Forest Products Industries' Economic Contributions: Maryland

May 2020

Prepared by

Public Sector Consultants
Lansing, Michigan
www.publicsectorconsultants.com

Prepared for

Maryland Department of Natural Resources
Forest Service
Annapolis, Maryland
dnr.maryland.gov/forests

Michigan Department of Natural Resources
Forest Resources Division
Lansing, Michigan
www.michigan.gov/dnr

Foreword

Maryland is the fifth most densely populated state, yet retains large areas of very productive, ecologically diverse forest land that yields a continuous flow of goods and services we value every day. Ecological services such as filtering our drinking water and restoring our aquifers are readily recognized and valued by Maryland residents. Just as importantly, but less well-recognized, is the daily contribution of Maryland's forest products industry to our economy. Even less known is the clear linkage between forest products and forest health, with the former driving the capacity to maintain and provide for the latter, which ultimately yields the ecological services we require.

Products made from wood are required by each one of us every day. This translates directly back to those who own forests, creating the tangible economic value that provides a very real incentive to keep their land forested. Strong local markets for wood result in forest landowners investing in better management of their forests, which in turn enhances the multitude of nontimber benefits forests provide to all of us. Forests provide a natural buffer that protects the Chesapeake Bay and the tributaries that make up our unique natural environment. Forest land is the second largest land-use in Maryland, with 2.5 million acres (nearly 40 percent of all state land), supporting a major industry and underpinning the environmental well-being of our state. If our forests lose their economic value to the people who own them, we will likely lose the forests.

This report contains new economic data for the forest products industry in Maryland. The forest products industry continues to be Maryland's fifth largest manufacturing industry (in terms of direct output), directly employing almost 9,000 Marylanders with an annual employee compensation of almost $600 million. Maryland benefits from 31 forest products subsectors; the business activities from these industries contribute $4.2 billion in total output to Maryland's economy. The top ten sectors benefiting from trade and spending by the forest products industries and their employees included wholesale trade, real estate, restaurants, trucking, and hospitals. These diverse sectors reflect the wide reach of Maryland's forest products industries.

Clearly, the forest products industry is integral to Maryland society. The forests across our state are the foundation for the forest products industry, which in turn is essential for the continued strength of our environment and economy. Moving forward, we hope to build on our strengths and advance the retention and growth of this critical industry.

Jeannie Haddaway-Riccio
Secretary, Maryland Department of Natural Resources

Suggested citation: Public Sector Consultants and Daniel R. Rider. 2020. *Forest Products Industries' Economic Contributions: Maryland*. Lansing: Public Sector Consultants.

Acknowledgements

This report was produced as part of a 20-state project supported by a U.S. Department of Agriculture Forest Service2017 Landscape Scale Restoration Grant, administered by the Michigan Department of Natural Resources, Forest Resources Division on behalf of the Northeast-Midwest State Foresters Alliance Forest Markets & Utilization Committee. Dan Rider of the Maryland Forest Service contributed extensively to the Maryland report, and we thank him for his contributions.

Table of Contents

Executive Summary

This report assesses broad forest conditions and economic contributions of forest products industries in Maryland. 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 Impact Analysis for Planning (IMPLAN), a commercially available economic input-output (IO) model.

Maryland boasts 2.5 million acres of forest land that cover nearly 40 percent of its land base, with most of this forest land able to produce commercial timber. The majority, 72.2 percent, is privately owned, while state and local governments own 24.9 percent and the federal government owns about 3.0 percent.

Forest Industries

This report presents seven forest products industries, which are based on 32 economic sectors in IMPLAN, 29 of which are present in Maryland:

- 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, Maryland's forest products industries provided direct employment to almost 9,000 people, leading to $2.6 billion in output. That same year, labor income was $589.5 million and value-added was $730.1 million. In total contributions, these industries supported over 18,000 jobs, $1.2 billion in labor income, $1.7 billion in value-added, and $4.2 billion in output.

Among the top sectors (excluding forest products sectors) impacted by forest products industries were wholesale trade, management of companies and enterprises, real estate, restaurants, trucking, and hospitals. 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 (2,506), the second highest value-added ($176.9 million), and the third highest direct output ($441.0 million).
- Secondary solid wood products had the second highest number of direct jobs (2,167), the highest value-added ($192.5 million), and the third highest direct output ($497.1 million).
- Secondary paperboard and other paper products had the third highest employment (1,909), third highest value-added ($149.3 million), and highest output ($825.0 million).
- Primary solid wood products had the sixth highest number of direct jobs (643), the fifth-highest value-added ($50.2 million), and the fifth-highest direct output ($224.4 million).

Leading Individual Forest Products Sectors

Among the 29 forest products sectors present in Maryland, the top four, by measure in order from highest to fourth highest of direct contributions, were:

- Employment—Paperboard container manufacturing, wood kitchen cabinet and countertop manufacturing, engineered wood member and truss manufacturing, and paper mills were the top four sectors and had a combined total of over 4,210 direct jobs, or 47.8 percent of direct employment.
- Labor income—Paperboard container manufacturing, paper mills, wood kitchen cabinet and countertop manufacturing, and engineered wood member and truss manufacturing had the highest labor income, totaling $266.0 million, or 45.1 percent of direct labor income.
- Value-added—Paperboard container manufacturing, paper mills, wood kitchen cabinet and countertop manufacturing, and engineered wood member and truss manufacturing had the highest value-added, totaling $341.3 million, or 46.7 percent of direct value-added.
- Output—Paperboard container manufacturing, paper mills, engineered wood member and truss manufacturing, and wood kitchen cabinet and countertop manufacturing were the top four sectors in output, totaling $1.6 billion, or 59.0 percent of total direct output.

Maryland's Forest Products Industries Compared to Other Maryland 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, forest products industries accounted for 8.5 percent of the nonfood manufacturing jobs in Maryland. Agricultural production provided the most employment and value-added. Almost 7 percent of Maryland's 118,000 direct manufacturing jobs in 2017 were in the forest products industries, one out of every 15 manufacturing jobs.

Maryland's Forest Products Industries Compared to Those of Delaware, West Virginia, and Pennsylvania

Forest products industries in Maryland and the neighboring states of Delaware, West Virginia, and Pennsylvania employed almost 90,000 workers and accounted for almost $28.1 billion in direct output. Pennsylvania's forest products industry was the largest in the region in terms of direct employment, followed by West Virginia, Maryland, and Delaware.

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 Maryland's economy. They provide jobs, raw materials, and finished goods that generate additional economic activity throughout the state, region, and nation. Previous studies of the industries' economic contributions have focused solely on Maryland—either documenting the industries' continuing recovery from the 2008–09 Recession or examining the role the industries play in the statewide economy. This report compares the contributions of Maryland'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.

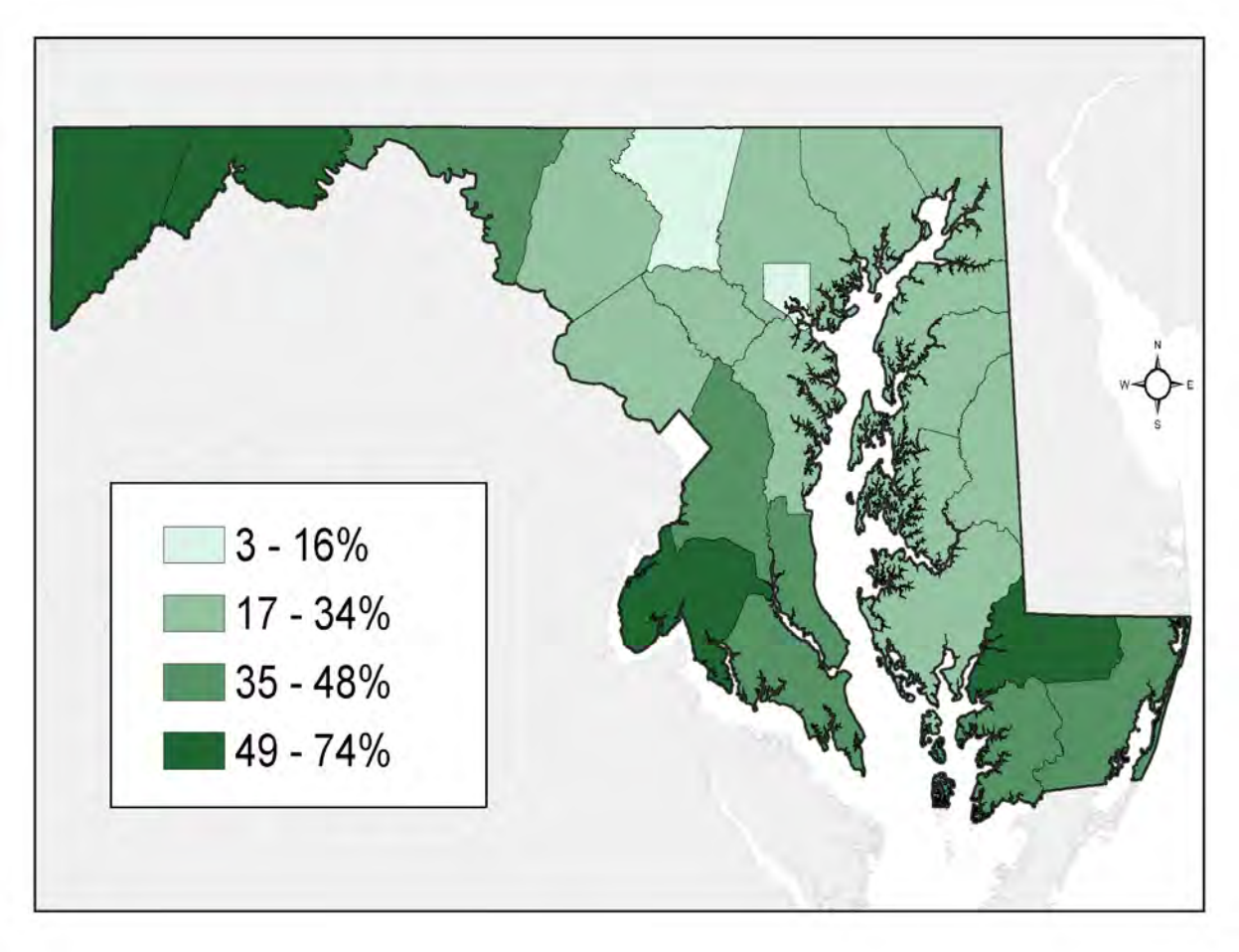
Much of the data used in this report were derived from the U.S. Forest Service Forest Inventory and Analysis database and from IMPLAN, a widely used economic modeling system. These data and related information are presented in four major sections: Forest Resources of Maryland, Forest Products Industries, Economic Contributions of Maryland'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 Maryland

Sustainable forest management promotes production of wood and nontimber forest products in a way that maintains the ecosystem's capacity for renewal. A forest's ability to provide these benefits is dependent upon soil type, moisture levels, and the general health of sites that are suitable for production. Forest-use decisions affect the acreage available for production and management choices affect short- and long-term yield potential.

Maryland is rich in forest resources from the mountains to the ocean. Exhibit 1 shows the percent of forest land by county in Maryland.

Exhibit 1. Maryland's Forest Land by County, 2017



Almost 40 percent of the state is forested, as shown in Exhibit 2. Timberland is the largest component of forest land, totaling 2.2 million acre; reserved forest land accounts for 0.3 million acres; and other forestland is the smallest category at approximately 5,000 total acres.

Exhibit 2. Maryland Land Area by Land Use Type, 2017 (U.S. Forest Service)

Land Use Type	Acres	Percentage
Forest land	2,459,561	39.7%
Nonforest land	3,740,394	60.3%
Total	**6,199,955**	**100.0%**

The majority of Maryland's forest land is privately owned (72.2 percent), while 24.9 percent is owned by state and local governments and the remainder is in federal ownership (Exhibit 3). Landowners pursue diverse goals. Private landowners have wide latitude in how they treat their lands—some have a hands-off approach, while others pursue active management. There are several state and federal programs

designed to encourage the active management of private forest lands. In keeping with third-party certified sustainable management goals and plans, all of which are publicly informed, State forests are actively managed for multiple uses, with resource protection emphasized always. Active timber management on private and public timberlands provides the feedstock for Maryland's forest products industries.

Trees are common throughout the state. They are in our forests, along our rivers, and in our yards. It is estimated that there are 1.4 billion trees in Maryland—more than 23 trees for each person in the state. (Lister 2017).

Exhibit 3. Forest Land by Ownership Group in Maryland (2017)

Ownership Group	Acres	Percentage
Other federal	73,087	3.0%
State and local governments	611,432	24.9%
Private	1,775,043	72.2%
Total	**2,459,561**	**100.0%**

Maryland's major forest types include oak/hickory, loblolly/shortleaf, oak/pine, maple/beech/birch, and oak/gum (Exhibit 4). Tree species with the greatest standing volume included yellow poplar, loblolly pine, red maple, white oak, sweetgum and chestnut oak (Lister 2017). Maryland is internationally known for its highest-quality northern red oak, white oak, yellow poplar and black cherry timber, which are prized for furniture manufacturing, cabinetry, high-end architectural millwork, and flooring. Maryland's diverse timber species support a variety of forest products industries, including heavy construction timbers, office and institutional furniture, pulp and paper manufacturing, paper and paperboard packaging, hardwood-grade lumber, industrial lumber, piling, pallets, and a variety of wood packaging products, animal bedding, additives for plastics, and even explosives.

Exhibit 3. Forest Land Area by Forest Type Group in Maryland (2017)

Forest Type Group	Acres	Percentage
Oak/hickory	1,447,162	58.8%
Loblolly/shortleaf	394,577	16.0%
Oak/pine	210,805	8.6%
Maple/beech/birch	123,653	5.0%
Oak/gum	117,401	4.8%
Other	165,963	6.7%
Total	**2,459,561**	**100.0%**

The estimated volume of standing timber suitable for forest products was about 6.6 billion cubic feet, or about 83 million standard cords[1] (Exhibit 5). Average annual net growth exceeded annual harvest removals by a ratio of about 4.8 to 1. That is, for every cubic foot of harvesting that took place, 4.8 cubic feet of timber grew, after accounting for mortality. Average annual harvest removals in 2017 of growing stock were about 25.8 million cubic feet, or about 326,321 cords—roughly 0.4 percent of standing volume.

Exhibit 4. Characteristics of Growing Stock on Forest Land in Maryland, 2017 (million cubic feet)

Measure	Total	Federal	State and Local Government	Private
Net volume	6,574.5	197.2	1,644.5	4,732.8
Net growth	115.8	2.6	18.2	95.0
Harvest removals	25.8	0.0	2.3	23.5
Annual mortality	58.3	2.5	20.5	35.3

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

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

[1] A standard cord is a unit of measurement for pulpwood or sawlogs, generally equivalent to a stack of wood measuring four feet wide by four feet tall by eight feet long. A stacked cord of wood typically contains about 79 cubic feet of solid wood, excluding air space.

- 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, 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 nonwood 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, and can be constructed for different geographic areas. Within these models, various sectors have production functions that show the value of inputs used in production of outputs or commodities. Maryland's economy was represented by 473 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).

Economic Contributions of Maryland's Forest Products Industries

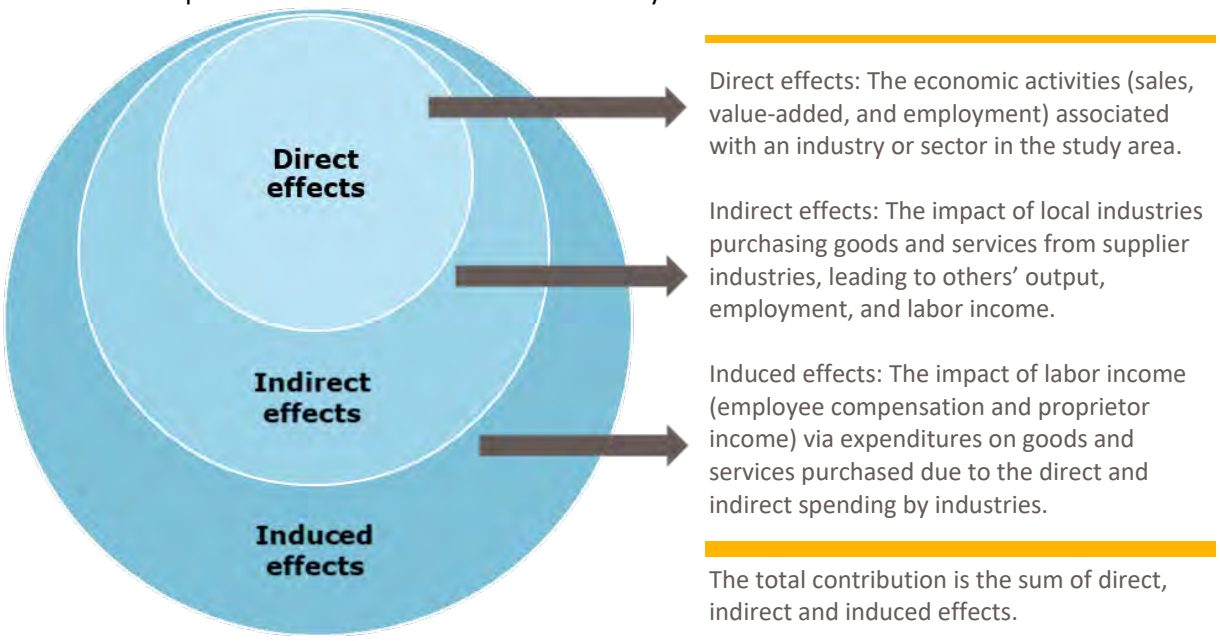
This section of the report includes four major subsections: Economic Contributions Defined, Economic Contribution Results, Importance of the Forest Products Industries in Context, and Supplemental Economic Contribution Information.

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 5. 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 recommended by Henderson and Evans (2017) as a primary method for estimating economic contributions of forest products industries (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 Maryland and Delaware, reveals that the direct employment for 2017 was 648 and 29 jobs, respectively. Summing the individual state's total employment contributions (direct, indirect, and induced) yields 1,240 jobs. However, if the states are combined as one region, the total employment contribution increases to 1,251 jobs. This increase reflects less leakage and more local purchases.

The larger role is due to trade, but IMPLAN does not explicitly show trade with specific states, only overall imports and exports. The regional analysis highlights the larger role of forest products industries in the region's economy. 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 Maryland'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. Maryland's forest products industries' total economic contribution in terms of output was $4.2 billion, based on direct output of $2.6 billion (Exhibit 7). Almost 9,000 direct jobs were associated with this level of economic activity, supporting a total of 18,046 jobs. Direct labor income, which includes employee compensation and proprietor income, was $589.5 million, or $66,893 per job. Total labor income, which includes income paid directly to industry employees and proprietors, their suppliers, and other industries they support, totaled $1.2 billion.

Exhibit 6. Economic Contribution of Forest Products Industries in Maryland, in 2017(2017 Dollars)

Effect	Employment	Labor Income (Thousands of Dollars)	Value-added* (Thousands of Dollars)	Output (Thousands of Dollars)
Direct	8,813	$589,530	$730,098	$2,633,880
Total	18,046	$1,162,355	$1,675,631	$4,200,375

* Value-added in IMPLAN is equivalent to GSP.

Each direct job in the forest products industries supported 1.05 additional jobs, and every $1 million in direct labor income supported an additional $0.97 million in indirect and induced labor income.

Most state economies are large relative to any particular industry or group of industries. The forest products industries are no exception. In 2017, Maryland's population was estimated at 6.1 million people, with total employment of 3.7 million. The gross state product was $408.7 billion from 473 economic sectors (of the possible 536 in the US). The GSP's largest component was labor income, which was $247.1 billion.

Direct value-added for forest products industries was $730.1 million, 0.2 percent of Maryland's total GSP, increasing to 0.4 percent when considering total value-added effects. These percentages hold for other economic measures (e.g., jobs) as well.

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 Maryland, wood furniture was the largest of these groups in terms of direct employment and second largest in terms of labor income and value-added. Secondary solid wood products was the second largest group in terms of direct employment and the largest in terms of labor income and value-added. Secondary paperboard and other paper products was the largest in terms of output and third largest in terms of employment, labor income, and value-added. Forestry, which includes maple syrup production, timber tract operations, and forestry support activities, was the smallest group for all metrics.

Two groups—wood furniture and secondary solid wood products—accounted for over half the employment, labor income, and value-added of forest products industries. Secondary paperboard and other paper products and pulp, paper, and paperboard mills accounted for over half of the output.

Exhibit 7. Direct Economic Contributions in Maryland, Industry Groups, 2017

Industry Group	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forestry	140	$5,978	$6,195	$8,425
Logging	648	$30,807	$39,041	$53,294
Primary solid wood products	643	$44,715	$50,233	$224,358
Secondary solid wood products	2,167	$175,056	$192,549	$497,136
Wood furniture	2,506	$142,565	$176,901	$441,018
Pulp, paper, and paperboard mills	800	$73,384	$115,912	$584,636
Secondary paperboard and other paper products	1,909	$117,026	$149,267	$825,013
Total	**8,813**	**$589,530**	**$730,098**	**$2,633,880**

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

Industry Group*	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forestry	60	$4,958	$5,772	$8,132
Logging	494	$22,754	$31,661	$45,964
Primary solid wood products	1,651	$103,840	$147,320	$370,206
Secondary solid wood products	4,312	$303,681	$404,662	$848,908
Wood furniture	4,202	$242,684	$342,202	$716,681
Pulp, paper, and paperboard mills	2,855	$206,107	$333,023	$950,120
Secondary paperboard and other paper products	4,471	$278,331	$410,991	$1,260,364
Total	**18,046**	**$1,162,355**	**$1,675,631**	**$4,200,375**

*Forestry and logging are reported in this table, but most of their contributions are as indirect inputs or intermediate inputs used for production in the other five industry groups.

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 $8.4 million in output, 140 jobs, $6.0 million in labor income, and $6.2 million 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, 86 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—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 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 fifth largest in terms of direct employment. The direct contributions of logging were $53.3 million in output, 648 jobs, $30.8 million in labor income, and $39.0 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 Maryland, 48 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 sixth largest group in terms of direct employment in Maryland. 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 $224.4 million in output, 643 jobs, $44.7 million in labor income, and $50.2 million in value-added. Total contributions for primary solid wood products, including direct, indirect, and induced effects, were $370.2 million in output, 1,651 jobs, $103.8 million in labor income, and $147.3 million in value-added. Many primary solid wood products (e.g., lumber and panels) are inputs in other industries; those inputs are accounted for in other industries' total contributions.

Secondary Solid Wood Products

Secondary solid wood products was the second largest group in terms of direct employment in Maryland. This 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 secondary solid wood products were $497.1 million in output, 2,167 jobs, $175.1 million in labor income, and $192.5 million in value-added. Total contributions were $848.9 million in output, 4,312 jobs, $303.7 million in labor income, and $404.7 million in value-added.

Wood Furniture

Wood furniture was the largest group in terms of direct employment in Maryland. Wood furniture includes wood kitchen cabinet and countertop manufacturing; upholstered household furniture manufacturing; nonupholstered 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 $441.0 billion in output, 2,506 jobs, $142.6 million in labor income, and $176.9

million in value-added. Total contributions of wood furniture were $716.7 million in output, 4,202 jobs, $242.7 million in labor income, and $342.2 million in value-added.

Pulp, Paper, and Paperboard Mills

The pulp, paper, and paperboard mills industry group was the fourth largest in terms of direct employment in Maryland. The group includes pulp mills, paper mills, and paperboard mills that make paper or pulp from raw wood and from purchased pulp. The pulp, paper, and paperboard mills group's direct contributions were $584.6 million in output, 800 jobs, $73.4 million in labor income, and $115.9 million in value-added. Total contributions were $950.1 million in output, 2,855 jobs, $206.1 million in labor income, and $ 333.0 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 Maryland. 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 $825.0 million in output, 1,909 jobs, $117.0 million in labor income, and $149.3 million in value-added. Total contributions were $1.3 billion in output, 4,471 jobs, $278.3 million in labor income, and $411.0 million 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 were paperboard container manufacturing (1648 jobs), wood kitchen cabinet and countertop manufacturing (1,117 jobs), engineered wood member and truss manufacturing (776 jobs), and paper mills (669 jobs). These sectors reflect the diversity of manufacturing in the state.

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 kitchen cabinet and countertop manufacturing sector has 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 engineered wood member and truss manufacturing sector comprises establishments primarily engaged in manufacturing fabricated or laminated wood arches and/or other fabricated or laminated

wood structural members as well as establishments primarily engaged in manufacturing laminated or fabricated wood roof and floor trusses.

The paper mills sector comprises establishments primarily engaged in manufacturing paper, newsprint, and uncoated groundwood paper from pulp. These establishments may manufacture or purchase pulp. In addition, the establishments may also convert the paper they make.

In terms of labor income, paperboard container manufacturing, paper mills, wood kitchen cabinet and countertop manufacturing, and engineered wood member and truss manufacturing had the highest labor income, totaling $266.0 million. They also had the highest value-added, totaling $341.3 million and output, totaling $1.6 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 Maryland. Including the 32 forest products industries, 131 sectors were impacted in 2017 (counting sectors with ten or more jobs supported). The top ten sectors (excluding forest products sectors) included wholesale trade, real estate, restaurants, trucking, and hospitals (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 220 jobs in truck transportation included log trucks, delivery trucks, and office jobs for some trucking companies, among others. Five of these sectors were among the top ten sectors in the state of Maryland (real estate was number one, followed by hospitals and wholesale trade—each had over 100,000 jobs).

Exhibit 8. Direct Jobs Impacted by the Forest Products Industries Among Maryland's Top Ten Non-Forest Products Industries in 2017

Sector	Description	Jobs
395	Wholesale trade	849
461	Management of companies and enterprises	361
502	Limited-service restaurants	360
440	Real estate	352
501	Full-service restaurants	327
468	Services to buildings	304
482	Hospitals	255
411	Truck transportation	220
449	Architectural, engineering, and related services	179
464	Employment services	168
Total	**NA**	**3,374**

Neighboring States

Maryland and the surrounding states of Delaware, West Virginia, and Pennsylvania are important for forest products. Forest products industries employ 89,419 workers across these states and account for $28.1 billion in direct output (Exhibits 11 and 12). Pennsylvania had the largest forest products economy with 68,541 direct jobs and output in excess of $22.4 billion. The next largest forest products economies were West Virginia's with 10,108 direct jobs and $2.2 billion in direct output and Maryland's with 8,813 direct jobs and $2.6 billion in direct output. The three largest industry groups, each with over 18,000 employees, were secondary solid wood products, secondary paperboard and other paper products, and wood furniture.

Exhibit 9. Forest Products Industries Direct Employment in Maryland, Delaware, West Virginia, and Pennsylvania, 2017

Industry	Maryland	Delaware	West Virginia	Pennsylvania
Forestry	140	88	701	1,865
Logging	648	29	1,919	4,740
Primary solid wood products	643	60	2,836	6,812
Secondary solid wood products	2,167	355	2,613	18,638
Wood furniture	2,506	436	1,527	13,720
Pulp, paper, and paperboard mills	800	-	232	3,186
Secondary paperboard and other paper products	1,909	988	281	19,581
Sum of Direct Contributions	**8,813**	**1,957**	**10,108**	**68,541**

Exhibit 12. Forest Products Industries Direct Output in Maryland, Delaware, West Virginia, and Pennsylvania, 2017

Industry	Maryland (Thousands of Dollars)	Delaware (Thousands of Dollars)	West Virginia (Thousands of Dollars)	Pennsylvania (Thousands of Dollars)
Forestry	$8,425	$982	$22,653	$126,178
Logging	$53,294	$51,148	$354,327	$697,606
Primary solid wood products	$224,358	$30,741	$878,920	$2,151,337
Secondary solid wood products	$497,136	$68,525	$512,662	$3,613,125
Wood furniture	$441,018	$72,076	$186,335	$2,282,116
Pulp, paper, and paperboard mills	$584,636	-	$150,748	$2,722,271
Secondary paperboard and other paper products	$825,013	$587,721	$109,328	$10,827,005
Sum of Direct Contributions	**$2,633,880**	**$811,193**	**$2,214,972**	**$22,419,639**

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 Maryland's forest products industries with others. Natural resources and agricultural industries significantly contribute to the diversity of economic activities reflected in Maryland's $408.7 billion GSP. The forest products industries provided the largest direct labor income and output and the second-largest value-added and employment when compared to commercial fishing, hunting, and trapping; mining and oil and gas production; and agricultural production industries (Exhibit 13). Maryland's forest products industries comprised 0.2 percent of the GSP in 2017. Agricultural production provided the largest amount of employment (full- and part-time), by far, of these industries.

Exhibit 10. Natural Resources and Agricultural Production Industries in Maryland, 2017

Industry	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Forest products	8,813	$589,530	$730,098	$2,633,880
Commercial fishing, hunting, and trapping	2,000	$19,948	$56,877	$85,477
Mining and oil and gas production	4,573	$116,192	$373,205	$721,750
Agricultural production (plant crop and animal)	22,843	$456,606	$850,073	$2,535,170
Total	**38,229**	**$1,182,276**	**$2,010,253**	**$5,976,277**

Labor income per job was highest in forest products ($66,893) and lowest in commercial fishing, hunting, and trapping ($9,976). For agricultural production, the average per job was $19,989; mining and oil and gas had the second highest average income at $25,407.

Most of the forest products industries are manufacturers, however, the forestry, logging, and biomass power groups are not. There were over 118,000 manufacturing jobs in Maryland in 2017. Of these, 8,025 were in the forest products industries, 6.8 percent of the total. Of 16 industries, forest products manufacturing was seventh in terms of employment, behind food manufacturing, computer and electronic product manufacturing, chemical manufacturing, printing, fabricated metal manufacturing, and miscellaneous manufacturing. It was sixth in terms of labor income, tenth in terms of value-added, and fifth in terms of output (Exhibit 14).

Exhibit 11. Manufacturing Industries in Maryland, 2017

Manufacturing Industries	Employment	Labor Income (Thousands of Dollars)	Value-added (Thousands of Dollars)	Output (Thousands of Dollars)
Food	20,856	$1,144,422	$2,290,055	$8,180,895
Computer and electronic product	18,994	$2,740,433	$4,893,820	$9,301,632
Chemical	11,900	$1,710,705	$6,816,122	$12,457,440
Printing	9,296	$522,128	$664,150	$1,487,912
Fabricated metal	8,737	$619,048	$887,185	$2,207,955
Miscellaneous	8,241	$517,554	$1,057,096	$2,345,963
Forest products	8,025	$552,746	$684,862	$2,572,161
Machinery	7,017	$613,480	$1,037,535	$3,274,199
Plastics and rubber products	5,796	$505,612	$1,022,389	$2,348,732
Transportation equipment	4,408	$463,487	$733,683	$2,332,333
Nonmetallic mineral product	4,321	$313,975	$574,660	$1,582,986
Beverage and tobacco product	3,503	$220,273	$699,383	$2,435,085
Textiles and apparel	3,288	$159,674	$240,773	$600,053
Electrical equipment	2,254	$187,566	$185,894	$784,568
Primary metal	880	$45,655	$81,376	$395,198
Petroleum and coal	848	$112,257	$353,804	$1,890,488
Total	**118,365**	**$10,429,016**	**$22,222,785**	**$54,197,600**

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 most conservative option was to include only sectors viewed as 100 percent in forest products, excluding sectors where only part produced forest products. At the other end of the spectrum, analysts could have focused on sectors producing any forest products at all, even if the forest products represented a small part of total output. Between these extremes, analysts could choose a third option—selecting the portion of a sector that produced forest products and include only that portion, mindful to include a means for assessing the magnitude of that portion. That is the approach used in this report.

Wood is used in many other products not covered by the 32 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 Maryland for 2017, as well as a baseline report for future analyses. State data were used in this report, but given IMPLAN's structure, substate and multistate analyses can be developed. However, future analyses may again require funding from the U.S. Forest Service or other institutions for assessments across multiple states. Methods used in developing this report are consistent across the region. There were 8,813 direct jobs in the forest products industries, and overall, 18,046 jobs were supported. Direct labor income was $589.5 million with total labor income at $1.2 billion. Direct value-added was $730.1 million, and the total contribution for value-added was $1.7 billion. Finally, direct output was $2.6 billion with a total contribution of $4.2 billion in output. Similar report findings are available from other states in the region and are summarized in a regional report.

References

Gibson, Melissa, Larry Leefers, and Jagdish Poudel. 2020. *Forest Products Industry Regional Economic Analysis: Methods.* Lansing: Public Sector Consultants.

Henderson, James and Garen Evans. 2017. *Single and Multiple Industry Economic Contribution Analysis Using IMPLAN.* Starkville: Mississippi State University Forest and Wildlife Research *Center.* Accessed October 11, 2019. https://www.fwrc.msstate.edu/pubs/implan_2017.pdf

Lister, Tonya W. 2017. "Forests of Maryland, 2016." *United States Department of Agriculture Forest Service.* Newtown Square, PA: U.S. Forest Service. Accessed March 18, 2020. https://www.nrs.fs.fed.us/pubs/54760

Parajuli, Rajan, James Henderson, Shaun Tanger, Omkar Joshi, and Ram Dahal. 2018. "Economic Contribution Analysis of the Forest-product Industry: A Comparison of the Two Methods for Multisector Contribution Analysis Using IMPLAN." *Journal of Forestry* 116(6): 513–519. https://doi.org/10.1093/jofore/fvy047

United States Department of Agriculture Forest Service. 2019. "Forest Inventory EVALIDator." *United States Department of Agriculture Forest Service Forest Inventory and Analysis Program.* Accessed October 22, 2019. http://apps.fs.usda.gov/Evalidator/evalidator.jsp

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	76	4,098	4,370	6,352
Support activities for forestry	64	1,880	1,826	2,072
Maple syrup production	-	-	-	-
Subtotal	**140**	**5,978**	**6,195**	**8,425**

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	648	30,807	39,041	53,294
Subtotal	**648**	**30,807**	**39,041**	**53,294**

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	511	33,234	35,549	148,074
Wood preservation	104	9,194	11,613	61,328
Veneer and plywood manufacturing	-	-	-	-
Reconstituted wood product manufacturing	28	2,286	3,071	14,956
Subtotal	**643**	**44,715**	**50,233**	**224,358**

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	776	47,959	51,600	176,246
Wood windows and doors manufacturing	156	13,077	14,302	38,912
Cut stock, resawing lumber, and planing	44	3,887	4,438	11,607
Other millwork, including flooring	536	43,925	49,820	124,752
Wood container and pallet manufacturing	313	22,851	24,190	56,081
Manufactured home (mobile home) manufacturing	3	544	555	1,115
Prefabricated wood building manufacturing	33	3,721	3,831	7,599
All other miscellaneous wood product manufacturing	305	39,093	43,814	80,825
Subtotal	**2,167**	**175,056**	**192,549**	**497,136**

Exhibit 12. 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	1,117	54,317	62,936	163,886
Upholstered household furniture manufacturing	208	10,085	12,639	41,677
Nonupholstered wood household furniture manufacturing	76	4,041	4,827	10,590
Institutional wood furniture manufacturing	106	6,617	8,434	21,920
Wood office furniture manufacturing	82	4,735	7,684	19,118
Custom architectural woodwork and millwork manufacturing	517	36,128	44,245	93,415
Showcase, partition, shelving, and locker manufacturing	399	26,642	36,136	90,413
Subtotal	**2,506**	**142,565**	**176,901**	**441,018**

Exhibit 13. 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	47	4,351	5,642	29,625
Paper mills	669	61,035	97,845	489,059
Paperboard mills	84	7,998	12,425	65,953
Subtotal	**800**	**73,384**	**115,912**	**584,636**

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	1,648	102,654	128,888	725,725
Paper bag and coated and treated paper manufacturing	48	3,401	4,615	20,637
Stationery product manufacturing	125	7,637	10,176	44,125
Sanitary paper product manufacturing	32	1,603	3,507	20,188
All other converted paper product manufacturing	55	1,732	2,080	14,338
Subtotal	**1,909**	**117,026**	**149,267**	**825,013**

Note: Value-added in IMPLAN is equivalent to gross state product.

U.S. Forest Service Nondiscrimination Statement

“In accordance with Federal law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, disability, and reprisal or retaliation for prior civil rights activity. (Not all prohibited bases apply to all programs.)

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible State or local Agency that administers the program or USDA’s TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information is also available in languages other than English.

To file a complaint alleging discrimination, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/ complaint_filing_cust.html , or at any USDA office or write a letter addressed to USDA and provided in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250- 9410; (2) fax: (202) 690-7442; or (3) email: program. intake@usda.gov.

This institution is an equal opportunity provider.”