, \$705.3 million in labor income, and \$851.3 million in value-added. Total contributions were \$4.2 billion in output, 23,096 jobs, \$1.2 billion in labor income, and \$1.7 billion in value-added.

Wood Furniture

Wood furniture was the largest group in terms of direct employment in Indiana. Wood furniture includes wood kitchen cabinet and countertop manufacturing; upholstered household furniture manufacturing; non-upholstered wood household furniture manufacturing; institutional wood furniture manufacturing; wood office furniture manufacturing; custom architectural woodwork and millwork manufacturing; and showcase, partition, shelving, and locker manufacturing. Direct contributions of wood furniture were \$4.0 billion in output, 22,062 jobs, \$1.2 billion in labor income, and \$1.6 billion in value-added. Total contributions of wood furniture were \$6.6 billion in output, 39,071 jobs, \$2.1 billion in labor income, and \$3.0 billion in value-added.

Pulp, Paper, and Paperboard Mills

The pulp, paper, and paperboard mills industry group was the second smallest in terms of direct employment in Indiana. The group includes pulp mills, paper mills, and paperboard mills that make paper or pulp from raw wood and from purchased pulp. This group's direct contributions were \$969.4 million in output, 1,202 jobs, \$126.3 million in labor income, and \$205.9 million in value-added. Total contributions were \$1.6 billion in output, 4,852 jobs, \$328.1 million in labor income, and \$544.2 million in value-added.

Secondary Paperboard and Other Paper Products

The secondary paperboard and other paper products group was the third largest in terms of direct employment in Indiana. The group comprises paper and paperboard manufacturing, paper bag and coated and treated paper manufacturing, stationery product manufacturing, sanitary paper product manufacturing, and all other converted paper product manufacturing. Facilities in this group manufacture products from purchased pulp, paper, paperboard, or recycled materials. The direct contributions in 2017 were \$4.1 billion in output, 8,995 jobs, \$746.6 million in labor income, and \$951.5

million in value-added. Total contributions were \$6.0 billion in output, 21,651 jobs, \$1.4 billion in labor income, and \$2.0 billion value-added.

Top Forest Product Sectors

Among the 32 industry sectors that comprise the seven industry groups listed above, the leading sectors varied by the contribution measure examined. In terms of direct jobs, the four largest forest products sectors are wood kitchen cabinet and countertop manufacturing (11,115 jobs), paperboard container manufacturing (5,974 jobs), wood office furniture manufacturing (3,534 jobs), and wood container and pallet manufacturing (3,115 jobs). These sectors reflect the diversity of Indiana's manufacturing sector.

The wood kitchen cabinet and countertop manufacturing sector comprises establishments primarily engaged in manufacturing wood or plastics laminated on wood kitchen cabinets, bathroom vanities, and countertops (except freestanding). The cabinets and counters may be made on a stock or custom basis.

The paperboard container manufacturing sector comprises establishments primarily engaged in converting paperboard into containers without manufacturing paperboard. These establishments use corrugating, cutting, and shaping machinery to form paperboard into containers. Products made by these establishments include boxes, corrugated sheets, pads, pallets, paper dishes, fiber drums, and reels.

The wood office furniture manufacturing sector comprises establishments primarily engaged in manufacturing wood office-type furniture. The furniture may be made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown).

The wood container and pallet manufacturing industry comprises establishments primarily engaged in manufacturing wood pallets, wood box shoo, wood boxes, other wood containers, and wood parts for pallets and containers.

In terms of direct labor income, wood kitchen cabinet and countertop manufacturing, paperboard container manufacturing, wood office furniture manufacturing, and manufactured home (mobile home) manufacturing had the highest labor income, totaling \$1.5 billion. In order, these same four sectors also had the highest value-added, totaling \$1.9 billion. For output, paperboard container manufacturing, wood kitchen cabinet and countertop manufacturing, paperboard mills, and paper bag and coated and treated paper manufacturing were the top four sectors, totaling \$6.3 billion.

Top Nonforest Industries Impacted

Contribution analysis using IMPLAN relies on backward linkages from forest products industries sectors among themselves and to other sectors in Indiana. Including the 32 forest products industries (of which Indiana only has 30), 179 sectors were impacted in 2017 (counting sectors with ten or more jobs supported). The top ten sectors (excluding forest products sectors) included wholesale trade,

restaurants, trucking, hospitals, and real estate (Exhibit 10). This set of sectors reflects indirect and induced spending by forest products companies, their suppliers, and individuals.

These data were at an aggregate level, so the 1,709 jobs in truck transportation included log trucks, delivery trucks, and office jobs for some trucking companies, among others. Seven of these sectors were among the top ten sectors in the state of Indiana (wholesale trade was second, followed by real estate and hospitals—each had over 120,000 jobs).

Exhibit 4. Direct Jobs Impacted by the Forest Products Industries Among Indiana’s Top Ten Non-Forest Products Industries in 2017

Sector	Description	Jobs
395	Wholesale trade	3,336
501	Full-service restaurants	2,122
502	Limited-service restaurants	2,121
411	Truck transportation	1,709
482	Hospitals	1,645
440	Real estate	1,611
464	Employment services	1,206
468	Services to buildings	1,183
405	Retail—general merchandise stores	1,014
461	Management of companies and enterprises	994
Total	NA	16,942

Neighboring States

Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin are important for forest products. Forest products industries employ over 281,600 workers across these states and account for \$88.9 billion in direct output (Exhibits 11 and 12). Pennsylvania had the largest forest products economy in terms of employment with 68,541 direct jobs, and Wisconsin had the largest forest products economy in terms of sales, which exceeded \$25 billion. Pennsylvania, Wisconsin, and Ohio had more direct jobs and output than Indiana. Among these states, Michigan’s forest products industry was the smallest. The three largest industry groups in terms of employment, each with over 65,000 employees, were secondary paperboard and other paper products, wood furniture, and secondary solid wood products. In terms of output, the three largest industry groups were secondary paperboard and other paper products (\$36.3 billion), pulp, paper, and paperboard mills (\$16.5 billion), and wood furniture (\$13.1 billion).

Exhibit 11. Forest Products Industries’ Direct Employment in Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin, 2017

Industry	Indiana	Michigan	Ohio	Pennsylvania	Wisconsin
Forestry	356	1,321	596	1,865	778
Logging	1,422	4,487	3,069	4,740	5,207
Primary solid wood products	3,485	4,768	3,178	6,812	4,564
Secondary solid wood products	12,572	7,048	12,516	18,638	14,911
Wood furniture	22,062	10,837	14,904	13,720	12,071
Pulp, paper, and paperboard mills	1,202	3,186	2,211	3,186	11,233
Secondary paperboard and other paper products	8,995	9,099	17,971	19,581	19,029
Sum of direct contributions	50,093	40,746	54,445	68,541	67,793

Exhibit 12. Forest Products Industries’ Direct Output in Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin, 2017

Industry	Indiana (Thousands of Dollars)	Michigan (Thousands of Dollars)	Ohio (Thousands of Dollars)	Pennsylvania (Thousands of Dollars)	Wisconsin (Thousands of Dollars)
Forestry	\$30,689	\$62,158	\$37,948	\$126,178	\$33,960
Logging	\$241,876	\$280,775	\$484,704	\$697,606	\$489,763
Primary solid wood products	\$997,860	\$1,689,173	\$987,376	\$2,151,337	\$1,630,002
Secondary solid wood products	\$2,596,710	\$1,420,592	\$2,379,878	\$3,613,125	\$3,041,763
Wood furniture	\$3,984,937	\$2,239,587	\$2,436,627	\$2,282,116	\$2,174,899
Pulp, paper, and paperboard mills	\$969,400	\$2,493,853	\$1,717,609	\$2,722,271	\$8,562,915
Secondary paperboard and other paper products	\$4,062,026	\$3,996,111	\$8,067,397	\$10,827,005	\$9,349,409
Sum of direct contributions	\$12,883,498	\$12,182,249	\$16,111,539	\$22,419,639	\$25,282,710

Importance of the Forest Products Industries in Context

To help contextualize the relative importance of the forest products industries, it is useful to compare the contribution of Indiana’s forest products industries with others. Natural resources and agricultural industries significantly contribute to the diversity of economic activities reflected in Indiana’s \$368.0 billion GSP. The forest products industries provide more direct labor income and output than commercial fishing, hunting, and trapping; mining and oil and gas production; and agricultural production industries (Exhibit 13). Indiana’s forest products industries comprised 1.1 percent of the GSP

in 2017. Agricultural production provided the largest amount of employment (full- and part-time) of these industries.

Exhibit 13. Natural Resources and Agricultural Production Industries in Indiana, 2017

Industry	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forest products	50,093	\$3,124,900	\$4,046,325	\$12,883,498
Commercial fishing, hunting, and trapping	387	\$6,788	\$(47,773)	\$4,561
Mining and oil and gas production	12,194	\$478,946	\$1,666,060	\$3,197,069
Agricultural production (plant crop and animal)	69,264	\$3,084,050	\$4,292,477	\$11,405,698
Total	131,938	\$6,694,684	\$9,957,091	\$27,490,825

Labor income per job is highest in forest products (\$62,382) and lowest in commercial fishing, hunting, and trapping (\$17,540). Agricultural production has the second highest average income at \$44,526, and mining and oil and gas production has the third highest at \$39,277.

Most of the forest products industries are manufacturers, however, the forestry, logging, and biomass power groups are not. There were approximately 540,600 manufacturing jobs in Indiana, of which 48,315 (8.9 percent) were in the forest products industries. Of 16 manufacturing industries, forest products was third in employment after transportation equipment and fabricated metal manufacturing. It was sixth in labor income, tenth in value-added, and ninth in output (Exhibit 14).

Exhibit 14. Manufacturing Industries in Indiana, 2017

Manufacturing Industries	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Transportation equipment	132,576	\$10,958,121	\$22,697,444	\$91,867,595
Fabricated metal	61,734	\$4,278,522	\$7,023,444	\$15,784,206
Forest products	48,315	\$2,991,218	\$3,808,534	\$12,610,933
Food	43,642	\$2,504,161	\$5,846,711	\$26,649,898
Machinery	43,231	\$3,629,686	\$5,744,684	\$19,323,291
Primary metal	41,121	\$3,988,075	\$8,723,264	\$30,135,426
Plastics and rubber products	40,390	\$2,610,122	\$4,003,339	\$13,084,107
Miscellaneous	34,168	\$2,623,920	\$4,051,222	\$11,143,476
Chemical	27,360	\$4,310,584	\$22,203,538	\$41,245,504
Printing	16,793	\$850,446	\$1,205,013	\$2,696,207
Nonmetallic mineral product	14,171	\$928,218	\$1,689,093	\$4,845,352
Computer and electronic product	12,933	\$1,078,073	\$2,118,418	\$4,974,765
Electrical equipment	9,099	\$666,630	\$861,663	\$3,035,404
Textiles and apparel	5,860	\$261,806	\$332,980	\$1,027,265
Beverage and tobacco product	5,782	\$375,702	\$1,111,265	\$3,609,584
Petroleum and coal	3,486	\$684,859	\$4,545,978	\$15,247,676
Total	540,660	\$42,740,144	\$95,966,591	\$297,280,687

Supplemental Economic Contribution Information

The report by Gibson, Leefers, and Poudel provides a detailed discussion of which sectors were included and excluded from this analysis (2020). Most economic data used in this report were derived from IMPLAN, with one notable exception.

For most of the partial sectors (Appendix B), ratios of published government data were used to identify a portion of the industry that would be treated as forest products. In cases where only part of an IMPLAN sector was associated with forest products, analysts faced three options. The first, most conservative, option was to include only sectors that produce only forest products; sectors that do not solely produce forest products would be excluded from the analysis. The second option was to include sectors producing any forest products, even if the product is a small part of total output. The third option was to assess what portion of a sector produces a forest product and to include only that portion. Of course, some means for assessing the magnitude of the portion is needed. This third option was the approach used in this report.

Wood is used in many other products not covered by the 30 sectors highlighted in this report. For example, boats, blinds, musical instruments, burial caskets, organic chemicals, and pharmaceuticals may use wood directly or as an extract. However, the wood-only component of these product groups is difficult to quantify and was unable to be included in this report. Surveys could be designed and conducted to determine the forest products component of these sectors. In practice, the production functions, employment, output, and other metrics would need to be compiled and inserted into IMPLAN.

Summary

Over the last 20 years, individual states located in the midwestern and northeastern area of the United States have conducted statewide economic contributions studies of the forest products industries. However, these studies differed in approach, data used, and measures reported. Developing a consistent approach required funding that spanned multiple states. The Forest Markets & Utilization Committee of the Northeast—Midwest State Foresters Alliance secured grant funds through the Landscape Scale Restoration Program within the U.S. Forest Service, Eastern Region, State and Private Forestry to support investigation of the economic contributions of the forest products industry in the 20 northeastern and midwestern states and Nebraska. To that end, the Michigan Department of Natural Resources Forest Resources Division (serving as the lead on the grant project) contracted with Public Sector Consultants to facilitate discussions among the project partner states and to reach consensus on an appropriate analysis methodology and report template for both the regional and state reports, in addition to conducting the analysis.

This report serves as a snapshot of economic contributions of the forest products industries in Indiana for 2017 as well as a baseline report for future analyses. However, future analyses may again require funding from the U.S. Forest Service or other institutions if multistate results are desired. Methods used in developing this report are consistent across the region. In Indiana, there were 50,093 direct jobs in the forest products industries, and overall, 96,444 jobs were supported. Direct labor income was \$3.1 billion, with total labor income at \$5.5 billion. Direct value-added was \$4.0 billion, and the total contribution for value-added was \$8.0 billion. Finally, direct output was \$12.9 billion, with a total contribution of \$19.9 billion in output. Similar report findings are available from other states in the region and are summarized in a regional report.

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Appendix A: Methods and Data

Input-Output Analysis: IMPLAN

Several key decisions related to methods were developed through a consensus process (Gibson, Leefers, and Poudel 2020). The project team, in consultation with the states, made consensus decisions regarding the modeling method for estimating economic contributions, the forest products sectors to include in analysis (either in total or in part), the IMPLAN year for reporting results, and the use of an analysis spreadsheet for consistent reporting.

The economic contributions of the region and each state's forest products industries relied on 2017 IMPLAN software and data. IMPLAN is a widely used economic IO model that focuses on interdependence among various producing and consuming sectors in the economy. IMPLAN has 536 industry sectors for the 2017 data set and is based on the NAICS. IMPLAN data are compiled and linked by the IMPLAN software (Version 3.1.1001.12); data come from various government agencies, including the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, and the U.S. Bureau of Economic Analysis. Economic measures in IMPLAN include employment, labor income, value-added, output, and others. More detailed information on data sources is available at [the IMPLAN website](#).

Wassily Leontief developed IO modeling in the mid-20th century. Impact analysis examines the effects of changes in demand in a regional economy, while contribution analysis can evaluate the role of several related sectors in a region. IMPLAN provides the software and data to conduct such analyses. Each sector has a production function tracing the backward linkages (i.e., suppliers) to other sectors. Various sectors produce commodities (e.g., the logging sector produces logs). Leakages (e.g., foreign and domestic imports/exports) to and from other regions are also modeled. Social accounting flows among industries, households, government, and capital are included in IMPLAN.

The analysis process begins with creating an IMPLAN model. One or more geographic areas (e.g., counties or states) are selected as the region. Then, models are run through the creation of multipliers. This report uses Social Accounting Matrix (SAM) multipliers. Next, activities are selected to estimate either economic impacts or contributions. For example, analysts can estimate the impacts of expanding or contracting industries. In the case of contribution analysis, it is important to ensure that the level of production does not exceed the actual level of production in the region. Contribution analysis essentially counters the effects of the multipliers.

Contributions can be in terms of value-added, output, employment, and/or labor income. Value-added is commonly used to describe an industry's economic contributions and is a conservative measure of these contributions. Value-added is the difference between an industry's output, and the costs of intermediate inputs. When a sawmill sells a board, the value of the log and other inputs is not counted in value-added because they were counted when produced by loggers and others. Thus, only new additions to value (e.g., labor income) are included. Labor income is the major component of value-

added and includes employee compensation and proprietor income. Value-added, summed across all sectors, is equal to GSP.

Another measure of economic contribution is industry output. For example, if a log is sold to a sawmill that sells boards, both sales are counted as part of the overall region's output, as they are important economic activities. Another measure, employment, includes both full- and part-time jobs. As the number of sectors in an analysis increases, there can be overlap in the number of part-time jobs across sectors.

Methods

IMPLAN estimates economic impacts (i.e., effects of economic changes) and contributions (i.e., effects of existing industries). Two methods for multisector economic contribution analysis are available (Parajuli et al., 2018), both requiring significant data manipulation.

The first method customizes the IMPLAN model by changing selected endogenous tables, whereas the second method adjusts input values based on matrix inversion prior to analysis. In method one, the changes are internal to IMPLAN and difficult to monitor from a quality control perspective.

Method two relies mostly on spreadsheet-based manipulation and is easier to monitor. When the contribution analysis is completed, direct effects from the IMPLAN sectors of interest equal the amounts shown in IMPLAN's "Industry Detail" table, and the total contributions (direct plus indirect plus induced) are estimated. Both methods prevent over reporting of total effects, which can occur if standard economic impact analysis is used when contribution analysis results are desired.

IMPLAN was designed for economic impact analysis. Multipliers ensure that the ripple effect manifests across the economy. A portion of those effects often involve self-purchases within the sector of interest. That is, if the output from the logging sector is \$1 million in a local economy, the economic impact of \$1 million in sales would be greater than that amount due to self-purchases. The contribution methods are designed to yield the \$1 million direct contribution and its associated effects. Put simply, the amount of sales (direct contribution) estimated cannot exceed the amount that actually exists. Methods one and two accomplish this.

The matrix inversion approach relies on developing a detailed social accounting matrix (SAM) output multipliers for each sector in the forest products industries. Hence, a 32x32 matrix is developed with the diagonal yielding a value close to 1.0 for the detailed multipliers relating each row-column sector to itself (e.g., logging to logging, sawmills to sawmills, etc.). The actual matrix can be developed in several ways. For example, the SAM matrix can be exported from IMPLAN and narrowed down to the appropriate row and columns for the forest products industries. Then, it can be used to develop detailed multipliers via matrix inversion. Alternatively, detailed multipliers can be exported and rearranged into a 32x32 matrix. The approach used in this report was to rely on a matrix developed by IMPLAN staff for

the state. Then, the matrix was inverted and multiplied the initial IMPLAN output values for forest industries sectors to yield inputs for IMPLAN analysis.

Appendix B: Forest Products Industries Groupings and IMPLAN Sectors

Exhibit B1. Forestry Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
10	Maple syrup production*
15	Forestry, forest products, and timber tract production
19	Support activities for forestry*

Note: Sectors with an “*” indicate that only a portion of the sector is included in the forest products industries.

Exhibit B2. Logging Industry Grouping and IMPLAN Sector

IMPLAN Sector	Sector Name
16	Commercial logging

Exhibit B3. Primary Solid Wood Products Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
47	Electric power generation—biomass*
134	Sawmills
135	Wood preservation
136	Veneer and plywood manufacturing
138	Reconstituted wood product manufacturing

Note: Sectors with an “*” indicate that only a portion of the sector is included in the forest products industries.

Exhibit B4. Secondary Solid Wood Products Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
137	Engineered wood member and truss manufacturing
139	Wood windows and doors manufacturing
140	Cut stock, resawing lumber, and planing
141	Other millwork, including flooring
142	Wood container and pallet manufacturing
143	Manufactured home (mobile home) manufacturing
144	Prefabricated wood building manufacturing
145	All other miscellaneous wood product manufacturing

Exhibit B5. Wood Furniture Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
368	Wood kitchen cabinet and countertop manufacturing
369	Upholstered household furniture manufacturing
370	Nonupholstered wood household furniture manufacturing
372	Institutional wood furniture manufacturing*
373	Wood office furniture manufacturing
374	Custom architectural woodwork and millwork manufacturing
376	Showcase, partition, shelving, and locker manufacturing*

Note: Sectors with an “*” indicate that only a portion of the sector is included in the forest products industries.

Exhibit B6. Pulp, Paper, and Paperboard Mills Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
146	Pulp mills
147	Paper mills
148	Paperboard mills

Exhibit B7. Secondary Paperboard and Other Paper Products Industry Grouping and IMPLAN Sectors

IMPLAN Sector	Sector Name
149	Paperboard container manufacturing
150	Paper bag and coated and treated paper manufacturing
151	Stationery product manufacturing
152	Sanitary paper product manufacturing
153	All other converted paper product manufacturing

Appendix C. Detailed Economic Contribution Results

Direct Economic Contribution by IMPLAN Sector

Exhibit C1. Direct Economic Contributions, Forestry Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forestry, forest products, and timber tract production	89	\$7,235	\$7,003	\$9,332
Support activities for forestry*	248	\$21,234	\$19,803	\$20,755
Maple syrup production*	19	\$240	\$339	\$602
Forestry Subtotal	356	\$28,709	\$27,144	\$30,689

Exhibit C2. Direct Economic Contributions, Logging Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Commercial logging	1,422	\$104,973	\$210,647	\$241,876
Subtotal	1,422	\$104,973	\$210,647	\$241,876

Exhibit C3. Direct Economic Contributions, Primary Solid Wood Products Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Electric power generation—biomass	-	-	-	-
Sawmills	1,712	\$80,872	\$88,358	\$465,613
Wood preservation	145	\$9,241	\$14,798	\$83,889
Veneer and plywood manufacturing	1,590	\$86,397	\$97,608	\$429,278
Reconstituted wood product manufacturing	38	\$2,283	\$3,276	\$19,080
Subtotal	3,485	\$178,792	\$204,039	\$997,860

Exhibit C4. Direct Economic Contributions, Secondary Solid Wood Products Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Engineered wood member and truss manufacturing	1,836	\$102,206	\$109,237	\$404,311
Wood windows and doors manufacturing	1,145	\$64,057	\$74,959	\$255,108
Cut stock, resawing lumber, and Planing	619	\$34,906	\$46,224	\$146,129
Other millwork, including flooring	1,533	\$85,441	\$104,689	\$319,050
Wood container and pallet manufacturing	3,115	\$145,621	\$162,064	\$479,508
Manufactured home (mobile home) manufacturing	2,609	\$179,521	\$246,844	\$679,695
Prefabricated wood building manufacturing	309	\$19,559	\$21,040	\$56,178
All other miscellaneous wood product manufacturing	1,406	\$74,009	\$86,205	\$256,731
Subtotal	12,572	\$705,322	\$851,261	\$2,596,710

Exhibit C5. Direct Economic Contributions, Wood Furniture Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Wood kitchen cabinet and countertop manufacturing	11,115	\$637,532	\$739,297	\$1,743,742
Upholstered household furniture manufacturing	2,496	\$145,499	\$180,814	\$529,611
Nonupholstered wood household furniture manufacturing	1,673	\$87,293	\$115,791	\$242,814
Institutional wood furniture manufacturing	594	\$33,600	\$41,934	\$117,175
Wood office furniture manufacturing	3,534	\$189,509	\$333,304	\$824,772
Custom architectural woodwork and millwork manufacturing	447	\$25,483	\$30,863	\$73,392
Showcase, partition, shelving, and locker manufacturing	2,203	\$115,268	\$153,823	\$453,429
Subtotal	22,062	\$1,234,184	\$1,595,826	\$3,984,937

Exhibit C6. Direct Economic Contributions, Pulp, Paper, and Paperboard Mills Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Pulp mills	-	-	-	-
Paper mills	12	\$3,073	\$3,942	\$11,191
Paperboard mills	1,189	\$123,204	\$202,005	\$958,209
Subtotal	1,202	\$126,277	\$205,947	\$969,400

Exhibit C7. Direct Economic Contributions, Secondary Paperboard and Other Paper Products Detail, 2017

Sector	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Paperboard container manufacturing	5,974	\$510,582	\$621,534	\$2,784,634
Paper bag and coated and treated paper manufacturing	1,975	\$151,377	\$208,987	\$862,324
Stationery product manufacturing	372	\$25,572	\$34,771	\$135,891
Sanitary paper product manufacturing	143	\$14,277	\$33,057	\$107,490
All other converted paper product manufacturing	531	\$44,835	\$53,111	\$171,687
Subtotal	8,995	\$746,643	\$951,460	\$4,062,026

Note: Value-added in IMPLAN is equivalent to GSP.

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