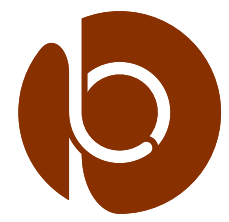


**The U.P. Economy and the
Role of Forest Products Industries**

Report # 2007-06

**LAND POLICY
INSTITUTE**

Shaping the Future from the Ground Up



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The U.P. Economy and the Role of Forest Products Industries

**Prepared for: People and Land (PAL)
2006 Higher Education Grant
and
Land Policy Institute
Michigan State University**

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A Natural Resources and Related Industries Report

**The MSU Land Policy Institute
Report #2007-06**

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The U.P. Economy and the Role of Forest Products Industries

Executive Summary

Over one million acres of forest lands changed ownership in the Upper Peninsula (UP) during 2005 and 2006. Similar changes have occurred in other regions of the US. The new owners are institutional investors rather than the traditional land owners who were tied directly to forest products industries. This report highlights details regarding the economy of the UP with a special emphasis on forest products industries and potential consequences of the forest land sales due to their role in supplying timber.

The UP plays a fairly small role in the overall Michigan economy, accounting for 3.7% of the state's establishments, 2.0% of the state's employee compensation, 2.7% of the state's employment, and 1.9% of the state's industry output/sales. However, it is very important for Michigan's forest products industries, which are central to the economy of the UP. More than half of the employee compensation in the Manufacturing sector in the UP originates from forest products industries, and total industry output/sales are also considerable. Forest resources and forest ownerships within the UP are significant and diverse, and they are a source of opportunity for future economic activity. Tourism is another important natural resource-based economic driver in the UP.

Overall, on average, the UP is worse off economically than many parts of the state. For example, unemployment rates are generally higher in the UP than the state as a whole, and average employee compensation in the UP is 73.6% of the state's average. In addition, the population of the UP has remained relatively unchanged for many decades, with a slight decline in the past 20 years. Population stability in the UP may limit economic opportunities for employment and income.

Most lands in the recent sales are enrolled in the Commercial Forest Program, a policy that reduces property taxes in exchange for public fishing and hunting access. Other policies needed to support the forest products industry include efforts in international marketing of forest products and increases in harvests from public lands. So, the forest products industries and forest lands are key economic drivers of the UP economy, and public policies should support them if they are to remain vital.

Forest products industries cover several economic sectors (see Appendix A, Table A.1). Each sector has its own unique linkages to other parts of the UP economy. Accordingly, increases or decreases in economic activity in forest products industries (e.g., in logging, sawmilling, and paper manufacturing) will have far-reaching effects beyond the industries themselves.

Economic impact analysis is used to estimate the effects changes in economic activity have on a region's economy. Though changes in economic activity due to recent land sales are not known presently, three examples of potential impacts are presented: new home construction, changes in sawmill operations, and a mill closure. Each of these potential events has significant economic impacts. More targeted impact estimates can be developed when the consequences of the recent land sales are better understood.

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1.0 Introduction

Land ownership in Michigan's Upper Peninsula (UP) has undergone significant change in recent years. This is highlighted by two major sales of timberlands. First, in 2005, Plum Creek Timber Company, Inc., a real estate investment trust (REIT), purchased 650,000 acres in the UP from Escanaba Timber LLC, formerly Mead Paper and MeadWestvaco lands. The Escanaba mill is now run by NewPage Corporation. The timberland purchase made Plum Creek, headquartered in Seattle, the largest private landowner in Michigan. A 10-year fiber supply agreement with the NewPage paper mill in Escanaba was part of the purchase agreement. Many of these lands are enrolled in the Commercial Forest Program (CFP) which provides a property tax incentive for landowners to encourage long-term commercial forestry management in exchange for public access for hunting and fishing. Some concerns were voiced about potential loss of access to or sale of some of these lands (Traverse City Record Eagle, 2005). The second major land sale was in 2006 when International Paper sold 440,000 acres in the UP to a consortium headed by Resource Management Service, LLC (<http://www.resourcemgt.com/>). A 10-year fiber supply agreement with the Verso Paper mill in Quinnesec (previously Champion International and then International Paper) was part of the purchase agreement.

Other recent notable sales activities include the purchase of 6,275 acres of land by The Nature Conservancy (www.nature.org/michigan/) on the Keweenaw Peninsula, the Forestland Group, LLC (<http://www.forestlandgroup.com/>) purchase of 390,000 acres from the Kamehameha Schools Trust of Hawaii, and We Energies' announcement of the potential sale of 11,000 acres in the Western UP (WUP). The Forestland Group purchase led to the Northern Great Lakes Project in which The Nature Conservancy and the State of Michigan entered into an agreement with them to protect more than 271,000 acres through a working forest easement. These ongoing land sales activities raise concerns about their effects on the UP's environment and society. This People and Land (PAL) project focuses on a central question of land use in Michigan's UP: how will changes in ownership of corporate timberland affect wildlife habitat, public access, and the economy? This report focuses on the economy of Michigan's UP with a special emphasis on the role of the forest products industries.

Economic activity of a region, or its economy, is characterized by the production and consumption of goods and services. Capital, human inputs, and natural resources are used in production that results in employment and income. Economies can be local, regional, national, or international in scope. This report has five sections. In the Introduction, demographic and housing data are presented to provide a historical context for the UP's contemporary economy. Section 2 describes the overall economy of the UP including the forest products industries. The third section focuses on forest (timber) production, and the fourth section illustrates linkages between the forest products sectors and other sectors of the UP economy. The linkages provide a mechanism for PAL project team members and the project advisory panel to assess selected economic consequences of development scenarios created. The final section presents conclusions.

In addition to government sources for a large portion of the data presented in this report, two recent studies also provide insights into social and economic trends in the UP: Social and Economic Assessment for Michigan's State Forests (Tessa Systems, LLC, 2006) and Social and Economic Assessment for the Michigan National Forests (Leefers et al., 2003). Data for this

report use counties aligned to the Michigan Department of Natural Resources' (MiDNR) ecoregion boundaries (Figure 1.1, Table 1.1). Data for the Upper Peninsula are often presented for the Western Upper Peninsula (WUP), the Eastern Upper Peninsula (EUP), and the UP as a whole. Lower Michigan is comprised of the Northern Lower Peninsula (NLP) and the Southern Lower Peninsula (SLP).

Figure 1.1 MiDNR ecoregion boundaries and associated counties (adapted from Tessa Systems, LLC, 2006)

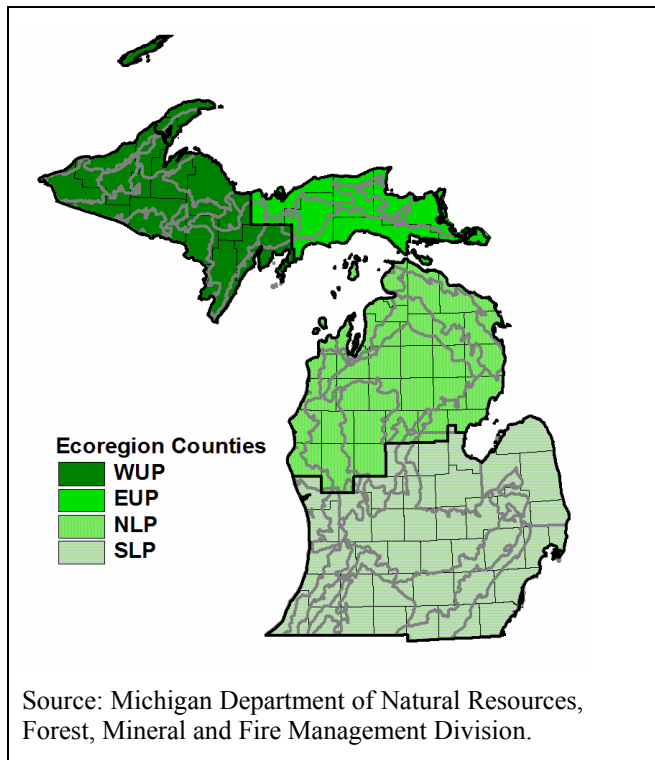


Table 1.1 Michigan ecoregion counties in the Upper Peninsula

Western Upper Peninsula	Eastern Upper Peninsula
Baraga	Alger
Delta	Chippewa
Dickinson	Luce
Gogebic	Mackinac
Houghton	Schoolcraft
Iron	
Keweenaw	
Marquette	
Menominee	
Ontonagon	

Source: Michigan Department of Natural Resources, Forest, Mineral and Fire Management Division.

1.1 Total Population & Population Change

Michigan’s population has increased steadily for over a century (Figure 1.2) with slower growth periodically as the economy slowed—for example, during the Great Depression and recessionary periods at the end of the 20th century. The UP population grew during the late 1800s with the expansion of mining and logging activities and a general influx of settlers to Michigan. The UP population level has been fairly stable since early in the 20th century, while the WUP has actually experienced a population decline in recent decades (Table 1.2, Figure 1.2). The 1995 closure of the K.I. Sawyer Air Force Base in Marquette County contributed to this phenomenon, but low natural population change (births-deaths) and modest out-migration have contributed to the population decline (Tessa Systems, LLC, 2006). Economic opportunities in other regions likely contribute to the out-migration. The population in the EUP increased due, in part, to an increase in prison population. In total, the UP accounts for 3.2% of the Michigan population.

The fairly stable population base provides some societal context for potential changes in resource availability associated with large-scale forest land sales—economic downturns may increase out-migration due to lack of economic opportunities in the UP. The population stability of the UP is directly related to economic opportunities and income.

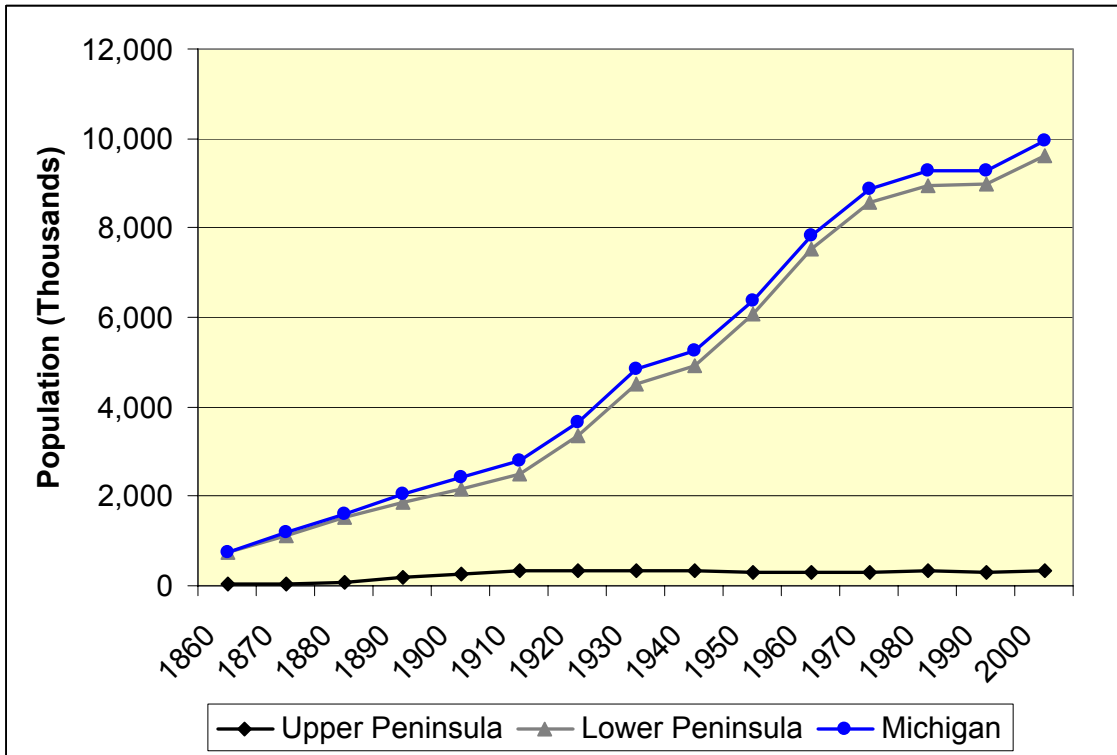
Long-term supply agreements between new landowners and paper mills in Escanaba and Quinnesec show economic promise; however, these businesses compete in an international marketplace, and raw material price and raw material availability are only two of many factors influencing the industries’ and the UP’s economic future.

Table 1.2 Total population in the United States, Michigan, and the Upper Peninsula (1980, 1990, and 2000) and percentage change in population

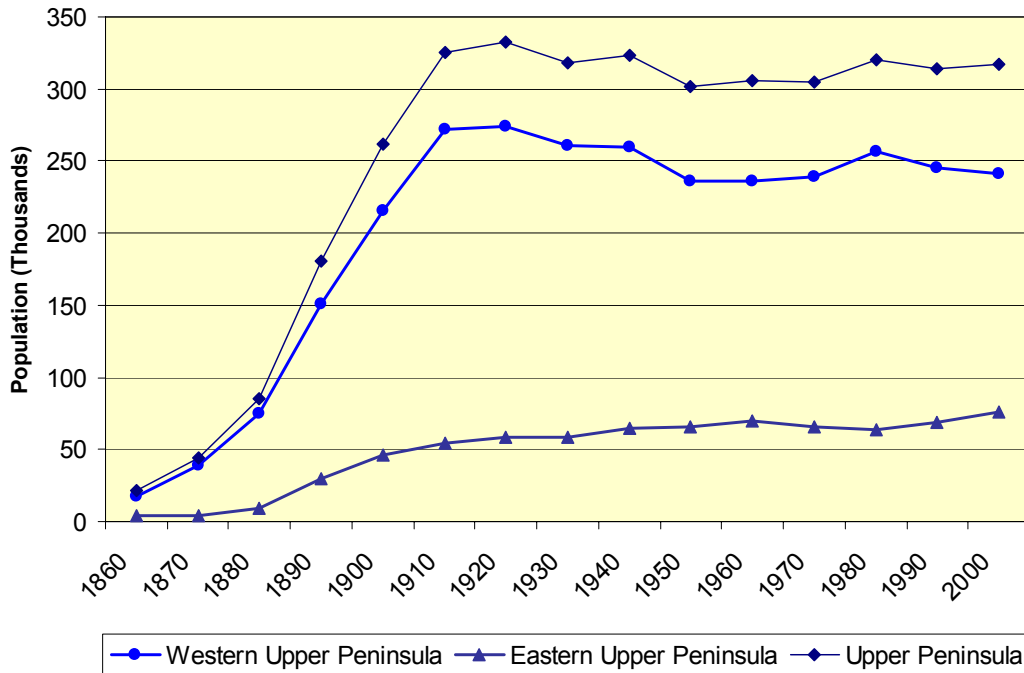
Impact area	Total population			Population change		
	1980	1990	2000	1980-1990	1990-2000	1980-2000
	thousands			thousands / percent		
Western Upper Peninsula	256.1	245.6	241.3	-10.5 -4.1%	-4.3 -1.7%	-14.8 -5.8%
Eastern Upper Peninsula	63.7	68.3	76.3	4.6 7.3%	8.0 11.7%	12.6 19.8%
Upper Peninsula-total	319.8	313.9	317.6	-5.9 -1.8%	3.7 1.2%	-2.2 -0.7%
Michigan	9,262.1	9,295.3	9,938.4	33.2 0.4%	643.1 6.9%	676.4 7.3%
United States	226,545.8	248,709.9	281,421.9	22,164.1 9.8%	32,712.0 13.2%	54,876.1 24.2%

Source: US Census Bureau, 1980 – 2000.

Figure 1.2 Total population, Michigan and the Upper Peninsula, 1860-2000

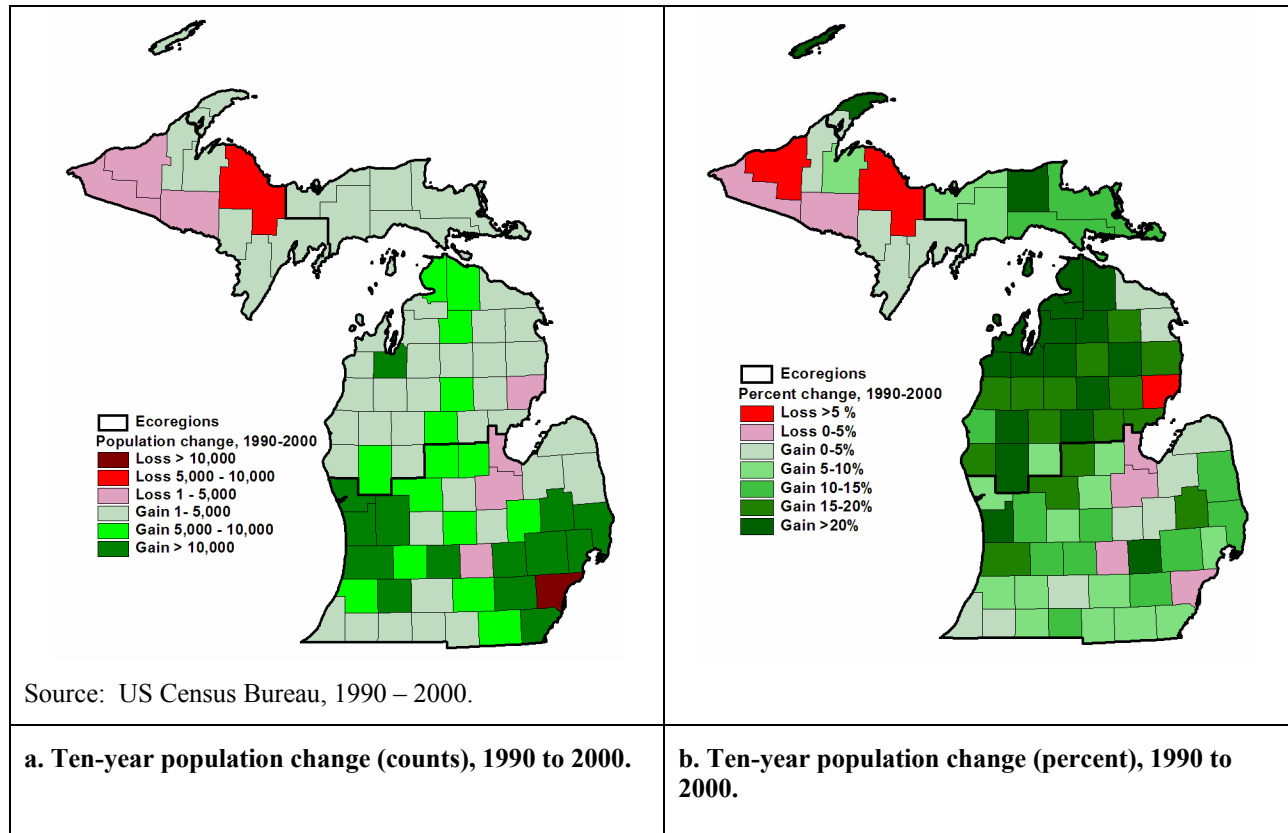


Source: US Census Bureau, 1860 – 2000.



Source: US Census Bureau, 1860 – 2000.

Figure 1.3 Population change and percentage change by county, 1990-2000.



1.2 Housing

Though population in the WUP decreased by over 4,000 from 1990 to 2000, housing units increased by over 5,000 units (Table 1.3). In the EUP, housing units increased more slowly than the population. Some of these units are seasonal homes, an important component of the housing stock in northern Michigan (Figure 1.4). The number of seasonal homes grew slowly in the UP overall. The combination of a stable population and increasing housing units leads to more sprawl, even if it is dispersed widely across the landscape. In other words, the number of housing units per person increased from 1990 to 2000.

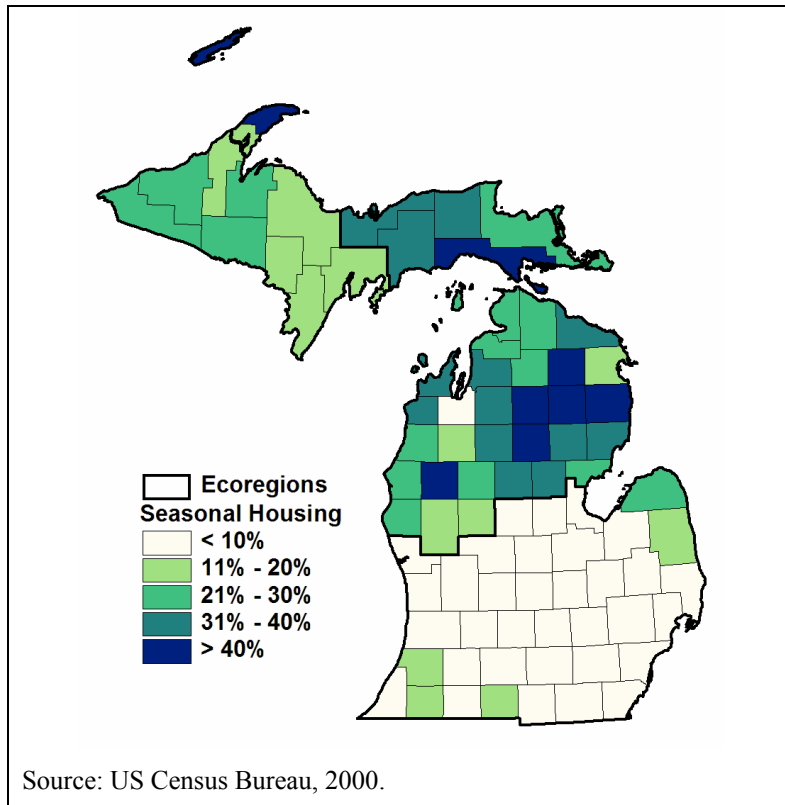
One potential source of additional economic activity associated with the sale of forest lands is the likely availability of building sites for new homes. Water access is often a desirable feature of home development and may be one focal point of development. These new homes may be for current residents or for seasonal residents. Economic impacts associated with current residents would include new home construction and the need for supporting infrastructure and services. And, of course, there could be some important effects on ecosystem processes and landscape patterns from the development (Rinkus, 2006, Ward et al., 2005). For seasonal homeowners, new spending in the UP is created, and their expenditures would have economic impacts. Overall, seasonal homeowners have provided a significant influx of money to northern Michigan counties, mostly during warmer months (Stynes et al, 1997).

Table 1.3 Total housing units by Michigan and the Upper Peninsula, 1990 and 2000

Impact Area	Year	Total Housing Units	Owner-Occupied Housing Units		Seasonal Homes	
			Number	Percent	Number	Percent
Western Upper Peninsula	1990	123,993	68,947	55.6%	21,029	17.0%
	2000	129,162	74,958	58.0%	21,463	16.6%
Eastern Upper Peninsula	1990	42,133	18,606	44.2%	13,654	32.4%
	2000	44,515	22,049	49.5%	13,538	30.4%
Upper Peninsula-total	1990	166,126	87,553	52.7%	34,683	20.9%
	2000	173,667	97,007	55.9%	35,001	20.2%
Michigan	1990	3,847,926	2,427,472	63.1%	224,030	5.8%
	2000	4,234,279	2,793,124	66.0%	233,922	5.5%

Source: US Census Bureau, 1990 and 2000. Note: Total Housing Units = Owner-Occupied Housing Units + Seasonal Homes + Rental Units + Vacant Units

Figure 1.4 Seasonal homes as a percent of housing units, 2000



2.0 The Economy of Michigan's Upper Peninsula

The economy for the UP can be described in terms of the number of economic establishments, employee compensation, employment, unemployment, income per household, number of economic sectors, economic concentration, and economic dependency. The focus is on the economy as a whole, but also on the forest products industries. Time series and point-in-time data come from a variety of government and private sources. As a result, there are some inconsistencies in years reported and levels of activity due to different sources of data. One message is clear; the UP plays a fairly small role in the overall Michigan economy, but a very important role for Michigan's forest products industries.

Economic sectors are often used to describe the structure of local, regional, or national economies. Several approaches to sectoral classification have evolved. Traditionally, the Standard Industrial Classification (SIC) system was used to identify and quantify sectors within the US economy (Pierce, 1957). The first effort at classification in the US was completed in 1939 and used broad industries, i.e., agriculture, forestry, and fisheries; mining; construction; manufacturing; wholesale and retail trade; finance, insurance, and real estate; transportation, communication, electric, gas, and sanitary services; and services. Manufacturing and non-manufacturing industries were identified.

In 1997, the SIC was transformed into the North American Industrial Classification System (NAICS); it was used to better define contemporary economic activity. Twenty broad industrial sectors were defined under NAICS whereas the SIC had only 10 broad sectors. Finer-scale data are presented for over 2,000 sectors and subsectors within the NAICS. They can be aggregated for reporting and analysis for diverse purposes. Generally, disclosure issues are present when highly disaggregated data are needed (e.g., county-level data for relatively small industry sectors). That is, the finer the scale, the less likely you are to find available (published) data. Hence, statewide data are easy to find, but data availability at lower levels varies depending on the level of economic activity. Tables 2.1-2.4 are based on the 2002 NAICS sectors.

SIC and NAICS data have historically provided the foundation for economic impact analysis, especially through the use of economic input-output (IO) models. IO-based analysis traditionally involves examining interrelationships within the economy between producers and between producers and consumers. A mathematical framework, developed by 1973 Nobel Laureate Wassily Leontief, captures monetary market transactions between sectors of the economy. Economic impacts are developed based on changes in one or more economic activities.

Descriptive IO modeling focuses on the structure of the economy and the flow of dollars between sectors whereas predictive IO modeling uses multipliers to describe the response of the local, regional, or national economy to changes in demand for goods and services, or changes in production functions (MIG, Inc., 2004). Most IO models are developed from existing data; they are called secondary IO models. In some cases, primary data is directly collected from industries to create a primary IO model. If more details on specific sectors are desirable, hybrid models are sometimes developed with primary data collected for selected sectors and secondary data used for others (Chappelle et al., 1986).

IMPLAN is one of several commercial IO models available in the US; it is a secondary IO model. It was developed by the USDA Forest Service and is now owned by the Minnesota

IMPLAN Group, Inc. (MIG) which compiles and maintains databases for economic impact analysis. In total, they used over 2,300 NAICS-based sectors to create 509 IMPLAN sectors. IMPLAN is an economic input-output modeling system for descriptive and predictive modeling (www.implan.org).

IMPLAN data are developed to provide county-level data for all US counties. By using a mixture of government sources and applying algorithms to estimate some data, issues of non-disclosure are overcome with estimates of employment and some economic activities. Tables 5-7 are based on IMPLAN data. IMPLAN models were developed for five aggregations of counties; counties for the WUP, EUP, UP, NLP (Northern Lower Peninsula), and Michigan were created to summarize economic structure and estimate economic impacts.

SIC and NAICS data focus on industry sectors. To complete the structure of the economy, IMPLAN adds government other non-industry (non-NAICS) sectors. For example, IMPLAN and NAICS have a Private Household subsector that includes households which have employees (maids, gardeners, etc.). Other households are captured in IMPLAN by “Owner Occupied Dwellings” which is a non-NAICS subsector created by the Bureau of Economic Analysis to capture the rent home owners would pay if they rented rather than owned their homes. In addition, it captures home repair and maintenance, property taxes and other costs of homeownership (MIG, Inc., 2004). This subsector represents a significant amount of economic activity in most areas.

2.1 Number of Establishments

The US Census Bureau reports the number of establishments and related data in its County Business Patterns series (Table 2.1). Most government and self-employed individuals are not included in their estimates, but NAICS-based industries with employees are included. To highlight linkages to the forest products industries, subsectors for Forestry and Logging, Agriculture and Forestry Support Services, Wood Products Manufacturing, and Paper and Paperboard Manufacturing are presented. The number of Wood Furniture Manufacturing establishments is not available for 2003 due to more aggregate NAICS reporting in that year, but IMPLAN-derived estimates of employee compensation and employment are available (Tables 2.2-2.4).

Most of the Agriculture, Forestry, Fishing and Hunting sector in the UP is associated with Forestry and Logging. In addition, it is likely that most related support services in the UP deal with forestry rather than agriculture. Over one-quarter of the manufacturing establishments in the UP are in Wood Products Manufacturing and Paper and Paperboard Manufacturing. As land-based industries, land-use changes can affect the vitality of these industries. The three largest sectors in the UP, based on numbers of establishments, are Retail Trade, Accommodation and Food Services, and Construction. In total, the UP has 3.7% of the state’s establishments.

Table 2.1 Number of establishments for selected economic sectors and subsectors in Michigan and the Upper Peninsula, 2003

Industry	WUP	EUP	UP-total	MI
Ag, forestry, fishing & hunting	192	61	253	639
**Forestry & Logging	167	51	218	386
**Ag & forestry support services	21	6	27	218
Mining	16	7	23	440
Utilities	34	8	42	457
Construction	783	289	1,072	26,403
Manufacturing	348	62	410	14,780
**Wood products manufacturing	76	22	98	574
**Paper & Paperboard manufacturing	6	2	8	200
Wholesale trade	226	48	274	12,507
Retail trade	1,256	454	1,710	38,620
Transportation & Warehousing	232	75	307	5,385
Information	113	34	147	3,945
Finance & Insurance	378	119	497	13,876
Real Estate & Rental	216	61	277	8,879
Professional & Technical Services	400	94	494	22,255
Management of companies	17	5	22	1,465
Administrative & Waste Services	187	51	238	11,628
Educational Services	66	11	77	11,985
Health Care & Social Assistance	637	149	786	24,790
Arts, Entertainment & Recreation	122	44	166	3,579
Accommodation & Food Services	719	377	1,096	19,095
Other services	760	210	970	24,855
Total, All Industries	6,702	2,159	8,861	237,122

Source: US Census Bureau, County Business Patterns (www.census.gov/epcd/cbp/view/cbpview.html).

Note: Sectors marked with “**” are subsectors of the more aggregate sector and total above.

2.2 Employee Compensation

Three different data sets are used to create IMPLAN compensation data: Bureau of Labor Statistics’ Covered Employment and Wages (CEW—formerly called ES202), Bureau of Economic Analysis’ Regional Economic Information System (REIS), and US Census Bureau’s County Business Patterns (MIG, Inc., 2004). Employee compensation is one of four components of Value Added calculated by IMPLAN. It includes wage and salary payments along with benefits. The other components are proprietary income, other property type income, and indirect business taxes. Though not included in Table 2.2, proprietary income and payments received by self-employed individuals, exceeds employee compensation in Forestry and Logging. Other property type income includes payments from interest, rents, royalties, dividends and profits (MIG, Inc., 2004). Indirect business taxes are comprised of sales and excise taxes. Over one-half of employee compensation in the Manufacturing sector comes from forest products industries in the UP. State and Local Government is the largest sector in the UP based on compensation. In total, the UP has 2.0% of the state’s employee compensation.

Table 2.2 Total employee compensation (million \$) for selected economic sectors and subsectors in Michigan and the Upper Peninsula, 2003

Industry	WUP	EUP	UP-total	MI
Ag, Forestry, Fishing & Hunting	\$38	\$10	\$48	\$875
**Forestry & Logging	\$26	\$5	\$31	\$64
**Ag & Forestry Support Services	\$4	\$1	\$5	\$134
Mining	\$104	\$13	\$116	\$390
Utilities	\$56	\$10	\$65	\$1,889
Construction	\$238	\$45	\$283	\$10,704
Manufacturing	\$594	\$110	\$704	\$59,530
**Wood Products Manufacturing	\$78	\$37	\$115	\$479
**Paper & Paperboard Manufacturing	\$186	\$36	\$223	\$952
**Wood Furniture Manufacturing	\$48	\$0	\$49	\$768
Wholesale Trade	\$84	\$11	\$96	\$10,971
Retail trade	\$279	\$78	\$356	\$14,385
Transportation & Warehousing	\$130	\$30	\$159	\$7,307
Information	\$56	\$8	\$64	\$4,052
Finance & Insurance	\$101	\$27	\$128	\$9,931
Real Estate & Rental	\$19	\$5	\$24	\$2,175
Professional & Technical Services	\$102	\$11	\$113	\$20,233
Management of companies	\$5	\$4	\$10	\$6,626
Administrative & Waste Services	\$48	\$8	\$56	\$8,677
Educational Services	\$12	\$1	\$13	\$1,612
Health Care & Social Assistance	\$461	\$48	\$510	\$20,318
Arts, Entertainment & Recreation	\$18	\$8	\$26	\$1,969
Accommodation & Food Services	\$101	\$60	\$161	\$5,416
Other services	\$202	\$43	\$245	\$8,347
Government & non NAICs	\$961	\$470	\$1,431	\$30,638
**Federal Government	\$85	\$45	\$130	\$2,887
**State & Local Government	\$877	\$425	\$1,301	\$27,751
Totals	\$3,608	\$999	\$4,607	\$226,045

Source: IMPLAN ProfessionalTM, 2003 data.

Note: Sectors marked with “***” are subsectors of the more aggregate sector and total above.

Average weekly employee compensation in forest products industries for the UP exceeded averages for the state as a whole for Forestry and Logging, Wood Products Manufacturing, Paper and Paperboard Manufacturing, and Wood Furniture Manufacturing. By adding proprietary income, compensation in the Forestry and Logging subsector would more than double. Regardless, the Utilities, Management of Companies, Mining, and Manufacturing sectors have some of the highest average compensation levels in the UP. Several forest products sectors also provide high levels of compensation to workers. Average employee compensation in the UP is 73.6% of the state’s average.

Table 2.3 Average weekly employee compensation, for selected economic sectors and subsectors in Michigan and the Upper Peninsula, 2003

Industry	WUP	EUP	UP-avg.	MI
Ag, Forestry, Fishing & Hunting	\$196	\$154	\$186	\$175
**Forestry & Logging	\$363	\$263	\$341	\$300
**Ag & Forestry Support Services	\$167	\$240	\$176	\$231
Mining	\$1,126	\$1,684	\$1,168	\$663
Utilities	\$1,643	\$1,561	\$1,630	\$1,893
Construction	\$718	\$573	\$690	\$700
Manufacturing	\$1,022	\$922	\$1,005	\$1,603
**Wood Products Manufacturing	\$716	\$800	\$741	\$700
**Paper & Paperboard Manufacturing	\$1,588	\$1,510	\$1,575	\$1,213
**Wood Furniture Manufacturing	\$1,017	\$636	\$1,011	\$958
Wholesale Trade	\$777	\$742	\$773	\$1,174
Retail Trade	\$366	\$385	\$370	\$451
Transportation & Warehousing	\$919	\$615	\$842	\$920
Information	\$588	\$473	\$571	\$1,031
Finance & Insurance	\$561	\$653	\$578	\$913
Real Estate & Rental	\$188	\$202	\$191	\$235
Professional & Technical Services	\$642	\$516	\$627	\$1,095
Management of companies	\$967	\$1,723	\$1,204	\$1,863
Administrative & Waste Services	\$452	\$393	\$443	\$522
Educational Services	\$286	\$420	\$295	\$411
Health Care & Social Assistance	\$658	\$586	\$650	\$696
Arts, Entertainment & Recreation	\$255	\$486	\$298	\$368
Accommodation & Food Services	\$192	\$292	\$220	\$272
Other services	\$309	\$250	\$297	\$393
Government & non NAICS	\$766	\$770	\$768	\$897
**Federal Government	\$1,037	\$1,198	\$1,088	\$1,156
**State & Local Government	\$748	\$742	\$746	\$877
Totals	\$588	\$568	\$584	\$794

Source: IMPLAN ProfessionalTM, 2003 Michigan data.

Note: Sectors marked with “**” are subsectors of the more aggregate sector and total above.

2.3 Employment by Sector

Almost half of the Manufacturing jobs in the UP were associated with the forest products industries in 2003. Forestry and Logging and Agriculture and Forestry Support Services were also significant employers in the UP. The Government and Other Non-NAICS sector was the largest sector, in terms of employment, in the UP followed by Retail Trade, Other Services, Health Care and Social Assistance, Accommodations and Food Services, and Manufacturing. State and Local Government was the largest employment subsector. In total, the UP has 2.7% of the state’s employment.

Table 2.4 Average annual employment, for selected economic sectors and subsectors in Michigan and the Upper Peninsula, 2003

Industry	WUP	EUP	UP-total	MI
Ag, Forestry, Fishing & Hunting	3,725	1,265	4,991	95,903
**Forestry & Logging	1,368	382	1,750	4,094
**Ag & Forestry Support Services	510	76	586	11,156
Mining	1,770	146	1,916	11,304
Utilities	650	117	767	19,189
Construction	6,375	1,504	7,879	294,031
Manufacturing	11,174	2,298	13,472	713,969
**Wood Products Manufacturing	2,082	897	2,979	13,167
**Paper & Paperboard Manufacturing	2,256	464	2,720	15,091
**Wood Furniture Manufacturing	910	13	923	15,419
Wholesale Trade	2,087	294	2,382	179,711
Retail Trade	14,626	3,868	18,494	613,499
Transportation & Warehousing	2,713	926	3,639	152,701
Information	1,825	316	2,141	75,550
Finance & Insurance	3,467	784	4,251	209,212
Real Estate & Rental	1,939	506	2,445	177,943
Professional & Technical Services	3,054	418	3,472	355,421
Management of companies	109	50	158	68,389
Administrative & Waste Services	2,046	378	2,424	319,531
Educational Services	780	53	833	75,410
Health Care & Social Assistance	13,490	1,587	15,077	561,657
Arts, Entertainment & Recreation	1,348	308	1,656	102,934
Accommodation & Food Services	10,138	3,942	14,081	383,005
Other services	12,547	3,304	15,851	408,010
Government & non NAICs	24,119	11,744	35,864	656,561
**Federal Government	1,572	725	2,297	48,033
**State and Local Government	22,548	11,020	33,568	608,528
Totals	117,982	33,810	151,792	5,473,930

Source: IMPLAN ProfessionalTM, 2003 Michigan data.

Note: Sectors marked with “***” are subsectors of the more aggregate sector and total above.

2.4 Employment Trends and Patterns

Employment, though relatively stagnant in recent years in the EUP, has been growing in the UP as a whole (Figure 2.1). Over the past 10 years, employment in the WUP has been growing at 1% per year. Unemployment has been cyclic in recent years (Figure 2.2). Unemployment peaked in 1991 in Michigan and in 1992 in the UP. The year 2000, a decennial census year, is often used for trend comparisons, but clearly the unemployment rate bottomed out at that time and has been substantially higher in the UP since then. Unemployment rates are generally higher in the UP than the state as a whole, and the highest average rates are in the EUP. There is considerable variation by county (Figure 2.3). The 2005 unemployment rate exceeded 10% in three UP counties: Baraga, Keweenaw and Schoolcraft. The UP is characterized by significant seasonal

variability in unemployment. The unemployment rate is high during the winter and spring and considerably lower during the summer and early fall (Tessa Systems, LLC 2006).

Figure 2.1 Employment in the Upper Peninsula, 1990-2005

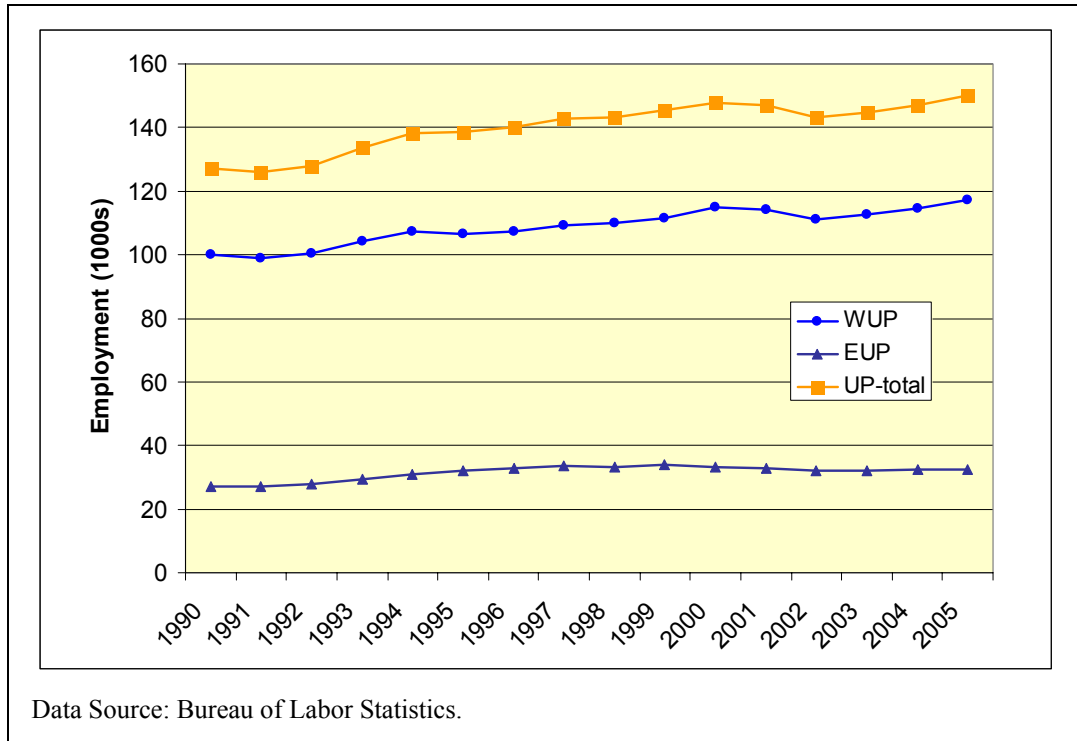


Figure 2.2 Unemployment in the Upper Peninsula, 1990-2005

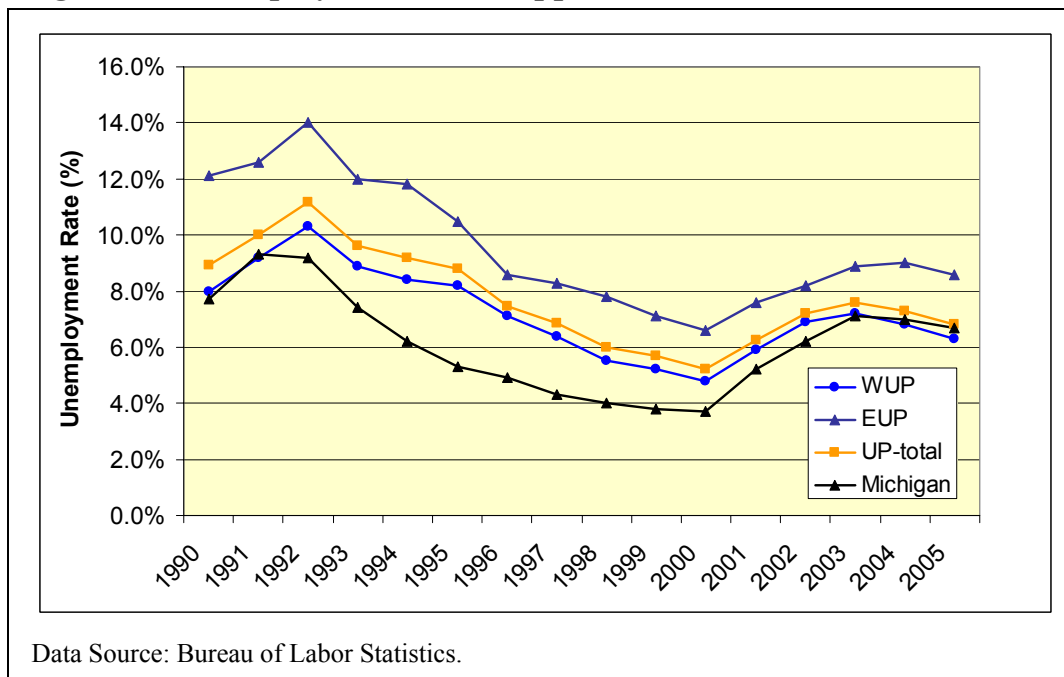
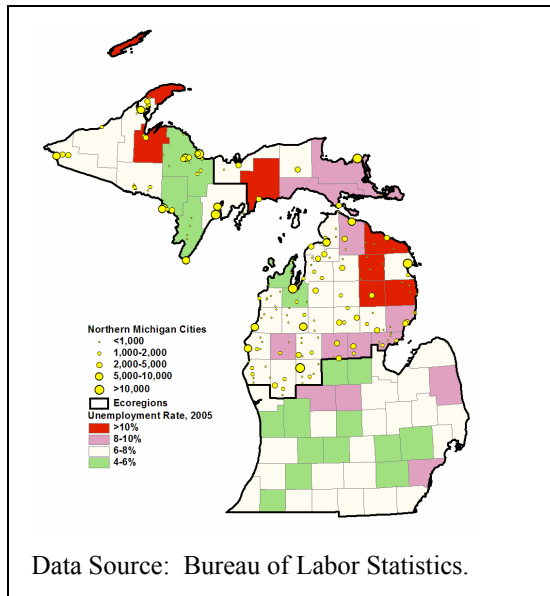


Figure 2.3 Unemployment rate by county, 2005



2.5 Household and Per Capita Income

Median household income was lowest in the WUP and highest in the counties in the most southern tiers of counties in 2000 (Figure 2.4, Table 2.5). UP counties had among the lowest median household incomes in the state. Gogebic County had the lowest level in the UP, followed by Keweenaw, Iron and Houghton counties. Those four counties also had the highest percentage of households with an income of less than \$25,000. The percentage of households in the UP with incomes greater than \$100,000 was much lower than the statewide average.

Figure 2.4 Median Household Income by County and MiDNR Ecoregion, 2000

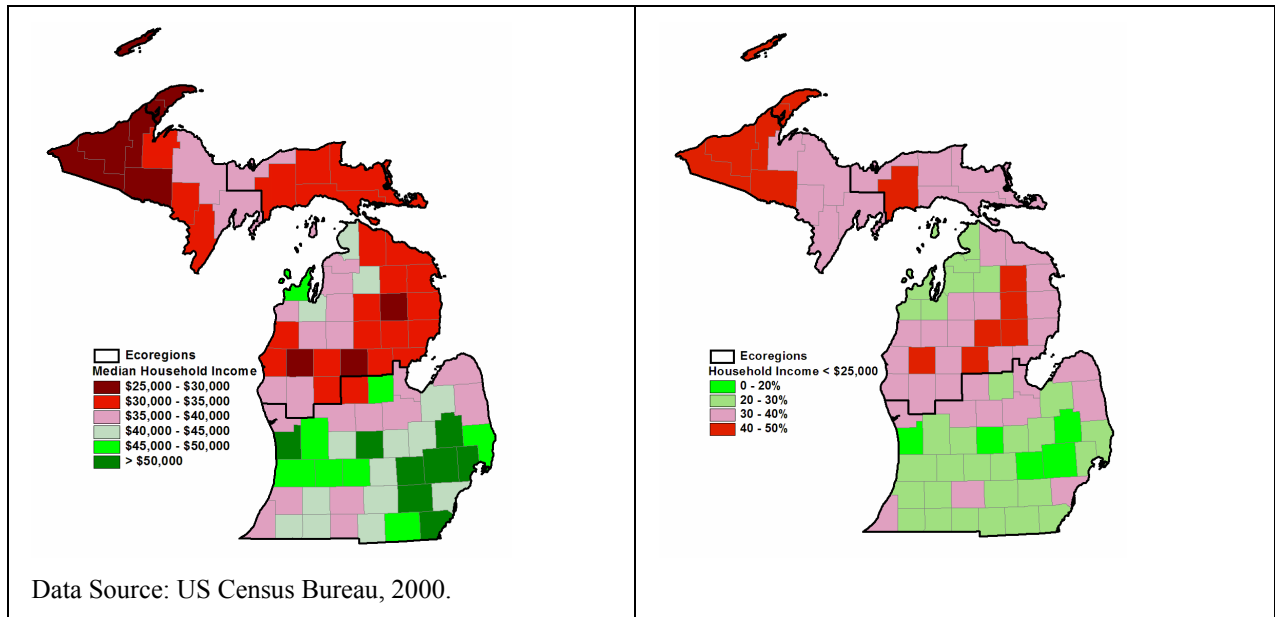


Table 2.5 Households and household income in Michigan and by county in the Upper Peninsula, 2000

Region - County	Median HH Income	Households (HH)	Households, less than \$25,000 income		Households, greater than \$100,000 income	
Western Upper Peninsula						
Baraga	\$33,673	3,371	1,244	36.9%	127	3.8%
Delta	\$35,511	15,820	5,357	33.9%	941	5.9%
Dickinson	\$34,825	11,407	4,002	35.1%	655	5.7%
Gogebic	\$27,405	7,401	3,384	45.7%	288	3.9%
Houghton	\$28,817	13,793	6,022	43.7%	612	4.4%
Iron	\$28,560	5,734	2,524	44.0%	162	2.8%
Keweenaw	\$28,140	1,012	416	41.1%	48	4.7%
Marquette	\$35,548	25,738	8,878	34.5%	1320	5.1%
Menominee	\$32,888	10,541	3,873	36.7%	349	3.3%
Ontonagon	\$29,552	3,443	1,444	41.9%	127	3.7%
Eastern Upper Peninsula						
Alger	\$35,892	3,797	1,233	32.5%	169	4.5%
Chippewa	\$34,464	13,491	4,994	37.0%	529	3.9%
Luce	\$32,031	2,486	946	38.1%	74	3.0%
Mackinac	\$33,356	5,072	1,797	35.4%	227	4.5%
Schoolcraft	\$31,140	3,616	1,474	40.8%	161	4.5%
Michigan						
Michigan	\$44,667	3,788,780	1,002,138	26.5%	480,461	12.7%

Source: US Census Bureau, 2000. Adapted from Tessa Systems, 2006.

2.6 Economic Sectors & Concentration of Economic Activity

Only 485 sectors were present in Michigan's economy in 2003, the most recent year for which IMPLAN data are available (Figure 2.5). The UP had 276 economic sectors. The number of sectors within individual counties ranged from 58 in Keweenaw County to 173 in Delta and Marquette counties. More sectors are associated with a more diverse economy, and larger aggregations of counties lead to a more complex, interconnected economy. In total, the UP accounts for 1.9% of the state's industry output/sales.

One metric used to assess the balance between sectors within a region is the Shannon-Weaver index (IMPLAN News, 2002). It can be applied to employment, industry output, and/or labor income. If a region has equal employment in all sectors (e.g., 100 employees in each of the region's 10 sectors), the index has a value of 1.0. If all employment were in one sector, then the index would have a value of 0.0. When compared to the UP and individual counties in the UP, the Shannon-Weaver employment index indicates that Michigan has a more balanced economy (Figure 2.5). Minnesota and Wisconsin have slightly higher indexes than Michigan. Delta and Dickinson counties have index values close to the level for the UP as a whole. Other counties have less evenly distributed, or more concentrated, IMPLAN sectors in terms of employment.

A more insightful way to view the balance within an economy is to look at the percent of employment or output for a number of sectors relative to total employment or output within the state, region or county—this is a measure of economic concentration (Figure 2.6).

Approximately 20% of Michigan’s employment was concentrated in four sectors in 2003. Two counties, Baraga and Keweenaw, have over 50% of their employment concentrated in four sectors. Ten of 15 UP counties have over 50% of the employment concentrated in eight sectors. Hence, economies in those counties are potentially influenced by upturns or downturns in a fairly small number of sectors.

Industry output from the top four sectors exceeded 50% of total county output in Alger, Luce and Ontonagon counties in 2003. When considering the top eight sectors, approximately half of the counties had a concentration at or above 50%. Overall, employment was slightly more concentrated than industry output in the UP though each county had a different economic structure. For employment, the top four IMPLAN subsectors in the UP, in order, were State and Local Education, State and Local Non-education, Food Services and Drinking Places, and Religious Organizations. The top four industry output subsectors were Pulp and Paper Mills, State and Local Education, Owner Occupied Dwellings, and State and Local Non-education.

Figure 2.5 Number of economic sectors and the Shannon-Weaver index based on IMPLAN sector employment, for Michigan and the Upper Peninsula and by county, 2003

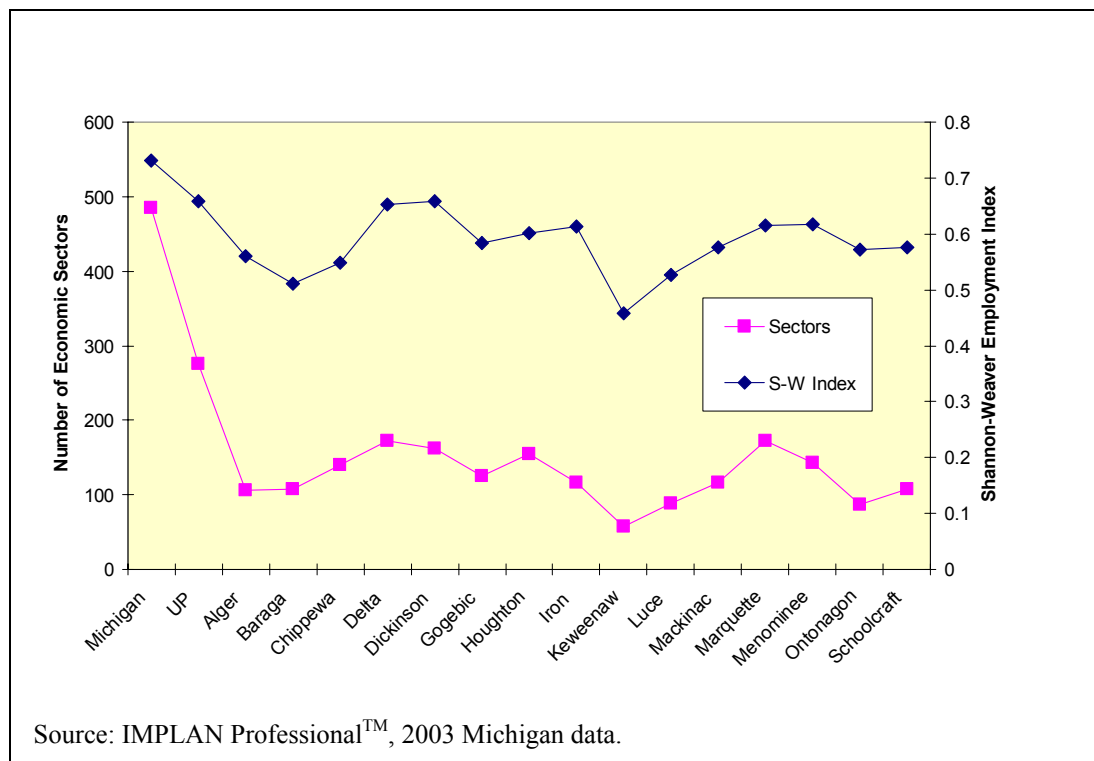
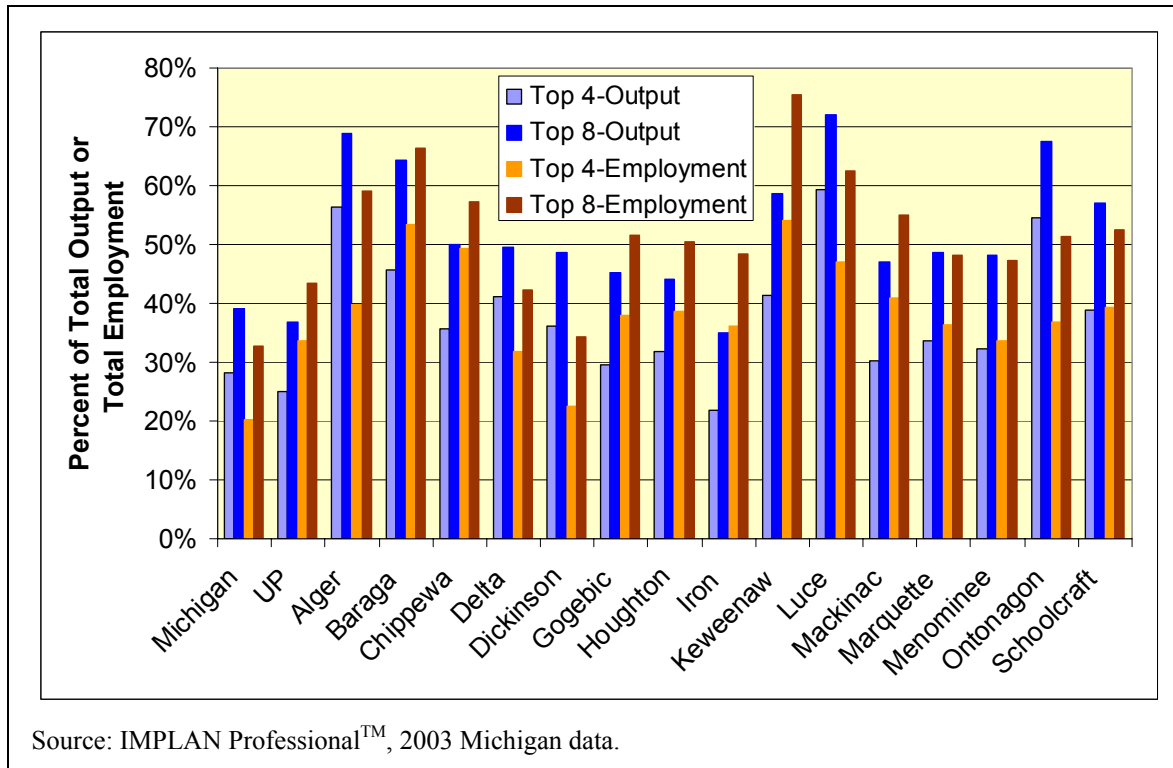


Figure 2.6 Concentration of output/sales and employment in largest four and eight IMPLAN sectors, for Michigan and the Upper Peninsula and by county, 2003



2.6.1 Tourism

Tourism is an important industry in Michigan, though it is not defined by the federal government (i.e., NAICS) in the same manner as forest products industries. This is due to the nature of tourism which is linked to many sectors—Accommodations, Food Services and Drinking Places, etc. Stynes (2002) estimated that tourism spending in Michigan totaled \$9.5 billion in 2000 (adjusted to 2003 dollars for comparability to IMPLAN data). Of this, \$750 million was associated with counties in the UP. In comparison, the forest products industry had statewide sales of \$11.2 billion in 2003 (Appendix A, Table A.1, from IMPLAN) with \$2.5 billion of sales in the UP.

Tourism tends to have a strong association with seasons; employment tends to be highest during the summer and fall months in Michigan, and unemployment is high during the winter and spring months. Tourism is often associated with lower wages (Table 2.3). Nonetheless, according to a recent US Department of Agriculture Economic Research Service (ERS) study, development of recreation and tourism in rural counties yields many positive results (Reeder and Brown, 2005). The study included 311 “nonmetro” recreation counties, sometimes called recreation-dependent counties. The study included all EUP counties and four WUP counties.

Reeder and Brown (2005) found that the overall effects of tourism development were positive. Recreation and tourism development was associated with increased employment rates, earnings

and educational attainment, and decreased poverty rates. Results differed by the type of tourism offered within the counties. For example, counties with ski areas fared best. Further examination of the study results is warranted due to the intriguing findings and concerns about their applicability to the UP. Notably, the average population growth in recreation-dependent counties was 20% from 1990 to 2000. Only Luce and Keweenaw counties, the least populous counties in the UP, exceeded the average growth rate during the 1990-2000 period. Nonetheless, the hopeful tone of the report raises the possibility of an important and growing role for tourism in the UP.

2.6.2 Timber and Wood Products

Forest products industries are often classified as producers—logging and trucking firms that extract trees from the forest, primary manufacturers—firms that convert those trees directly into products, and secondary manufacturers—firms that take primary products and add value to create further-processed, value-added products. Sawmills, for example, would be primary manufacturers whereas firms making wood windows and doors would be secondary manufacturers. Some firms are vertically integrated; for example, they may harvest logs, produce lumber, and manufacture wood products.

Based on Michigan Department of Natural Resources data, there are over 12,000 jobs associated with forest products industries in the UP (Table 2.6). Most of these jobs are located in the WUP. Likewise, most logging/trucking, primary manufacturing and secondary manufacturing firms are located in the WUP. However, Table 2.6 figures are drawn from the MiDNR’s Wood Products Directory (www.dnr.state.mi.us/wood/) which was designed to communicate information from firms to potential clients. As a result, Table 2.6 over-reports the number of jobs and firms due to double counting for vertically integrated firms, over-counts jobs for horizontally integrated firms (ones which have forest products as part of their product mix), and includes firms which voluntarily added their names to the data base, but are not forest products industry firms.

US Census Bureau and IMPLAN data provide a more accurate depiction of the forest products industries with respect to establishments, employment and compensation, but the MiDNR data provides detailed information for each firm in the data base.

Table 2.6 Employment and firms in the forest products industries, Michigan and the Upper Peninsula, 2005

Region	Estimated Employees	Firms		
		Logging/ Trucking	Primary Manufacturing	Secondary Manufacturing
WUP	10,397	335	61	87
EUP	1,976	111	19	21
UP Total	12,373	446	80	108
Michigan	88,774	840	339	1,291

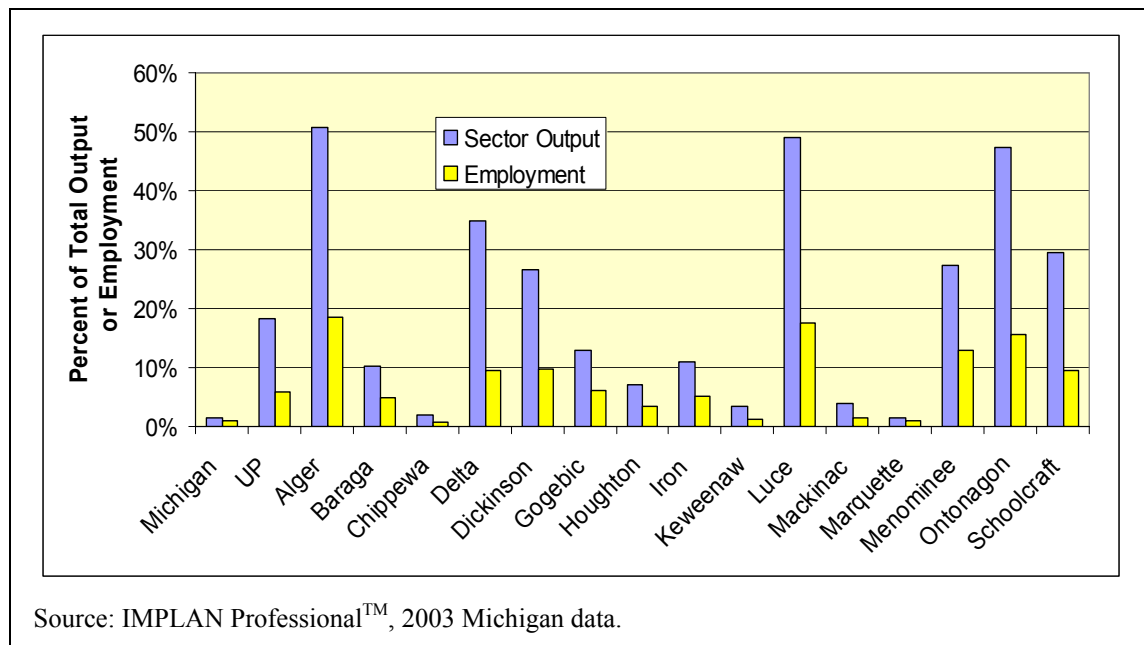
Source: Compiled by Jack Pilon, Michigan DNR, Gaylord, MI. Generally based on 2005 information. Note: Over-counting regarding table figures is due to the nature of the data base—see related text in report. IMPLAN estimates over 8,500 forest products industry jobs in the UP and over 50,000 statewide. Adapted from Tessa Systems, LLC, 2006.

2.6.3 Forest Products Dependency

From an employment standpoint, forest products industries are a main contributor to the UP's economic base (Appendix Table A2). Industries that export goods and services to other regions bring new dollars into the region's economy; these industries form the region's economic base (Maki et al., 1985). Typically, manufacturing industries make up part of the economic base, while service industries focused on local needs typically are not. The economic growth of a region is often dependent on growth in its economic base. After dropping retail trade, other services, and state and local government as potential sources of base economic growth, the forest products industries and tourism (accommodations and food services) form the main sectors for generating new dollars from outside of the UP (Appendix A, Table A.2).

Concentration of economic activity based on forest products industries provides a measure of the importance of the industries within the state, regional and county economies. Though forest products industries' output and sales were over \$11 billion in 2003, they only accounted for 1.6% of the state's total output (Appendix A Table A.1, Figure 2.7). The percent of jobs attributed to the industries accounted for 1.1% of Michigan's employment. The UP regional role was significantly higher. Almost 20% of total UP output was directly associated with forest products industries along with approximately 6% of employment.

Figure 2.7 Percent of output/sales and employment (dependency measure) in forest products IMPLAN sectors, for Michigan and the Upper Peninsula and by county, 2003



Ten of 15 UP counties had over 10% of the county output attributable directly to the forest products industries. Seven counties had about 1 out of 10 jobs or more from the forest products industries. Hence, forest products industries are very important in the UP economy, and they are especially important to the majority of county economies.

Data in Figure 2.7 does not include other sources of economic activity directly related to the forest products economy in the UP. For example, the Michigan Department of Natural Resources and the USDA Forest Service make payments in lieu of taxes and other payments to local governments annually that are associated with forest land ownership and timber production (Leefers et al., 2003, Tessa Systems, LLC, 2006). These payments total over \$6 million annually. In addition, many of the agencies' employees work on preparing and administering timber sales. These activities are captured under government sectors rather than the forest products industries. Finally, employees' and agencies' expenditures in these government sectors provide additional economic inputs into the regional economy.

2.6.4 Forest Products Industries Outlook

Several government and private sources provide projections and economic outlooks for the US economy and various economic sectors. These projections are often tied to a set of assumptions. For example, the Bureau of Labor Statistics' (BLS) Monthly Labor Review (Saunders 2005) provided industry output and employment projections with some of the following standard disclaimers: no major wars, no natural catastrophes, and no other unanticipated factors which could upset the behavior of the projection models. While these factors do not currently hold given recent hurricanes and ongoing wars, the overall US economy is still on a growth trajectory. BLS projections are published in November of odd years and provide a long-range (10-year) estimate of employment and output by major industry sectors.

Berman (2005) reported a mixed picture in BLS's projected forest products industries employment and output in the US for 2014 (Tables 2.7 and 2.8). Projected gains in employment in Wood Products Manufacturing (sector 321) offset losses in Forestry and Logging (sectors 1131 and 1132), Paper Manufacturing (sector 322), and Furniture and Related Product Manufacturing (sector 337). In total, employment in forest products industries nationwide was projected to be relatively unchanged. Projected increases in output were expected in all sectors except Forestry, which was projected to remain unchanged.

The Michigan Department of Labor & Economic Growth (DLEG) develops regional projections of employment by industry sector (www.milmi.org). The most recent projections are for 2012; projections to 2014 will be available in early 2007 (pers. comm., M. Reffitt, MLEG, 12/4/06). Existing projections for the UP indicated that employment was expected to be stable for Forestry, Logging, Wood Products Manufacturing, and Furniture and Related Product Manufacturing. "Stable" included slight declines. Paper Manufacturing was expected to be a declining sector.

Several studies and reports provide some insights into the economic vitality of these industries. Rickenbach and others (2005) completed a recent study of some trends for the logging sector in Wisconsin and the Upper Peninsula of Michigan. They characterized factors regarding the business environment, timber production and supply, markets, and firm retention. Two findings support a regional decline in the logging industry: the average firm owner is 47 years old and almost 1/4 of the firms do not expect to be in business in five years. Older owners, often in single-person firms, are approaching retirement age, and it is likely many of these firms will go out of business.

Banzhaf & Company (2005) noted several recent trends regarding Michigan's forest products industries.

- Although the number of pulp and board mills has stabilized in recent decades, capacity has increased substantially and pulp and paper prices have remained low due to international competition.
- OSB capacity has been stable, and composite panel prices have been rising. This increases demand for species such as aspen.
- Sawmills have declined in number in recent years, but there are more, larger mills.
- The number of veneer mills has declined by approximately half over the past three decades.

Table 2.7 US employment by industry for 1994, 2004, and projected for 2014

NAICS	Sector	Thousands of jobs			Average Annual Rate of Change	
		1994	2004	2014	1994-2004	2004-2014
1131-2	Forestry	22.2	24.4	19.8	0.9	-2.1
1133	Logging	118.6	100.3	91.0	-1.7	-1.0
115	Support for Ag & Forestry	117.3	153.8	167.6	2.7	0.9
321	Wood Product Manufacturing	560.5	548.4	588.0	-2	0.7
3211	Sawmills & Wood Preservation	138.9	117.5	95.9	-1.7	-2.0
3212	Veneer, plywood, and engin'ed Wood Product Manuf.	102.2	117.3	125.2	1.4	0.7
3219	Other Wood Product Manufacturing	319.4	313.6	366.9	-2	1.6
322	Paper Manufacturing	639.4	499.1	487.3	-2.4	-2
3221	Pulp, Paper & Paperboard Mills	224.5	146.9	124.0	-4.2	-1.7
3222	Converted Paper Product Manufacturing	414.9	352.2	363.3	-1.6	0.3
337	Furniture & Related Product Manufacturing	600.2	572.7	562.9	-5	-2
3371	Household & Institutional Furniture & Kitchen Cabinet Manuf.	398.7	384.4	374.9	-4	-2
3372	Office Furniture (including fixtures) Manufacturing	154.4	136.1	138.0	-1.3	0.1

Source: Berman, 2005

The Minnesota Governor's Advisory Task Force (2003) provided some views regarding Michigan's competitiveness relative to Minnesota's primary forest products industry. The Task Force found that Michigan was more competitive in the areas of wood and fiber availability and price, transportation (vehicle weight limits), wood and fiber quality, research and forestland productivity. Minnesota was more competitive in terms of energy costs and education. Neither state had a plain advantage in taxation and labor/construction costs.

A recent Wisconsin study (Center for Technology Transfer, Inc., 2004) highlighted the importance of forest products industries as export-based sectors—the products are made within the state and principally shipped elsewhere bringing new dollars into the state economy. The study noted several national trends creating problems for forest products industries, especially in the paper industry: mill closures due to overcapacity, consolidation of companies, globalization, and the high cost of reinvestment. Weak domestic markets and tough foreign competition were viewed as factors harming the logging, sawmill, and furniture sectors, as well.

Table 2.8 US output by industry for 1994, 2004, and projected for 2014

NAICS	Sector	Billions of chained 2000 dollars			Average Annual Rate of Change	
		1994	2004	2014	1994-2004	2004-2014
1131-2	Forestry	5.5	5.2	5.2	−.6	0.0
1133	Logging	28.3	26.0	28.0	−.8	0.7
115	Support for Ag & Forestry	10.8	11.1	12.3	0.2	1.1
321	Wood Product Manufacturing	81.1	101.2	124.1	2.2	2.1
3211	Sawmills & Wood Preservation	25.1	30.4	37.6	1.9	2.1
3212	Veneer, plywood, & engin'ed Wood Product Manuf.	18.4	21.4	27.3	1.5	2.5
3219	Other Wood Product Manufacturing	37.5	49.4	59.2	2.8	1.8
322	Paper Manufacturing	161.5	171.1	184.4	0.6	0.8
3221	Pulp, Paper & Paperboard Mills	73.6	82.9	87.0	1.2	0.5
3222	Converted Paper Product Manufacturing	87.9	88.3	97.5	0.0	1.0
337	Furniture & Related Product Manufacturing	56.4	71.1	90.8	2.3	2.5
3371	Household & Institutional Furniture & Kitchen Cabinet Manuf.	33.6	41.4	50.8	2.1	2.1
3372	Office Furniture (including fixtures) Manufacturing	17.2	23.1	32.0	3.0	3.3

Source: Berman, 2005

The US is the world's highest-cost producer of raw materials and of many finished products (Schuler et al., 2005). Hence, price competition from other countries creates challenges for domestic suppliers and their infrastructure. Residential construction is a major market for wood products, and consolidation in housing construction and demands for low-cost materials will continue in the foreseeable future. A slowing housing market creates difficulties for industries linked to housing. One approach to maintaining forest products industries is to focus on higher value-added products—where firms can compete on quality rather than quantity, but other strategies must be considered as well (Schuler et al., 2005).

Hoovers™, a Dun & Bradstreet Company, regularly develops overviews of various industries; overviews are available for several forest products industries. The home furniture market has undergone significant change in recent years (Colbert, 2006). There is an increasing reliance on furniture made outside the US, especially from China. As a result, there has been a loss of over

40,000 US furniture industry jobs since 1995. Low-cost production elsewhere has led to mill closings and overseas investments for some companies. Some firms are focusing on high-end furniture and on ready-to-assemble furniture as a strategy for the future. The industry will continue with its cyclical nature due to strong ties to home construction.

According to another Hoovers™ overview, paper and paper product manufacturing has been faced with mill closures and restructuring due to overcapacity (Walker, 2006). The recovering US economy has led to an increased demand for coated and uncoated papers, especially coated papers in the past few years. Paper is a highly cyclical industry, and competition, especially from China which has expanded capacity, will be at the forefront of industry concerns for the near future.

Strong housing markets in the 2002-2004 period kept lumber and wood construction product prices up, though prices fell off somewhat as the housing market cooled in 2005 (Sarath, 2006). The overall picture for forest products industries is one of continuing threats from lower-cost international competition. As part of this situation, softwood logs and lumber exports have declined in recent years, whereas hardwood logs and lumber exports have increased.

Price competition with imports has resulted in the loss of market share by US firms—they have difficulty competing on price alone. US forest products industries have several inherent advantages, however: close proximity to suppliers and markets (short supply chains), good access to high quality and sustainable forest resources, wide species selections, high levels of technology and innovation, and stable economic and political conditions (Lawser, 2004). Nevertheless, global competition, low profitability, and scarcity of high-skilled labor are challenges the industries face.

Three other forces will have unknown impacts on forest products industries: biofuels, forest certification, and carbon markets. Each of these areas has the potential to positively affect forest products industries in Michigan. Cellulosic biomass as a feedstock for ethanol is on the horizon, and direct burning of wood for energy already exists in Michigan. The state forests and many private forests have been certified for sustainable management under the Sustainable Forestry Initiative and/or the Forest Stewardship Council. Products made from certified wood may become more popular in the future, leading to a competitive advantage for some Michigan firms. Finally, carbon markets are evolving, and these may offer opportunities for firms with investments in forestlands.

Some people see the tourism industry as a substitute for the forest products industries in the UP. In reality, both are important sectors. Tourism also faces challenges for growth: declining automobile trips to the UP, a stable population base, and an aging Michigan population. As fewer people travel to the UP, it is important economically to capture more tourist dollars while they visit.

2.6.5 Commercial Forest and Forest Industry Policy Needs

The principal policy associated with private forest lands in Michigan is the Commercial Forest Program (Natural Resources and Environmental Protection Act 451 of 1994, Part 511). The act encourages private landowners to retain and manage forestland for long-term timber production

by providing a property tax reduction in exchange for access by hunters, anglers, and trappers. Approximately 2.2 million acres are enrolled in the CFP. The continuation of this program is a key element in maintaining accessible, private working forests in Michigan.

Timber produced in Michigan, from private and public lands, must have a market. The Michigan Forest Products Council has identified several policies that will support and encourage forest industries (Berghorn, 2005). These include:

- Highlight and promote the importance of sustainable forest products industries as a key Michigan industry,
- Support the \$20 million capitalization of the Forest Finance Authority's forest development fund,
- Promote the forest products industries within the Michigan Department of Natural Resources,
- Create a stable regulatory climate that will encourage retention and growth of forest products industries,
- Adequately fund the MiDNR to implement a state-of-the-art GIS-based forest inventory system to provide information for the forest products industries and natural resource management agencies and organizations,
- Publicize and promote existing incentives, programs, and services available to existing and potential forest products businesses,
- Support and improve efforts by the Department of Agriculture in the international marketing program for forest products, and
- Improve and expand the management of timber harvests from Michigan's national forests.

Stumpage markets softened in 2006 and early 2007 (i.e., prices declined) due to changes in production and market demand for end uses. Many firms purchase timber from state and federal lands. Purchased timber is generally cut under a two to three-year contract (Leefers and Potter-Witter, 2006). These contracts do not include provisions for lowering the price paid when markets decline (G. Berghorn, pers. comm., March, 23, 2007). As a result, firms can suffer financial losses by having higher priced stumpage under contract. Policies for adjusting contracted stumpage prices would help mitigate this effect. Recent changes in stumpage pricing policies by the MiDNR should alleviate some market issues in the short run.

3.0 Forest Production

To provide a context for assessing potential effects of land use change on the economy of the UP, and especially on the forest products industries, it is useful to examine forest production. Many tables and figures in this section were adapted from Tessa Systems, LLC (2006) with permission. More detailed tables, figures and discussion are available in the Social and Economic Assessment for Michigan's State Forests (Tessa Systems, LLC, 2006).

The USDA Forest Service conducts inventories of forest lands to provide a basis for portraying forest conditions and for monitoring change. The two most recent periodic inventories were completed in Michigan for 1980 and 1993 (Raile and Smith, 1983; Leatherberry and Spencer, 1996). Starting in 2000, the USDA Forest Service implemented an annual survey for completing statewide efforts over a five-year period, from 2000 to 2004 (Hansen and Brand, 2006). Though some changes in inventory procedures were implemented, comparisons are made between the 1980, 1993 and 2004 data (Table 3.1). Notably, the Forest Service combined the industrial and corporate classes of landowners with all other private landowners to protect the privacy of inventory data. Also, procedures for tallying reserved lands were based on sampling in 2004 rather than known reserved lands used in 1980 and 1993. Hence, ownership data are not presented in this report, but are available from the Forest Service reports.

Table 3.1 Forest area (thousand acres) by land class for all owner groups, by ecoregion, 1980, 1993, and 2004

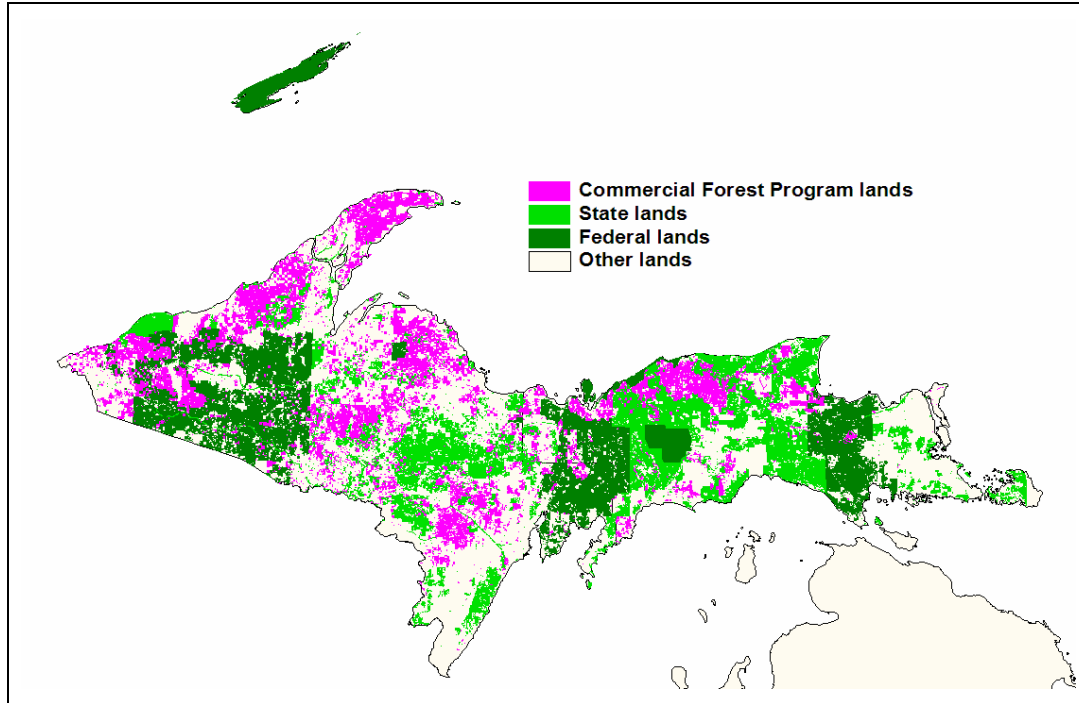
Year	Total Land	Timber-land	Reserved Timber-land	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
Western Upper Peninsula							
1980	6,806	5,606	271	54	875	5,930	87.1%
1993	6,937	5,708	232	23	973	5,963	86.0%
2004	6,917	5,686	240	80	911	6,006	86.8%
Eastern Upper Peninsula							
1980	3,526	2,734	144	57	592	2,935	83.2%
1993	3,572	2,690	118	41	723	2,849	79.8%
2004	3,613	2,903	29	65	617	2,996	82.9%
Michigan							
1980	36,126	17,493	682	194	17,757	18,369	50.8%
1993	36,358	18,616	575	90	17,077	19,281	53.0%
2004	36,408	18,746	321	245	17,096	19,312	53.0%

Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004. Changes in estimation procedures yield differences in total land area from period to period. Adapted from Tessa Systems, LLC, 2006.

Approximately 53% of Michigan was forested in 2004; the percentage was relatively unchanged from 1993. Small increases were reported in the WUP and the EUP.

Public lands and commercial forest lands dominate the landscape in the UP (Figure 3.1). Over 4.2 million acres are in public ownership and 2.2 million acres are Commercial Forest Program lands. These lands provide "...timber, recreation, wildlife, minerals, water, and mental well-being" (Botti and Moore, 2006).

Figure 3.1 Public and Commercial Forest Program lands in the UP, 2005



3.1 Timberland Area by Forest Type

There were 5.7 million acres of hardwood timberlands and 2.9 million acres of softwood timberlands in the UP in 2004. Softwoods, northern white cedar, black spruce, balsam fir, jack pine, and red pine had 100,000 acres or more in both the WUP and EUP in 2004 (Figure 3.2). Sugar maple-beech-yellow birch had 2.7 million acres in the UP, concentrated heavily in the WUP (Figure 3.3). Aspen was the second most common forest type in the UP with more acreage than northern white cedar. In terms of hardwood timberland area, aspen was followed by hard maple-basswood, upland red maple, paper birch, and black ash-American elm-red maple.

Potential impacts on forest products industries from changing ownership patterns will occur if new owners reduce access to resources that are not offset by other available resources. This is more likely for relatively scarce species than for more common species, but local effects could be more pronounced. Some species may change in abundance over time due to specific management policies (e.g., public agencies may favor old growth forests over early successional species such as aspen).

Figure 3.2 Softwood timberland area in the WUP and EUP, 2004

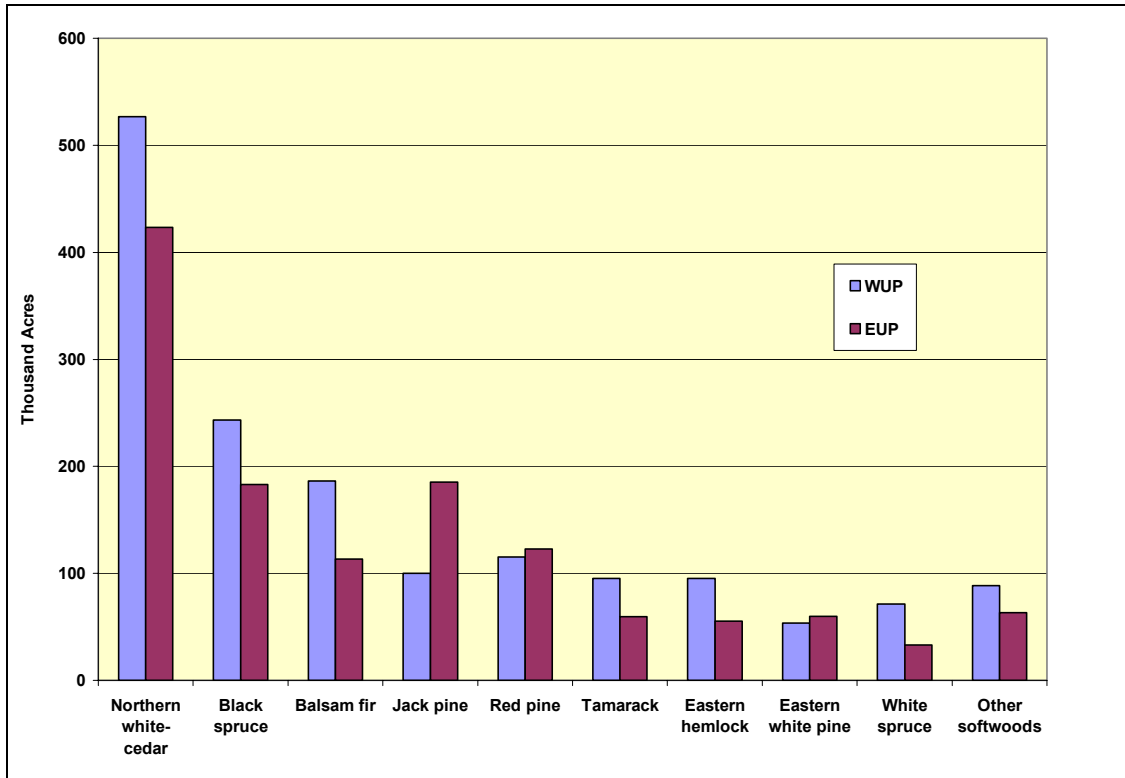
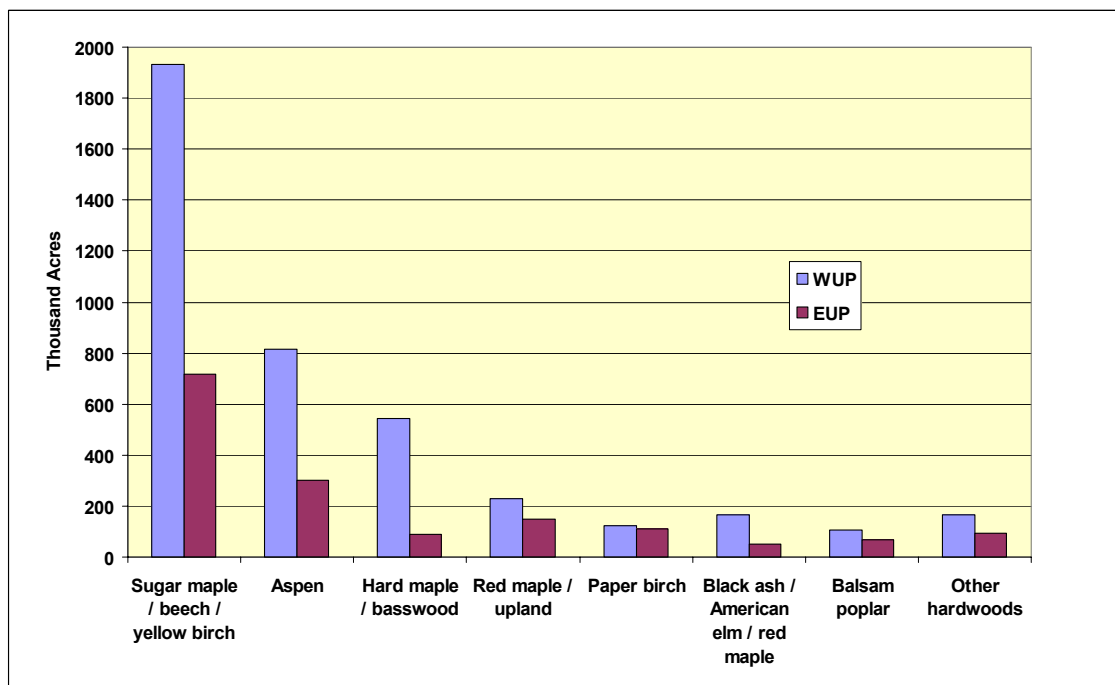


Figure 3.3 Hardwood timberland area in the WUP and EUP, 2004



3.2 Volume

Almost half of the growing stock volume in Michigan is in the UP (Table 3.2). And the WUP has over twice the volume in the EUP. On average, this translates to about 18 cords per acre (using 80 cubic feet/cord as the conversion factor). Of course, all of this volume is not available for harvest given different owners and management objectives. Nonetheless, the volumes are substantial.

Table 3.2 Volume of all growing stock trees (million cubic feet) on timberland, all owners, by forest type for the Upper Peninsula and Michigan, 2004

Forest type group	EUP	WUP	Michigan
Aspen	311	798	2,678
Balsam fir	90	169	315
Black spruce	147	205	372
Elm-Ash-Cottonwood	92	266	1,878
Jack pine	160	91	521
Maple-Beech-Birch	1,624	5,065	10,733
Northern white-cedar	777	978	2,363
Other Hardwoods	134	229	4,728
Other Softwoods	142	244	597
Paper birch	134	160	395
Red pine	204	237	1,797
Tamarack	42	86	155
White Pine	138	173	599
White spruce	46	88	173
Total	4,041	8,789	27,304

3.3 Growth & Removals

Statewide, net growth was 923 million cubic feet in 2004 (Table 3.3). 43% of Michigan's annual growth was in the UP. Growing stock volume growth was greatest for forest types that had the most acreage. So maple-beech-birch, northern white cedar, and aspen had the most growth in the UP.

Based on Forest Service estimates for the 2000-2004 period, statewide annual removals were 291 million cubic feet (Table 3.4). This was approximately 3.6 million cords. Forty-seven percent of statewide removals were in the UP. Maple-beech-birch accounted for about 50% of the removals in the UP. Mortality is another factor affecting net growth. For the 2000-2004 period, average mortality was 225 million cubic feet statewide (Hansen and Brand, 2006).

Net annual growth exceeded net annual removals for most forest types and regions. Clearly, statewide removals are considerably lower than growth. These figures do not necessarily apply to all local situations due to different ownerships and related accessibility.

Table 3.3 Average net annual growth (million cubic feet) on timberland, all owners, by forest type for the Upper Peninsula and Michigan, 2004

Forest type group	EUP	WUP	Michigan
Aspen	3.0	30.3	97.2
Balsam fir	1.8	4.7	11.6
Black spruce	6.9	5.5	12.7
Elm-Ash-Cottonwood	0.8	9.4	61.7
Jack pine	2.9	5.7	15.8
Maple-Beech-Birch	50.6	142.8	325.3
Northern white-cedar	25.2	31.6	63.2
Other Hardwoods	4.5	9.4	176.6
Other Softwoods	6.1	11.2	29.9
Paper birch	2.1	4.1	10.8
Red pine	6.4	5.5	85.4
Tamarack	1.3	4.5	7.6
White Pine	3.7	4.0	12.9
White spruce	2.5	8.5	11.1
Unclassified	0.1	-0.2	1.7
Total	117.8	276.9	923.3

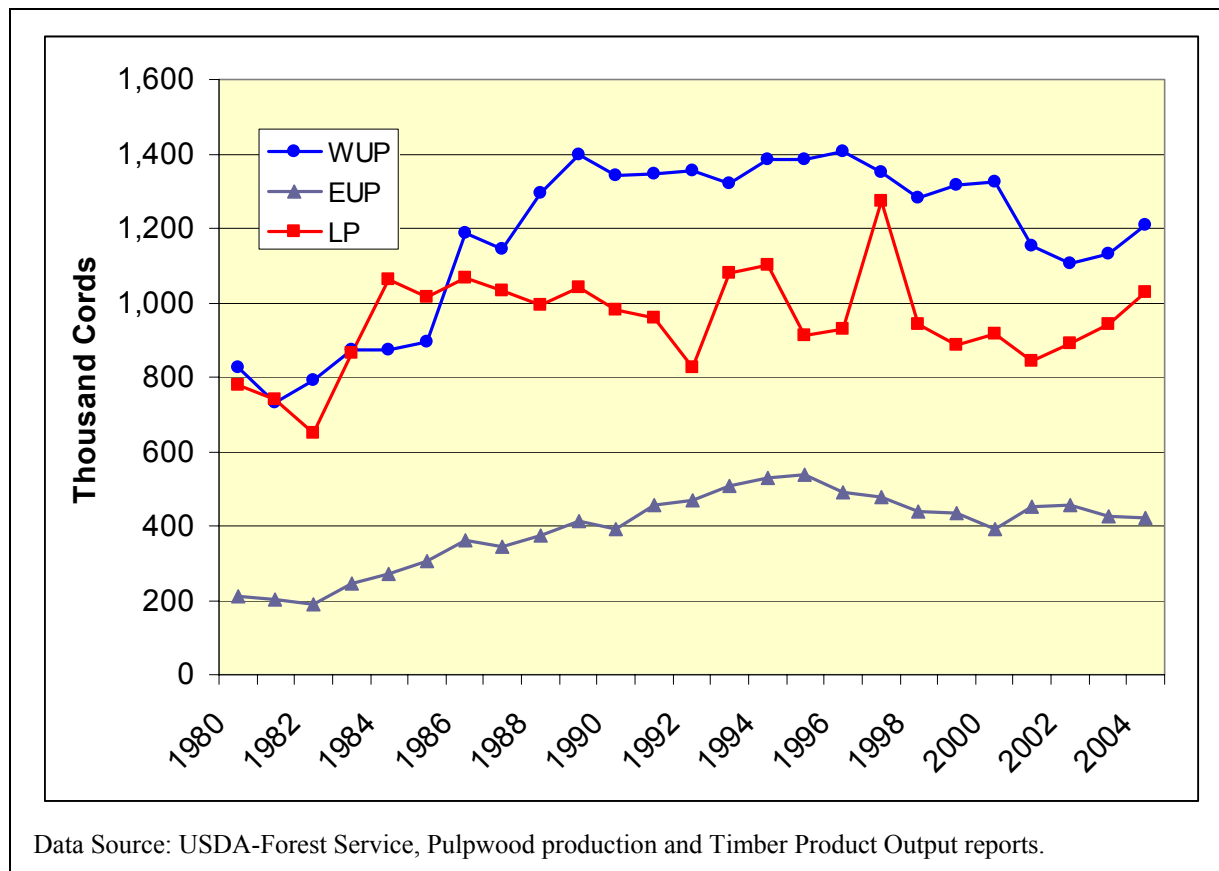
Table 3.4 Average annual removals of merchantable volume (million cubic feet) from growing stock trees on timberland, all owners, by forest type for the Upper Peninsula and Michigan, 2004

Forest type group	EUP	WUP	Michigan
Aspen	2.4	12.6	28.4
Balsam fir	0.8	2.0	3.1
Black spruce	1.1	0.6	1.7
Elm-Ash-Cottonwood	2.0	1.5	13.5
Jack pine	1.5	1.8	6.5
Maple-Beech-Birch	17.4	54.1	111.1
Northern white-cedar	3.8	5.0	8.8
Other Hardwoods	0.4	7.8	56.9
Other Softwoods	2.9	5.2	10.8
Paper birch		0.4	0.4
Red pine	0.9	5.2	19.3
Tamarack		1.8	1.8
White Pine	1.6	2.3	4.5
White spruce	1.1	0.2	2.2
Unclassified	0.7	0.8	22.0
Total	36.8	101.2	291.2

3.4 Timber Production

Timber Output Product data provide historic trends of timber production for both pulpwood and sawtimber (Piva, 1999-2006; Haugen and Pilon, 2002; and Haugen and Weatherspoon, 2003). Statewide, pulpwood production has increased since 2000, but current levels are still similar to those of the late 1980s (Tessa Systems, LLC 2006). Total statewide pulpwood production was 2.66 million cords in 2004 (Piva, 2006). The trend in the WUP and Lower Peninsula (LP) showed harvest increases in recent years; whereas the EUP production has been fairly flat (Figure 3.4). The WUP produced more pulpwood than the LP or the EUP.

Figure 3.4 Pulpwood production (thousand cords) from all lands for the WUP, EUP and LP, 1980 to 2004



Pulpwood production in the WUP is comprised mostly of three major species or species groups: aspen, mixed hardwoods, and hard maple (Figure 3.5). Mixed hardwoods and aspen are mainstays in the EUP as well, with pine or hard maple as the third species group (Figure 3.6). Pulpwood production peaked in the UP during the 1995-1996 period.

Figure 3.5 Pulpwood production from all lands, by species group, WUP, 1980 – 2004
 (reprinted from Tessa Systems, LLC, 2006)

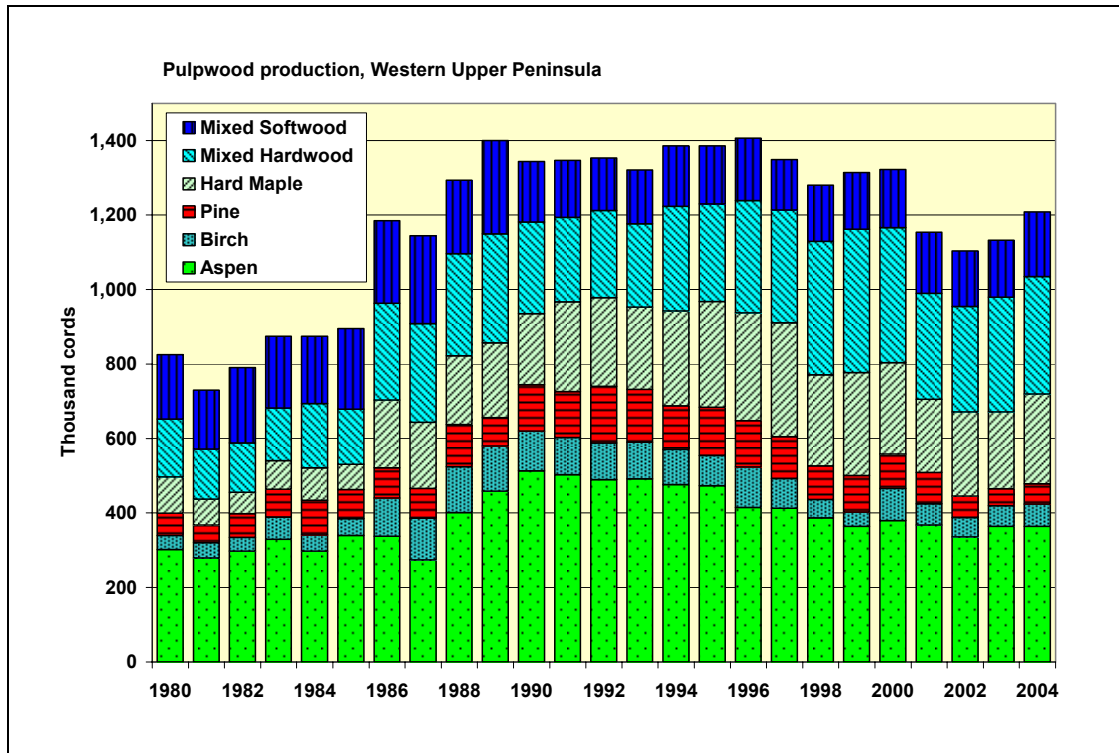
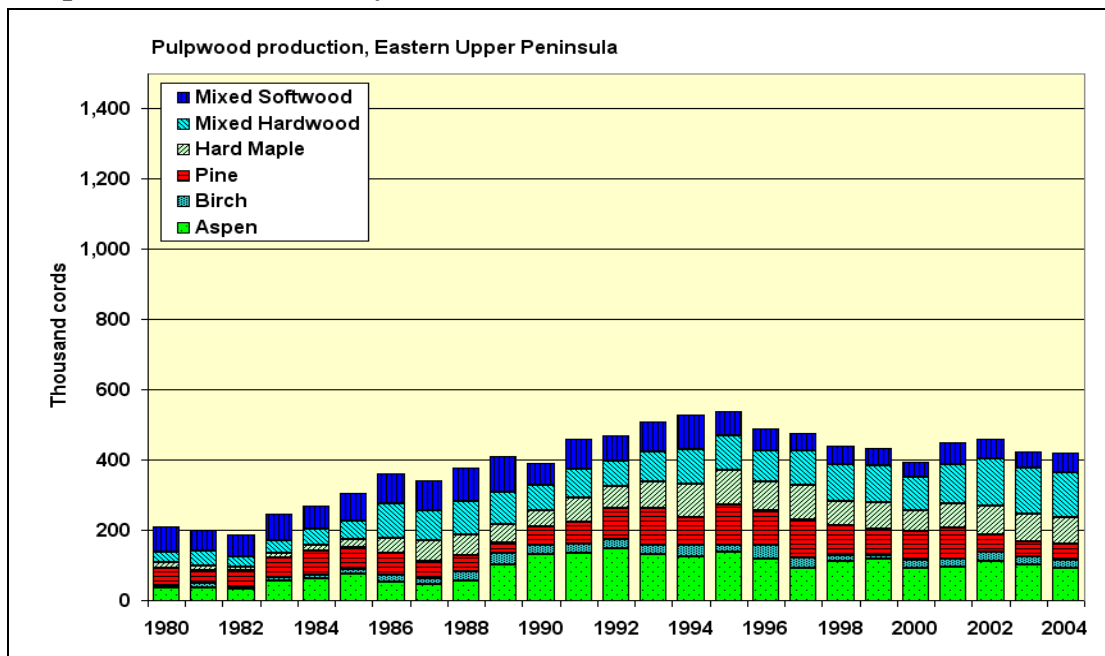


Figure 3.6 Pulpwood production from all lands, by species group, EUP, 1980 – 2004.
 Reprinted from Tessa Systems, LLC, 2006



Data on sawlog production are not published annually. The most recent data are from 1998 (Table 3.5). Sawlog production was concentrated in the LP, but one-quarter of total production was in the WUP in 1998. Hard maple sawlogs provided the most volume in the UP. From a percentage standpoint, production of several species was concentrated in the UP. Ninety-eight percent of spruce sawlogs were harvested in the UP. Yellow birch (95%), white birch (69%), and jack pine (64%) were also concentrated in the UP.

Table 3.5 Distribution of sawlog production (MBF) by species and region, 1998

Species	State Total	Total Volume	WUP	EUP	LP
	Percent	MBF	Percent of species total		
Hard maple	18%	134,358	35%	9%	55%
Red oak	14%	106,219	5%	1%	95%
Red pine	14%	103,736	11%	10%	79%
Aspen	14%	103,466	20%	3%	77%
Soft maple	9%	70,803	19%	8%	83%
Jack pine	7%	53,063	37%	27%	36%
Ash	4%	28,057	9%	15%	76%
Basswood	3%	23,995	33%	1%	65%
White oak	3%	19,264	0%	0%	100%
Spruce	3%	18,970	84%	13%	2%
Black cherry	2%	16,347	8%	3%	89%
White pine	2%	12,624	34%	22%	44%
Beech	2%	11,795	11%	36%	52%
Yellow birch	2%	11,602	80%	14%	5%
White birch	1%	11,164	46%	23%	31%
Other Species	4%	31,935	41%	9%	50%
All Species	100%	757,398	24%	9%	67%

Source: USDA Forest Service, North Central Research Station. Data published in the Timber Product Output report series. Reprinted from Tessa Systems, LLC 2006.

4.0 Linkages Between the Forest Products Industries and Other Sectors of the Economy of Michigan's Upper Peninsula

Linkages between the forest products industries and other sectors of the economy are numerous. Establishments purchase goods and services directly from other establishments. The other establishments purchase goods and services from others. These additional purchases “ripple” through the economy creating indirect effects, and the effects of changes in household expenditures (from compensation) are called induced effects. The combination of direct, indirect, and induced effects measures the total economic impact of a change in economic activity, such as the opening or closing of a mill. The total economic impacts differ by sector, but are often twice as large as the direct impacts whether you are looking at the impacts of the existing industry or modest expansions and contractions. Substantial changes may exceed estimated impacts because they can create structural changes in the economy.

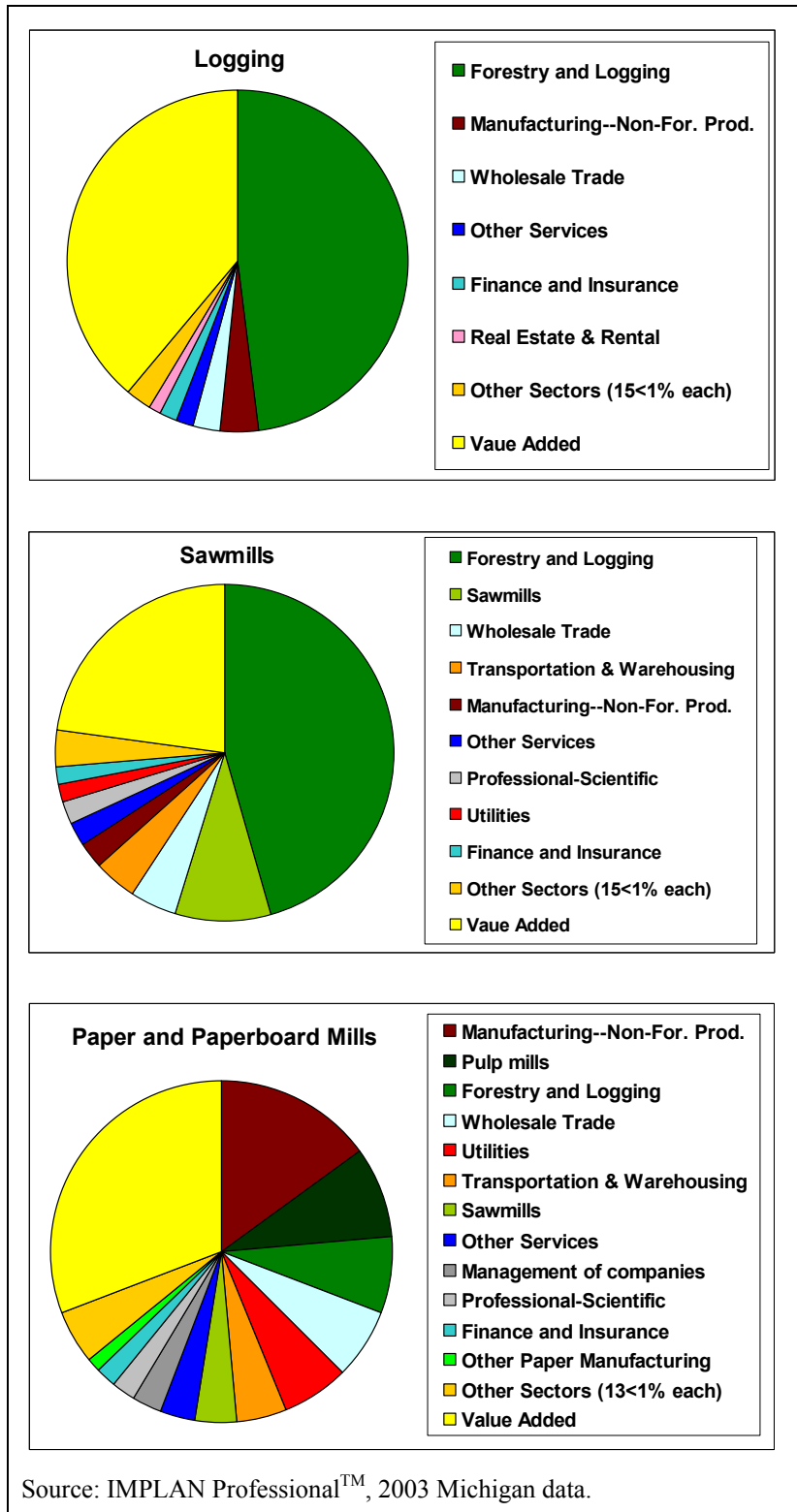
Input-output models such as IMPLAN are designed to estimate the effects that changes in economic activity have on sales/output, employment, and income. For example, the Wednesday, March 8, 2006 headline in the *Gaylord Herald Times* read “*WHAT NOW? After G-P Closing*”. The first article was “*210 lose jobs at plant*” (Comings, 2006). The 210 jobs lost are called a direct effect by regional economists. Using IMPLAN, we can estimate (using 2003 dollars) that 210 jobs in that sector represented a loss of \$7.8 million in direct labor income. The estimated annual total employment impact for the Georgia-Pacific mill closing was 447 jobs, and \$15.9 million in total labor income lost. For predictive purposes, multipliers are often developed to estimate the impacts. Of course, a new “replacement” forest products mill in Gaylord will undo part or all of the negative economic impacts.

Central to this project is the linkage between changing landownership in the UP and its consequences. Though the potential ramifications of the change have not been enumerated, two aspects of linkages are presented. First, forest products industries purchase goods and services from other sectors of the economy. If those sectors are influenced by the change in landownership, the forest products sectors are potentially affected. Second, and more explicitly, if the change leads to some direct economic decisions or activities, then those impacts can be estimated. Several examples are presented to illustrate the magnitude of these potential changes.

4.1 Linkages Between Sectors

Production functions in IMPLAN quantify the relationship or linkage between the industry sector of interest and other sectors that provide inputs for production of outputs in that industry sector. Specifically, the production functions show what the dollar inputs (or actually cents) required to produce one dollar of output in the sector (Figure 3.7; Appendix A Tables A.3-A.5). IMPLAN production functions are based on mean nationwide relationships, but can be modified locally. Economic structure within a region, however, is based on survey data from the region.

Figure 3.7 Sources of inputs for production for logging, sawmill, and paper and paperboard mill industry sectors by percent for one dollar of output, 2003



A major part of most production functions is value-added—employee compensation, proprietary income, other property type income (including profit), and indirect business taxes used to produce outputs (MIG, Inc., 2004). Hence, the price of the value-added product reflects labor, private business owners' income, rents, profits, and sales and excise taxes used in the production process.

The composition of the production function varies by industry (Figure 3.7). The two largest components of the Logging and Sawmills sectors are (1) Forestry and Logging and (2) Value Added. But Transportation and Warehousing, Professional and Technical Services, and Utilities play a much larger role in the Sawmills sector. In the Paper and Paperboard Mills sector, manufacturing (non-forest products) is the largest production factor after Value Added. When combined, Forestry and Logging and Pulp Mills are also major inputs. This input combination may reflect vertical integration with some raw material arriving in the form of logs or chips from the Forestry and Logging sector and other wood-based materials coming from Pulp Mills or it may reflect different mills using different raw material sources.

The production functions highlight the many linkages between sectors. And each of those sectors is, in turn, linked to others. Linkages are often called backward linkages or forward linkages. One backward linkage for the Sawmills sector is Forestry and Logging, the source of logs. For the Forestry and Logging sector, Sawmills and Paper and Paperboard Mills are forward linkages; that is, they purchase commodities sold by the Logging and Forestry sector.

4.2 Examples of Linkages

To provide insights regarding the potential impacts of economic decisions affecting the forest products industries, three cases are presented. First, if some Commercial Forest Program (CFP) lands are subdivided for housing, what are some potential economic impacts? Second, what if additional economic activity occurs, such as sawmill operations, due to additional harvesting from CFP lands or simply from increased demand for housing? Finally, what if a large amount of the land is no longer available as a working forest and a major paper mill closes? These examples are intended to illustrate linkages and potential impacts. A clearer understanding of the consequences of the recent land sales is required before making more targeted impact estimates.

4.2.1 Home Construction

The population of the UP is projected to increase over the next two decades (Burchell et al. 2002). Though the UP population has been fairly stagnant for decades, additional home development will be needed to support an expanded population and potential seasonal homeowners. A common concern among many citizens is that parcelization (dividing parcels into smaller saleable lots) will be accelerated as a result of the sale of forest lands. This is not entirely bad economic news. Two sectors immediately come to mind as winners if this occurs: home builders and realtors.

Parcels with attractive natural resource attributes (e.g., waterfront properties, good scenic views, etc.) are likely to be the most desirable lands. Based on 2005 data on CFP parcels, there are 370 lakes, 100 acres or larger in size, adjacent to CFP lands. If lot depths are 300 feet, there will be approximately 2,400 acres of lakeside real estate for potential development. This is a fairly small percentage of the CFP land base. For two-acre lots, this translates to 1,200 parcels, and for five-

acre parcels, there would be 480 potential building sites. The total seasonal housing stock for the UP was 35,001 units in 2000 (Table 1.3). The growth in seasonal homes from 1990 to 2000 was just over 300 homes.

If 100 homes were built on these potential CFP parcels in the near term, it would be a very modest addition to the housing stock. Large-scale development is not likely due to slow population growth and distance from population centers that may fuel seasonal home building. For homes built on CFP lands, an additional cost for home construction would be the penalty associated with removing CFP lands from the program.

Sixty-seven jobs and \$2.7 million in associated income will directly contribute to the construction and sale of 100 new, \$100,000 homes if they are built (a miniscule percentage of the regional housing stock) (Table 4.1). Realtors are given 6% of the sales value as a commission. A variety of forest products go into home construction. Total regional impacts are considerably higher due to indirect and induced effects. Additional impacts would accrue if these homes bring new or seasonal homeowners to the UP (Stynes et al., 1997).

There are also concerns about fiscal and institutional effects (e.g., fire protection) and ecological effects of additional home construction. For example, high infrastructure and land conversion costs are associated with rural sprawl (Burchell et al., 2003). Water and sewer infrastructure (including wells and septic systems), and other public-services are part of the costs of rural sprawl, too. Moreover, additional travel time and greater need for local roads is attributed to rural sprawl. These concerns, however, do not diminish the occurrence of some positive impacts. For example, many people view a rural lifestyle as a better quality of life, and in many cases homes in rural areas are less expensive than comparable homes in towns and cities. A full impact analysis should include both the positive and negative impacts. Part of the issue is “would these homes be built without access to lakeside properties?”

4.2.2 Sawmill Production

As noted previously, hardwood lumber exports are increasing from the US, though hardwood lumber producers may not be immune from global competition either (Grushecky, 2006). One possible impact of potential home development in the UP may be additional harvesting and processing of timber. Land sales may or may not drive increased opportunities for access to timber.

Though longer-term impacts were not estimated for home construction, they can be illustrated for a sawmill. The average sawmill in the UP has approximately 20 employees (based on 2004 NAICS data). If a new sawmill were constructed, there would be impacts associated with the construction—in a similar manner to those for home construction. If an average size sawmill were to simply operate a second shift as a consequence of land sales (perhaps partially from land clearing for homes), then 20 jobs and \$630,000 in labor income per year would be attributed to the mill as long as operations continued (Table 4.1). Regional impacts are considerably higher, but relatively low when compared to home construction in the short run.

4.2.3 Mill Closure

A major consequence of large-scale land sales could be the eventual loss of those lands as a source for timber. If there are not substitutes for those sources, timber prices may increase and mill closure could be a possible consequence. However, this is not a likely scenario. The new CFP timberland owners support continued timber production because it is their main source of revenue, and timber management is needed to secure returns for investors. Relative to CFP lands, timber supplies from national and state forest lands may be more difficult to secure in the future given other societal goals (e.g., more protected areas, less commodity focus, etc.).

More broadly, several projections indicate a decline in paper manufacture in the US and in the UP. This is most likely associated with global competition. For example, St. Mary's Paper in Sault Ste. Marie, Ontario, citing high production costs, closed in early 2007 (Digital Journal, 2007), leading to the loss of 385 mill jobs. NewPage Corporation recently shutdown one production line at its Maryland plant due to unfair competition, but the U.S. Commerce Department imposed duties on coated paper imported from China, Indonesia and South Korea. Commerce Department actions are expected to ease price pressure from these overseas competitors (Connolly 2007).

Significant consequences would result from the closing of a large, 750-employee paper mill closed in the UP (Table 4.1). The UP would lose over 2,400 jobs and \$113 million in labor income. This magnitude of loss dwarfs the economic impacts of the other examples. However, it is important to note that this is a hypothetical case. In fact, many factors contribute to mill or Air Force closures. Currently, the two largest land sales in the UP include long-term timber supply agreements to preclude this type of short-term consequence.

Table 4.1 Economic impacts of three potential events associated with forest lands in Michigan's Upper Peninsula, 2003 data

Type of impact	Potential Event		
	Home Construction	Sawmill Operations	Paper Mill Closure
Description	100 homes	20-employee mill	750 employees
Direct Impacts			
Output/Sales	\$10.6 mil	\$4.3 mil/year	-\$382.4 mil
Employment	67 jobs	20 jobs	-750 jobs
Labor Income	\$2.7 mil	\$630 M/year	-\$61.9 mil
Total Impacts			
Output/Sales	\$15.9 mil	\$7.9 mil/year	-\$569.5 mil
Employment	131 jobs	50 jobs	-2,431 jobs
Labor Income	\$4.5 mil	\$1.2 mil/year	-\$113.0 mil

Source: IMPLAN ProfessionalTM, 2003 Michigan data.

Note: mil = million, and M = thousand.

5.0 Conclusions: The UP Economy and the Role of the Forest Products Industries

Over one million acres of CFP lands changed ownership in 2005 and 2006. These changes are a source of opportunity and concern. Traditional land owners have been directly tied to forest products industries whereas institutional investors are now in charge. The purpose of this report is to highlight details regarding the economy of the UP with a special emphasis on forest products industries. Due to their role in supplying timber, consequences of the forest land sales are of particular interest.

In 2003, the UP accounted for 3.2% of the Michigan population, 3.7% of the state's establishments, 2.0% of the state's employee compensation, 2.7% of the state's employment, and 1.9% of the state's industry output/sales. With 15 of 83 counties, it contributes a fairly small portion of economic activity. Also, it is relatively worse off economically on average than many parts of the state. For example, average employee compensation in the UP is 73.6% of the state's average, and unemployment rates are generally higher in the UP than the state as a whole.

Moreover, the population count of the UP has remained fairly even for many decades. Population stability in the UP is likely related to economic opportunities for employment and income. In many cases, out-migration is the major demographic force that regulates the population count. Many people move to other regions in search of opportunities.

Though the UP plays a fairly small role in the overall Michigan economy, it is very important for Michigan's forest products industries. The Forest Products Industries play an essential role in the success of the economy of the UP. Over one-half of the employee compensation in the Manufacturing sector in the UP comes directly from forest products industries, as well as almost 20% of the total industry output/sales in the UP. The significant and diverse forest resources and forest ownerships can provide an opportunity for economic growth. So, the forest products industries and forest lands are key economic drivers of the UP economy, and policies should support them. Tourism is another, lesser economic driver.

Forest products industries cover an array of economic sectors (see Appendix A Table A.1). Each of these sectors has its own unique linkages to other parts of the UP economy. The production functions for forest products industries indicate the types of linkages that exist to other sectors of the economy. Indeed, increases or decreases in economic activity in forest products industries (e.g., in logging, sawmilling, and paper manufacturing) have far-reaching effects beyond the industries themselves.

Examples of three potential impacts of changing land ownership are presented: new home construction, additional sawmill operations, and a mill closure. Each of these potential events has significant economic impacts, both directly and in total. Mill closure is not likely to be a short-term effect of land ownership changes given long-term timber supply agreements between new owners and the mills. But, home construction and additional small-scale logging and sawmill operations may occur. A better understanding of the consequences of the recent land sales is required before making more targeted impact estimates.

6.0 References

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Appendix A. IMPLAN Software Inputs

Table A.1 IMPLAN sectors, output and employment associated with forest products industries in Michigan, 2003

IMPLAN Sector No.	Industry	Output (mil. \$)	Employment
14	Logging	679.938	3,869
15	Forest nurseries- forest products- and timber	79.075	225
18	Agriculture and forestry support activities	188.471	11,156
112	Sawmills	411.769	1,869
113	Wood preservation	48.554	202
114	Reconstituted wood product manufacturing	592.519	1,805
115	Veneer and plywood manufacturing	184.124	1,122
116	Engineered wood member and truss manufacturing	316.508	1,930
117	Wood windows and door manufacturing	162.31	941
118	Cut stock- resawing lumber- and planing	81.964	605
119	Other millwork- including flooring	218.387	1,394
120	Wood container and pallet manufacturing	186.576	1,821
121	Manufactured home- mobile home- manufacturing	17.419	108
122	Prefabricated wood building manufacturing	112.736	756
123	Miscellaneous wood product manufacturing	72.469	614
124	Pulp mills	21.477	40
125	Paper and paperboard mills	2,757.42	5,401
126	Paperboard container manufacturing	1,741.41	6,446
127	Flexible packaging foil manufacturing	0	0
128	Surface-coated paperboard manufacturing	38.377	140
129	Coated and laminated paper and packaging mate	355.511	1,095
130	Coated and uncoated paper bag manufacturing	53.944	220
131	Die-cut paper office supplies manufacturing	31.962	146
132	Envelope manufacturing	55.522	245
133	Stationery and related product manufacturing	38.574	174
134	Sanitary paper product manufacturing	38.327	88
135	All other converted paper product manufacturing	258.487	1,096
362	Wood kitchen cabinet and countertop manufacturing	346.114	2,742
363	Upholstered household furniture manufacturing	134.511	914
364	Non-upholstered wood household furniture manufacturing	200.257	1,520
366	Institutional furniture manufacturing	265.805	1,540
368	Wood office furniture manufacturing	815.327	4,088
369	Custom architectural woodwork and millwork	89.553	578
371	Showcases- partitions- shelving- and lockers	557.382	4,037
	Total	11,152.778	58,927

Note: Three sectors likely overstate the forest products role in the statewide summary: Agriculture and Forestry Support Activities (18), Institutional Furniture Manufacturing (366), and Showcases-Partitions-Shelving-and Lockers (371). For the Upper Peninsula, these sectors are likely to fit well in the forest products industries.

Table A.2 IMPLAN sectors employment in the UP and Michigan, excess employment, and economic base dependency index, 2003.

Industry	Employment		Employment (%)		UP Excess Employment ^a	Dependency Index ^b
	UP	MI	UP	MI		
Ag, fishing & hunting	2,655	80,653	1.75	1.47	0.28	2.98
Forestry & Logging	1,750	4,094	1.15	0.07	1.08	11.65
Ag & Forestry Support Services	586	11,156	0.39	0.20	0.18	1.97
Mining	1,916	11,304	1.26	0.21	1.06	11.41
Utilities	767	19,189	0.51	0.35	0.15	1.67
Construction	7,879	294,031	5.19	5.37		
Non forest Prod Manufacturing	6,850	670,292	4.51	12.25		
Wood Products Manufacturing	2,979	13,167	1.96	0.24	1.72	18.60
Paper & Paperboard Manufacturing	2,720	15,091	1.79	0.28	1.52	16.38
Wood Furniture Manufacturing	923	15,419	0.61	0.28	0.33	3.53
Wholesale Trade	2,382	179,711	1.57	3.28		
Retail Trade	18,494	613,499	12.18	11.21		
Transportation & Warehousing	3,639	152,701	2.40	2.79		
Information	2,141	75,550	1.41	1.38	0.03	0.33
Finance & Insurance	4,251	209,212	2.80	3.82		
Real Estate & Rental	2,445	177,943	1.61	3.25		
Professional and Technical Services	3,472	355,421	2.29	6.49		
Management of Companies	158	68,389	0.10	1.25		
Administrative & Waste Services	2,424	319,531	1.60	5.84		
Educational Services	833	75,410	0.55	1.38		
Health Care & Social Assistance	15,077	561,657	9.93	10.26		
Arts, Entertainment & Recreation	1,656	102,934	1.09	1.88		
Accommodation & Food Services	14,081	383,005	9.28	7.00	2.28	24.63
Other services	15,851	408,010	10.44	7.45		
Federal Government	2,297	48,033	1.51	0.88	0.64	6.87
State and Local Government	33,568	608,528	22.11	11.12		
Totals	151,792	5,473,930	100.00	100.00	9.26	100.00

^a UP % employment minus Michigan % employment. The excess employment technique helps identify sectors that comprise a region's economic base. Using the Michigan % employment as the norm, sectors with higher percentages are treated as part of the economic base (Maki et al., 1985). State and local government, retail trade, and other services were dropped as components of the economic base.

^b Individual sector excess expressed as a percent of the total excess in economic base sectors.

Table A.3 IMPLAN sectors linked to the logging sector production function in Michigan, 2003

Economic Sectors	Input values
Forestry & Logging	48.09%
Manufacturing--Non-For. Prod.	3.63%
Wholesale Trade	2.40%
Other Services	1.77%
Finance & Insurance	1.68%
Real Estate & Rental	0.95%
Utilities	0.72%
Management of Companies	0.71%
Professional-Scientific	0.41%
Transportation & Warehousing	0.30%
Information	0.27%
Sawmills	0.11%
Administrative & Waste Services	0.06%
Mining	0.03%
Construction	0.02%
Retail Trade	0.02%
Other Paper Manufacturing	0.01%
Paper & Paperboard Mills	0.01%
Accommodation & Food Services	0.00%
Arts- Entertainment & Recreation	0.00%
Government & non-NAICS	0.00%
Value Added	38.80%

Table A.4 IMPLAN sectors linked to the sawmill sector production function in Michigan, 2003

Economic Sectors	Input values
Forestry & Logging	45.62%
Sawmills	9.09%
Wholesale Trade	4.50%
Transportation & Warehousing	4.14%
Manufacturing--Non-For. Prod.	2.50%
Other Services	2.30%
Professional-Scientific	2.16%
Utilities	1.74%
Finance & Insurance	1.65%
Management of companies	0.72%
Wood Products Manufacturing	0.54%
Information	0.50%
Administrative & Waste Services	0.48%
Accommodation & Food Services	0.47%
Real Estate & Rental	0.38%
Construction	0.14%
Other Paper Manufacturing	0.10%
Arts- Entertainment & Recreation	0.09%
Retail Trade	0.09%
Paper & Paperboard Mills	0.05%
Government & non-NAICS	0.03%
Mining	0.02%
Educational Services	0.01%
Wood Furniture Manufacturing	0.00%
Value Added	22.66%

Table A.5 IMPLAN sectors linked to the paper and paperboard sector production function in Michigan, 2003

Economic Sectors	Input values
Manufacturing--Non-For. Prod.	15.12%
Pulp mills	8.47%
Forestry & Logging	7.16%
Wholesale Trade	6.70%
Utilities	6.58%
Transportation & Warehousing	4.66%
Sawmills	3.77%
Other Services	3.40%
Management of companies	2.67%
Professional-Scientific	2.42%
Finance & Insurance	1.78%
Other Paper Manufacturing	1.47%
Mining	0.88%
Administrative & Waste Services	0.87%
Real Estate & Rental	0.60%
Information	0.52%
Accommodation & Food Services	0.52%
Construction	0.47%
Government & non-NAICS	0.39%
Paper & Paperboard Mills	0.26%
Retail Trade	0.19%
Arts- Entertainment & Recreation	0.10%
Educational Services	0.09%
Wood Products Manufacturing	0.08%
Wood Furniture Manufacturing	0.01%
Value Added	30.82%

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