FOREST PRODUCTS INDUSTRIES' ECONOMIC CONTRIBUTIONS TO MICHIGAN'S REGIONAL ECONOMIES 2016 UPDATE

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Forest Resources Division

IC4008-2 (06/05/2017)

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IC4008-2 (06/05/2017)

Executive Summary

Regional Summary of the Forest Products Industries' Economic Contributions to Michigan's Economy: 2016 Update

This report supplements a statewide report titled "*Forest Products Industries' Economic Contributions to Michigan's Economy: 2016 Update.*" It provides a regional perspective on the status of the forest products industries and supports monitoring of progress following the 2013 Governor's Forest Products Summit. The Michigan Department of Natural Resources (MDNR) and the Governor-appointed Timber Advisory Council developed five goals to encourage growth of the industries by 2018:

- Increase the economic impact of the timber industry to $20 billion.
- Increase exports of value-added forest products by 50 percent.
- Increase forest products jobs by 10 percent.
- Support existing industry.
- Encourage regionally based industry development.

This report provides county-based, direct economic contributions from forest products industries using county groupings that correspond closely to the MDNR's Forest Resource Division Regions. This report assesses industries' contributions using 2014 IMPLAN data. The statewide version of the report is the second in a series designed to help monitor progress toward the first three goals.

Contributions of Forest Products Industries to Michigan's Statewide Economy
As documented in the statewide forest products industries report, the forest products industries' contributions in 2014 were:

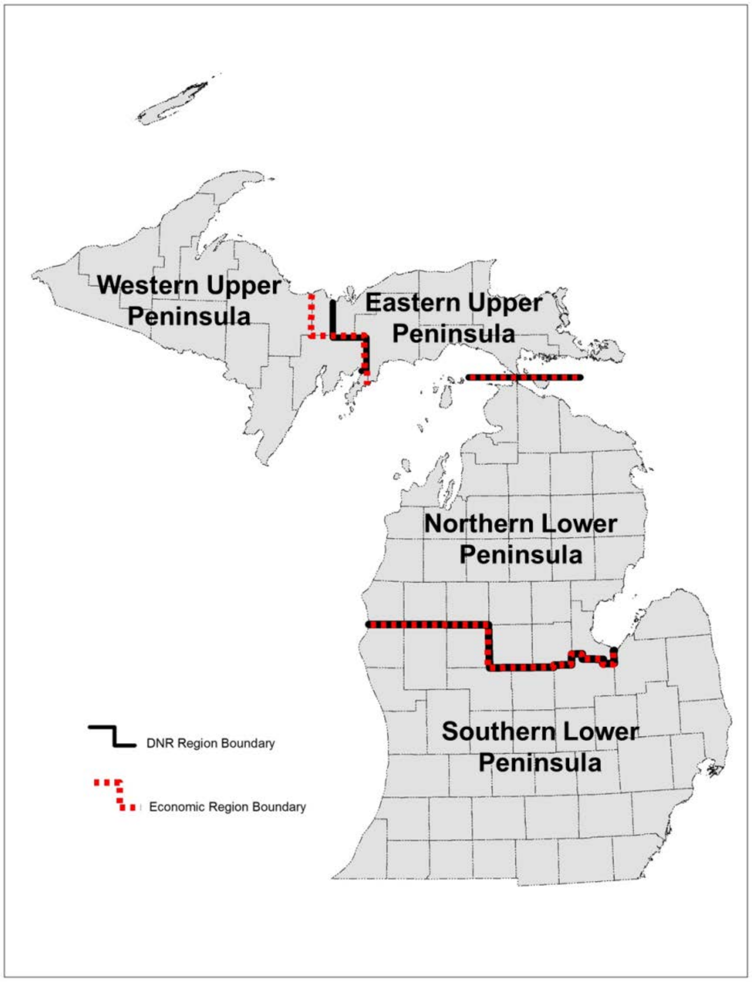
- $3.2 billion in direct value added, total value added of $7.7 billion.
- $11.6 billion in direct output or sales, total output of $20.3 billion.
- Over 38,000 direct jobs, and over 96,000 total jobs supported.
- $2.3 billion in direct labor income, $5.2 billion in total.

Contributions of Forest Products Industries to Michigan's Regional Economies
Forest products industries provide a significant portion of manufacturing jobs in Michigan, and these industries are very important especially in the northern regions. In general:

- In the Upper Peninsula, over one-third of manufacturing jobs were in these industries.
- Forest products industries were the leading manufacturing employer in the Eastern Upper Peninsula.
- Direct value added by region and as a percentage of the statewide direct total was:
    - Southern Lower Peninsula (SLP) - $2.3 billion or 72%.
    - Western Upper Peninsula (WUP) - $462 million or 14%.
    - Northern Lower Peninsula (NLP) - $338 million or 11%.
    - Eastern Upper Peninsula (EUP) - $91 million or 3%.
- Regional employment, output, and labor income followed a similar pattern: SLP - 71%, WUP - 15%, NLP - 11%, and EUP - 3%.
- In absolute terms, the largest contributions were in the SLP and the smallest in the EUP.
- The WUP and NLP switch from second to third largest depending on economic metric; the NLP has more direct employment, but the WUP has more output and labor income.
- Forest products industries provided 5.5 percent of manufacturing jobs in Michigan.

Direct Contributions For Seven Aggregated Forest Products Industries By Region, 2014.

Direct Contributions by Region	Employment	Output	Labor Income	Value Added
	(Jobs)	(Millions of 2014 Dollars)		
SLP	27,051	8,054	1,685	2,300
NLP	5,201	1,313	240	338
EUP	1,073	383	62	91
WUP	4,966	1,849	310	462
Statewide	38,291	11,601	22,967	3,191



Michigan DNR-Forest Resources Division Planning Regions and County-Based Economic Regions, 2014.

ACKNOWLEDGEMENTS

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1.0 INTRODUCTION

This report supplements a statewide report titled "*Forest Products Industries' Economic Contributions to Michigan's Economy in 2014.*" It provides a regional perspective on the status of the forest products industries and supports monitoring of progress following the 2013 Governor's Forest Products Summit held in Lansing, Michigan. The Michigan Department of Natural Resources (MDNR) and the Governor-appointed Timber Advisory Council developed statewide, five-year (2018) goals related to the industries; they are:

- Increase the economic impact of the timber industry to $20 billion;
- Increase the export of value-added forest products by 50 percent;
- Increase forest products-related jobs by 10 percent;
- Support existing industry; and
- Encourage regionally based industry development.

This report provides 2014 data and information related to the first and third goals above (i.e., increasing economic impact and jobs). This report is organized into three main sections. The introduction is followed by the methods section, which broadly describes the approach used in developing this report. Third, recent data reflecting the direct economic contributions of the forest products industries statewide and by region for 2014 are presented.

2.0 METHODS

The section on the economic contributions of Michigan's forest products industries relied on 2014 Impact Analysis for Planning (IMPLAN) software and data (IMPLAN Group LLC, www.implan.com). IMPLAN is a widely used economic input-output model that focuses on the interdependence among various producing and consuming sectors in the economy. 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 or sales and others. The economic values are reported in nominal (2014) dollars.

IMPLAN was used to examine the current status of the forest products industry statewide and by region. For this report, 31 IMPLAN sectors (out of 511 sectors in Michigan) were identified as forest products sectors. They were aggregated into 7 larger industries for ease of communication and analysis. The industries are: Forestry, Logging, Primary Solid Wood Products and Wood-based Power, Secondary Solid Wood Products, Wood Furniture, Primary Paper and Paperboard Products, and Secondary Paper and Paperboard Products.

3.0 ECONOMIC CONTRIBUTIONS OF THE FOREST PRODUCTS INDUSTRIES TO MICHIGAN'S STATEWIDE AND REGIONAL ECONOMIES

Two goals related to the forest products industries' economic contributions emerged from the 2013 Governor's Forest Products Summit: 1) increasing the economic impact of the timber industry on state and regional economies to $20 billion, and 2) increasing forest products-related careers by 10 percent. Using recent IMPLAN data from 2014, this report section provides a more detailed examination of the structure of the forest products industries in Michigan as a whole and by region: the Southern Lower Peninsula (SLP), the Northern Lower Peninsula (NLP), the Eastern Upper Peninsula (EUP), and the Western Upper Peninsula (WUP). Descriptive statistics regarding the economic contributions of the forest products industries to Michigan's economy are presented. The county-based economic regions closely parallel MDNR-Forest Resources Division (FRD) planning regions (Figure 1).

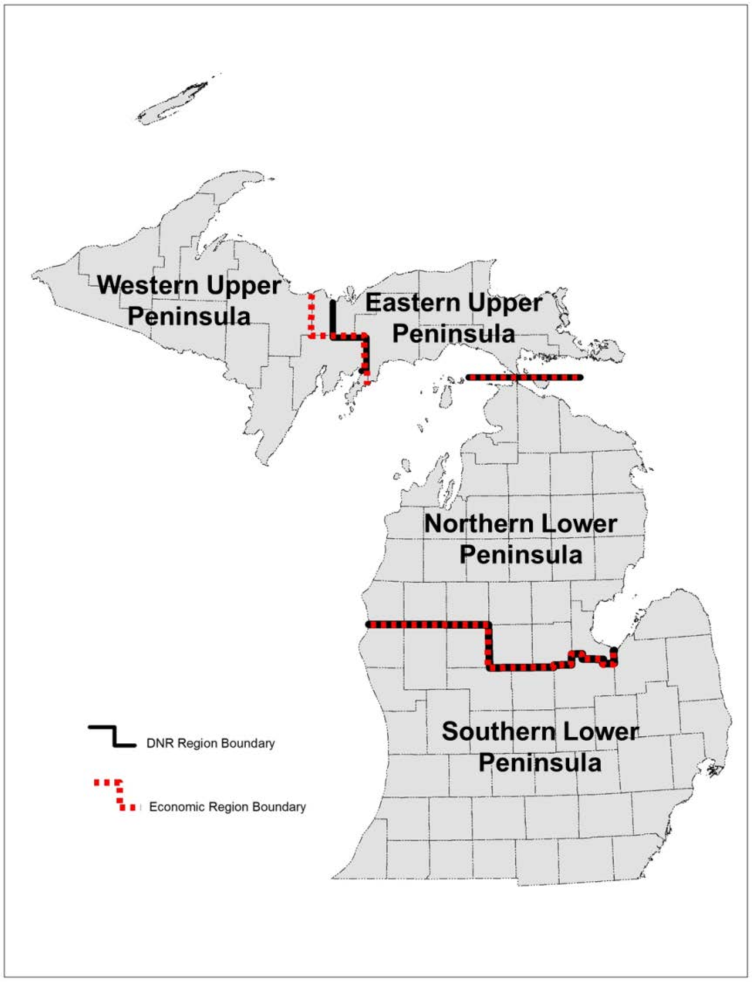

Figure 1. Michigan DNR FRD Planning Regions & County-Based Economic Regions, 2014.

3.1 Economic Contributions Defined

The economic contributions of the forest products industries is a snapshot of direct economic activity associated with given industries and other economic activities linked to those industries. An introduction to some economic terminology is helpful in describing the concept of economic contributions.

Economic contributions are defined as "the changes in a region's existing economy that can be attributed to a given industry" (Watson et. al. 2007). Hence, economic contributions define the role of an industry within a state or region. Several terms are used to describe economic effects (Table 1).

Table 1. Terms Used to Describe Economic Contributions.

Term	Description
Output	The dollar measure of production within an area; it is also viewed as sales.
Employment	The number of full-time and part-time jobs associated with an industry.
Labor income	The dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.
Value added	The sum 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 state equals the Gross State Product.
Direct effects	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.
Indirect effects	The impact of local industries purchasing goods and services from other industries leading to others' outputs, employment and labor income.
Induced effects	The impact of labor income (employee compensation and proprietor income) via goods and services purchased due to the direct and indirect spending by industries.
Total effects	Sum of direct, indirect and induced effects.
Social Accounting Matrix (SAM) multipliers	These multipliers are derived by dividing the sum of direct, indirect and induced effects by the direct effects. The social accounts include payments made between households, households and government, etc. 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").

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 the economic contributions of an industry. It is a conservative measure of economic contributions. Value added is the difference between an industry's output or sales 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, etc.) 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 the gross regional or gross state product. Another measure of economic contribution is industry output or sales. For example, if a log is sold to a sawmill and the sawmill sells boards, both sales are counted as part of the overall region's sales or output - 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. Summit goals focused on output and employment, which are the main statistics reported in this section.

3.2 Using IMPLAN to Estimate Economic Contributions

Impact Analysis for Planning (IMPLAN) was used to estimate statewide economic contributions of the forest products industries (IMPLAN Group, LLC 2014). It is a widely used input-output model comprised of economic data and software. Input-output (IO) models characterize financial linkages among industries, households and institutions. Within IO models, various industries have production functions which show the value of inputs used in production of industry outputs. Michigan's economy was represented by 536 sectors in 2014 associated with the North American Industrial Classification System (NAICS). Economic values for 2014 were used.

Counties provide the building blocks for a state, and Michigan's 83 counties were included in IMPLAN modeling for this report. Given IMPLAN's structure, sub-state analyses were developed using MDNR Regions (Appendix 1).

To more compactly describe the economic contribution of the forest products industries, 31 economic sectors were aggregated into 7 broad industries (Appendix 2): Forestry, Logging, Primary Solid Wood Products and Wood-based Power, Secondary Solid Wood Products, Wood Furniture, Primary Paper and Paperboard Products, and Secondary Paper and Paperboard Products. Detailed descriptions of the sectors are presented in Appendix 3. Primary industries (e.g., sawmills, OSB [reconstituted wood product], and power plants) use wood directly from the forest, including roundwood, chips or similar forms. Secondary industries (e.g., trusses and furniture) use one or more primary forest products (e.g., lumber and paper) in their manufacturing processes.

Several sectors included wood and non-wood products (e.g., institutional furniture manufacturing); output and other measures were reduced to better reflect the wood-only component; details of the reduction process are described in Appendix 3. Further, statewide values for IMPLAN Sector 19 (Support Activities for Forestry) were disaggregated to regions based on the distribution of consulting foresters within regions (Data supplied by the Michigan Association of Consulting Foresters). This step was needed because IMPLAN data are based on agricultural and forestry support, which is skewed by SLP agricultural production.

3.3 Economic Contribution Results

The direct contributions of Michigan's forest products industries in 2014 were $11.6 billion in output (2014 dollars), 38,291 jobs and $2.3 billion in labor income (Table 2). Total contributions, including direct, indirect and induced effects, were $20.3 billion in output, 96,623 jobs and $5.2 billion in labor income. All of these measures exceeded the 2012 and 2013 estimates and highlight positive growth in the forest products industries, even with declines in some sectors.

Economic contributions vary by region (Tables 3, 4, 5 and 6). The largest contributions in 2014 were in the SLP (38-county region) and the smallest absolute contributions were in the EUP (5-county region). The WUP (10-county region) and NLP (30-county region) switch from second to third largest depending on economic metric. The NLP has more direct employment, but the WUP has more output and labor income.

The SLP was Michigan's most populous region with a population of 8.7 million in 2014. Five hundred eight (508) IMPLAN-based economic sectors comprised the regional economy; the Hospital sector was number one in terms of employment with 182,512 jobs. With respect to employment, the Wood Furniture industry was the largest forest products industry with over 9,200 jobs (Table 3). However, the Secondary Paper and Paperboard Production industry had the highest output or sales of $3.6 billion. Overall, the SLP had 71 percent of forest products industries' employment (Figure 1), 70 percent of output (Figure 2) and 73 percent of labor income (Figure 3) in 2014. Interestingly, there was a large Logging industry in the SLP. This was due, in part, to the Sawmill sector and to the Wood Container and Pallet Manufacturing sector. The latter had 1,900 jobs in the SLP, representing almost 90 percent of the Michigan's employment in that sector.

The NLP was Michigan's second most populous region with a population of 902 thousand in 2014. The number of economic sectors, at 400, was considerably below the SLP level. The largest employment sector was Local Government-Education with almost 19,000 jobs. The Primary Solid Wood Products and Wood-based Power industry was the largest forest products industry in employment, output and labor income (Table 4). It accounted for over 2,000 jobs. In 2014, the NLP had 13 percent of the forest products industries' employment, 11 percent of output and 10 percent of labor income.

The EUP was the least populous region with 73,000 residents in 2014. It was the smallest in terms of economic sectors (207), number of counties and land area. The Non-Educational Local Government sector had the largest employment with approximately 3,500 jobs (includes full- and part-time county and other local government employees). The Primary Paper and Paperboard Production industry was the largest forest products industry in employment, output and labor income (Table 5). However, the Primary Solid Wood Products and Wood-based Power industry and Logging industry had similar employment levels. In total, the EUP had 3 percent of forest products industries' employment, output and income in 2014.

Table 2. Direct Contributions, Total Contributions & SAM Multipliers for 7 Aggregated Forest Products Industries in Michigan, 2014.

Forest Products Industries	Employment	Output	Labor Income
	(Jobs)	(Millions of 2014 Dollars)	
Direct Contributions			
Forestry	678	45.2	20.4
Logging	4,402	402.4	160.9
Primary Solid Wood Products and Wood-based Power	5,022	1,693.6	280.7
Secondary Solid Wood Products	6,874	1,157.7	320.5
Wood Furniture	9,943	2,017.1	628.2
Primary Paper and Paperboard Products	3,288	2,603.4	332.0
Secondary Paper and Paperboard Products	8,084	3,682.0	554.9
Grand Total	**38,291**	**11,601.3**	**2,297.6**
Total Contributions			
Forestry	1,019	79.8	33.2
Logging	7,076	689.5	260.5
Primary Solid Wood Products and Wood-based Power	17,197	3,399.7	847.4
Secondary Solid Wood Products	14,049	2,225.0	669.5
Wood Furniture	20,076	3,498.9	1,113.2
Primary Paper and Paperboard Products	15,318	4,566.7	959.4
Secondary Paper and Paperboard Products	21,888	5,874.6	1,266.7
Grand Total	**96,623**	**20,334.1**	**5,150.1**
SAM Multiplier	**Ratios (Total Contributions/Direct Contributions)**		
Forestry	1.50	1.77	1.62
Logging	1.61	1.71	1.62
Primary Solid Wood Products and Wood-based Power	3.42	2.01	3.02
Secondary Solid Wood Products	2.04	1.92	1.81
Wood Furniture	2.02	1.73	1.25
Primary Paper and Paperboard Products	4.66	1.75	2.89
Secondary Paper and Paperboard Products	2.71	1.60	2.28
Grand Total	**2.52**	**1.75**	**2.24**

Table 3. Direct Contributions for 7 Aggregated Forest Products Industries in Michigan's Southern Lower Peninsula, 2014.

Direct Contributions - SLP	Employment	Output	Labor Income
	(Jobs)	(Millions of 2014 Dollars)	
Forest Products Industries			
Forestry	279	24.6	11.0
Logging	1,421	117.8	46.6
Primary Solid Wood Products and Wood-based Power	1,563	529.4	103.3
Secondary Solid Wood Products	5,396	916.7	268.0
Wood Furniture	9,268	1,915.4	599.2
Primary Paper and Paperboard Products	1,167	921.8	108.8
Secondary Paper and Paperboard Products	7,958	3,630.3	548.8
Grand Total	**27,051**	**8,054.4**	**1,684.6**

Table 4. Direct Contributions for 7 Aggregated Forest Products Industries in Michigan's Northern Lower Peninsula, 2014.

Direct Contributions - NLP	Employment	Output	Labor Income
	(Jobs)	(Millions of 2014 Dollars)	
Forest Products Industries			
Forestry	156	9.1	4.1
Logging	1,351	124.7	48.0
Primary Solid Wood Products and Wood-based Power	2,064	708.0	107.4
Secondary Solid Wood Products	738	113.6	24.9
Wood Furniture	474	71.5	20.3
Primary Paper and Paperboard Products	292	234.7	29.2
Secondary Paper and Paperboard Products	126	51.6	6.1
Grand Total	**5,201**	**1,313.3**	**240.0**

Table 5. Direct Contributions for 7 Aggregated Forest Products Industries in Michigan's Eastern Upper Peninsula, 2014.

Direct Contributions - EUP	Employment	Output	Labor Income
	(Jobs)	(Millions of 2014 Dollars)	
Forest Products Industries			
Forestry	66	3.5	1.7
Logging	321	32.6	13.9
Primary Solid Wood Products and Wood-based Power	296	77.9	12.0
Secondary Solid Wood Products	48	8.9	1.5
Wood Furniture	8	1.2	0.4
Primary Paper and Paperboard Products	333	258.9	32.4
Secondary Paper and Paperboard Products	0	0.0	0.0
Grand Total	**1,073**	**382.9**	**61.9**

The WUP’s population in 2014 was almost 235,000. Two hundred ninety-eight (298) economic sectors were present. Like the EUP, the Non-Educational Local Government sector had the largest employment with approximately 6,000 jobs, and the largest forest products employer was the Primary Paper and Paperboard Production industry with almost 6,000 jobs (Table 6). The Logging industry and the Primary Solid Wood Products and Wood-based Power industry are also significant in the WUP. In northern Michigan, the WUP had the highest percentage of forest products industries’ output (16%) and labor income (14%), and the second highest percentage of employment (13%).

Table 6. Direct Contributions for 7 Aggregated Forest Products Industries in Michigan's Upper Peninsula, 2014.

Direct Contributions - WUP	Employment	Output	Labor Income
	(Jobs)	(Millions of 2014 Dollars)	
Forest Products Industries			
Forestry	176	8.0	3.5
Logging	1,309	127.3	52.5
Primary Solid Wood Products and Wood-based Power	1,099	378.4	58.0
Secondary Solid Wood Products	692	118.5	26.1
Wood Furniture	193	28.9	8.2
Primary Paper and Paperboard Products	1,496	1,188.0	161.6
Secondary Paper and Paperboard Products	0	0.0	0.0
Grand Total	**4,966**	**1,849.1**	**309.9**

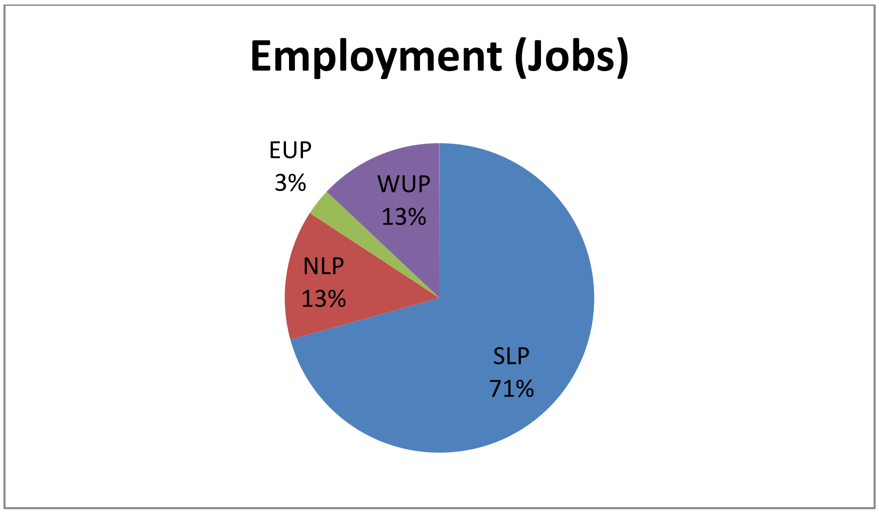

Figure 2. Percentage Distribution of Michigan Forest Products Industries' Direct Employment by Region, 2014.

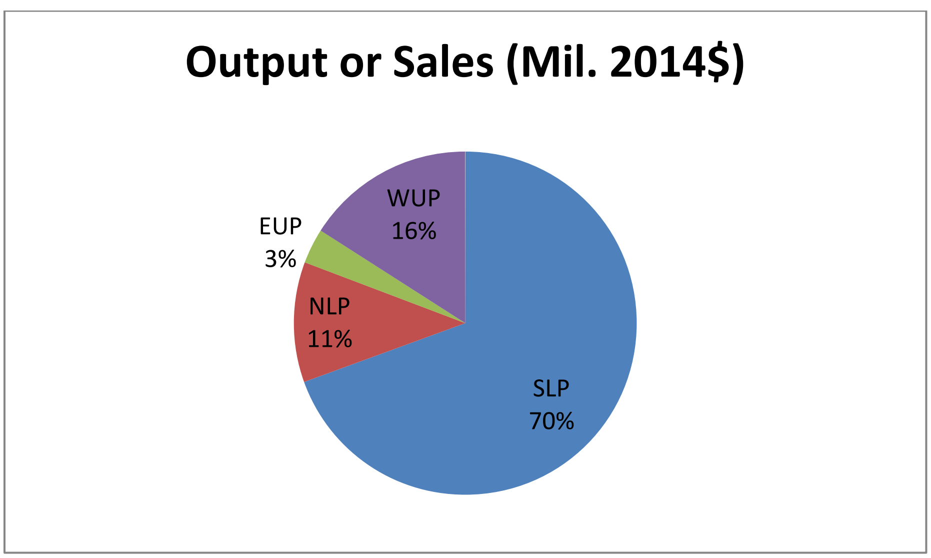

Figure 3. Percentage Distribution of Michigan Forest Products Industries' Direct Output or Sales by Region, 2014

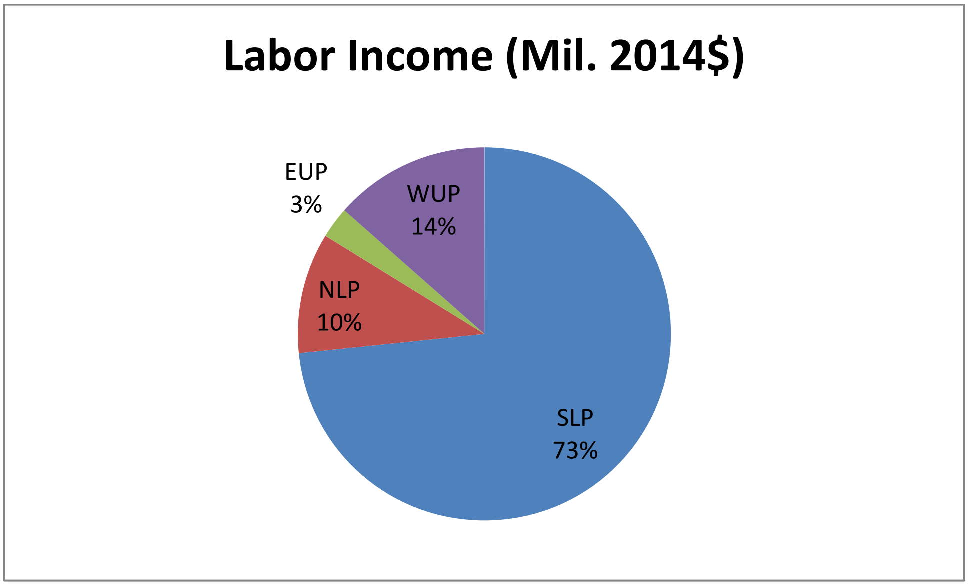

Figure 4. Percentage Distribution of Michigan Forest Product Industries' Direct Labor Income by Region, 2014.

Forest products industries' employment in northern Michigan was almost evenly split between the WUP and NLP with lower levels in the EUP (Figure 5).The WUP was more dependent on paper and paperboard products manufacturing, and the NLP had higher levels of primary solid wood products manufacturing. Notably, there was no secondary paper and paperboard products manufacturing in the EUP and WUP for 2014. Existing pulp and paper mills were categorized as primary manufacturers in this report.

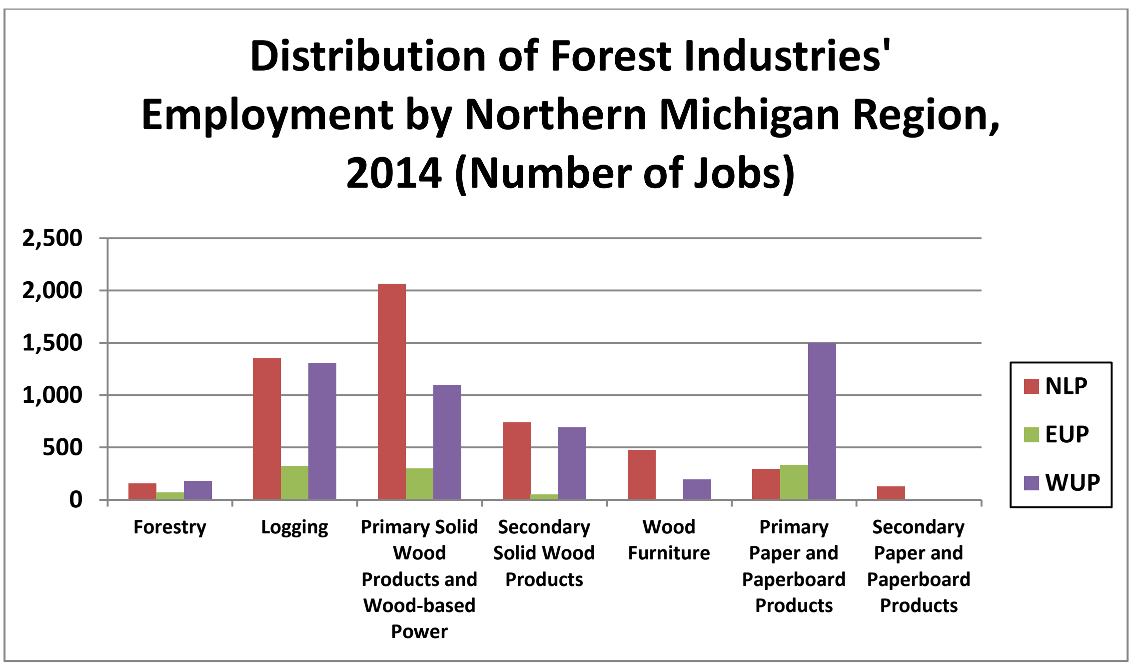

Figure 5. Distribution of Forest Industries' Employment (number of jobs) by Northern Michigan Region, 2014.

The role of the forest products industries, in manufacturing, varied by region (Table 7). In absolute terms, most forest products industries' jobs were in the SLP. However, as a proportion of total jobs in each region, forest products industries were the leading employer in the EUP, comprising 45% of the jobs (Figure 6). Over one-third of manufacturing jobs in the Upper Peninsula were in the forest products industries.

Table 7. Michigan's Forest Products Industries' Manufacturing Employment by Region, 2014.

Employment Category	Employment in Manufacturing (Jobs and Percentage)				
	SLP	NLP	EUP	WUP	MI
Total Employment (Jobs)	4,804,934	454,276	33,699	117,869	5,410,778
Manufacturing Employment (Jobs)	550,746	44,661	1,522	10,712	607,641
Percentage of Jobs in Manufacturing	11.5%	9.8%	4.5%	9.1%	11.2%
Forest Products Manufacturing Employment (Jobs)	25,351	3,694	686	3,481	33,211
Percentage of Manufacturing Jobs in Forest Products Industries	4.6%	8.3%	45.1%	32.5%	5.5%

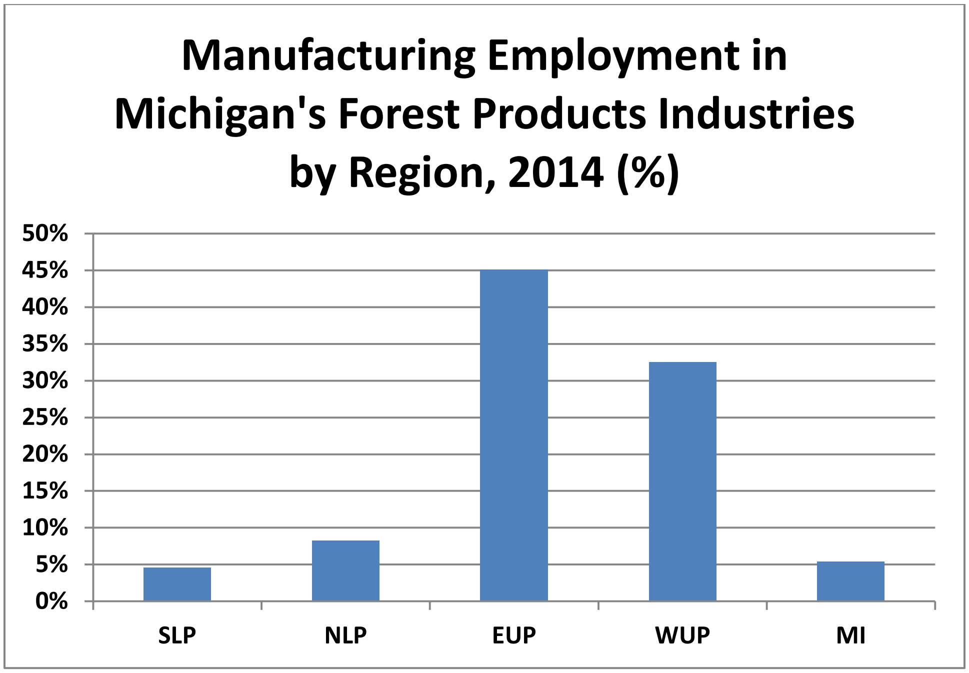

Figure 6. Manufacturing Employment (% of total manufacturing employment) in Michigan's Forest Products Industries by Region, 2014.

Gross state product, the sum of value added across all economic sectors, was $454.5 billion in 2014. Value added addresses double counting associated with output or sales data by counting only the new value added by a sector. Most of the added value is employee compensation. Value added in forest products industries was highest in the SLP, followed by the WUP, NLP and EUP (Table 8). On a percentage basis, the WUP and EUP had the highest regional effect on gross regional product.

Table 8. Michigan's Forest Products Industries' Value Added by Region, 2014.

Economic Measure	SLP	NLP	EUP	WUP	MI
Gross Regional Product (Millions of 2014 $)	415,356	29,099	2,049	8,018	454,522
Value Added (Millions of 2014 $)	2,273	338	91	462	3,164
Percentage of Gross Regional Product in Forest Products Industries	0.5%	1.2%	4.5%	5.8%	0.7%

4.0 SUMMARY

The direct contributions of Michigan's forest products industries in 2014 were $11.6 billion in output (2014 dollars), 38,291 jobs and $2.3 billion in labor income. Total contributions, including direct, indirect and induced effects, were $20.3 billion in output, 96,623 jobs and $5.2 billion in labor income.

On a regional basis, most forest products industries' employment was in the SLP employment (27,051 jobs) followed by the NLP (5,201 jobs), WUP (4,966 jobs), and EUP (1,073 jobs). The pattern is similar for labor income and output. In the SLP, Wood Furniture, Secondary Paper and Paperboard Products and Secondary Solid Wood products industries accounted for the dominance of the region. On a regional basis, however, forest products industries made the highest proportional contributions in the EUP and WUP.

5.0 REFERENCE CITED

Michigan Department of Natural Resources. 2016. Forest Products Industries' Economic Contributions to Michigan's Economy in 2014. L. Leefers, author. Michigan Department of Natural Resources, Forest Resources Division, Lansing.

APPENDIX 1

Table 9. Counties Included in Four MDNR Forest Resources Division Regions.

Western Upper Peninsula (10)	Eastern Upper Peninsula (5)	Northern Lower Peninsula (30)	Southern Lower Peninsula (38)
Baraga	Alger	Alcona	Allegan
Delta	Chippewa	Alpena	Barry
Dickinson	Luce	Antrim	Berrien
Gogebic	Mackinac	Arenac	Branch
Houghton	Schoolcraft	Bay	Calhoun
Iron		Benzie	Cass
Keweenaw		Charlevoix	Clinton
Marquette		Cheboygan	Eaton
Menominee		Clare	Genesee
Ontonagon		Crawford	Gratiot
		Emmet	Hillsdale
		Gladwin	Huron
		Grand Traverse	Ingham
		Iosco	Ionia
		Isabella	Jackson
		Kalkaska	Kalamazoo
		Lake	Kent
		Leelanau	Lapeer
		Manistee	Lenawee
		Mason	Livingston
		Midland	Macomb
		Missaukee	Mecosta
		Montmorency	Monroe
		Ogemaw	Montcalm
		Osceola	Muskegon
		Oscoda	Newaygo
		Otsego	Oakland
		Presque Isle	Oceana
		Roscommon	Ottawa
		Wexford	Saginaw
			Sanilac
			Shiawassee
			St. Clair
			St. Joseph
			Tuscola
			Van Buren
			Washtenaw
			Wayne

APPENDIX 2

Table 10. Aggregated Forest Products Industries & IMPLAN Component Sectors.

IMPLAN Sector	SECTOR NAME
	Forestry
15	Forestry, forest products, and timber tract production
19	Support activities for forestry*
	Logging
16	Commercial logging
	Primary Solid Wood Products and Wood-based Power
47	Electric Power Generation – Biomass
134	Sawmills
135	Wood preservation
136	Veneer and plywood manufacturing
138	Reconstituted wood product manufacturing
	Secondary Solid Wood Products
137	Engineered wood member and truss manufacturing
139	Wood windows and doors manufacturing
140	Cut Stock, resawing lumber, and planing
141	Other millwork, including flooring
142	Wood Container and Pallet Manufacturing
143	Manufactured home (mobile home) manufacturing
144	Prefabricated wood building manufacturing
145	All other miscellaneous wood product manufacturing
	Wood Furniture
368	Wood kitchen cabinet and countertop manufacturing
369	Upholstered household furniture manufacturing
370	Nonupholstered wood household furniture manufacturing
372	Institutional wood furniture manufacturing*
373	Wood office furniture manufacturing
374	Custom architectural woodwork and millwork manufacturing
376	Showcase, partition, shelving, and locker manufacturing*
	Primary Paper and Paperboard Products
146	Pulp mills
147	Paper mills
148	Paperboard Mills
	Secondary Paper and Paperboard Products
149	Paperboard container manufacturing
150	Paper bag and coated and treated paper manufacturing
151	Stationery product manufacturing
152	Sanitary paper product manufacturing
153	All other converted paper product manufacturing

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

APPENDIX 3

Table 11. Description of Economic Sectors for Forest Industries, Including IMPLAN Industry Sectors & 2007 North American Industry Classification System (NAICS) Codes.

IMPLAN Sector	Description (NAICS Code): Detailed Description
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 Forestry (115310): This industry 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 4.5% of initial values based on the employment and annual wages ratios between (1) Forestry Support Activities and (2) Agriculture and Forestry Support Activities for the MI from 2012-14 (Bureau of Labor Statistics).
47 (NA)	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.
134 (95)	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 (95)	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 (96)	Hardwood Veneer and Plywood Manufacturing (321211): This U.S. industry comprises establishments primarily engaged in manufacturing hardwood veneer and/or hardwood plywood. Softwood Veneer and Plywood Manufacturing (321212): This U.S. industry comprises establishments primarily engaged in manufacturing softwood veneer and/or softwood plywood.
137 (97)	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.
138 (98)	Reconstituted Wood Product Manufacturing (321219): This U.S. industry comprises establishments primarily engaged in manufacturing reconstituted wood sheets and boards.
139 (99)	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

IMPLAN Sector	Description (NAICS Code): Detailed Description
140 (99)	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 (99)	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 (100)	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 (101)	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 (102)	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 (103)	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 (104)	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.
147 (105)	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 (106)	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 (107)	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, and 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).

IMPLAN Sector	Description (NAICS Code): Detailed Description
150 (108, 109)	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 (110)	Stationery Product Manufacturing (322230): This industry comprises establishments primarily engaged in converting paper or paperboard into products used for writing, filing, art work, and similar applications.
152 (111)	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 (112)	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 (295)	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 (296)	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.
370 (297)	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).
372* (299)	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 is wood-based, the ratio of wood-based subsectors (337121 and 337122) and total household furniture subsectors (337121, 337122, 337124 and 337125) for MI in 2014 (Bureau of Labor Statistics) was calculated for employment (69.9%) and applied to adjust IMPLAN Sector 372 values.
373 (300)	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).
374 (301)	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.

IMPLAN Sector	Description (NAICS Code): Detailed Description
376* (302)	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 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 MI in 2014 (Bureau of Labor Statistics) was calculated for employment (36.8%) and applied to adjust IMPLAN Sector 376 values.

Note: Sector numbers from 2012 IMPLAN sectorization scheme noted in parentheses, and sectors modified for this analysis denoted with "*".