MICHIGAN'S GREAT LAKES JOBS

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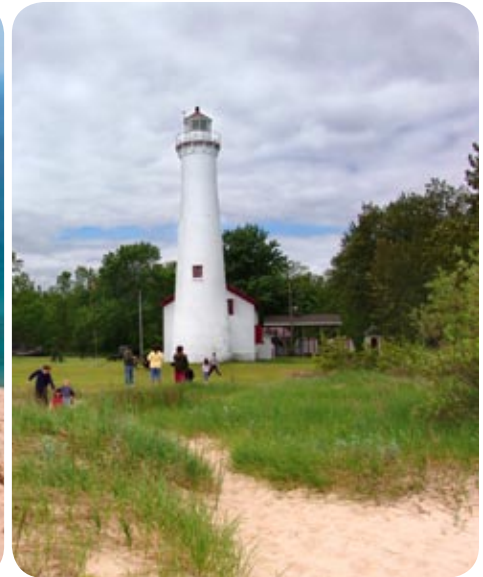
February, 2009.

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INTRODUCTION

The recent focus by Michigan Lieutenant Governor John Cherry on Green Jobs and a Blue Water Economy has inspired the question – how many of Michigan's current jobs are connected to the Great Lakes? Michigan residents recognize that their 2,147 miles of Great Lakes coastline is one of the state's most valuable assets – but how does this natural resource support the economy?

Michigan is *the* Great Lakes state, and the Lakes shape where we live, what we do, and how we spend our free time. Historically, the Great Lakes have served as a water highway and fundamentally influenced settlement, extraction, and production patterns in the region. The existence of the Great Lakes is the primary reason that the region became the industrial heartland of the nation.[1]

Services provided by Great Lakes continue to offer an economic advantage to many Michigan industries and without this support these industries might not be able to compete in a global economy. For example, the Lakes provide inexpensive transportation for important commodities such as iron ore, coal, stone, and grain, which sustain our steel production, manufacturing, and agricultural industries. Great Lakes vessels can transport one ton of cargo three times more efficiently than trains and 10 times more efficiently than trucks, which reduces shipping expenses substantially. In 2006, Great Lakes vessels transported more than 173 million tons of cargo, saving companies over $3.6 billion when compared to the next most cost effective transportation option.[2]

The Great Lakes are also a central driver of Michigan's tourism and recreation industries. Michigan ranks fifth in the nation in numbers of licensed resident and non-resident anglers, who together contribute $2 billion annually to the state's economy.[3] Charter fishing trips draw visitors to coastal regions, with 80 percent of its customers traveling from over 50 miles away. In 2002 there were 468 licensed charter boat captains in Michigan who generated $10.1 million in annual gross sales, not including additional spending on food and lodging.[4] Michigan is also home to almost a million recreational and commercial boats, placing it third in the nation in numbers of registered boats. The Great Lakes Commission estimated that in 2003, boaters spent $3.9 billion on trip and craft expenses in Michigan, which supported 51,000 jobs.[5] In short, the Great Lakes directly support tourism, recreation and transportation, while providing economic advantages for other Michigan industries such as utilities, manufacturing, and agriculture.

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[1] For a more detailed discussion of the Lakes and industrial development see: Thorp, S. (1992). *Liquid Asset: Great Lakes Water Quality and Industry Needs*. Ann Arbor, MI: Great Lakes Commission. Retrieved January 20, 2009, from www.glc.org/docs/liqasset/liqasset.html.

[2] Press release describes the results of a forthcoming report prepared by the Tennessee Valley Authority for the Army Corp of Engineers: Lake Carrier's Association. (January 27, 2009). *Great Lakes Shipping Annually Saves Users $3.6 Billion*. Rocky River, OH: Author. Retrieved January 28, 2009, from www.lcaships.com.

[3] State rankings compiled by: Michigan Department of Natural Resources. (2009). *Economic Impact*, Lansing, MI: Author. Retrieved January 20, 2009, from www.michigan.gov/dnr/0,1607,7-153-38948-121641--,00.html.

[4] Pistis, C. and F.R. Lichtkoppler. (2003) *Michigan's Great Lakes Charter Fishing Industry in 2002*. Columbus, OH: Ohio Sea Grant College Program. Retrieved December, 2008, from www.miseagrant.umich.edu/fisheries/fish-sport.html.

[5] Great Lakes Commission (2007). *Great Lakes Recreational Boating's Economic Punch*, Ann Arbor, MI: Author. Retrieved November 20, 2008, from www.glc.org/recboat/pdf/rec-boating-final-small.pdf.

OBJECTIVES AND APPROACH

The goal of this report is to examine the economic importance of the Great Lakes to the state of Michigan. To demonstrate the role of the Lakes, we have estimated the number of jobs and total payroll for industries that are significantly influenced by the Great Lakes.

Recognizing the importance of the Lakes in the historical development of Michigan's economy, we developed a broad definition of Lake-influenced industries that is appropriate for the Great Lakes region. Our definition of Lake-influenced industries is narrower than the National Ocean Economics Program's definition of the *coastal economy* and more inclusive than their definition of the *ocean (or Great Lakes) economy*.[6] (See sidebar below.) Our approach highlights the diverse ways that the Lakes influence Michigan's industries - by providing inexpensive transportation, by moderating the climate for specialty crops, and by providing abundant water for manufacturing.

This report uses data from the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Census Bureau, and the Travel Industry of America to calculate the number of jobs in these Lake-influenced industries in 2000 and in 2007. The

methodology relies on publically available, national datasets and thus can be replicated annually for Michigan and other Great Lakes states. These estimates include the number of direct jobs and do not include jobs in industries that support Great Lakes industries, such as banking, construction, or legal services.

In addition to directly supporting or creating a competitive advantage for Michigan industries, the Great Lakes can also help attract businesses and skilled workers to the state. Increasingly businesses worry about recruiting and retaining a talented workforce.[7] A healthy environment, diverse outdoor opportunities, and a vibrant culture will make Michigan more attractive to young people and growing companies. Although we recognize its economic importance, we have not tried to estimate the role of the Lakes in attracting non-Lake related businesses to Michigan.

A NOTE ABOUT OTHER APPROACHES

The National Ocean Economics Program (NOEP) collects data about each state's ocean (or Great Lakes) economy and its coastal economy.[6] NOEP's methodology for capturing Michigan's *Lake economy* differs from ours in several key ways-

1. NOEP includes establishments from 20 industries within 6 sectors: Marine Construction, Living Resources, Tourism & Recreation, Minerals, Ship & Boat Building, and Transportation. Because the Great Lakes have historically influenced Michigan's development, we captured a broader range of industries, including those that are influenced but not necessarily dependent on the Lakes, such as manufacturing, coastal agriculture, and coastal utilities.
2. For most industries, like tourism, NOEP includes only related establishments within zip codes adjacent to a Great Lake. For estimates of jobs in the coastal region, we restricted our analysis to coastal counties, a much larger area.
3. NOEP uses data collected as part of the federal unemployment insurance program, which excludes jobs associated with farming, railroad, military, self employment, and most of the fish harvesting industry. Our estimates primarily rely on Bureau of Economic Analysis (BEA) data, which does include farming, fishing, and self employed proprietors.

4. Part time, seasonal and full time jobs are counted equally in our estimates, in contrast, the data source underlying NOEP's estimates (BLS) uses part time and seasonal positions to calculate the number of full time equivalent jobs.
5. NOEP estimates that in 2004, 57,589 jobs were part of Michigan's Lake economy.

NOEP's methodology for describing Michigan's *coastal economy* also differs from our approach-

1. NOEP's estimates of the coastal economy include *all* economic activity within counties adjacent to a Great Lake, rather than specific Lake influenced industries.
2. NOEP estimates that in 2007, 1,858,049 jobs were part of Michigan's coastal economy.

MI Sea Grant's report's estimates of Lake-influenced industries includes fewer jobs than included in NOEP's *coastal economy* and more than the number included in NOEP's *Lake economy*. This methodology best captures the range of industries with important, but sometimes indirect, connections to the Great Lakes (e.g., utilities that draw water from the Lakes and crops that flourish because of the Lake-mediated climate); however, by considering a larger geographic area, coastal counties, the effect of the Lakes could be exaggerated for industries such as tourism.

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[6] For more information see: Colgan, C.S. (2007). *A Guide to the Measurement of the Market Data for the Ocean and Coastal Economy in the National Ocean Economics Program*. Moss Landing, CA: National Ocean Economics Program. Retrieved January 10, 2009, from http://noep.mbari.org/Market.

[7] The Battle for Brainpower. (2006, October 7). *The Economist*, 381(8498), 3. Retrieved February 1, 2009, from ABI/INFORM Global database. (Document ID: 1142599091).

MICHIGAN'S LAKE-INFLUENCED INDUSTRIES

We consider the following industries to be significantly influenced by the Great Lakes. In each case, we describe its connection to the Lakes and how we identified the Lake and non-Lake connected jobs within this industry. The number of jobs and payroll associated with each industry are reported in Table 1. Details about replicating these estimates in other states are in the Appendix.

1. FARMING IN COASTAL COUNTIES [8]

The Great Lakes moderate the climate of coastal Michigan, improving all crop production and creating microclimates that are ideal for specialty crops such as cherries, beets, and wine grapes. Fluctuations in lake levels over geologic time have created unique soil conditions and topography along the coast that benefit agriculture, for example by creating coastal dunes that are perfect for fruit in the southwest and by depositing rich soils within the former lake bed of Saginaw Bay. In addition, the Lakes provide access to cheap transportation for commodities and water for irrigation and food processing. All of these factors are likely to be more influential within coastal counties; for this reason, only agricultural jobs in these counties are considered connected to the Great Lakes.

2. FISHING, HUNTING, AND AGRICULTURAL SUPPORT IN COASTAL COUNTIES [8]

The Great Lakes are an influential part of Michigan's landscape, climate, and ecology. Many of the most popular fish and waterfowl species move between the Great Lakes and their tributaries, thus most fishing and hunting in the coastal counties is connected to the Great Lakes.

3. UTILITIES IN COASTAL COUNTIES [8]

Power plants are more likely to be located in coastal regions because they utilize the water to cool their facilities. Sixty-eight percent of the jobs in this industry are located within coastal counties.

4. WAREHOUSING AND TRANSPORTATION IN COASTAL COUNTIES [8]

Many of Michigan's transportation routes are multi-modal and involve transfers between ships, rail cars, and trucks. Sixty-three percent of the jobs in this industry are located within coastal counties. In addition, much of the transport business is directly related to other Lake influenced industries, such as manufacturing, agriculture, and tourism.

5. TOURISM IN COASTAL COUNTIES [9]

The Great Lakes offer a scenic setting for vacations and numerous recreational and cultural opportunities for tourists. Michigan's state parks and coastal areas offer attractive destinations for local residents and out-of-state visitors. This analysis assumes that all tourism in coastal counties is in some way related to the Great Lakes.

The Travel Industry of America estimates travel-generated employment for specific industries within Michigan. We elected to include four of these industries (lodging, foodservice, recreation, retail) and exclude three industries (public transport, auto transport, and planning) because these later jobs are partially captured elsewhere. We used tourism market share estimates for each county to estimate the proportion of travel-related employment in coastal counties.

6. SPECIFIC ENGINEERING AND SCIENTIFIC PROFESSIONS [10]

Many large environmental research institutes, such as NOAA's Great Lakes Environmental Research Lab and the USGS's Great Lakes Science Center, are located in Michigan because of the state's central location within the Great Lakes basin. For this analysis, Lake-influenced technical jobs include scientific and engineering occupations connected directly to Michigan's natural environment, such as nautical engineers or environmental scientists, and occupations tied directly to an industry influenced by the Lakes, such as food scientists (agriculture, food processing) and nuclear engineers (utilities). This limited number of technical professions represents 4.5 percent of all engineering and scientific jobs in Michigan.

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[8] Employment and compensation data from Michigan's 43 coastal counties are from: Bureau of Economic Analysis. (2000 and 2006). *Local Area Personal Income*, Tables CA06N,CA05N, CA25N. Washington D.C.: US Department of Commerce. Retrieved on November 18, 2009, from www.bea.gov/regional/reis.

[9] Employment and payroll data for tourism sectors statewide are provided by: The Travel Industry of America. (2007). *The Impact of Travel on State Economies*. Washington, DC: Author. The coastal counties' share of the tourism market was estimated using accommodation sales data from: Economic Census Geographic Area Series. (2005) *Michigan:2002 - Accommodation and Food Service*. Washington D.C.: Census Bureau. Retrieved January 10, 2009, from www.census.gov/prod/ec02/ec0272ami.pdf.

[10] Data is from: Bureau of Labor Statistics. (2000 and 2007). *Occupation Employment Statistics (OES)*. Washington, D.C.: US Department of Labor. Retrieved on November 18, 2008, from, http://data.bls.gov/oes/search.jsp?data_tool=OES.

7. MINING, EXCEPT OIL AND GAS [11]

Mining operations flourished in Michigan because there were abundant natural resources (minerals, water, and energy sources), a market for the material, and access to inexpensive transportation via Great Lakes vessels. The Lakes continue to support the mining industry, as evidenced by the 60 billion tons of iron ore that was transported on Great Lakes vessels in 2006.[12] This analysis considers all mining jobs in Michigan, except those connected to oil and gas, to be Lake influenced.

8. MANUFACTURING, MOST DURABLE AND NON-DURABLE GOODS [11]

The Great Lakes provide an economic advantage to manufacturing by providing inexpensive transportation for raw materials and finished goods as well as abundant water for industrial processes.[13] Many factories have also used the Lakes for waste disposal; although this provided an immediate benefit to the companies, in some cases such practices have created expensive remediation challenges. Given the importance of the Lakes in attracting factories to the state, all of Michigan's manufacturing jobs, except those related to petroleum products or printing, are considered Lake-connected.

INDUSTRIES NOT CAPTURED BY THIS ANALYSIS

There are several important Lake-influenced industries that are not captured by this analysis. Currently, 20,934 of Michigan's residents are employed by the military as active duty or reserve unit members.[11] Michigan has one large combination base and nineteen coast guard stations, and many of its military personnel work closely with Great Lakes resources.[14] Because the majority of Michigan's military jobs are filled by reserve unit members, we did not include positions in the coast guard for this analysis.

Many real estate professionals sell coastal properties and rent coastal vacation homes. It was outside the scope of this project to estimate the number of real estate jobs supported by Lake-related sales. In addition, this analysis has not been able to separate environmental educators, environmental journalists, and other Great Lakes advocacy professionals from more general information and education job categories.

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[11] Data is from: Bureau of Economic Analysis. (2000 and 2007). *State Annual Personal Income*, Tables SA06N, SA25N. Washington D.C.: US Department of Commerce. Retrieved on November 18, 2009, from www.bea.gov/regional/spi.

[12] Lake Carrier's Association. (2006). *Statistical Annual Report of Lake Carriers' Association*. Rocky River, OH: Author. Retrieved January 28, 2009, from www.lcaships.com/06SRcontents.htm.

[13] For more background on industrial uses of Great Lakes water, see Thorp (1992).

[14] US Coast Guard (2009) *District Nine Units*. Retrieved February 3, 2009, from www.uscg.mil/d9/D9Units.asp.

Lake- influenced Industry	Jobs in 2000	Jobs in 2007	Change 2000 to 2007	Percent change	Total compensation 2007 (millions)
Farming, coastal	31,810	30,603	-1,207	-3.8%	413
Fishing, coastal	5,612	4,654	-958	-17.1%	99
Utilities, coastal	8,714	6,782	-1,932	-22.2%	756
Warehousing and transportation, coastal	68,205	66,330	-1,875	-2.7%	3,323
Tourism, coastal	63,461	57,456	-7,938	-9.5%	955
Engineering, specific occupations	2,570	2,460	-110	-4.3%	155
Science, specific occupations	2,670	4,900	2,230	83.5%	270
Mining, except oil and gas	7,835	6,498	-1,337	-17.1%	430
Durable goods manufacturing	727,811	496,070	-231,741	-31.8%	40,256
Non-durable goods manufacturing	159,071	129,350	-29,721	-18.7%	7,398
All MI Great Lakes Jobs	1,077,172	804,381	-271,991	-25.3%	54,055
All MI Jobs	5,629,498	5,450,992	-178,506	-3.2%	232,822
Percentage considered lake related	19.1%	14.8%			23.2%

Table 1.Summary of employment and compensation in Lake-influenced industries

IMPLICATIONS

The Great Lakes are integral to the past, present, and future economic vitality of Michigan. The Great Lakes have influenced the historical development of the state's economy and the Lakes continue to support many of our most important industries including tourism, transportation, and energy production. Based on the assumptions outlined above, we estimate that Michigan has 804,381 Lake-influenced jobs, which translates into $54 billion in compensation for these employees (Table 1). By this estimate, 15 percent of all Michigan jobs garnering 23 percent of Michigan payroll are associated with the Great Lakes, demonstrating that Lake-influenced jobs are both numerous and comparatively well paying.

Unfortunately, we have been losing jobs from these Great Lakes industries at a rate faster than from the statewide economy. The number of people employed within Great Lakes industries has dropped by 25 percent since 2000, while the overall loss of jobs in Michigan amounted to only 3.2 percent during the same time period (Table 1). The large change in Lake-connected employment is driven by the well documented loss of manufacturing jobs. These losses further emphasize the need to support sustainable coastal industries that can replace the loss of traditional steel belt jobs.

Given the economic importance of the Great Lakes, Michigan should work to maintain water quality, healthy coastal ecosystems, recreational and commercial access to the Lakes, and a safe navigational system. Although the number of jobs associated with the Lakes has declined, the Lakes offer a doorway to a new sustainable economy. Comprehensive restoration of the Great Lakes could profoundly improve Michigan's economy by stimulating the development of new technologies, improving quality of life, increasing opportunities for recreation and tourism, and helping Michigan attract and retain talented works.[15] We hope that an understanding of the relationship between the environment and the economy in Michigan will help the state best plan for its future and invest in its abundant natural resources.

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[15] For more information, read the related report by Michigan Sea Grant: Vaccaro, L., D. Scavia, D. Sivaraman, and B. Sederberg. (2009) *Michigan's Economic Vitality: The Benefits of Restoring and Protecting the Great Lakes*. Ann Arbor, MI: Michigan Sea Grant. Website: www.miseagrant.umich.edu/coastal/economy.

APPENDIX - METHODS FOR INDUSTRY ESTIMATES

LAKE-INFLUENCED JOBS IN FARMING, FISHING, UTILITIES, AND TRANSPORTATION

We considered all jobs in farming, fishing, utilities, and transportation within coastal counties to be Lake-influenced. Employment and salary information from Michigan's 41 coastal counties are from the Bureau of Economic Analysis (BEA). 2006. Local Area Personal Income, Tables CA06N, CA05N, CA25N. (www.bea.gov/regional/reis).

To access county level data for an entire state, select "single line of data for all counties" and then select the type of data of interest (e.g., CA25N- employment by NAIS Industry, and 0070 Farm Employment, and 2006). Display the data and copy and paste the data for the counties from the state of interest. Finally, determine the counties that are adjacent to the Great Lakes and sum the numbers for just these counties.

To estimate payroll we used reports of total compensation in each industry (Table CA06N). Compensation includes direct wages and employer contributions to pensions and insurance. Estimating payroll for fishing and farming is challenging because of the high degree of self-employment, poor reporting of seasonal and part time labor, and the overlap between proprietor's earnings and income. For these two industries, we considered "earnings" (Table CA05N) to be equivalent to compensation in other industries. Average earnings per job in these industries ($13,000 and $21,000) were still lower than the average compensation in other industries.

LAKE-INFLUENCED JOBS IN TOURISM

Employment and payroll information for tourism sectors statewide are provided by The Travel Industry of America. 2007. *The Impact of Travel on State Economies*. Washington, DC. Travel Industry of America (TIA) uses a proprietary Travel Economic Impact Model (TEIM) to measure the impact of travel-related expenses on the US economy. By their definition, travel includes both business and leisure trips either to a destination over 50 miles from home or which includes overnight, paid accommodation regardless of distance. Thus, local tourism, such as a museum visit or a local birding expedition, is not included.

Statewide tourism figures were multiplied by an estimate of the percentage of tourism spending occurring in coastal counties. For county level spending, we used accommodation sales data from the Census Bureau's Geographic Area Series, (www.census.gov/econ/census02/guide/geosumm.htm). We considered the percentage of accommodation sales from coastal counties to be a reasonable indicator of the coastal region's share of the tourism market.

LAKE-INFLUENCED JOBS IN SCIENCE AND ENGINEERING

The Bureau of Economic Analysis lumps all science, engineering, legal, accounting, veterinary, and consulting professions under a single industry sector, "Professional and Technical Services". Thus, in order to identify Michigan's Lake-related technical jobs, we had to use a different data source, the Bureau of Labor Statistics (BLS). 2000 and 2007. Occupation Employment Statistics (OES), (http://data.bls.gov/oes/search.jsp?data_tool=OES).

We considered five engineering occupation categories (environmental, marine and naval, mining and geological, and nuclear engineers, and related technicians) and 12 science occupation categories (food, soil and plant, zoology and wildlife, conservation, atmospheric, environmental, geosciences, and hydrologic scientists, and related technicians) to be connected to the Great Lakes. This excludes professions that may involve some work with the Lakes, such as mapping technicians, and professions that may support Lake-related industries, such as mechanical engineers. Without the ability to further discriminate among occupation categories, we opted to include only professions clearly connected to the natural environment or a specific lake-related industry.

We calculated the total payroll to be (annual mean wage for an occupation) x (number of jobs in this occupation). BLS calculates mean annual wages by dividing total wages from an occupation by the number of full time equivalent jobs, so our estimates do represent total payroll. The employee compensation values used from BEA include salary and employer contributions to insurance and pensions. Therefore, the payroll data for these science and engineering jobs is an underestimate of total compensation.

LAKE-INFLUENCED JOBS IN MANUFACTURING AND MINING

Estimating the jobs within manufacturing and mining requires statewide data. Employment and compensation data is from the Bureau of Economic Anlaysis (BEA). 2000 and 2007. State Annual Personal Income, Tables SA06N, SA25N, (www.bea.gov/regional/spi). We used the newer NAIS industry categories.

Within the mining sector, we excluded "oil and gas extraction" jobs because this industry will develop anywhere there are accessible resources. We included all durable goods manufacturing jobs because these industries benefit from the Lake-based shipping of raw materials and finished goods and the ample water for processing and disposal. Within non-durable goods manufacturing, we excluded petroleum products for the reasons outlined above, and printing because this industry is more connected to a consumer market than to Lake-influenced resources. We considered all other mining and durable and non-durable goods manufacturing to be Lake-influenced.

Michigan is the only state located almost entirely within the Great Lakes basin. Other Great Lakes states may not consider all of their manufacturing and mining work to be connected to the Lakes and therefore may want to restrict their analysis to coastal counties.

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