Acknowledgements

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Introduction

Over the last 20 years, individual states located in the northeastern and midwestern area of the United States have conducted economic contributions studies of the forest product industries within their states or as small groups of states. However, these studies differed in approach, data used, and measures reported. Until now, no attempt has been made to assess the contributions of forest products industries for the Northeast and Midwest area as a whole, nor to examine the interaction of those industries at the regional level. Recently, 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. Department of Agriculture Forest Service’s Northeastern Area State and Private Forestry (NA S&PF) to support investigation of the economic contributions of the forest products industry in the 20 northeastern and midwestern states\(^1\) and Nebraska. To that end, the Michigan Department of Natural Resources (MDNR) Forest Resources Division (serving as the lead on the grant project) contracted with Public Sector Consultants (PSC) to facilitate discussions among the project partners states 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 document summarizes the methods selected for this work. The project’s final products include a regional report for the states covered by the NA S&PF and reports for each participating state (Leefers et al. 2020).

Between December 2018 and February 2019, PSC hosted three webinars for the Northern Region Economic Analysis Landscape Scale Restoration Grant Project Team to facilitate discussions among the partners and the MDNR. During these meetings, PSC documented key points of discussion, methods for analysis, and the final methods, which were selected through consensus. Before each webinar, PSC provided reading materials on methods, state and regional report examples, as well as other documents and Excel files with forest products industries information. Moreover, states were surveyed twice to gather additional information, opinions, and preferences. Appendix A includes a summary of the discussion at each webinar, Appendix B lists previous economic analyses conducted for states in the region, and Appendices C–F list reading material and related discussion items for the webinars.

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\(^1\) The Northeastern Area states are Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.
Methods

The regional and state reports are based on compiled data from the federal government as well as commercially available IMPLAN data. This report and associated materials provide a documented approach for updating this assessment as needed in future years.

A number of key decisions regarding methods were made via consensus among the project participants (see Appendix A for detailed descriptions of three webinars used to facilitate this process). Key decisions included:

- Method for contribution analysis
- Method for regional analysis
- IMPLAN year of analysis

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 input-output model that focuses on the 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 North American Industrial Classification System (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.

IMPLAN was used to examine the current status of the forest products industries and to provide a consistent method for comparison between states and across time. For this report, 32 IMPLAN sectors were identified as forest products sectors. They are aggregated into seven larger industries or industry groups for ease of communication and analysis. The industry groups are Forestry; Logging; Primary Solid Wood Products; Secondary Solid Wood Products; Pulp, Paper, and Paperboard Mills; Paperboard and Other Paper Products; and Wood Furniture.

The economic values for the regional and state reports are reported in nominal dollars. Rather than summing individual analyses, the regional analysis combined the 20 states into a joint region in IMPLAN to capture the interstate economic contributions. (Note: Nebraska was not included in the regional analysis.)

Economic Contributions Defined

The economic contributions of the forest products industries serve as a snapshot of direct economic activity associated with given industries and other economic activities linked to those industries. Economic contributions are “the changes in a region’s existing economy that can be attributed to a given industry” (Watson et al. 2007), and hence define the role of an industry within a state or region. Exhibit 1 defines several terms used throughout the reports to describe economic effects.
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct effects/contributions</td>
<td>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.</td>
</tr>
<tr>
<td>Employment</td>
<td>The number of full- and part-time jobs associated with an industry.</td>
</tr>
<tr>
<td>Indirect effects/contributions</td>
<td>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.</td>
</tr>
<tr>
<td>Induced effects/contributions</td>
<td>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.</td>
</tr>
<tr>
<td>Labor Income</td>
<td>The dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.</td>
</tr>
<tr>
<td>Output</td>
<td>The dollar measure of production within an area; it is also viewed as sales.</td>
</tr>
<tr>
<td>Total effects/contributions</td>
<td>The sum of direct, indirect and induced effects.</td>
</tr>
<tr>
<td>Social Accounting Matrix (SAM) Multipliers</td>
<td>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”).</td>
</tr>
<tr>
<td>Value-added (also known as gross state product, or GSP)</td>
<td>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.</td>
</tr>
</tbody>
</table>

Source: www.implan.com

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-time 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.

**Method One Versus Method Two**

IMPLAN estimates economic impacts (i.e., effects of economic changes) and contributions (i.e., effects of existing industries). The latter is the focus of this project. Two methods for multisection economic contribution analysis are available (Parajuli et al. 2018), both requiring significant data manipulation.

Method one customizes the IMPLAN model by changing selected endogenous tables, whereas method two 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. Furthermore, method one suppresses the indirect and induced effect numbers, which renders users unable to understand the industries’ backward linkages.

Method two relies mostly on spreadsheet-based manipulation, is easier to monitor, and shows backward linkages. 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 overreporting 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 the associated effects. Put simply, the amount of sales (direct contribution) estimated cannot exceed the amount that actually exists. Methods one and two accomplish this.

Method one uses the following steps to modify the IMPLAN model:

- Modifying production functions so only one commodity is produced for each sector, representing 100 percent of production. This prevents production of byproducts, which could lead to excessive reporting of outputs in the region.
- Modifying trade flows by setting local use ratios (RSC) to zero, ensuring commodity purchases of interest from other sectors are imports. Again, this prevents additional endogenous (local) production of the commodity.
- Using direct outputs from the Industry Detail table as inputs to estimate economic contributions.

For this project, 32 production functions and 32 trade flows were modified for each state. Contribution analysis results were then exported from IMPLAN and imported to an analysis spreadsheet. Then, report tables were generated.
Method two, which was used for this project, adopts a different approach and modifies inputs rather than the IMPLAN model. The steps for this method are:

- Extracting IMPLAN SAM output multipliers for industry sectors of interest.
- Creating a matrix using the output multipliers that links the industry sectors.
- Calculating the Leontief inverse matrix \((I-A)^{-1}\).
- Multiplying IMPLAN’s direct effects (or partial sector values) of the industry sectors by the inverse matrix to estimate inputs needed for IMPLAN calculations.
- Entering modified values into IMPLAN to calculate total contributions.

The middle three steps (creating, calculating, and multiplying) were all completed with an Excel spreadsheet. For this project, the “creating” step was completed by IMPLAN staff, and 32 by 32 matrices were provided for the region and each state. After calculating the inverse in a spreadsheet, direct effects were multiplied by the inverse, and the resulting 32 values were used as inputs into IMPLAN contribution analysis. The analysis results were exported from IMPLAN and imported to the analysis spreadsheet. Report tables were then generated.

Methods one and two are used by analysts in estimating the economic contributions of forest products industries. Both methods produce similar results (Parajuli et al. 2018). With a well-designed analysis spreadsheet, method two reduces the likelihood of errors in editing IMPLAN models and provides a means to replicate analyses across states and over time. Moreover, method two generates data that can be used to examine backward linkages among sectors (e.g., linking the sawmill sector with the commercial logging sector).

**Forest Product Industry Sectors**

The project team identified 32 IMPLAN sectors as directly related to the forest products industries. They are aggregated into seven larger industries for ease of communication and analysis, as noted previously (see Exhibit 2). Several other sectors were discussed for possible inclusion, but lack of available data across the region prevented their addition. Several of these sectors will be discussed in the individual state reports.
### Exhibit 2. Forest Products Industries Groupings and IMPLAN Sectors

#### Forestry Industry Grouping

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Maple syrup production*</td>
</tr>
<tr>
<td>15</td>
<td>Forestry, forest products, and timber tract production (full six-digit NAICS, partial of IMPLAN sector 15)</td>
</tr>
<tr>
<td>19</td>
<td>Support activities for forestry (forestry portion of support activities for agriculture and forestry sector)*</td>
</tr>
</tbody>
</table>

#### Logging Industry Grouping

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Commercial logging</td>
</tr>
</tbody>
</table>

#### Primary Solid Wood Products Industry Grouping

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Electric power generation – biomass*</td>
</tr>
<tr>
<td>134</td>
<td>Sawmills</td>
</tr>
<tr>
<td>135</td>
<td>Wood preservation</td>
</tr>
<tr>
<td>136</td>
<td>Veneer and plywood manufacturing</td>
</tr>
<tr>
<td>138</td>
<td>Reconstituted wood product manufacturing</td>
</tr>
</tbody>
</table>

#### Secondary Solid Wood Products Industry Grouping

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>137</td>
<td>Engineered wood member and truss manufacturing</td>
</tr>
<tr>
<td>139</td>
<td>Wood windows and doors manufacturing</td>
</tr>
<tr>
<td>140</td>
<td>Cut stock, resawing lumber, and planing</td>
</tr>
<tr>
<td>141</td>
<td>Other millwork, including flooring</td>
</tr>
<tr>
<td>142</td>
<td>Wood container and pallet manufacturing</td>
</tr>
<tr>
<td>143</td>
<td>Manufactured home (mobile home) manufacturing</td>
</tr>
<tr>
<td>144</td>
<td>Prefabricated wood building manufacturing</td>
</tr>
<tr>
<td>145</td>
<td>All other miscellaneous wood product manufacturing</td>
</tr>
</tbody>
</table>
### Wood Furniture Industry Grouping

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>368</td>
<td>Wood kitchen cabinet and countertop manufacturing</td>
</tr>
<tr>
<td>369</td>
<td>Upholstered household furniture manufacturing</td>
</tr>
<tr>
<td>370</td>
<td>Nonupholstered wood household furniture manufacturing</td>
</tr>
<tr>
<td>372</td>
<td>Institutional wood furniture manufacturing*</td>
</tr>
<tr>
<td>373</td>
<td>Wood office furniture manufacturing</td>
</tr>
<tr>
<td>374</td>
<td>Custom architectural woodwork and millwork manufacturing</td>
</tr>
<tr>
<td>376</td>
<td>Showcase, partition, shelving, and locker manufacturing*</td>
</tr>
</tbody>
</table>

### Pulp, Paper and Paperboard Industry Grouping

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>146</td>
<td>Pulp mills</td>
</tr>
<tr>
<td>147</td>
<td>Paper mills</td>
</tr>
<tr>
<td>148</td>
<td>Paperboard mills</td>
</tr>
</tbody>
</table>

### Secondary Paperboard and Other Paper Products Industry Grouping

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>149</td>
<td>Paperboard container manufacturing</td>
</tr>
<tr>
<td>150</td>
<td>Paper bag and coated and treated paper manufacturing</td>
</tr>
<tr>
<td>151</td>
<td>Stationery product manufacturing</td>
</tr>
<tr>
<td>152</td>
<td>Sanitary paper product manufacturing</td>
</tr>
<tr>
<td>153</td>
<td>All other converted paper product manufacturing</td>
</tr>
</tbody>
</table>

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

### Partial Sectors in the Contribution Analysis

Contribution analysis focuses on industries’ role in an economy. The main focus of this project was to determine the forest products industries’ role in individual states’ economies. How many jobs and how much labor income, value-added, and output are associated with forest products industries (e.g., logging, solid wood products, etc.)? Industries comprise IMPLAN’s economic sectors that are linked to NAICS categories. In cases where only part of an IMPLAN sector is associated with forest products, analysts faced three options. The most conservative option was to include only sectors viewed as 100 percent in forest products. At the other end of the spectrum, analysts could have focused on sectors producing any forest product at all, even if the forest product is 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.

For example, maple syrup, a forest product, is part of IMPLAN sector 10, All Other Crop Farming (NAICS code 111940). Among many types of farming, this sector includes alfalfa hay, clover hay, and maple syrup (i.e., maple sap reducing). If analysts want to include a portion of sector 10, they need a defensible approach that can be replicated across the region.

For illustration purposes, 2017 Michigan data are used to show the effects of the three options. Total output in sector 10 is $137,574,371. None of this output would be included in an analysis using the most conservative approach. Conversely, all this output would be included in an analysis using the other extreme. Using the third option, the project team decided to refer to the National Agricultural Statistics Service, which does annual surveys of maple syrup production. It estimated Michigan’s 2017 maple syrup sales at $5,632,000. Given this source of data, it seems prudent to include this amount as part of the forest products industries’ output.

Another dimension of IMPLAN modeling comes into play when partial sectors are used. Namely, analysts can modify the production function (i.e., inputs used to produce outputs or commodities) for the commodity being produced if an appropriate source can be found for the new production function. In this project, no production functions were modified for the five partial sectors. Additional studies are necessary to gather appropriate data to modify the production functions, and this is beyond the scope of this project.

Exhibit 3 presents the IMPLAN sectors and corresponding NAICS codes used in this analysis, as well as a description of how partial sectors are calculated for the regional and state analysis.

**Exhibit 3. Forest Products Sectors: IMPLAN Sectors and NAICS Correspondences**

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Description (NAICS Code): Detailed Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10*</td>
<td>All Other Miscellaneous Crop Farming (111998): This industry comprises establishments primarily engaged in one of the following: 1) growing crops (except oilseeds and/or grains; vegetables and/or melons; fruits and/or tree nuts; greenhouse, nursery, and/or floriculture products; tobacco; cotton; sugarcane; hay; sugar beets; or peanuts); 2) growing a combination of crops [except a combination of oilseed(s) and grain(s); and a combination of fruit(s) and tree nut(s)], with no one crop or family of crops accounting for one-half of the establishment’s agricultural production (i.e., value of crops for market); or 3) gathering tea or maple sap. National Agricultural Statistics Service (NASS) conducts an annual survey of maple syrup producers for its annual report. The NASS data provide a comprehensive data set that ties in well with IMPLAN and was used for estimating the maple syrup portion of IMPLAN sector 10, since NAICS data do not provide the detail needed to separate maple syrup from All Other Miscellaneous Crop Farming.</td>
</tr>
<tr>
<td>IMPLAN Sector</td>
<td>Description (NAICS Code): Detailed Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------</td>
</tr>
</tbody>
</table>
| 15            | • Timber Tract Operations (113110): This industry comprises establishments primarily engaged in the operation of timber tracts for the purpose of selling standing timber.  
|               | • Forest Nurseries and Gathering of Forest Products (113210): This industry comprises establishments primarily engaged in (1) growing trees for reforestation and/or (2) gathering forest products, such as gums, barks, balsam needles, rhizomes, fibers, Spanish moss, ginseng, and truffles. |
| 16            | Logging (113310): This industry comprises establishments primarily engaged in one or more of the following: (1) cutting timber; (2) cutting and transporting timber; and (3) producing wood chips in the field. |
| 19*           | Support Activities for Agriculture and Forestry (115310): Only the forestry portion of this sector will be used. The forestry portion comprises establishments primarily engaged in performing particular support activities related to timber production, wood technology, forestry economics and marketing, and forest protection. These establishments may provide support activities for forestry, such as estimating timber, forest firefighting, forest pest control, and consulting on wood attributes and reforestation.  
|               | IMPLAN sector 19 (NAICS 115) initial values were reduced to reflect only the portion of the sector that is forestry related (removing the agriculture-related activity). This was done based on the employment ratio between (1) Forestry Support Activities [NAICS 1153] and (2) Agriculture and Forestry Support Activities [NAICS 115] using data from 2017 (Bureau of Labor Statistics) and applied to all economic aggregates for the sector. |
| 47*           | Biomass Electric Power Generation (221117): This U.S. industry comprises establishments primarily engaged in operating biomass electric power generation facilities. These facilities use biomass (e.g., wood, waste, alcohol fuels) to produce electric energy. The electric energy produced in these establishments is provided to electric power transmission systems or to electric power distribution systems. This was a new sector in 2013 IMPLAN datasets.  
|               | U.S. Energy Information Administration data were used to identify wood percentage for each state, but state representatives provided employment data for calibrating IMPLAN data. |
| 134           | Sawmills (321113): This U.S. industry comprises establishments primarily engaged in sawing dimension lumber, boards, beams, timbers, poles, ties, shingles, shakes, siding, and wood chips from logs or bolts. Sawmills may plane the rough lumber that they make with a planing machine to achieve smoothness and uniformity of size. |
| 135           | Wood preservation (321114): This U.S. industry comprises establishments primarily engaged in (1) treating wood sawed, planed, or shaped in other establishments with creosote or other preservatives, such as alkaline copper quat, copper azole, and sodium borates, to prevent decay and to protect against fire and insects and/or (2) sawing round wood poles, pilings, and posts and treating them with preservatives. |
| 136           | • Hardwood Veneer and Plywood Manufacturing (321211): This U.S. industry comprises establishments primarily engaged in manufacturing hardwood veneer and/or hardwood plywood.  
<p>|               | • Softwood Veneer and Plywood Manufacturing (321212): This U.S. industry comprises establishments primarily engaged in manufacturing softwood veneer and/or softwood plywood. |</p>
<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Description (NAICS Code): Detailed Description</th>
</tr>
</thead>
</table>
| 137           | • Engineered Wood Member (except Truss) Manufacturing (321213): This U.S. industry comprises establishments primarily engaged in manufacturing fabricated or laminated wood arches and/or other fabricated or laminated wood structural members.  
  • Truss Manufacturing (321214): This U.S. industry comprises establishments primarily engaged in manufacturing laminated or fabricated wood roof and floor trusses. |
<p>| 138           | Reconstituted Wood Product Manufacturing (321219): This U.S. industry comprises establishments primarily engaged in manufacturing reconstituted wood sheets and boards. |
| 139           | Wood Window and Door Manufacturing (321911): This U.S. industry comprises establishments primarily engaged in manufacturing window and door units, sash, window and door frames, and doors from wood or wood clad with metal or plastics. |
| 140           | Cut Stock, Resawing Lumber, and Planing (321912): This U.S. industry comprises establishments primarily engaged in one or more of the following: (1) manufacturing dimension lumber from purchased lumber; (2) manufacturing dimension stock (i.e., shapes) or cut stock; (3) resawing the output of sawmills; and (4) planing purchased lumber. These establishments generally use woodworking machinery, such as jointers, planers, lathes, and routers to shape wood. |
| 141           | Other Millwork, including Flooring (321918): This U.S. industry comprises establishments primarily engaged in manufacturing millwork (except wood windows, wood doors, and cut stock). |
| 142           | Wood Container and Pallet Manufacturing (321920): This industry comprises establishments primarily engaged in manufacturing wood pallets, wood box shook, wood boxes, other wood containers, and wood parts for pallets and containers. |
| 143           | Manufactured home (mobile home) manufacturing (321991): This U.S. industry comprises establishments primarily engaged in making manufactured homes (i.e., mobile homes) and nonresidential mobile buildings. Manufactured homes are designed to accept permanent water, sewer, and utility connections and although equipped with wheels, they are not intended for regular highway movement. |
| 144           | Prefabricated Wood Building Manufacturing (321992): This U.S. industry comprises establishments primarily engaged in manufacturing prefabricated wood buildings and wood sections and panels for prefabricated wood buildings. |
| 145           | All Other Miscellaneous Wood Product Manufacturing (321999): This U.S. industry comprises establishments primarily engaged in manufacturing wood products (except establishments operating sawmills and preservation facilities; establishments manufacturing veneer, engineered wood products, millwork, wood containers, pallets, and wood container parts; and establishments making manufactured homes (i.e., mobile homes) and prefabricated buildings and components). |
| 146           | Pulp Mills (322110): This industry comprises establishments primarily engaged in manufacturing pulp without manufacturing paper or paperboard. The pulp is made by separating the cellulose fibers from the other impurities in wood or other materials, such as used or recycled rags, linters, scrap paper, and straw. |</p>
<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Description (NAICS Code): Detailed Description</th>
</tr>
</thead>
</table>
| 147 | • Paper (except Newsprint) Mills (322121): This U.S. industry comprises establishments primarily engaged in manufacturing paper (except 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.  
• Newsprint Mills (322122): This U.S. industry comprises establishments primarily engaged in manufacturing 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. |
| 148 | Paperboard Mills (322130): This industry comprises establishments primarily engaged in manufacturing paperboard from pulp. These establishments may manufacture or purchase pulp. In addition, the establishments may also convert the paperboard they make. |
| 149 | Paperboard Container Manufacturing (32221): This industry 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.  
Six-digit NAICS industries are: Corrugated and Solid Fiber Box Manufacturing (322211), folding Paperboard Box Manufacturing (322212), and Other Paperboard Container Manufacturing (322219). |
<p>| 150 | Paper Bag and Coated and Treated Paper Manufacturing (322220): This industry comprises establishments primarily engaged in one or more of the following: (1) cutting and coating paper and paperboard; (2) cutting and laminating paper, paperboard, and other flexible materials (except plastics film to plastics film); (3) manufacturing bags, multiwall bags, sacks of paper, metal foil, coated paper, laminates, or coated combinations of paper and foil with plastics film; (4) manufacturing laminated aluminum and other converted metal foils from purchased foils; and (5) surface coating paper or paperboard. |
| 151 | Stationery Product Manufacturing (322230): This industry comprises establishments primarily engaged in converting paper or paperboard into products used for writing, filing, artwork, and similar applications. |
| 152 | Sanitary Paper Product Manufacturing (322291): This U.S. industry comprises establishments primarily engaged in converting purchased sanitary paper stock or wadding into sanitary paper products, such as facial tissues, handkerchiefs, table napkins, toilet paper, towels, disposable diapers, sanitary napkins, and tampons. |
| 153 | All Other Converted Paper Product Manufacturing (322299): This U.S. industry comprises establishments primarily engaged in converting paper or paperboard into products (except containers, bags, coated and treated paper, stationery products, and sanitary paper products) or converting pulp into pulp products, such as egg cartons, food trays, and other food containers from molded pulp. |
| 368 | Wood Kitchen Cabinet and Countertop Manufacturing (337110): This industry 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. |
| 369 | Upholstered Household Furniture Manufacturing (337121): This U.S. industry comprises establishments primarily engaged in manufacturing upholstered household-type furniture. The furniture may be made on a stock or custom basis. |</p>
<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Description (NAICS Code): Detailed Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>370</td>
<td>Nonupholstered Wood Household Furniture Manufacturing (337122): This U.S. industry comprises establishments primarily engaged in manufacturing nonupholstered wood household type furniture and freestanding cabinets (except television, radio, and sewing machine cabinets). The furniture may be made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown).</td>
</tr>
<tr>
<td>372*</td>
<td>Institutional Furniture Manufacturing (337127): This U.S. industry comprises establishments primarily engaged in manufacturing institutional-type furniture (e.g., library, school, theater, and church furniture). Included in this industry are establishments primarily engaged in manufacturing general purpose hospital, laboratory, and dental furniture (e.g., tables, stools, and benches). The furniture may be made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown). Bureau of Labor Statistics does not break this industry into wood and non-wood components. To estimate the amount of this industry that is wood-based, the ratio of wood-based subsectors (337121 and 337122) and total household furniture subsectors (337121, 337122, 337124 and 337125) for each state in 2017 (Bureau of Labor Statistics) were calculated for employment and applied to adjust IMPLAN sector 372 values. This was applied to all economic aggregates for the sector.</td>
</tr>
<tr>
<td>373</td>
<td>Wood Office Furniture Manufacturing (337211): This U.S. industry 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). This was a new sector in 2013 IMPLAN datasets. Previously, IMPLAN Sector 300 included Non-Wood Office Furniture Manufacturing (337214).</td>
</tr>
<tr>
<td>374</td>
<td>Custom Architectural Woodwork and Millwork Manufacturing (337212): This U.S. industry comprises establishments primarily engaged in manufacturing custom designed interiors consisting of architectural woodwork and fixtures utilizing wood, wood products, and plastics laminates. All of the industry output is made to individual order on a job shop basis and requires skilled craftsmen as a labor input. A job might include custom manufacturing of display fixtures, gondolas, wall shelving units, entrance and window architectural detail, sales and reception counters, wall paneling, and matching furniture.</td>
</tr>
<tr>
<td>376*</td>
<td>Showcase, Partition, Shelving, and Locker Manufacturing (337215): This U.S. industry comprises establishments primarily engaged in manufacturing wood and nonwood office and store fixtures, shelving, lockers, frames, partitions, and related fabricated products of wood and nonwood materials, including plastics laminated fixture tops. The products are made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown). Establishments exclusively making furniture parts (e.g., frames) are included in this industry. Like Institutional Furniture Manufacturing, this sector includes both wood and nonwood components. To estimate the amount of this industry that is wood-based, the ratio of wood-based custom and office furniture subsectors (337211 and 337212) and total office furniture subsectors (337211, 337212, and 337214) for each state for 2017 (Bureau of Labor Statistics) was calculated for employment and applied to adjust IMPLAN sector 376 values. This was applied to all economic aggregates for the sector.</td>
</tr>
</tbody>
</table>

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

To fulfill the project’s goal of creating a uniform method for the 20 Northeast and Midwest states and Nebraska to conduct a joint regional analysis, make comparisons using 2017 data, and set methods for comparisons over time, the project team developed a step-by-step guide to direct analysts/researchers through the process and allow them to replicate the work. Each partner state will be provided with these steps, as well as the accompanying Excel document for their state’s current analysis, which can then be updated in future years or for other geographic regions (e.g., multicounty or multistate areas) by following this process.

Analysis Spreadsheet

Jagdish Poudel (DNR) and Larry Leefers (Michigan State University) designed an analysis spreadsheet for use in generating reports summarizing the contribution of the forest products industry in the region for each individual state and Nebraska. It was designed for use with 2017 IMPLAN data to implement method two for multi-industry contribution analysis.

The spreadsheet comprises 18 tabs, starting with the Analysis Process tab (analysis steps) and ending with report tables. The analysis spreadsheet plays a central role in compiling and manipulating data and generating report tables for state-level reports. The analysis steps are detailed below.

Analysis Steps (From Analysis Process Tab)

1. Generate state-level IMPLAN model “through multipliers.”
2. Export model overview; copy and paste into the Model Overview tab.
3. Export industry detail; copy and paste columns A–H into the Industry Detail tab.
4. Copy and paste the Excel multipliers matrix provided by IMPLAN staff (Wes Morgan) into the 32 by 32 Matrix tab starting in cell A2, which is inverted in the Matrix Inversion tab.
5. In the Sector 10 tab, select the correct calibration rate (cell D5) for the state being analyzed (e.g., cell G18 for Michigan).
6. In the Sector 19 tab, select the correct calibration rate (cell C5) for the state being analyzed (e.g., cell F19 for Michigan).
7. In the Sector 47 tab, select the correct employment numerator value (in cell D5) for the state being analyzed (e.g., cell I17 for Michigan).
8. In the Sector 372 tab, select the correct calibration rate (cell C5) for the state being analyzed (e.g., cell F20 for Michigan).
9. In the Sector 376 tab, select the correct calibration rate (cell C5) for the state being analyzed (e.g., cell E20 for Michigan).
10. Use column E values in the Industry Adjustment tab as input into IMPLAN for industry output for all industry sectors. Note: Change analysis year to 2017 before entering sales values.
11. Run IMPLAN single region model with column G adjusted IMPLAN inputs from the Industry Adjustment tab. Check IMPLAN inputs for Quality Control in columns H and I.
12. Export All Industries Scenario.
13. Copy and paste exported scenario into the All Industries Scenario tab.
14. Export All Industries Impact Summary. Be sure it is in 2017 dollars.
15. Copy and paste exported All Industries Impact Summary into the All Industries Impact Results tab.
16. Run IMPLAN scenarios for each of the seven industry groups and export Impact Summaries by copying the existing All Industry Scenario and editing it.
17. Copy and paste Impact Summary tables for all seven industries into the Total Industry Contrib Table tab. Note: Be sure analysis year is 2017 and exported file is in 2017 dollars.
18. Export All Impact Detail.
19. Copy and paste All Impact Detail into the Top 10 Sectors Impacted Table tab, sort on employment (top to bottom), delete all forest product sectors from the top 10, and delete other non-top-10 sectors.
20. Copy and paste Direct Industry Contrib Table from other states into the Neighboring States Table tab. Revise table generated if more than two neighbors are included.
21. Review tables; copy and paste tables into report.
## Model Overview Tab

This tab provides general economic data about the state (or region) of interest, as well as information on some IMPLAN settings used in analysis. An example from 2017 data on Michigan is presented below.

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>1</td>
<td>Michigan</td>
<td>Copyright 2019 Minnesota IMPLAN Group, Inc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Model Information</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td><strong>Model Year</strong></td>
<td>2017</td>
<td><strong>Value Added</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>GRP</td>
<td>$517,585,047,412</td>
<td>Employee Compensation</td>
<td>$291,349,693,854</td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>Total Personal Income</td>
<td>$450,647,100,000</td>
<td>Proprietor Income</td>
<td>$31,068,306,757</td>
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<tr>
<td>7</td>
<td>Total Employment</td>
<td>5,675,402</td>
<td>Other Property Type Income</td>
<td>$162,727,860,065</td>
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<tr>
<td>8</td>
<td></td>
<td></td>
<td>Tax on Production and Imports</td>
<td>$32,439,186,735</td>
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<tr>
<td>9</td>
<td>Number of Industries</td>
<td>510</td>
<td>Total Value Added</td>
<td>$517,585,047,412</td>
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<tr>
<td>10</td>
<td>Land Area (Sq. Miles)</td>
<td>56,809</td>
<td>Final Demand</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Area Count</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Population</td>
<td>9,962,311</td>
<td>Households</td>
<td>405,714,629,072</td>
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<tr>
<td>14</td>
<td>Total Households</td>
<td>3,985,357</td>
<td>State/Local Government</td>
<td>$71,396,054,843</td>
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<tr>
<td>15</td>
<td>Average Household Income</td>
<td>$113,126</td>
<td>Federal Government</td>
<td>$19,569,027,271</td>
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<td></td>
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<td>16</td>
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<td>Capital</td>
<td>$92,689,259,431</td>
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<tr>
<td>17</td>
<td>Trade Flows Method</td>
<td>Trade Flows Model</td>
<td>Exports</td>
<td>$338,774,275,264</td>
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<tr>
<td>18</td>
<td>Model Status</td>
<td>Multipliers</td>
<td>Imports</td>
<td>-$381,509,322,690</td>
<td></td>
<td></td>
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<tr>
<td>19</td>
<td></td>
<td></td>
<td>Institutional Sales</td>
<td>-$25,048,914,375</td>
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<td></td>
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<tr>
<td>20</td>
<td>Economic Indicators</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>21</td>
<td>Shannon-Weaver Index</td>
<td>.77571</td>
<td>Total Final Demand:</td>
<td>$517,585,048,816</td>
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<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>23</td>
<td><strong>Top Ten Industries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Sector</td>
<td>Description</td>
<td>Employment Labor Income</td>
<td>Output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>440</td>
<td>Real estate</td>
<td>225,954</td>
<td>$6,399,055,000</td>
<td>$41,755,240,000</td>
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</tr>
<tr>
<td>26</td>
<td>482</td>
<td>Hospitals</td>
<td>208,969</td>
<td>$15,787,980,000</td>
<td>$32,643,830,000</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>395</td>
<td>Wholesale trade</td>
<td>200,213</td>
<td>$17,426,480,000</td>
<td>$47,802,670,000</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>534</td>
<td>* Employment and payroll of local gov, education</td>
<td>192,130</td>
<td>$13,410,350,000</td>
<td>$16,029,950,000</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>501</td>
<td>Full-service restaurants</td>
<td>153,182</td>
<td>$5,277,005,000</td>
<td>$7,173,090,000</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>502</td>
<td>Limited-service restaurants</td>
<td>152,962</td>
<td>$2,894,881,000</td>
<td>$12,579,590,000</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>464</td>
<td>Employment services</td>
<td>144,811</td>
<td>$5,603,900,000</td>
<td>$10,748,420,000</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>533</td>
<td>* Employment and payroll of local gov, non-education</td>
<td>130,598</td>
<td>$8,036,272,000</td>
<td>$9,610,158,000</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>405</td>
<td>Retail - General merchandise stores</td>
<td>105,481</td>
<td>$3,038,715,000</td>
<td>$8,115,553,000</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>449</td>
<td>Architectural, engineering, and related services</td>
<td>91,583</td>
<td>$10,028,470,000</td>
<td>$16,451,610,000</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Areas In the Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Michigan</td>
<td>State</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Industry Detail Tab

This tab provides specific economic data about the state (or region) of interest for 536 IMPLAN sectors. It can be filtered to show forest products industries. However, several sectors must be modified before final analyses, so care must be used in reviewing this table. A filtered example from 2017 data on Michigan is presented, but no modifications are made on this tab.

<table>
<thead>
<tr>
<th>Industry Code</th>
<th>Description</th>
<th>Employment</th>
<th>Output</th>
<th>Employee Compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>10 All other crop farming</td>
<td>5,805.58</td>
<td>137,674,371.34</td>
<td>54,486,564.64</td>
</tr>
<tr>
<td>17</td>
<td>15 Forestry, forest products, and timber tract production</td>
<td>477.45</td>
<td>32,759,882.12</td>
<td>7,285,615.40</td>
</tr>
<tr>
<td>18</td>
<td>16 Commercial logging</td>
<td>4,486.84</td>
<td>290,774,871.83</td>
<td>93,992,042.54</td>
</tr>
<tr>
<td>21</td>
<td>19 Support activities for agriculture and forestry</td>
<td>11,780.58</td>
<td>462,527,038.57</td>
<td>303,333,831.79</td>
</tr>
<tr>
<td>49</td>
<td>47 Electric power generation - Biomass</td>
<td>103.61</td>
<td>85,147,282.87</td>
<td>9,545,525.05</td>
</tr>
<tr>
<td>136</td>
<td>134 Sawmills</td>
<td>2,583.24</td>
<td>733,313,354.40</td>
<td>121,556,259.16</td>
</tr>
<tr>
<td>137</td>
<td>135 Wood preservation</td>
<td>180.31</td>
<td>103,717,041.02</td>
<td>7,027,311.41</td>
</tr>
<tr>
<td>138</td>
<td>136 Veneer and plywood manufacturing</td>
<td>1,002.84</td>
<td>275,210,021.97</td>
<td>52,473,362.49</td>
</tr>
<tr>
<td>139</td>
<td>137 Engineered wood member and truss manufacturing</td>
<td>850.11</td>
<td>193,521,377.56</td>
<td>46,458,446.50</td>
</tr>
<tr>
<td>140</td>
<td>138 Reconstituted wood product manufacturing</td>
<td>844.59</td>
<td>452,849,149.03</td>
<td>88,106,742.88</td>
</tr>
<tr>
<td>141</td>
<td>139 Wood windows and door manufacturing</td>
<td>774.37</td>
<td>182,615,009.42</td>
<td>43,603,130.34</td>
</tr>
<tr>
<td>142</td>
<td>140 Cut stock, resawing lumber, and planing</td>
<td>690.83</td>
<td>162,753,265.38</td>
<td>34,758,044.10</td>
</tr>
<tr>
<td>143</td>
<td>141 Other millwork, including flooring</td>
<td>1,252.91</td>
<td>261,763,732.91</td>
<td>58,124,485.02</td>
</tr>
<tr>
<td>144</td>
<td>142 Wood container and pallet manufacturing</td>
<td>2,032.38</td>
<td>334,556,610.11</td>
<td>91,350,227.36</td>
</tr>
<tr>
<td>145</td>
<td>143 Manufactured home (mobile home) manufacturing</td>
<td>119.82</td>
<td>37,849,683.53</td>
<td>11,548,861.53</td>
</tr>
<tr>
<td>146</td>
<td>144 Prefabricated wood building manufacturing</td>
<td>412.17</td>
<td>73,815,811.16</td>
<td>26,571,180.34</td>
</tr>
<tr>
<td>147</td>
<td>145 All other miscellaneous wood product manufacturing</td>
<td>999.87</td>
<td>173,829,800.79</td>
<td>29,706,506.73</td>
</tr>
<tr>
<td>148</td>
<td>146 Pulp mills</td>
<td>58.34</td>
<td>37,688,638.78</td>
<td>5,481,499.07</td>
</tr>
<tr>
<td>149</td>
<td>147 Paper mills</td>
<td>2,263.02</td>
<td>1,763,528,930.05</td>
<td>247,703,427.73</td>
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<tr>
<td>150</td>
<td>148 Paperboard mills</td>
<td>864.33</td>
<td>692,635,620.12</td>
<td>81,558,303.83</td>
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<tr>
<td>151</td>
<td>149 Paperboard container manufacturing</td>
<td>6,972.20</td>
<td>3,146,681,054.69</td>
<td>478,792,144.78</td>
</tr>
<tr>
<td>152</td>
<td>150 Paper bag and coated and treated paper manufacturing</td>
<td>1,109.85</td>
<td>507,552,581.79</td>
<td>95,281,555.18</td>
</tr>
<tr>
<td>153</td>
<td>151 Stationery product manufacturing</td>
<td>245.90</td>
<td>85,678,508.47</td>
<td>12,920,128.78</td>
</tr>
<tr>
<td>154</td>
<td>152 Sanitary paper product manufacturing</td>
<td>56.47</td>
<td>33,662,497.25</td>
<td>1,496,197.70</td>
</tr>
<tr>
<td>155</td>
<td>153 All other converted paper product manufacturing</td>
<td>714.76</td>
<td>222,706,298.83</td>
<td>49,988,267.14</td>
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<tr>
<td>370</td>
<td>368 Wood kitchen cabinet and countertop manufacturing</td>
<td>1,558.73</td>
<td>230,417,053.22</td>
<td>81,825,843.81</td>
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<tr>
<td>371</td>
<td>369 Upholstered household furniture manufacturing</td>
<td>222.86</td>
<td>43,205,123.90</td>
<td>10,725,800.51</td>
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<tr>
<td>372</td>
<td>370 Nonupholstered wood household furniture manufacturing</td>
<td>792.14</td>
<td>96,572,212.22</td>
<td>30,005,342.48</td>
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<tr>
<td>374</td>
<td>372 Institutional furniture manufacturing</td>
<td>2,799.92</td>
<td>558,358,191.89</td>
<td>188,876,558.40</td>
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<tr>
<td>375</td>
<td>373 Wood office furniture manufacturing</td>
<td>4,474.42</td>
<td>1,107,471,191.41</td>
<td>364,252,624.51</td>
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<tr>
<td>376</td>
<td>374 Custom architectural woodwork and millwork</td>
<td>898.13</td>
<td>155,748,771.12</td>
<td>52,452,819.82</td>
</tr>
<tr>
<td>378</td>
<td>376 Showcase, partition, shelving, and locker manufacturing</td>
<td>3,159.52</td>
<td>689,355,516.03</td>
<td>219,530,914.31</td>
</tr>
</tbody>
</table>
### 32 by 32 Matrix Tab

This tab provides the detailed economic multipliers among forest products sectors that are used in later calculations. The Type SAM (social accounting matrix) multipliers are used. IMPLAN staff provided the matrix for the 20-state region and for individual states. However, the matrix can be generated by exporting individual sector SAM output multipliers from IMPLAN or by exporting the SAM matrix from IMPLAN and reducing the matrix down to the 32 by 32 matrix needed for forest products sectors. An example from the beginning of the 2017 data on Michigan is presented below.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<td>Copied from Wes Morgan (IMPLAN)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>2</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>Forestry, forest products, and timber tract production</td>
<td>4.22E-05</td>
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<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
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<td>16</td>
<td>Commercial logging</td>
<td>4.96E-05</td>
<td>3.45E-05</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>6</td>
<td>19</td>
<td>Support activities for agriculture and forestry</td>
<td>0.07197908</td>
<td>0.177617</td>
<td>0.02458233</td>
<td>1.00</td>
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<tr>
<td>7</td>
<td>47</td>
<td>Electric power generation - Biomass</td>
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<td>4.78E-05</td>
<td>5.45E-05</td>
<td>6.08E-05</td>
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<tr>
<td>8</td>
<td>334</td>
<td>Sawmills</td>
<td>0.00015968</td>
<td>0.00012158</td>
<td>0.005226</td>
<td>0.00019491</td>
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<tr>
<td>9</td>
<td>335</td>
<td>Wood preservation</td>
<td>3.58E-05</td>
<td>2.88E-05</td>
<td>0.00133219</td>
<td>0.003</td>
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<td>336</td>
<td>Veneer and plywood manufacturing</td>
<td>3.07E-05</td>
<td>2.88E-05</td>
<td>9.74E-05</td>
<td>3.49E-05</td>
</tr>
<tr>
<td>11</td>
<td>337</td>
<td>Engineered wood member and truss manufacturing</td>
<td>2.21E-05</td>
<td>2.11E-05</td>
<td>9.74E-05</td>
<td>3.49E-05</td>
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<tr>
<td>12</td>
<td>338</td>
<td>Reconstituted wood product manufacturing</td>
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<td>4.44E-05</td>
<td>5.98E-05</td>
<td>5.29E-05</td>
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<td>Wood windows and door manufacturing</td>
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<td>1.00E-04</td>
<td>9.99E-05</td>
<td>0.00013333</td>
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<tr>
<td>14</td>
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<td>Cut stock, sparing lumber, and planing</td>
<td>0.00010389</td>
<td>3.00E-05</td>
<td>0.00028205</td>
<td>0.0034E-05</td>
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<tr>
<td>15</td>
<td>141</td>
<td>Other millwork including flooring</td>
<td>8.32E-05</td>
<td>7.49E-05</td>
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<td>0.00013399</td>
<td>0.00010438</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>Prefabricated wood building manufacturing</td>
<td>7.67E-06</td>
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<td>6.87E-06</td>
<td>8.75E-06</td>
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<tr>
<td>19</td>
<td>345</td>
<td>All other miscellaneous wood product manufacturing</td>
<td>9.45E-05</td>
<td>0.00</td>
<td>6.63E-05</td>
<td>6.27E-05</td>
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<tr>
<td>20</td>
<td>346</td>
<td>Pulp mills</td>
<td>1.79E-07</td>
<td>2.12E-07</td>
<td>2.10E-07</td>
<td>2.90E-07</td>
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<tr>
<td>21</td>
<td>347</td>
<td>Paper mills</td>
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<td>0.00015854</td>
<td>0.00015724</td>
<td>0.00021325</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>Paperboard mills</td>
<td>2.20E-05</td>
<td>1.65E-05</td>
<td>1.62E-05</td>
<td>2.12E-05</td>
</tr>
<tr>
<td>23</td>
<td>349</td>
<td>Paperboard container manufacturing</td>
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<td>0.00046429</td>
<td>0.00044549</td>
<td>0.00057029</td>
</tr>
<tr>
<td>24</td>
<td>350</td>
<td>Paper bag and coated and treated paper manufacturing</td>
<td>3.16E-05</td>
<td>3.48E-05</td>
<td>3.42E-05</td>
<td>3.43E-05</td>
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<tr>
<td>25</td>
<td>151</td>
<td>Stationery product manufacturing</td>
<td>9.80E-06</td>
<td>8.65E-06</td>
<td>8.65E-06</td>
<td>1.15E-05</td>
</tr>
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<td>26</td>
<td>352</td>
<td>Sanitary paper product manufacturing</td>
<td>4.93E-06</td>
<td>5.00E-06</td>
<td>4.93E-06</td>
<td>6.88E-06</td>
</tr>
<tr>
<td>27</td>
<td>353</td>
<td>All other converted paper product manufacturing</td>
<td>1.37E-05</td>
<td>1.69E-05</td>
<td>1.62E-05</td>
<td>2.20E-05</td>
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<tr>
<td>28</td>
<td>356</td>
<td>Wood kitchen cabinet and countertop manufacturing</td>
<td>2.06E-05</td>
<td>2.36E-05</td>
<td>2.33E-05</td>
<td>3.16E-05</td>
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<td>29</td>
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<td>Upholstered household furniture manufacturing</td>
<td>6.65E-06</td>
<td>8.37E-06</td>
<td>8.31E-06</td>
<td>1.14E-05</td>
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<td>30</td>
<td>370</td>
<td>Nonupholstered wood household furniture manufacturing</td>
<td>1.01E-05</td>
<td>1.27E-05</td>
<td>1.26E-05</td>
<td>1.73E-05</td>
</tr>
<tr>
<td>31</td>
<td>372</td>
<td>Institutional furniture manufacturing</td>
<td>9.35E-06</td>
<td>2.43E-06</td>
<td>2.42E-06</td>
<td>3.33E-06</td>
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<tr>
<td>32</td>
<td>373</td>
<td>Wood office furniture manufacturing</td>
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<td>2.90E-06</td>
<td>2.94E-06</td>
<td>4.03E-06</td>
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<td>33</td>
<td>374</td>
<td>Custom architectural woodworking and millwork</td>
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<td>4.57E-07</td>
<td>4.53E-07</td>
<td>6.23E-07</td>
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<tr>
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<td>376</td>
<td>Showcase, partition, shelving, and locker manufacturing</td>
<td>1.46E-05</td>
<td>1.79E-05</td>
<td>1.80E-05</td>
<td>2.12E-05</td>
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</tbody>
</table>
Matrix Inversion Tab

This tab provides the Leontief matrix inverse based on the previously imported 32 by 32 matrix (i.e., SAM output multipliers). An example based on 2017 data on Michigan is presented below.

| Sectors | Industry | A       | B       | C       | D       | E       | F       | G       | H       | I       | J       |
|---------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
Sector 10 Tab

This is one of five tabs used to select the appropriate state calibration ratio for modifying values in IMPLAN sectors 10, 19, 47, 372, and 376. In this example, a little over 4 percent of the Michigan output in sector 10 is associated with maple syrup production, which is based on NASS data. Therefore, the Industry Detail data in row three is modified by the calibration ratio; results are presented in row four with the new sector name. There is a tab for each partial IMPLAN sector. Descriptions of data sources used to calibrate initial IMPLAN values are included for each sector.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
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<td>Sector 10 - Multiplied IMPLAN Sector 10 values by the ratio of (1) 2017 maple syrup maple syrup value (NASS) divided by (2) the Sector 10 Output value.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Industry Code</td>
<td>Description</td>
<td>Employment</td>
<td>Output</td>
<td>EmployeeCompensation</td>
<td>ProprietorIncome</td>
<td>OtherPropertyType</td>
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<td>---</td>
<td>---</td>
<td>---</td>
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<tr>
<td>10 All other crop farming</td>
<td>5805.58</td>
<td>137574371.34</td>
<td>54486664.84</td>
<td>883371.13</td>
<td>219557382.90</td>
<td></td>
</tr>
<tr>
<td>10 Maple syrup production</td>
<td>237.87</td>
<td>6832000.00</td>
<td>2336582.21</td>
<td>32888.29</td>
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<td>Calibration ratio</td>
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<td></td>
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</tr>
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<td>1</td>
<td>Column A has the sales levels from NASS surveys. Column B has the jobs estimates for sector 10 in state-level analyses based on NASS sales data.</td>
<td></td>
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<td>2017 data</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>Industry Code</td>
<td>Description</td>
<td>Employment</td>
<td>IMPLAN Sector Output</td>
<td>Maple Syrup Value</td>
<td>Percent of Output</td>
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<td>Connecticut</td>
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<td>564</td>
<td>9882476</td>
<td>1244000</td>
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<tr>
<td>Delaware</td>
<td>10 All other crop farming</td>
<td>394</td>
<td>20522964</td>
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<tr>
<td>Illinois</td>
<td>10 All other crop farming</td>
<td>1715</td>
<td>70153145</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Indiana</td>
<td>10 All other crop farming</td>
<td>1782</td>
<td>5575146</td>
<td>602000</td>
<td>1.1%</td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>10 All other crop farming</td>
<td>887</td>
<td>7415198</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Maine</td>
<td>10 All other crop farming</td>
<td>3727</td>
<td>49498928</td>
<td>23893000</td>
<td>48.3%</td>
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<tr>
<td>Maryland</td>
<td>10 All other crop farming</td>
<td>2317</td>
<td>59807555</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Massachusetts</td>
<td>10 All other crop farming</td>
<td>1526</td>
<td>17214664</td>
<td>4217000</td>
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<td>Michigan</td>
<td>10 All other crop farming</td>
<td>5806</td>
<td>137574371</td>
<td>5632000</td>
<td>4.1%</td>
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<tr>
<td>Minnesota</td>
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<td>1727</td>
<td>84587593</td>
<td>932000</td>
<td>1.1%</td>
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<td>8356</td>
<td>18573145</td>
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<tr>
<td>NEBRASKA</td>
<td>10 All other crop farming</td>
<td>2702</td>
<td>321178223</td>
<td>-</td>
<td>-</td>
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<tr>
<td>New Hampshire</td>
<td>10 All other crop farming</td>
<td>1742</td>
<td>16111561</td>
<td>665900</td>
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<tr>
<td>New Jersey</td>
<td>10 All other crop farming</td>
<td>1483</td>
<td>29302004</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>New York</td>
<td>10 All other crop farming</td>
<td>1187</td>
<td>266865951</td>
<td>2064000</td>
<td>11.1%</td>
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<tr>
<td>Ohio</td>
<td>10 All other crop farming</td>
<td>8671</td>
<td>178925644</td>
<td>3080000</td>
<td>17.4%</td>
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<tr>
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<td>10 All other crop farming</td>
<td>13613</td>
<td>286084959</td>
<td>4768000</td>
<td>1.7%</td>
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<tr>
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<td>10 All other crop farming</td>
<td>160</td>
<td>1806098</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Vermont</td>
<td>10 All other crop farming</td>
<td>351</td>
<td>71195290</td>
<td>5346000</td>
<td>75.1%</td>
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<tr>
<td>West Virginia</td>
<td>10 All other crop farming</td>
<td>4355</td>
<td>34157028</td>
<td>330000</td>
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<td>6685</td>
<td>174850273</td>
<td>6260000</td>
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<td>1815002239</td>
<td>140777000</td>
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</tbody>
</table>
The matrix algebra product of the Leontief matrix inverse and the initial IMPLAN output with adjusted partial sectors (column D) produces adjusted inputs (column E) needed to estimate the economic contributions of the forest products industries. An example based on 2017 data on Michigan is presented below. Note: the value in cell D2 is from the sector 10 tab.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>Description</th>
<th>Initial IMPLAN Output</th>
<th>Initial IMPLAN output with adjusted partial sectors</th>
<th>E</th>
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</thead>
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<tr>
<td>2</td>
<td>10</td>
<td>All other crop farming</td>
<td>117,514,171</td>
<td>5,632,000</td>
<td>1,079,750.60</td>
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<tr>
<td>3</td>
<td>15</td>
<td>Forestry, forest products, and timber tract production</td>
<td>32,750,862</td>
<td>32,750,862</td>
<td>23,820,194.40</td>
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<tr>
<td>4</td>
<td>16</td>
<td>Commercial logging</td>
<td>280,774,872</td>
<td>280,774,872</td>
<td>60,254,452.00</td>
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<tr>
<td>5</td>
<td>19</td>
<td>Support activities for agriculture and forestry</td>
<td>462,577,039</td>
<td>23,774,734</td>
<td>12,035,601.32</td>
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<tr>
<td>6</td>
<td>47</td>
<td>Electric power generation - Biomass</td>
<td>55,147,263</td>
<td>124,093,862</td>
<td>122,706,016.00</td>
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<tr>
<td>7</td>
<td>134</td>
<td>Sawmills</td>
<td>733,313,354</td>
<td>733,313,354</td>
<td>544,036,013.81</td>
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<td>135</td>
<td>Wood preservation</td>
<td>103,717,041</td>
<td>103,717,041</td>
<td>78,716,537.70</td>
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<tr>
<td>9</td>
<td>136</td>
<td>Veneer and plywood manufacturing</td>
<td>275,210,022</td>
<td>275,210,022</td>
<td>247,531,232.99</td>
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<td>10</td>
<td>137</td>
<td>Engineered wood manufacturer and millwork manufacturing</td>
<td>189,523,378</td>
<td>189,523,378</td>
<td>182,594,981.70</td>
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<tr>
<td>11</td>
<td>138</td>
<td>Reconstituted wood product manufacturing</td>
<td>452,840,149</td>
<td>452,840,149</td>
<td>424,601,116.60</td>
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<td>12</td>
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<td>182,515,060</td>
<td>180,241,800.72</td>
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<td>13</td>
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<td>Cut stock, sawing lumber, and planing</td>
<td>162,753,285</td>
<td>162,753,285</td>
<td>137,936,811.96</td>
</tr>
<tr>
<td>14</td>
<td>141</td>
<td>Other millwork, including flooring</td>
<td>261,763,733</td>
<td>261,763,733</td>
<td>258,174,944.90</td>
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<tr>
<td>15</td>
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<td>Wooden container and pallet manufacturing</td>
<td>334,556,610</td>
<td>334,556,610</td>
<td>318,042,633.62</td>
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<tr>
<td>16</td>
<td>143</td>
<td>Manufactured home (mobile home) manufacturing</td>
<td>37,845,654</td>
<td>37,845,654</td>
<td>37,524,548.80</td>
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<td>17</td>
<td>144</td>
<td>Prefabricated wood building manufacturing</td>
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<td>73,815,811</td>
<td>73,250,732.31</td>
</tr>
<tr>
<td>18</td>
<td>145</td>
<td>All other miscellaneous wood product manufacturing</td>
<td>173,820,801</td>
<td>173,820,801</td>
<td>165,900,973.70</td>
</tr>
<tr>
<td>19</td>
<td>146</td>
<td>Pulp mills</td>
<td>37,688,637</td>
<td>37,688,637</td>
<td>36,756,209.89</td>
</tr>
<tr>
<td>20</td>
<td>147</td>
<td>Paper mills</td>
<td>1,763,529,931</td>
<td>1,763,529,931</td>
<td>1,671,396,212.59</td>
</tr>
<tr>
<td>21</td>
<td>148</td>
<td>Paperboard mills</td>
<td>692,635,620</td>
<td>692,635,620</td>
<td>654,899,512.10</td>
</tr>
<tr>
<td>22</td>
<td>149</td>
<td>Paperboard container manufacturing</td>
<td>3,146,881,045</td>
<td>3,146,881,045</td>
<td>3,064,688,786.09</td>
</tr>
<tr>
<td>23</td>
<td>150</td>
<td>Paper bag and coated and treated paper manufacturing</td>
<td>507,452,582</td>
<td>507,452,582</td>
<td>501,451,916.17</td>
</tr>
<tr>
<td>24</td>
<td>151</td>
<td>Stationery product manufacturing</td>
<td>85,578,566</td>
<td>85,578,566</td>
<td>85,445,488.35</td>
</tr>
<tr>
<td>25</td>
<td>152</td>
<td>Sanitary paper product manufacturing</td>
<td>33,692,497</td>
<td>33,692,497</td>
<td>32,998,129.03</td>
</tr>
<tr>
<td>26</td>
<td>153</td>
<td>All other converted paper product manufacturing</td>
<td>222,706,299</td>
<td>222,706,299</td>
<td>218,006,079.28</td>
</tr>
<tr>
<td>27</td>
<td>156</td>
<td>Wood kitchen cabinets and countertop manufacturing</td>
<td>230,417,053</td>
<td>230,417,053</td>
<td>229,737,881.73</td>
</tr>
<tr>
<td>28</td>
<td>159</td>
<td>Upholstered household furniture manufacturing</td>
<td>43,205,124</td>
<td>43,205,124</td>
<td>43,137,042.24</td>
</tr>
<tr>
<td>29</td>
<td>160</td>
<td>Nonupholstered household furniture manufacturing</td>
<td>96,572,212</td>
<td>96,572,212</td>
<td>96,406,109.45</td>
</tr>
<tr>
<td>30</td>
<td>172</td>
<td>Institutional furniture manufacturing</td>
<td>555,359,192</td>
<td>367,991,849</td>
<td>357,222,824.79</td>
</tr>
<tr>
<td>31</td>
<td>173</td>
<td>Wood office furniture manufacturing</td>
<td>1,107,471,191</td>
<td>1,107,471,191</td>
<td>1,104,551,342.40</td>
</tr>
<tr>
<td>32</td>
<td>174</td>
<td>Custom architectural woodworking and millwork</td>
<td>155,749,771</td>
<td>155,749,771</td>
<td>155,662,845.77</td>
</tr>
<tr>
<td>33</td>
<td>176</td>
<td>Showcase, partition, shelving, and locker manufacturing</td>
<td>686,353,516</td>
<td>258,370,596</td>
<td>249,271,117.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>Description</th>
<th>Initial IMPLAN Output</th>
<th>Initial IMPLAN output with adjusted partial sectors</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>Total</td>
<td></td>
<td>13,338,559,470.67</td>
<td>12,143,303,352.10</td>
<td>11,359,864,600.85</td>
</tr>
</tbody>
</table>
All Industries Impact Results Tab

Values from the Industry Adjustment tab are entered into IMPLAN, and economic contributions are estimated. Direct effects (IMPLAN inputs) are reduced to ensure that estimated impacts do not exceed what is produced in the state, which are the initial IMPLAN direct results. Michigan results using 2017 data are presented below. A detailed (sector-by-sector) table is also available. For reporting, direct effects from this tab are replaced by the sum of the initial IMPLAN direct employment, output, and other variables, with modifications in five sectors (see Total Contributions table).

<table>
<thead>
<tr>
<th>Impact Summary</th>
<th>Michigan 2017 Direct</th>
<th>Copyright 2019 Minnesota IMPLAN Group, Inc.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impact Type</strong></td>
<td><strong>Employment</strong></td>
<td><strong>Labor Income (Thousands $)</strong></td>
<td><strong>Value Added (Thousands $)</strong></td>
</tr>
<tr>
<td>Direct Effect</td>
<td>34,966</td>
<td>2,423,905,326</td>
<td>3,182,713,683</td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>28,790</td>
<td>1,809,109,408</td>
<td>2,641,276,335</td>
</tr>
<tr>
<td>Induced Effect</td>
<td>27,421</td>
<td>1,244,189,190</td>
<td>2,163,232,431</td>
</tr>
<tr>
<td>Total Effect</td>
<td>91,176</td>
<td>5,477,203,924</td>
<td>7,987,222,449</td>
</tr>
</tbody>
</table>

Total Contributions Table Tab

This table is generated by combining direct IMPLAN results with total effects from the All Industries Impact Results tab. Michigan results using 2017 data are presented below.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Employment</th>
<th>Labor Income (Thousands $)</th>
<th>Value Added (Thousands $)</th>
<th>Output (Thousands $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>49,746</td>
<td>2,674,487</td>
<td>3,481,726</td>
<td>12,182,249</td>
</tr>
<tr>
<td>Total</td>
<td>91,176</td>
<td>5,477,204</td>
<td>7,987,222</td>
<td>20,196,166</td>
</tr>
</tbody>
</table>

Direct Industry Contrib Table Tab

This table is created by summing the direct IMPLAN results by industry group from the Appendix Table tab. Michigan results using 2017 data are presented below.

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Employment</th>
<th>Labor Income (Thousands $)</th>
<th>Value Added (Thousands $)</th>
<th>Output (Thousands $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry</td>
<td>1,321</td>
<td>38,420</td>
<td>44,745</td>
<td>62,158</td>
</tr>
<tr>
<td>Logging</td>
<td>4,487</td>
<td>159,122</td>
<td>182,134</td>
<td>280,775</td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>4,768</td>
<td>321,265</td>
<td>404,679</td>
<td>1,689,173</td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>7,048</td>
<td>444,056</td>
<td>490,191</td>
<td>1,420,592</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>10,817</td>
<td>737,746</td>
<td>919,632</td>
<td>2,239,587</td>
</tr>
<tr>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>3,186</td>
<td>334,961</td>
<td>593,328</td>
<td>2,493,853</td>
</tr>
<tr>
<td>Secondary Paperboard and Other Paper</td>
<td>9,599</td>
<td>639,396</td>
<td>848,708</td>
<td>3,996,111</td>
</tr>
<tr>
<td>Sum of Direct Contributions</td>
<td>40,746</td>
<td>2,674,487</td>
<td>3,481,726</td>
<td>12,182,249</td>
</tr>
</tbody>
</table>

*Value Added in IMPLAN is also called Gross State Product.*
Total Industry Contrib Table Tab

This table is created by referencing IMPLAN results from Impact Summary files exported for each industry group. Michigan results using 2017 data are presented below.

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Employment</th>
<th>Labor Income (Thousands $)</th>
<th>Value Added (Thousands $)</th>
<th>Output (Thousands $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry</td>
<td>1,006</td>
<td>34,924</td>
<td>45,601</td>
<td>68,754</td>
</tr>
<tr>
<td>Logging</td>
<td>1,360</td>
<td>50,753</td>
<td>66,245</td>
<td>106,630</td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>13,650</td>
<td>762,121</td>
<td>1,098,788</td>
<td>2,792,150</td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>14,888</td>
<td>859,083</td>
<td>1,145,152</td>
<td>2,609,545</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>22,207</td>
<td>1,340,506</td>
<td>1,888,220</td>
<td>4,008,738</td>
</tr>
<tr>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>14,008</td>
<td>946,094</td>
<td>1,549,500</td>
<td>4,202,047</td>
</tr>
<tr>
<td>Secondary Paperboard and Other Paper Products</td>
<td>24,658</td>
<td>1,483,723</td>
<td>2,193,716</td>
<td>6,408,302</td>
</tr>
<tr>
<td>Total</td>
<td>91,176</td>
<td>5,477,204</td>
<td>7,987,222</td>
<td>20,196,166</td>
</tr>
</tbody>
</table>

Value Added in IMPLAN is also called Gross State Product.

Top 10 Sectors Impacted Table Tab

This table is based on the All Impact Detail file exported from IMPLAN results. The forest industry sectors are deleted from the results. Then the top ten remaining sectors (based on employment) are reported. Michigan results using 2017 data are presented below.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Description</th>
<th>Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>395</td>
<td>Wholesale trade</td>
<td>3,753</td>
</tr>
<tr>
<td>440</td>
<td>Real estate</td>
<td>2,103</td>
</tr>
<tr>
<td>501</td>
<td>Full-service restaurants</td>
<td>1,944</td>
</tr>
<tr>
<td>502</td>
<td>Limited-service restaurants</td>
<td>1,919</td>
</tr>
<tr>
<td>411</td>
<td>Truck transportation</td>
<td>1,743</td>
</tr>
<tr>
<td>482</td>
<td>Hospitals</td>
<td>1,618</td>
</tr>
<tr>
<td>461</td>
<td>Management of companies and enterp</td>
<td>1,602</td>
</tr>
<tr>
<td>468</td>
<td>Services to buildings</td>
<td>1,417</td>
</tr>
<tr>
<td>464</td>
<td>Employment services</td>
<td>1,406</td>
</tr>
<tr>
<td>405</td>
<td>Retail - General merchandise stores</td>
<td>954</td>
</tr>
<tr>
<td>184</td>
<td></td>
<td>18,458</td>
</tr>
</tbody>
</table>

194 sectors are impacted with 10 or more jobs, including the 32 forest products industries.
**Neighboring States Table Tab**

The Direct Industry Contrib table from neighboring or nearby states is copied and pasted into this tab. The resulting table provides a comparison with the other states in terms of employment and output by industry group. An example using 2017 Michigan employment data is presented below.

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Michigan</th>
<th>Wisconsin</th>
<th>Minnesota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry</td>
<td>1,321</td>
<td>778</td>
<td>782</td>
</tr>
<tr>
<td>Logging</td>
<td>4,487</td>
<td>5,207</td>
<td>2,495</td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>4,768</td>
<td>4,564</td>
<td>1,489</td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>7,648</td>
<td>14,911</td>
<td>11,288</td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>10,837</td>
<td>12,071</td>
<td>8,575</td>
</tr>
<tr>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>3,186</td>
<td>11,233</td>
<td>2,542</td>
</tr>
<tr>
<td>Paperboard and Other Paper Products</td>
<td>9,099</td>
<td>19,029</td>
<td>6,885</td>
</tr>
<tr>
<td>Sum of Direct Contributions</td>
<td>40,746</td>
<td>67,793</td>
<td>34,955</td>
</tr>
</tbody>
</table>

**Industry Comparison Table Tab**

Two tables are created for comparisons. The first compares the forest products industries’ total direct employment, labor income, value-added, and output with other resource-based, extractive industries. The second table compares forest products manufacturing with 15 other manufacturing industries. An example of the first comparison table using 2017 data on Michigan is presented below.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Labor Income (Thousands $)</th>
<th>Value Added&lt;sup&gt;1&lt;/sup&gt; (Thousands $)</th>
<th>Output (Thousands $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Products</td>
<td>40,746</td>
<td>2,674,987</td>
<td>3,481,716</td>
<td>12,182,249</td>
</tr>
<tr>
<td>Commercial Fishing, Hunting and Trapping</td>
<td>1,452</td>
<td>7,325</td>
<td>51,774</td>
<td>55,329</td>
</tr>
<tr>
<td>Mining, and Oil &amp; Gas Production</td>
<td>20,687</td>
<td>827,114</td>
<td>2,486,183</td>
<td>4,133,628</td>
</tr>
<tr>
<td>Agricultural Production</td>
<td>87,073</td>
<td>1,588,824</td>
<td>2,949,105</td>
<td>8,196,106</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>149,097</strong></td>
<td><strong>5,098,249</strong></td>
<td><strong>8,967,778</strong></td>
<td><strong>24,564,311</strong></td>
</tr>
</tbody>
</table>

<sup>1</sup> Value Added in IMPLAN is also called Gross State Product.
Appendix Table Tab

A sector-by-sector summary of direct employment, labor income, gross state product, value-added, and output is presented for each state and the region. Industry groups are also identified. The summary includes modifications, if any, made in the five partial sectors. These are the direct effects from the Industry Detail tab, with modifications. An example using 2017 data for Michigan is presented below, with partial sectors highlighted in yellow.

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Industry Group</th>
<th>Description</th>
<th>Employment (Thousands $)</th>
<th>Labor Income (Thousands $)</th>
<th>Value Added† (Thousands $)</th>
<th>Output (Thousands $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry</td>
<td>Forestry, forest products, and timber tract products</td>
<td>477</td>
<td>15,245</td>
<td>20,043</td>
<td>30,731</td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>Support activities for forestry*</td>
<td>606</td>
<td>20,589</td>
<td>21,481</td>
<td>33,779</td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>Maple syrup production*</td>
<td>238</td>
<td>2,198</td>
<td>3,052</td>
<td>5,082</td>
<td></td>
</tr>
<tr>
<td>Logging</td>
<td>Commercial logging</td>
<td>1,021</td>
<td>56,420</td>
<td>64,745</td>
<td>62,438</td>
<td></td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>Electric power generation - Wood*</td>
<td>120</td>
<td>9,463</td>
<td>10,126</td>
<td>13,789</td>
<td></td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>Sawmills</td>
<td>5,185</td>
<td>10,578</td>
<td>14,179</td>
<td>17,515</td>
<td></td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>Wood preservation</td>
<td>186</td>
<td>11,240</td>
<td>14,886</td>
<td>16,917</td>
<td></td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>Veneer and plywood manufacturing</td>
<td>1,009</td>
<td>9,164</td>
<td>10,603</td>
<td>13,510</td>
<td></td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>Reconstituted wood product manufacturing</td>
<td>845</td>
<td>7,146</td>
<td>9,146</td>
<td>10,840</td>
<td></td>
</tr>
<tr>
<td>Primary Solid Wood Products</td>
<td>Primary Solid Wood Products Subtotal</td>
<td>6,788</td>
<td>22,145</td>
<td>29,977</td>
<td>31,807</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>Engineered wood member and truss manufacturing</td>
<td>850</td>
<td>8,346</td>
<td>10,693</td>
<td>11,930</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>Wood windows and door truss manufacturing</td>
<td>771</td>
<td>4,978</td>
<td>6,062</td>
<td>7,059</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>Cutstock, reusing lumber, and planing</td>
<td>697</td>
<td>4,256</td>
<td>5,019</td>
<td>5,573</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>Other millwork, including flooring</td>
<td>1,123</td>
<td>7,679</td>
<td>8,477</td>
<td>9,418</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>Wood container and pallet manufacturing</td>
<td>2,183</td>
<td>11,544</td>
<td>13,748</td>
<td>14,314</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>Manufactured home (mobile home) manufacturing</td>
<td>120</td>
<td>4,965</td>
<td>5,795</td>
<td>6,416</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>Prefabricated wood building manufacturing</td>
<td>442</td>
<td>2,583</td>
<td>2,874</td>
<td>3,056</td>
<td></td>
</tr>
<tr>
<td>Secondary Solid Wood Products</td>
<td>All other miscellaneous wood product manufacturers</td>
<td>910</td>
<td>5,169</td>
<td>6,047</td>
<td>6,782</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Wood kitchen cabinet and counter top manufacturer</td>
<td>1,059</td>
<td>6,266</td>
<td>7,528</td>
<td>8,147</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Upholstered household furniture manufacturing</td>
<td>253</td>
<td>10,760</td>
<td>12,051</td>
<td>13,195</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Unupholstered wood household furniture manufacture</td>
<td>792</td>
<td>9,308</td>
<td>10,405</td>
<td>11,372</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Institutional wood furniture manufacturing</td>
<td>1,791</td>
<td>24,534</td>
<td>28,801</td>
<td>29,739</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Wood office furniture manufacturing</td>
<td>4,474</td>
<td>35,419</td>
<td>38,823</td>
<td>40,974</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Custom architectural woodwork and millwork</td>
<td>808</td>
<td>5,236</td>
<td>6,194</td>
<td>6,863</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Showcase, partition, shelving, and locker manufacture</td>
<td>1,180</td>
<td>3,700</td>
<td>4,263</td>
<td>4,763</td>
<td></td>
</tr>
<tr>
<td>Wood Furniture</td>
<td>Wood Furniture Subtotal</td>
<td>9,087</td>
<td>72,746</td>
<td>81,622</td>
<td>82,597</td>
<td></td>
</tr>
<tr>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>Pulp mills</td>
<td>188</td>
<td>5,499</td>
<td>7,069</td>
<td>7,469</td>
<td></td>
</tr>
<tr>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>Paper mills</td>
<td>2,093</td>
<td>27,652</td>
<td>31,688</td>
<td>32,559</td>
<td></td>
</tr>
<tr>
<td>Pulp, Paper, and Paperboard Mills</td>
<td>Paperboard mills</td>
<td>804</td>
<td>8,183</td>
<td>12,981</td>
<td>13,939</td>
<td></td>
</tr>
<tr>
<td>Pulp, Paper, and Paperboard Mills Subtotal</td>
<td></td>
<td>3,085</td>
<td>33,335</td>
<td>37,618</td>
<td>38,525</td>
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<tr>
<td>Secondary Paperboard and Other Paper Products</td>
<td>Paperboard container manufacturing</td>
<td>6,972</td>
<td>47,091</td>
<td>62,056</td>
<td>63,958</td>
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<tr>
<td>Secondary Paperboard and Other Paper Products</td>
<td>Paper bag and coated and treated paper manufacturing</td>
<td>1,110</td>
<td>94,449</td>
<td>109,644</td>
<td>111,953</td>
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<tr>
<td>Secondary Paperboard and Other Paper Products</td>
<td>Sanitary paper product manufacturing</td>
<td>245</td>
<td>12,658</td>
<td>14,762</td>
<td>16,079</td>
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<td>Secondary Paperboard and Other Paper Products</td>
<td>All other converted paper product manufacturing</td>
<td>580</td>
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<td>Secondary Paperboard and Other Paper Products Subtotal</td>
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<td>715</td>
<td>50,845</td>
<td>58,014</td>
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<td>Secondary Paperboard and Other Paper Products Subtotal</td>
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<td>9,099</td>
<td>259,396</td>
<td>286,706</td>
<td>299,011</td>
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†Value Added in IMPLAN is also called Gross State Product.
References


Appendix A: Meeting Notes and Consensus Building

Consensus Building

Project Team Meeting One
On Monday, December 17, 2018, from 10:00 AM to 12:00 PM EST, PSC hosted the initial meeting of the Northern Region Economic Analysis Landscape Scale Restoration Grant Project Team. Project team members present included: David Neumann and Dr. Jagdish Poudel, MDNR; Dr. Larry Leefers, Michigan State University; Melissa Gibson, Eric Pardini, and Mark Coscarelli, PSC; Douglas Emmerthal, Connecticut Division of Forestry; Sam Topper, Delaware Forest Service; Jeff Settle, Indiana DNR; Jeff Goerndt, Iowa DNR; Donald Mansius, Maine Forest Service; Sean Mahoney, Massachusetts Department of Conservation and Recreation; Mike Morris, Missouri Department of Conservation; Samantha Hensen and Bill Casey, New Jersey Forest Service; Jared Craig, Ohio DNR; Ben Livelsberger, Pennsylvania Department of Conservation and Natural Resources; Andrew Fast and Jim Frohn, University of New Hampshire Cooperative Extension (UNH Extension); Ed Cesa, U.S. Department of Agriculture Forest Service; Paul Frederick, Vermont Department of Forest, Parks, and Recreation; Joe McNeel and Katherine Zall, West Virginia Division of Forestry; and Sabina Dhungana, Wisconsin DNR.

Overview of Methodological Research

Dr. Larry Leefers began the meeting by providing an overview of the methodological research performed so far. He explained that the IMPLAN tool was introduced to determine linkages between economic sectors. IMPLAN is an input-output modeling system; once direct economic impacts are identified, the system can calculate indirect and induced impacts based on a set of multipliers and other factors. Dr. Leefers explained that there are three decisions that participants need to make before beginning analysis:

- Determining which method the project team would utilize for their analysis
- Determining which method to use for the multistate regional analysis
- Determining the IMPLAN year of analysis/reporting

He added that during the next webinar, the team would discuss which sectors to include in the analysis.

Next, Dr. Leefers discussed how economic impact studies compare to economic contribution analyses and how IMPLAN helps define economic contributions, providing as an example the impact of jobs in the logging sector. Examples were then provided using IMPLAN data to illustrate the method for the economic contribution analysis.

Discussion of Decision Item One: Methods One and Two

The first decision item for participants was to choose which method to use for determining economic impact versus contributions in this project (Parajuli et al. 2018). Method one consists of modifying commodity production and trade flows for each IMPLAN sector, then using current output levels to
estimate contributions. Method two consists of downloading over 20 multiplier spreadsheets to an analysis spreadsheet to generate reduced output levels, then using those reduced levels to estimate contributions. Participants received a complete explanation of the methods’ differences in advance of the meeting. Dr. Leefers also described the difference between the two methods, briefly explaining that results for the two models are almost identical and the slight differences represent rounding errors. His professional recommendation was to use method two for this project.

A participant asked if either method was more accurate. Dr. Leefers referred to an article from the Journal of Forestry, noting that one is not more accurate than the other, they are just different means to get to the same endpoint. Dr. Poudel added that method two is more efficient in regard to time and resources.

A participant asked if multipliers change over time. Dr. Leefers stated that they do change because they are based on structure of a state’s economy, and each state has a different set of multipliers. Ms. Gibson added that it is important to retain the conversion spreadsheet used.

Mr. Neumann recommended using the most efficient of the two methods (method two)

A participant asked if there was anything lost using method two over method one. Dr. Leefers stated there was not, but, as noted in the journal article, the two methods offer slightly different starting points for analysis.

Mr. Neumann asked which method most economists use. Dr. Poudel responded method two can show indirect and induced effects in the forest products industries and that method one shows all direct effects of forest product activity. Ms. Gibson added method two is newer and is less well known, but economists are transitioning towards this method.

**Discussion of Decision Item Two: Methods for Regional Analysis**

The second decision item discussed was which approach to use for the multistate analysis portion of the project. Dr. Leefers described the two approaches for participants, explaining that approach one uses the IMPLAN results for the individual states and adds them together to get regional totals. Approach two creates a 20-state region in IMPLAN that includes interstate linkages. Dr. Leefers provided participants with an example of how approach two works.
The recommendation from the project team was to use approach two for the analysis. Dr. Leefers explained that for this approach, the team would create a 20-state model accounting for interstate linkages and better reflecting the larger size of the forest industries’ economic contributions. Dr. Poudel noted that model two will be easier to replicate in five years.

One participant noted that if using approach two, the team should not limit the project to geopolitical boundaries of states and instead it should be aligned with ecological boundaries of the forest types presented in each state. Mr. Neumann responded that the IMPLAN data does not report information at ecological boundaries because the data is compiled from the U.S. Census Bureau and others, and it would be difficult to develop that classification for economic data. Ms. Gibson noted it could be very difficult to replicate an approach like this in the future.

The project team continued discussing the key differences between the two approaches. Mr. Neumann asked how the report would describe differences between states within the larger region. Dr. Leefers responded that it depends on direct outputs and jobs within those states and that this information will be presented in the state-level analysis and documented in the regional report.

A participant asked whether the 20-state report will only extend to the state level, and whether it incorporates trade between states. Dr. Leefers clarified that the regional report will combine all states showing the economic contribution across the 20-state region and the contribution within each state.

Another participant asked if an individual state could use the IMPLAN data to run their own analysis using any of the approaches described. Dr. Leefers noted the recommendation for this report is to use approach two. Mr. Neumann added that contractual agreements within the grant require the project team to prepare one regional report, but other states will receive a copy of their state’s data and may do further analysis as desired.

A participant asked whether method one should be used, as it is the more conservative value. They added that it seems that method one would be more useful to the states for informing their own policymakers. Dr. Leefers responded that both approaches yield similar results, but a minor amount of additional effort is required for approach one because additional states must be analyzed. However, approach two has the added economic impact of interstate linkages.

A participant questioned whether the regional approach would inadvertently include economic contributions from states outside of the region that share a border or forest resource (e.g., Kentucky). Dr. Leefers responded that the IMPLAN model is designed to deal with trade flow between states. He suggested that in the analysis, researchers would capture the interactions between states, but would not capture economic contributions to states outside the scope of the analysis.

Mr. Pardini directed participants to contact Ms. Gibson or Dr. Leefers if further questions arise.

**Discussion of Decision Item Three: IMPLAN Year of Analysis**
The third and final decision item for participants to discuss was what year to use for analysis and reporting. The data available from IMPLAN will be from 2017, which means that during the analysis and by the time the final report is issued, the data could appear to be less relevant. To counteract this, economists will frequently adjust the dollars for inflation and convert them to those of a different year.

Dr. Leefers presented the three options for analyzing and reporting data. Option one was to use IMPLAN data from 2017 for the analysis and reporting. Option two was to use IMPLAN data from 2017 for analysis and a different year for reporting (e.g., 2020). The third option was to use IMPLAN data from 2017 for analysis and reporting, but to also report the data in 2020 terms. Dr. Leefers provided examples of how each of these options might look when applied to the reporting of economic contribution. He recommended always conducting analysis in the year of data collection, which in this case is 2017. The project team’s recommendation was to use only IMPLAN data from 2017 for the analysis and reporting (option one), so there is no converting back and forth between the years.

Mr. Pardini noted time was running short for the webinar and encouraged participants to share pressing questions. He also noted that additional questions or comments could be sent via email, if needed.

To allow participants additional time to consider the three decision items presented during the discussion, Mr. Pardini explained that decisions would be made after the conclusion of the webinar and instructed participants to wait to receive instructions from the project team.

**Discussion of Forest Product IMPLAN Sectors**

In preparation for the next webinar, Ms. Gibson explained that participants needed to determine which sectors to include in the analysis. She noted that the team will be asked to review proposed IMPLAN forestry sectors and provide comments on the list of sectors to be included in advance of the next webinar. Ms. Gibson gave participants a brief overview of the proposed IMPLAN forestry sectors.

A participant asked whether, when entering data in the spreadsheet, individuals should identify whether they are from a primary or secondary sector industry. Dr. Leefers responded that participants should only identify which specific sectors they are from and subsequent discussion at the next webinar will determine whether an industry is primary, secondary, or a different sector classification.
Ms. Gibson called attention to handout eight provided, which contained IMPLAN codes, and noted that the more specific digits narrow the industry into products. She noted that the team can crosswalk the process between codes. Dr. Leefers added that if a person does not know product-type codes, they can enter the product in the spreadsheet to find the specific code.

Project Team Meeting Two
On Monday, January 28, 2019, from 10:00 AM to 12:00 PM EST, PSC hosted the second team meeting to discuss what IMPLAN sectors would be included in the economic analysis. Project team members present were David Neumann and Dr. Jagdish Poudel, MDNR; Dr. Larry Leefers, Michigan State University; Melissa Gibson, Eric Pardini, Mark Coscarelli, and Alec Esparza, PSC. State partner project team members present were Douglas Emmerthal, Connecticut Division of Forestry; Sam Topper, Delaware Forest Service; Paul Deizman, Illinois DNR; Jeff Settle, Indiana DNR; Aaron Flickinger, Iowa DNR; Donald Mansius, Maine Forest Service; Sean Mahoney, Massachusetts Department of Conservation and Recreation; Mike Morris, Missouri Department of Conservation; Kristen Bergstrand and Scott Burns, Minnesota DNR; Samantha Hensen and Bill Zipse, New Jersey Forest Service; Jared Craig, Ohio DNR; Ben Livelsberger, Pennsylvania Department of Conservation and Natural Resources; Andrew Fast and Jim Frohn, UNH Extension; Paul Frederick, Vermont Department of Forest, Parks, and Recreation; Katherine Zall, West Virginia Division of Forestry; and Sabina Dhungana, Wisconsin DNR.

Prior to the webinar, a survey was sent to the project team to gain input of the opinions and preferences for each decision item. All 19 states responded to the survey, with the majority responding to every question posed to the group.

Decision Item One: Methods One and Two
Ms. Gibson recapped the first decision item. She reiterated that the project team recommended using method two (additional discussion of both methods is provided in the summary of webinar one) for the economic contribution analysis. The results of the survey distributed following the webinar indicated that participants agreed with the proposed use of method two. Respondents raised no additional questions or concerns.

Decision Item Two: Methods for Regional Analysis
The second decision item discussed was which approach was to be used for multistate regional analysis (additional discussion of this decision item is available in the webinar one summary). The project team’s recommendation was to use approach two. Everyone who responded to the survey agreed with the recommended approach.
Regarding approach two, one participant asked whether it would be possible to add state results to create subregional reports, or would another subregion need to be created. The participant also asked that if a subregion needed to be created, would the data be available, and how much work would that require? Ms. Gibson replied that approach two would require the creation of a new subregion and that this analysis would be outside of the scope of this report.

**Decision Item Three: IMPLAN Year of Analysis**

The third decision item discussed was what year the project team should use for conducting the analysis and reporting results. The project team’s recommendation was to use 2017 IMPLAN data for analysis and reporting (full discussion of the different options presented is available in the summary from webinar one). All participants responded that they were able to accept the use of 2017 as the year for analysis and reporting.

A participant commented that the project team should provide states with an inflation rate for 2020, so results could be communicated using current values. Ms. Gibson noted that this could be provided and reminded participants that such rates could only apply to dollar values, not employment numbers.

Another participant raised a concern about what the individual state outputs would be, given that they will be broken out of the 20-state analysis and there will be interstate linkages. This participant stated they would like to see caveats on individual state information to clearly understand what the analysis includes and excludes, as well as how state data and interstate linkages were determined when split out of the regional analysis. Ms. Gibson responded that those caveats will be included in the individual state reports and noted that interstate linkages would only be available in the regional analysis. A multistate input-output analysis would account for the contributions one state makes to other states, but splitting out the interstate linkages in each individual state report is beyond the scope of this analysis.

**Discussion of Forest Products IMPLAN Sectors**

To lead the next portion of the discussion, Mr. Pardini introduced Dr. Larry Leefers. Dr. Leefers explained that he would be going through IMPLAN sectors presented in an Excel worksheet. He noted that the worksheet was distributed to participants ahead of the meeting and could also be viewed through the webinar. Participants were asked to comment on which sectors or partial sectors should be included in the analysis. Dr. Leefers noted he would first provide an overview of the types of North American Industry Classification System forest product IMPLAN sectors, then discuss the sectors in depth. NAICS is a standard used by federal statistics agencies to classify industries for the purpose of collecting and analyzing statistical data.
Two documents were used for reference in this section: NAICS Codes for Products—Industries Suggested by States and Questions for States Based on Sector Spreadsheet Responses. Dr. Leefers reminded participants that there are no incorrect answers for whether a sector should be included and that the group simply needed to reach agreement. Dr. Leefers also stressed that if a partial sector approach is decided for a particular sector, the group must eventually decide what fraction of the data will be included in analysis. Dr. Leefers concluded his introduction by stressing that companies self-report some data, and that should be kept in mind when considering data and how certain industries classify themselves. He noted, however, that aggregation tends to smooth out the fine details and differences of classification.

**Sectors with Full Agreement**

There were 25 sectors that almost all participants agreed should be included in the analysis. Dr. Leefers described how the cells containing the sectors with full agreement were highlighted in yellow on the Excel spreadsheet. Dr. Leefers also noted how some states marked their responses with Xs on the Excel sheet and the team used their best judgment in determining what those meant.

Dr. Leefers then turned participants’ attention to sectors that a small number of participants said to include.

At least two participants wanted to include sector 371, Other Household Non-Upholstered Furniture Manufacturing. Dr. Leefers clarified that sector 371 could be thought of as nonwood furniture manufacturing (and sector 370, Non-Upholstered Wood Household Furniture Manufacturing, as wood furniture manufacturing) and as such, the project team would recommend not including sector 371 in the analysis. The floor was then opened to discussion on this recommendation. Participants agreed with the recommendation not to include sector 371 in the analysis.

Dr. Leefers then proceeded to discussion of sector 375, Office Furniture, except Wood, Manufacturing. Several participants responded that they would like at least part of this sector included in the report. Dr. Leefers explained that sector 375 is nonwood office furniture manufacturing and sector 373 is Wood Office Furniture Manufacturing. The team recommended not including this sector in the analysis. The floor was opened to discussion, and there were no objections to excluding sector 375.

**Possible New Sectors**

Next, Dr. Leefers presented additional sectors that participants suggested to include the analysis. In response to the survey, participants suggested including 13 sectors:

- 49, Electric Power Transmission and Distribution
- 145, Wood Pellet Manufacturing
- 16/134, Mulch (made from roundwood not as a sawmill byproduct), Landscape/Agricultural Mulch, Chips, Etc.
- 165, Other Basic Organic Chemical Manufacturing
- 165, Witch Hazel Extract
• 173, Pharmaceutical Industry
• 364, Boat Building
• 378, Blinds and Shades
• 390, Musical Instruments
• 393, Burial Casket Manufacturing
• 399, Retail—Building Materials and Garden Supplies
• 411, Truck Transportation
• 531, State and Local Government Payroll

Dr. Leefers explained that for additional sectors to be included in the analysis, the project team would first need to ensure that the sectors are part of the forest products industry (as a product or a support sector) or that new products are not already included in the IMPLAN data.

For sector 49, Electric Power Transmission and Distribution, PSC commented that this is a support or delivery sector of the product, and as such, it is not included in the analysis. The project team recommends to not include the sector in analysis. One participant asked whether they could include it in their state analysis, but not in the regional analysis. Dr. Leefers responded that the analysis is trying to do a consistent coding method, but an individual state could add this to their own reporting. Participants agreed to not include sector 49.

For sector 145, Wood Pellet Manufacturing, Dr. Leefers noted that this is an emerging sector in NAICS. Wood pellets are already in analysis within a different sector, so sector 145 is redundant for this analysis. Participants agreed to not include sector 145.

Mulch was the next item of discussion. Dr. Leefers referenced a document emailed to participants, where mulch was classified as 145, but the production of chips comes from two other sectors, either at a logging site or a sawmill site. As such, mulch is already included in the analysis where chips are mentioned, so again, there is no need to create additional sectors. One participant asked how mulch from a different, urban wood source is recorded. Mr. Neumann responded that it depends what industry sector the manufacturing firm reports under; for instance, Owen Tree Service is a Michigan-based tree service that produces Scotts Miracle-Gro and reports under fertilizer industry codes. The challenge is separating out a company’s wood manufacturing component from its other, nonwood manufacturing. That will have to be addressed in future work to determine appropriate ratios and estimates, as this work is beyond the scope of this analysis.

One participant asked whether it can be mulch if it is possibly a byproduct of manufacturing or logging. Dr. Neumann responded that those residue captures are already being reported in the analysis under forestry services and logging services.

Dr. Leefers combined the next three sectors (165, Witch Hazel Extract; 165, Other Basic Organic Chemical Manufacturing; and 173, Pharmaceutical Industry) into one discussion. The question for these sectors is how much product comes from forests and how much from other sources. Dr. Leefers noted
that data for this differentiation is not available and that a state could include the industries in their narrative if they knew what portion of it is from the forest products sector. Mr. Neumann pointed out that states can provide data already available in other studies, as well as information regarding number of jobs and total sales. A participant noted that data could be easily acquired. Another participant added that they have enough data to include those sectors in their narrative.

One participant asked which part of witch hazel is not associated with wood. Dr. Leefers responded that it all is, but the problem is figuring out how much witch hazel there is, as it does not have its own NAICS code.

The next sector discussed was sector 364, Boat Building. A NAICS code exists, but there is no NAICS code for wood boat building. The project team’s recommendation is to not include this, unless another state has a method of distinguishing these two sectors from each other. Representatives from individual states commented that they can include their available data in their reports.

Dr. Leefers combined the next three sectors (378, Blinds and Shades; 390, Musical Instruments; and 393, Burial Casket Manufacturing) into one discussion. For each of these sectors, the issue is how to determine the wood component. This information may be better suited for inclusion in the narrative.

One participant asked if a percent of the industry that is related to wood would be useful, as the challenge is determining what percent of the broader sector used. This data was not known to be available.

For sector 399, Retail—Building Materials and Garden Supplies, Dr. Leefers noted that these are end-market, retail contributors, so they are usually not included in these analyses, and that is the recommendation of the project team. There were no objections.

For sector 411, Truck Transportation, Dr. Leefers noted that this is already included in a production function sector.

One participant was curious how the team is clear on trucking from forest to manufacturer and of products to end-user. Dr. Leefers clarified that such data should be made clear in the recording methods.

For sector 531, State and Local Government Payroll, Dr. Leefers explained that there are a lot of aspects of government that provide services to various sectors (e.g., MDNR). He explained that those analyses are beyond the scope of this analysis. There were no objections from the group.

**Partial Sectors**

The next portion of the discussion related to sectors for inclusion in the report was focused on partial sectors. These are NAICS sectors where only a fraction of total output relates to the forest industries.
Dr. Leefers explained that the official definition of sector 19 is Support Activities for Agriculture and Forestry. The project team recommended including only the support activities for forestry, not agriculture. There were no disagreements with this approach from participants.

Dr. Leefers explained that sector 47, Electric Power Generation—Biomass, is not primarily wood based in all states in the region. The recommendation from the project team is to use the U.S. Energy Information Agency (U.S. EIA) data to differentiate and determine what amount of biomass energy generation comes from wood in each participant’s state.

Two participants were interested in obtaining the U.S. EIA data’s source and location. Mr. Pardini noted that the project team will send that to participants via email after the webinar.

One participant asked how to compare the intensity of manpower needed in electricity generation methods. Mr. Pardini noted that the U.S. EIA data should provide the appropriate level of detail. Mr. Neumann suggested that biomass from agricultural sources would require similar manpower as biomass from other materials and wood. Dr. Leefers noted that a limitation of this data and IMPLAN sector methods is that if materials such as corn cobs and wood chips are classified together, the data needs to note that biomass from agricultural sources and biomass from other materials were differentiated.

Another participant asked if International Organization for Standardization (ISO) New England data could be used to look at electricity generation data for a state. Mr. Pardini responded that U.S. EIA includes national, regional, state information, whereas ISO New England data only covers a few states in the northeast and will not provide a complete regional picture.

For sector 143, Manufactured Home (Mobile Home) Manufacturing, Dr. Leefers stated that not every state has such a sector. At least 12 participants responded that this entire sector should be included, two participants said do not include it, and a few other participants responded that only a part of the sector should be included. The recommendation from the project team is to include this sector in its entirety. Mr. Neumann discussed how this entire sector has been included in past analyses. Dr. Leefers remarked the variance in sector size across various states in the region.

One participant asked if the sector includes modular homes. Mr. Neumann responded that if it is made in the factory and then shipped, it is probably included in the sector, but the project team can follow up on that question.

The project team recommended to include the entirety of sector 369, Upholstered Household Furniture Manufacturing. No objections were raised to this recommendation.

For sector 372, Institutional Furniture Manufacturing, the project team recommended including the sector as a partial sector, as the official NAICS code includes nonwood manufacturing, but wood-only data can be found. One participant asked where additional data for this sector can be found. Mr.
Neumann responded that a Google search of the company usually yields results, with websites like Manta, Buzzfile, and Bloomberg also proving useful.

Multiple responses to the survey asked to include sector 372 as a partial sector. There were no objections to including it as a partial sector.

For sector 376, Showcase, Partition, Shelving, and Locker Manufacturing, most participants responded in favor of a partial sector inclusion, including the wood-only sections. This aligned with the project team’s recommendation, and part of sector 376 will be included in the analysis.

**Industry Groupings**

The next portion of the discussion related to how the project team would group various sectors together. Groupings are especially useful when working with a large number of sectors and help make the data easier to digest and communicate.

Dr. Leefers explained how industry groupings were developed out of a desire to aggregate the reporting data from 30 or more sectors. The seven industries listed are forestry; logging; primary solid woods products; secondary solid wood products; wood furniture; pulp, paper, and paperboard; and secondary paperboard and other paper products.

A participant stated they would like a poll to weigh in on the proposed industry groupings. Mr. Pardini responded that a poll would be sent out to all participants regarding the groupings so an official decision could be made in time for the next webinar.

One participant noted that they would like to separate pulp from paper and paperboard, as there is a general confusion among policymakers regarding the two products and production methods.

Another participant was curious if there was a recommendation to separate wood-based power from solid wood products. Mr. Neumann clarified that no, wood-based power would not be separated from primary solid wood products.

**Project Team Meeting Three**

On Wednesday, March 6, 2019, from 10:00 AM to 12:00 PM EST, PSC hosted the final webinar. The purpose of this webinar was to continue the discussion of the forest products industry groupings and to provide an overview of the draft report layout for the state and regional reports. Project team members present were David Neumann and Dr. Jagdish Poudel, MDNR; Dr. Larry Leefers, Michigan State University; and Melissa Gibson, Eric Pardini, and Alec Esparza, PSC. State partner project team members present were Douglas Emmerthal, Connecticut Division of Forestry; Sam Topper, Delaware Forest Service; Jeff Settle, Indiana DNR; Aaron Flickinger, Iowa DNR; Sean Mahoney, Massachusetts Department of Conservation and Recreation; Mike Morris, Missouri Department of Conservation; Kristen Bergstrand, Minnesota DNR; Samantha Hensen and Bill Zipse, New Jersey Forest Service; Ben Livelsberger, Pennsylvania Department of Conservation and Natural Resources; Andrew Fast and Jim
Frohn, UNH Extension; Ed Cesa, USDA Forest Service; Kawa Ng, United States Forest Service; Paul Frederick, Vermont Department of Forest, Parks, and Recreation; Clinton, West Virginia; and Sabina Dhungana, Wisconsin DNR.

Prior to the webinar, the project team was surveyed to gather input. All 19 partner states provided feedback, with most responding to every question posed. The following section provides a thorough review of the survey findings and discussion.

Survey Findings

Ms. Gibson explained that during the last webinar, participants asked the project team to solicit input on the forest products groupings to be used in the report development. She noted that this survey was sent out following the webinar. The project team proposed grouping the forest products into the following seven categories: forestry; logging; primary solid wood products; secondary solid wood products; wood furniture; pulp, paper, and paperboard mills; and secondary paperboard and other paper products. The project team also proposed which the sectors would go into each grouping. The surveys asked participants if these groupings were satisfactory. Ms. Gibson added the explanation that the appendix of the report will provide more in-depth data tables that could be used for various levels of reporting.

Of 20 total participants, 13 responded to the survey, and there was nearly full agreement with the proposed groupings. Some participants proposed slight changes to the industry categories, but these participants also expressed they understood that the final report will be at the regional level and their changes were more state-specific.

One respondent asked why primary solid wood products was changed from its previous listing as primary solid wood products and wood-based power. Ms. Gibson answered that this change was just a wording change and an attempt to be more specific in the naming of categories. Dr. Leefers commented that in previous sector categorization efforts, wood-based power was recognized as an important sector. However, it is currently a very small sector and was removed because its size does not justify being included in a category title.

One participant asked how wood pellets and firewood are included in the sectors. Ms. Gibson answered that these are in sector 145, All Other Miscellaneous Wood Product Manufacturing, which will be included in the analysis.

Another participant asked if truck transportation could be included as a partial sector for logging. Ms. Gibson noted that the project team planned to include truck transportation as an indirect effect in the model due to the difficulty in pinpointing the transportation that is connected to logging alone. The project team also discussed elevating truck transportation in the report, possibly in a subsection.

One participant asked if the wood power sector data could be separated out for state reports, as it is a major market in some states and will need to be broken out. Dr. Leefers responded that such
information will be separated in the appendix of the final report. It can also be highlighted in several ways in the main section of the final report, as can numerous sectors that participants feel deserve more discussion.

Another participant expressed interest in removing maple syrup from the forest category and listing it on its own to avoid confusion. Dr. Leefers described that if the NAICS codes were redesigned today, maple syrup may be differentiated from agriculture, but as of now, this is not the case. He then described three options for presenting maple syrup production in the report: on its own and separate from the forest category, combined with the forest category, or combined with the forest category and called out individually in the text and appendix.

Ms. Gibson then outlined which sectors would be included in which industry groupings and presented participants’ feedback on the proposed categorization. One objection raised was regarding IMPLAN sector 369, upholstered household furniture manufacturing. The participant said that the sector should only be included as a partial sector. Dr. Leefers responded that NAICS codes can be used to determine the wood component of that sector.

Ms. Gibson then noted several sectors that participants agreed should not be included in the categories of this study. These sectors were: 49, Electric Power Transmission and Distribution; 145, Wood Pellet Manufacturing; 16/134, Mulch (made from wood not as a sawmill byproduct), Landscape/Agricultural Mulch, Chips, etc.; 165, Other Basic Organic Chemical Manufacturing; 165, Witch Hazel Extract; 173, Pharmaceutical Industry; 364, Boat Building; 378, Blinds and Shades; 390, Musical Instruments; 393, Burial Casket Manufacturing; 399, Retail—Building Materials and Garden Supplies; Truck Transportation; 531, State and Local Government Payroll. Individual states can still provide supplemental information in their reports to highlight these sectors if the sectors are important to their state.

Review of Report Template

Next, Ms. Gibson explained that participants needed to discuss the report template. A draft template was sent out to participants prior to the meeting for participants to review. Ms. Gibson reviewed the draft report template and explained that Appendix B would contain the data for each independent sector, which individual states could then refer to if they had sector-specific questions. She added that the project team would try to put most information regarding methods in Appendix A, rather than in the main body of the report.

Ms. Gibson then presented an example of the report that PSC will produce, highlighting the ability for the report to be ADA-compliant. She first discussed the general layout of the executive summary, as well as what information individual states will submit for consideration in the executive summary.

One participant asked if it makes sense to include boilerplate language on methods that is shared. Ms. Gibson explained that PSC will provide a lot of boilerplate language in these reports, with the data being
the unique aspect of most reports. She estimated that 60 to 70 percent of the report will be boilerplate, with the remainder being information unique to individual states.

One participant was curious if all reports will be made available on the Northeast–Midwest State Foresters Alliance (NMSFA) website, as some states will present information on their websites, but not in this specific format. Mr. Neumann explained that the contract with PSC specifies that PSC will deliver white papers to the MDNR, which is then responsible for creating and distributing short draft bulletins distilled from the white papers to individual states. The MDNR is also responsible for final formatting and publication of the regional report, but the project group has not yet discussed publication of the individual reports or coordination with NMSFA.

Another participant asked if it makes sense to put so much content into the state white papers if PSC will ultimately be writing the final white paper. Mr. Neumann responded that the goal is for PSC to write as much of the reports as possible, and the reports can be revised by the DNR or other project partners from there. But the intent is to provide consistency in the baseline reports to allow for various types of comparisons. Ms. Gibson noted that this report will be more than a research report; rather, it will be a report that state agencies will be able to publish immediately if desired. She highlighted that the final report will not be marketing material.

Ms. Gibson then described the general content of the introduction section of the report, followed by an outline of the report section, “Forest Resources of (Region/State).” She noted that infographics for this section could be useful, but they present additional challenges when making the report ADA-compliant. Mr. Neumann noted that including tabular data could be a way to simplify satisfying ADA compliance requirements. A participant confirmed that accessibility would be required since this project receives federal funding.

One participant suggested that having Excel files containing data can help the project team meet a variety of needs. Ms. Gibson responded that Excel files will be provided to states for that purpose.
Ms. Gibson then described the content of the Forest Products Industries section of the report, including total employment comparisons. She then described the next section of the report, titled, “Economic Contributions of the Forest Product Industries to (Region’s/State’s) Economy,” and its subsections, including definitions of economic contributions and results of economic contributions.

One participant asked how this report compares to the southern regional report that was completed a few years prior. Dr. Poudel and Mr. Neumann responded that the report in question was likely a different sort of document, so comparison might be difficult. But the project team can locate that southern report, distribute it to participants, and review to ensure that the outline of this northern region report is appropriate. Dr. Leefers noted that making those direct comparisons are likely unnecessary, due to the wide differences between the two reports. Ms. Gibson noted that the analysis in the southern region report is also different from the type of analysis being done in this report.

Ms. Gibson noted that the project team may want to add subsections for industries affected by certain products, such as noting that trucking is particularly impacted by the forestry industry. This could be noted for two or three top industries affected by each category, as well as industries that states specifically want to highlight.

Another participant asked why pulp, paper, and paperboard mills are combined, and what the group’s thoughts were regarding breaking out pulp as its own industry group. Mr. Neumann responded that pulp, paper, and paperboard will be broken out in the appendix in IMPLAN sector 146, pulp mills, which will allow state-level reports to address that data as they see fit. He also noted that one aim of the classification system was to differentiate primary and secondary manufacturing.

Ms. Gibson noted that the report will also include a subsection comparing states, possibly in terms of employment numbers or forestry output. Dr. Leefers raised the possibility of comparing states included in the report to their neighboring states. Ms. Gibson noted that this would include a ranking for the region report and comparison to neighbor states for the state reports. More detailed information regarding how states compare will be available in the appendix of the report. If states could provide a list of states that they would like to include in their state comparison, that would be helpful.

Ms. Gibson then described the next section of the report, titled, “Supplemental Economic Contribution Information.” Mr. Neumann then said that the project team will ask states to provide the text and data that they would like to include in this section. Ms. Gibson explained that the project team will reach out to participants later in the summer in order to receive template and methods feedback and review. That review will serve as the go-ahead for states to begin data collection and writing in July and August. Dr. Leefers stated that “data” might not necessarily be quantitative information but can also include text describing the prevalence or importance of a sector.

One participant noted that it would be good to show how forestry industries compare with manufacturing or other manufacturing sectors. Ms. Gibson noted that total forest industries
comparisons will be included in the earlier section of the report titled, “Forest Product Industries.” Dr. Leefers highlighted that the project team would need to be specific in their comparisons, as not all forest product industries are manufacturing industries.

One participant posited that gross state product (GSP) may be more important than jobs, considering employment challenges and the fact that mills are actively trying to reduce the number of employees needed for operation. The project team responded that they can include both employment and GSP in the report.

Ms. Gibson then provided an overview of the general structure of the report’s references section, followed by a description of Appendix A, which will include explanations of input-output analysis, as well as definitions of terms, methods, and data sources. Ms. Gibson then described the outline of Appendix B, which includes economic contribution results, direct and indirect contributions, industries affected, and more economic measures. This section will differ between the regional and state reports, and the outline will describe those differences.

One participant asked if the information from this section will be broken out. Dr. Neumann confirmed that the information will be in spreadsheets, which will allow states to locate the data they want.

One participant suggested including percent of totals. Dr. Neumann stated that including such a measure would require doing so for each measure for each sector, effectively doubling the number of columns. Ms. Gibson suggested that if the team wanted to include a percentage column, they would want to decide for which single data measure that would be included, and the team would need to obtain consensus on that decision. Dr. Leefers pointed out that such an analysis is more fitting of the narrative a state may want to build, and is not necessarily vital data.

Ms. Gibson then presented supplemental information that participants noted they would include in their reports. These included timber price trends, firewood, witch hazel, and other related forestry products. She then explained that the regional report will include discussion of additional sectors that are not included in the report but could be added in the future upon the availability of the necessary data.

Ms. Gibson concluded this section of the webinar with a presentation of the services and reports PSC can provide, showing participants an example report from PSC. She highlighted the ADA compliance, color schemes, and diverse images that PSC can integrate into these products.
**Review Timeline**

Mr. Neumann presented participants with the general timeline for this project, as well as reviewed what is expected of participants to stay on track with this timeline. PSC will summarize the content of the webinars in a white paper report and provide a draft report template. Drafts of these documents are due to the MDNR by May 15, 2019. Mr. Neumann and Dr. Poudel will distribute this draft for participants to review, and concerns from participants can be discussed at the next NMSFA Utilization & Marketing meeting. PSC will finalize the report and template, considering comments from participants, by June 30, 2019. Analysis will begin in July of 2019, with a draft regional level report due December 1, 2019. Participants will then review and comment on the draft regional report and a final report will be completed by April 1, 2020. State-level draft reports will be written during the summer of 2019, with drafts due by January 30, 2020. Those state-level draft reports will be distributed soon after January 30, 2020, for review by individual states. After consideration of comments from participants, final drafts of state reports will be written by PSC by April 30, 2020. PSC will provide a progress report in February 2020, with a final presentation in spring 2020.
# Appendix B: Impact Contribution Studies from Participating States

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Appendix C: Webinar One Background Reading Material

In preparation for the first webinar, Public Sector Consultants identified several readings (including three recent Journal of Forestry articles) and related material to help the project team focus on decision items on the agenda. PSC recommended reading in sequence. Two of the readings were optional but may be of interest to some team members.

First Reading (Required)


Abstract: Economic contributions from forestry and forest products help define the importance of this industry to a state or regional economy. IMPLAN input-output modeling software has proven helpful to conduct this analysis and is commonly used in the United States. However, input-output modeling and the results of economic impact or contribution analyses can vary substantially, depending on the modeling assumptions of the analyst, creating confusion among end users as comparisons are made among studies. Southern Regional Extension Forestry and the Southern Group of State Foresters invited forest and regional economists from the Southern Region to a summit in Little Rock, Arkansas, in 2015 to discuss concerns and issues with respect to collection, calculation, and delivery of information on the economic role of forestry and the forest products industry to the southern region. This article discusses major issues identified and recommendations suggested at the Little Rock Summit.

PSC note: The article evolved out of a 2015 meeting of forest economists and other stakeholders in the southern U.S. Their ongoing work provides a foundation for this project. The article highlights the difference between economic impact and economic contribution analysis and touches on other topics the project team will discuss (e.g., definition of forest industries).

Second Reading (Required)

Abstract: The forest products sector plays an important role in regional economies in the United States. Although direct economic contribution values are relatively easy to estimate and compare across states, several modeling- and data-related assumptions used in contribution analysis create variations among states that can be difficult to explain. Economic contribution analysts were surveyed to understand variations in methodologies used in conducting economic contribution analysis of the forest products sector. Survey results suggest that although analysts were generally consistent with direct effect sector selection of traditional forest industries (e.g., logging and sawmills) in the IMPLAN sector scheme, several variations were noted in decisions to include or exclude nontraditional forest industries that produce engineered wood products, among others. Likewise, there were subtle differences in opinions on which institutions to include in the social accounting matrix. Some policy-related suggestions were provided for consistent reporting.

PSC note: A key finding of this survey research was identifying the industry sectors used by analysts in different states across the southern U.S. The researchers also noted sectors that were rarely used. This project will develop a consensus of sectors to be used across the northern U.S. Though not discussed, an include-exclude option on industry sectors is not the only choice; partial sectors are also a possibility (e.g., “support activities for agriculture and forestry” may focus only on the forestry component). The seventh reading gives specific examples for our discussion.

Third Reading (Required)


Abstract: State agencies and universities often use IMPLAN software and data to quantify economic contributions of forest product industries in specific regions. Since IMPLAN software is designed to estimate economic impacts rather than economic contributions, adjustments have to be made to the direct effect values to avoid overstating the results of the analysis. Two economic contribution analysis approaches are most common: internal adjustments to the IMPLAN software and external adjustments of the input values by using output multipliers. Results suggest that both methods of contribution analysis produce similar total effects, but their approaches of handling direct effects are substantially different. The strengths and weaknesses of each method are discussed, and the importance of adjustments to obtain economic contribution estimates as opposed to economic impact estimates is highlighted. Furthermore, practitioners are cautioned to follow the steps carefully and explain which, between the two contribution analysis methods, was used in their analysis.
**PSC note:** This is a fairly technical article but highlights an important decision item for the project team—using method one or method two. PSC, in cooperation with the Michigan Department of Natural Resources, will make a recommendation based on recently completed analyses.

**Fourth Reading (Optional)**


**Abstract:** Industry economic contribution analysis is used to estimate the contribution of a sector or group of sectors to an entire economy. The methods presented here describes a technique that accounts for input bias that results when modeling output as a final demand. This type of bias can be corrected by adjusting the direct effect to account for indirect and induced effects a sector can have upon itself and other sectors of interest. This method uses model multipliers to account for this input bias by reducing the direct effect and is described for conducting both single and multiple industry economic contribution analyses.

**PSC note:** This is a background reading related to the third reading. It provides simple examples using matrix algebra and Excel.

**Fifth Reading (Skim Only)**


**Abstract:** South Carolina’s forests are one of the foundations of the state’s economy and define its natural resource environment. They represent the dominant landscape of the state and support many important manufacturing industries. Forests are renewable resources that contribute to the growth of the state, while providing its citizens desirable aesthetic, recreational, wildlife, water quality, and other environmental values. The South Carolina Forestry Commission initiated the 20/15 Project in cooperation with the Forestry Association of South Carolina and other partners to grow forestry’s economic impact from $17.4 billion to $20 billion by 2015. Forests contribute over $21 billion annually to South Carolina’s economy and provide employment to over 84,000 of its citizens.
PSC note: This study is a complete statewide report from outside the northern region that will be the focus of upcoming reports, and it provides a useful comparison to reports from our region (see the sixth reading, below). The report begins by offering some background material on South Carolina’s forest products industries, then it presents material related to contribution analysis. For reporting purposes, the authors aggregated IMPLAN sectors into six industries (they call them sectors, but this is somewhat confusing because IMPLAN also uses sectors). The data for the analysis were from 2015. For reporting, researchers inflated the dollars to 2017 values—this is a decision item for the project team as well.

Sixth Reading (Recommended Review of Your State’s Report)

See Word file: State Impact-Contribution Studies.docx

PSC Note: One or more links are provided to economic impact and/or economic contribution studies for each state. Members of the project team should read the report(s) specific to their state. This may add to professional understanding of unique features of the forest products industries in project team members’ states and what sectors may be most relevant for this project. PSC did not find reports for Delaware, Iowa, Nebraska and New Jersey. In those cases, a link to the American Forest and Paper Association website is provided—there is limited data on forest industries. If any team members find reports for their states not listed, please share them with Melissa Gibson at mgibson@publicsectorconsultants.com.

Seventh Reading (Recommended)

See Word file: Examples of IMPLAN Sectors and Industries.docx

PSC Note: This table summarizes forest products industry IMPLAN sectors used in Michigan and South Carolina (fifth reading) studies. It also includes sectors tabulated in the southern U.S. study (second reading).

Eighth Reading (Recommended)

See Word file: NAICS Codes and Descriptions for Selected Forest Industry Sectors.docx

PSC note: This table provides descriptions of sectors used in Michigan studies, including partial sectors.
Ninth Reading (Optional)


Abstract: The analysis in this article provides an update on the southern forest sector economic activity after the downturn experienced in 2008–2009. The analysis was conducted using Impact Analysis for Planning (IMPLAN) software and data sets for 2009 and 2011 and results from the USDA Forest Service Timber Products Output latest survey of primary wood processing mills. Although improving economic conditions are reflected by increased mill roundwood consumption during 2011, the forest industry’s economic contribution improved slightly but not across all states. At the regional scale, the sector displayed a downward trend in employment, value-added, and number of active primary mills.

PSC note: This article provides an example of a multistate analysis using IMPLAN data. IMPLAN sectors are aggregated into industries.
Appendix D: State-suggested NAICS Codes for Products

Industries

In reviewing IMPLAN sectors for inclusion, partial inclusion or exclusion, several conditions must be assessed:

- Is the sector/product part of a traditional forest products industry sector?
- Is it a new, emerging sector/product that is not included in existing (2017) IMPLAN data?
- Is the sector a forest products industry sector or a support sector?
- If it is a partial sector, do we have some “across-the-region” means of separating the “wood vs. non-wood” component?

Many of these sectors/products were mentioned in the text of the Journal of Forestry article on methodological variations; they were likely used by one or a few respondents.

NAICS source: https://www.naics.com/naics-code-description/

Sectors Noted by States

Electric Power Transmission and Distribution

- NAICS 221121—Electric Bulk Power Transmission and Control
- IMPLAN sector: 49

**Description:** This U.S. industry comprises establishments primarily engaged in operating electric power transmission systems and/or controlling (i.e., regulating voltages) the transmission of electricity from the generating source to distribution centers or other electric utilities. The transmission system includes lines and transformer stations. Note: Also, NAICS 221122—Electric Power Distribution (to final consumers).

**PSC Note:** This is a support sector. IMPLAN production functions link backwards to suppliers; forward linkages to wholesale and retail consumers a typically excluded from the manufacturing contribution analysis.

Wood Pellet Manufacturing

- NAICS 321999—All Other Miscellaneous Wood Product Manufacturing
- IMPLAN sector: 145

**Description:** This U.S. industry comprises establishments primarily engaged in manufacturing wood products (except establishments operating sawmills and preservation facilities; establishments manufacturing veneer, engineered wood products, millwork, wood containers, pallets, and wood container parts; and establishments making manufactured homes (i.e., mobile homes) and prefabricated buildings and components).
PSC Note: This is an emerging sector currently only listed in NAICS. The IMPLAN bridge table from NAICS to IMPLAN sectors does not include wood pellet manufacturing yet. The IMPLAN data team notes that Quarterly Census of Employment and Wages data were used, and that wood pellet manufacturing was included in Sector 145.

Mulch

- NAICS 321999—All Other Miscellaneous Wood Product Manufacturing
- IMPLAN sector: 145

Description: This U.S. industry comprises establishments primarily engaged in manufacturing wood products (except establishments operating sawmills and preservation facilities; establishments manufacturing veneer, engineered wood products, millwork, wood containers, pallets, and wood container parts; and establishments making manufactured homes (i.e., mobile homes) and prefabricated buildings and components).

PSC Note: This is an existing product (chips) which is captured in two different sectors.

Witch Hazel Extract and Other Basic Organic Chemical Manufacturing

- NAICS 325194—Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
- IMPLAN sector: 165

Description: This U.S. industry comprises establishments primarily engaged in one or more of the following: (1) distilling wood or gum into products, such as tall oil and wood distillates; (2) distilling coal tars; (3) manufacturing wood or gum chemicals, such as naval stores, natural tanning materials, charcoal briquettes, and charcoal (except activated); and (4) manufacturing cyclic crude oils or cyclic intermediates (i.e., hydrocarbons, except aromatic petrochemicals) from refined petroleum or natural gas.

PSC Note: This is in an existing sector, but likely only a small component. We will follow up to see if we have some “across-the-region” means of separating the wood component from the nonwood component.

Pharmaceutical Industry

- NAICS 325411—Medicinal and Botanical Manufacturing
- IMPLAN sector: 173

Description: This U.S. industry comprises establishments primarily engaged in (1) manufacturing uncompounded medicinal chemicals and their derivatives (i.e., generally for use by pharmaceutical preparation manufacturers) and/or (2) grading, grinding, and milling uncompounded botanicals.

PSC Note: Not clear on the specific request.
Boat Building
- NAICS 336612—Boat Building
- IMPLAN sector: 364

**Description:** This U.S. industry comprises establishments primarily engaged in building boats. Boats are defined as watercraft not built in shipyards and typically of the type suitable or intended for personal use. Included in this industry are establishments that manufacture heavy-duty inflatable rubber or inflatable plastic boats.

**PSC Note:** This is in an existing sector. In Michigan, the sector was historically based on wood, but in contemporary times, fiberglass and other materials have replaced wood. We will follow up to see if we have some across-the-region means of separating the wood component from the nonwood component.

Blinds and Shades Manufacturing
- NAICS 337920—Blinds and Shades Manufacturing
- IMPLAN sector: 378

**Description:** This industry comprises establishments primarily engaged in manufacturing one or more of the following: venetian blinds, other window blinds, shades; curtain and drapery rods, poles; and/or curtain and drapery fixtures. The blinds and shades may be made on a stock or custom basis and may be made of any material.

**PSC Note:** This is in an existing sector, but likely only a small component. We will follow up to see if we have some across-the-region means of separating the wood component from the nonwood component.

Musical Instrument Manufacturing
- NAICS 339992—Musical Instrument Manufacturing
- IMPLAN sector: 390

**Description:** This U.S. industry comprises establishments primarily engaged in manufacturing musical instruments (except toys).

**PSC Note:** This is in an existing sector, but likely only a small component. We will follow up to see if we have some across-the-region means of separating the wood component from the nonwood component.

Burial Casket Manufacturing
- NAICS 339995—Burial Casket Manufacturing
- IMPLAN sector: 393

**Description:** This U.S. industry comprises establishments primarily engaged in manufacturing burial caskets, cases, and vaults (except concrete).

**PSC Note:** This is in an existing sector. We will follow up to see if we have some across-the-region means of separating the wood component from the nonwood component.
Building Materials and Garden
- NAICS 444000—Building Material and Garden Equipment and Supplies
- IMPLAN sector: 399

**Description:** Industries in the Building Material and Garden Equipment and Supplies Dealers subsector retail new building material and garden equipment and supplies from fixed point-of-sale locations. Establishments in this subsector have display equipment designed to handle lumber and related products and garden equipment and supplies that may be kept either indoors or outdoors under covered areas. The staff is usually knowledgeable in the use of the specific products being retailed in the construction, repair, and maintenance of the home and associated grounds.

**PSC Note:** This is an end-market (retail) sector and not included in industry contribution analyses. Retail markets for furniture, paper, and so on are important, but beyond our scope. Moreover, separating the wood component would likely be challenging.

Truck Transportation
- NAICS 484000—Truck Transportation
- IMPLAN sector: 411

**Description:** Industries in the Truck Transportation subsector provide over-the-road transportation of cargo using motor vehicles, such as trucks and tractor trailers. The subsector is subdivided into general freight trucking and specialized freight trucking.

**PSC Note:** This is a support sector.

State and Local Government
- NAICS S00700—Employment and Payroll of State Government, Non-Education
- IMPLAN sector: 531

**PSC Note:** This is one of several government sectors that provide support to industries. However, they are not private industries, which are the focus of this project. It is possible to look at the economic contribution of forestry agencies, as we have done in Michigan.
Appendix E: Questions for States Based on Sector Spreadsheet Responses

Overall Notes

We included Sector 19—Support Activities for Forestry in the spreadsheet. It should have read Support Activities for Agriculture and Forestry. Hence, we used “partial” in Michigan to address the forestry component. We received responses of “all,” “partial,” and “yes” to this sector. This may be due to our miscommunication. We need to confirm that the consensus is to include only the forestry component.

Likewise, we included Institutional Wood Furniture Manufacturing, a subset (partial accounting) of Sector 372—Institutional Furniture Manufacturing, which should have been listed. We received varied responses here as well. We need to confirm that the consensus is to include only the wood component.

Several responses had “X’s” noted for sectors. Following the spreadsheet instructions, we treated these as “Yes” or “Include.” If you had a different use for the “X,” let us know.

Connecticut

PSC Questions

You left Paperboard Container Manufacturing blank. IMPLAN data indicates Connecticut has almost 1,200 jobs in this sector. Is there a reason you excluded it?

Additional products/sectors you noted are discussed in “NAICS Codes for Products-Industries Suggested by States.doc” file.

Delaware

PSC Questions

You included Electric Power Generation—Biomass as “partial.” IMPLAN has no jobs in this sector for 2017. Is something missing in the IMPLAN data?

You included Other Household Nonupholstered Furniture Manufacturing in your list. There is a sector Nonupholstered Wood Household Furniture Manufacturing that explicitly relates to wood-based furniture. IMPLAN data for 2017 shows ten jobs for the Wood sector and 48 jobs for the Other sector. Was there a specific reason for including the Nonupholstered Furniture Manufacturing sector?

Illinois

PSC Questions

You included Manufactured Home (Mobile Home) Manufacturing as a partial sector. Were there specific aspects of this sector that led to the “partial” response?

You included an “X” for Other Household Nonupholstered Furniture Manufacturing. Did you mean “Include” or “Yes” with this “X”?
Indiana

**PSC Questions**

You included Burial Casket Manufacturing in your list. Was there a specific reason for including it? Burial Casket Manufacturing includes wood and nonwood (generally steel) caskets. If this is included, we likely will have to determine how to include it as a partial sector. This will be discussed in the upcoming webinar.

Iowa

**PSC Questions**

You included Manufactured Home (Mobile Home) Manufacturing and Upholstered Household Furniture Manufacturing as partial sectors. Were there specific aspects of these sectors that led to the “partial” response?

Maine

**State Note**

“I don’t know the IMPLAN sector code, but the study should include log trucking. The contractor may need to make some assumptions about percentage of all trucking that is log trucking.”

**PSC comment:** Trucking is a support industry to commercial logging and many other sectors. As a result, it is part of the production process (indirect inputs). We will discuss this as part of the upcoming webinar.

**PSC Questions**

You did not include Forestry, Forest Products, and Timber Tract Production in your list. Was there a specific reason for excluding it?

You had “X” for most Furniture sectors; however, they do exist in the state (modest size). We are treating the “X’s” as “Include” for these sectors.

Maryland

**PSC comment:** You noted the following additional sectors: Boat Building, Blinds and Shades, Musical Instruments, Burial Caskets, Retail—Building Materials and Garden Supplies, and State and Local Government Payroll. These will be discussed during the upcoming webinar.

Massachusetts

**State Note**

“[It] may be appropriate for the Biomass Electric sector given that a majority of the generation capacity in the state is from municipal solid waste. Note: IMPLAN Sector 47—Massachusetts has 234 megawatts
of municipal solid waste incinerators compared to 16MW wood biomass. Not sure if IMPLAN sectors separate the two.”

**PSC comment:** IMPLAN 2017 data for Electric Power Generation—Biomass had zero jobs indicated for Massachusetts. NAICS 562213—Solid Waste Combustors and Incinerators is in IMPLAN Sector 471, Waste Management and Remediation Services. This is a very large sector. We will need to examine the power sectors more closely. Some of the western states may burn biomass, but it could be from agricultural residues.

“I didn’t see a code for arborists, but their firms are certainly a part of the forest industry and they are a major forestry employer here in Massachusetts.”

**PSC comment:** As David Neumann noted, urban forestry will be the focus of a new study across the region. NAICS 561730—Landscaping Services includes arboriculture along with many other components.

**PSC Questions**

You used “X” for Support Activities for Forestry; Upholstered Household Furniture Manufacturing; Other Household Nonupholstered Furniture Manufacturing; and Showcase, Partition, Shelving, and Locker Manufacturing. We are treating the “X” the same as “Include/Yes.”

Regarding Other Household Nonupholstered Furniture Manufacturing in your list, there is a sector Nonupholstered Wood Household Furniture Manufacturing that explicitly relates to wood-based furniture. Was there a specific reason for including the Other sector?

**Michigan**

**PSC Questions**

None.

**Minnesota**

**State Note**

“We had in past included electric power transmission and distribution in some of our IMPLAN analysis maybe something Minnesota just includes? Or a poll of state could be done?” There was also a note on how to determine specific partial sector percentages.

**PSC Questions**

You included Electric Power Transmission and Distribution, Other Basic Organic Chemical Manufacturing, and Truck Transportation on your list. These will be discussed as part of the upcoming webinar. Was there a specific component of Organic Chemical Manufacturing of interest?

Questions related to partial sectors in Northeast Minnesota will be discussed in the upcoming webinar.
Missouri

PSC Questions
None.

Nebraska

PSC Questions
You do have a modest Manufactured Home (Mobile Home) Manufacturing sector. Was there a specific reason for excluding it?

New Hampshire

State Note
“We included three sectors which do not exist in the state and are not making an economic contribution (136) Veneer and Plywood Manufacturing, (373) Wood Office Furniture Manufacturing, and (146) Pulp Mills. Given that this is baseline information that will allow us to monitor trends over time, I think there would be value in a report showing the sectors present as well as the sectors that are not present. In addition, when presenting results, you can inform the audience what sectors aren’t present in the state (this can be used in comparison studies between states and regions, etc.). Is there a disadvantage to including all the sectors?”

PSC comment: There are seven sectors that exist in Michigan that did not exist in New Hampshire in 2017 (data year), including two of the three you noted. How these are reported is part of the future discussions we will have. For example, if we aggregate sectors into industries (we did this in Michigan), then specific sectors are not highlighted in the main report; rather, details are put in the appendix. Then, we may reference the sectors as “regional sectors” where you would have zeroes, or we could have state-specific sectors only. This has yet to be decided, but there are several options.

“We would like to include (143) Manufactured Home (Mobile Home) Manufacturing and it seems like this would be a partial contribution. Previous studies show ‘all’ or ‘none.’ I would welcome any thoughts on why this would be ‘all’ or ‘none’ rather than ‘partial.’”

PSC comment: For 2017 in New Hampshire, IMPLAN has zero jobs associated with Manufactured Home (Mobile Home) Manufacturing. This raises an issue for all states. At some point, you will review data for your state; if there are concerns about missing data or grossly incorrect data, then we must address those issues with your help. In this case, is 2017 data missing for New Hampshire?
How do we/you decide on full or partial sectors? Experience/knowledge is the basis for recognizing sectors that are largely wood based or only partially wood based. In Michigan, we have been able to split some IMPLAN sectors into wood and nonwood components using six-digit NAICS codes. For some sectors, this is not possible. If we believe the wood component is relatively small, we would err on the side of excluding the sector if it cannot be split using some reasonable approach.

“We would like to add Wood Pellet Manufacturing and Landscape/Agricultural Chips, but am not sure what sectors these should reference. Also, some chips are a result of sawmill residues, but we have some mulch/chip, etc. manufacturers separate from sawmills that we would like to capture in the analysis.

**PSC comment:** These sectors will be discussed in the upcoming webinar. They are addressed in “NAICS Codes for Products-Industries Suggested by States.”

**PSC Questions**

None.

**New Jersey**

**State Note**

“There seem to be a lot of laboratories in New Jersey and we/our Connecticut neighbors have a witch hazel market as a component in a liquid more and was curious if New Jersey has the same trends/markets happening.”

**PSC comment:** As Dave Neumann noted in correspondence, this product is captured in NAICS 325194—Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing (IMPLAN Sector 165). There are almost 3,000 jobs in this sector. The challenge is separating out the wood-based component. If we cannot find a good means for separating out the wood component, this may be part of the descriptive supplemental information you provide. This will be discussed during the upcoming webinar.

**PSC Questions**

You included Other Household Nonupholstered Furniture Manufacturing in your list. There is a sector Nonupholstered Wood Household Furniture Manufacturing that explicitly relates to wood-based furniture. IMPLAN data for 2017 shows 441 jobs for the Wood sector and 116 jobs for the Other sector. Was there a specific reason for including it?

You included Office Furniture, Except Wood, Manufacturing in your list. There is a sector Wood Office Furniture Manufacturing that explicitly relates to wood-based furniture. IMPLAN data for 2017 shows
149 jobs for the Wood sector and 429 jobs for the Other sector. Was there a specific reason for including it? We will need to look into how to make it “partial,” if included.

Ohio
PSC Questions
None.

Pennsylvania
PSC Questions
None.

Vermont
PSC comment: You put “all” for most sectors, and had a number of blanks. There were also many “X’s.” We are treating the “X’s” as “Include/Yes.” We may need to discuss the “X’s” in more detail later.

West Virginia
PSC Questions
None.

Wisconsin
PSC Questions
You noted partial inclusion on biomass energy. This will be discussed during webinar.
You also say “no” on Upholstered Household Furniture Manufacturing, Institutional Wood Furniture Manufacturing, and Showcase, Partition, Shelving, and Locker Manufacturing. partial. All these sectors are present in your economy. Was there a specific reason for excluding them?
Appendix F: Forest Products Sector Suggested Addition—Maple Syrup

When we consider IMPLAN sectors for inclusion, partial inclusion, or exclusion, it is important to ask the following questions:

- Is the sector/product part of a traditional forest products industry sector?
- Is it a new, emerging sector/product that is not included in existing (2017) IMPLAN data?
- Is the sector a forest products industry sector or a support sector?
- If it is a partial sector, do we have some across-the-region means of separating the wood vs. nonwood component?

Though maple syrup production is part of the traditional forest products industry, it has often been excluded from economic contribution analyses. It is produced in the northeast and midwest United States, and the Southern state/regional analyses have not included it. It can be treated as a partial sector because government data are available across the region to separate it from other NAICS components within an IMPLAN sector.

PSC and the MDNR have discussed including maple syrup production in the analysis and recommend it as a partial sector. We would like your feedback on this recommendation. By Friday, February 15, we ask for you to do the following:

1. Review the material below and inform Dave Neumann (MDNR) of your agreement/disagreement of including maple syrup production as a partial sector.
2. Contact state representatives of this sector (e.g., industry associations, universities) to identify any economic impact/contribution studies that have been completed in your state. If studies exist, please forward them to Dave Neumann. For example, we found a study in Michigan that was completed several years ago on the further development potential of Michigan’s maple syrup industry. We will review any studies you find before proceeding with analysis should you decide to include this sector.

Maple Syrup Production

NAICS 111998—All Other Miscellaneous Crop Farming

Information on this NAICS code, including the full list of all other miscellaneous crop farming included in this sector, can be found at: https://www.naics.com/naics-code-description/

IMPLAN Sector 10

NAICS 111998 makes up a small portion of IMPLAN Sector 10. Maple syrup production makes up a portion of the overall NAICS 111998.
**Description**

This U.S. industry comprises establishments primarily engaged in one of the following: 1) growing crops (except oilseeds and/or grains; vegetables and/or melons; fruits and/or tree nuts; greenhouse, nursery, and/or floriculture products; tobacco; cotton; sugarcane; hay; sugar beets; or peanuts); 2) growing a combination of crops (except a combination of oilseed(s) and grain(s); and a combination of fruit(s) and tree nut(s)), with no one crop or family of crops accounting for one-half of the establishment's agricultural production (i.e., value of crops for market); or 3) gathering tea or maple sap.

**PSC Comments**

This is part of an existing sector (IMPLAN Sector 10). There are four NAICS descriptions associated with maple syrup production: maple sap concentrating (i.e., producing pure maple syrup in the field), maple sap gathering, maple syrup (i.e., maple sap reducing), and maple syrup mixing into other products. There are an additional 30 types of miscellaneous farming in this sector (e.g., alfalfa hay farming, mint farming). Fortunately, the National Agricultural Statistics Service (NASS) conducts an annual survey of maple syrup producers for its annual report (2018 report attached in the email). NASS data are used in the development of IMPLAN data sets. Pending review of state-specific reports sent to Dave Neumann, the NASS data provide a comprehensive data set that ties in well with IMPLAN (see Exhibit F1). For 2017, NASS estimated the value of maple syrup production to be $141 million, which was 6.6 percent of IMPLAN Sector 10’s value.
### Exhibit F1. IMPLAN to NASS Data Crosswalk

<table>
<thead>
<tr>
<th>State</th>
<th>Industry Code</th>
<th>Description</th>
<th>Employment</th>
<th>IMPLAN Sector Output</th>
<th>2017 NASS Maple Syrup Value</th>
<th>Percent of Output</th>
<th>% Applied to Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>10</td>
<td>All other crop farming</td>
<td>564</td>
<td>$9,882,476</td>
<td>$1,244,000</td>
<td>12.6%</td>
<td>71</td>
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<tr>
<td>Delaware</td>
<td>10</td>
<td>All other crop farming</td>
<td>394</td>
<td>$20,522,964</td>
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<td></td>
<td></td>
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<tr>
<td>Illinois</td>
<td>10</td>
<td>All other crop farming</td>
<td>1,715</td>
<td>$70,153,145</td>
<td></td>
<td></td>
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<tr>
<td>Indiana</td>
<td>10</td>
<td>All other crop farming</td>
<td>1,782</td>
<td>$55,751,446</td>
<td>$602,000</td>
<td>1.1%</td>
<td>19</td>
</tr>
<tr>
<td>Iowa</td>
<td>10</td>
<td>All other crop farming</td>
<td>887</td>
<td>$74,451,988</td>
<td></td>
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<td></td>
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<tr>
<td>Maine</td>
<td>10</td>
<td>All other crop farming</td>
<td>3,727</td>
<td>$49,498,928</td>
<td>$23,893,000</td>
<td>48.3%</td>
<td>1,799</td>
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<tr>
<td>Maryland</td>
<td>10</td>
<td>All other crop farming</td>
<td>2,317</td>
<td>$50,807,655</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massachusetts</td>
<td>10</td>
<td>All other crop farming</td>
<td>1,526</td>
<td>$17,384,684</td>
<td>$4,217,000</td>
<td>24.3%</td>
<td>370</td>
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<tr>
<td>Michigan</td>
<td>10</td>
<td>All other crop farming</td>
<td>5,806</td>
<td>$137,574,371</td>
<td>$5,632,000</td>
<td>4.1%</td>
<td>238</td>
</tr>
<tr>
<td>Minnesota</td>
<td>10</td>
<td>All other crop farming</td>
<td>1,727</td>
<td>$84,587,593</td>
<td>$932,000</td>
<td>1.1%</td>
<td>19</td>
</tr>
<tr>
<td>Missouri</td>
<td>10</td>
<td>All other crop farming</td>
<td>8,356</td>
<td>$185,731,445</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Nebraska</td>
<td>10</td>
<td>All other crop farming</td>
<td>2,762</td>
<td>$321,178,223</td>
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<tr>
<td>New Hampshire</td>
<td>10</td>
<td>All other crop farming</td>
<td>1,742</td>
<td>$16,111,561</td>
<td>$6,699,000</td>
<td>41.6%</td>
<td>724</td>
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<td>All other crop farming</td>
<td>1,483</td>
<td>$29,302,004</td>
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<tr>
<td>New York</td>
<td>10</td>
<td>All other crop farming</td>
<td>11,477</td>
<td>$266,865,051</td>
<td>$29,640,000</td>
<td>11.1%</td>
<td>1,275</td>
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<tr>
<td>Ohio</td>
<td>10</td>
<td>All other crop farming</td>
<td>8,671</td>
<td>$178,925,644</td>
<td>$3,080,000</td>
<td>1.7%</td>
<td>149</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>10</td>
<td>All other crop farming</td>
<td>13,613</td>
<td>$286,084,595</td>
<td>$4,768,000</td>
<td>1.7%</td>
<td>227</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>10</td>
<td>All other crop farming</td>
<td>160</td>
<td>$1,806,098</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vermont</td>
<td>10</td>
<td>All other crop farming</td>
<td>3,511</td>
<td>$71,195,290</td>
<td>$53,460,000</td>
<td>75.1%</td>
<td>2,636</td>
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<tr>
<td>West Virginia</td>
<td>10</td>
<td>All other crop farming</td>
<td>4,355</td>
<td>$34,157,028</td>
<td>$330,000</td>
<td>1.0%</td>
<td>42</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>10</td>
<td>All other crop farming</td>
<td>6,685</td>
<td>$174,808,273</td>
<td>$6,280,000</td>
<td>3.6%</td>
<td>240</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td><strong>83,258</strong></td>
<td><strong>2,136,780,462</strong></td>
<td><strong>140,777,000</strong></td>
<td><strong>6.6%</strong></td>
<td><strong>7,810</strong></td>
</tr>
</tbody>
</table>
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