



MICHIGAN'S ECONOMIC VITALITY

THE BENEFITS OF RESTORING THE GREAT LAKES

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ABOUT THE AUTHORS

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Michigan Sea Grant, a cooperative program of the University of Michigan and Michigan State University, supports understanding and stewardship of the Great Lakes through research, outreach and extension education.

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INTRODUCTION

The Great Lakes are integral to the economic and cultural vitality of Michigan; however, their health is threatened by toxic contaminants, outdated sewage infrastructure, invasive species, and a lack of coordinated conservation efforts. In December 2005, the Great Lakes Regional Collaboration (GLRC) proposed a comprehensive strategy for protecting and restoring the health of the Great Lakes.¹ The priority areas were agreed upon by key stakeholders, including the Council of the Great Lakes Governors, the Great Lakes Cities Initiative, and the Great Lakes Indian Fish and Wildlife Commission; however, implementation has been slow. To advance these restoration priorities, the Michigan Office of the Great Lakes consulted with stakeholders from around the state and developed a comprehensive framework, the *MI-Great Lakes Plan: Our Path to Protect, Restore, and Sustain Michigan's Natural Treasures*, outlining the federal, state and local initiatives required to implement the restoration strategy within Michigan.² The recommended actions will help Michigan meet eight priority goals:

1. Prevent the introduction of new aquatic invasive species
2. Conserve and restore coastal, riparian, and upland habitat
3. Protect the health of beaches and near shore drinking water sources
4. Accelerate the cleanup of Areas of Concern (AOCs)
5. Mitigate non-point sources of pollution
6. Eliminate or reduce the release of toxic pollutants
7. Support a comprehensive system for environmental monitoring of the Great Lakes
8. Promote sustainable development practices

Restoration of the Great Lakes will provide *economic* as well as environmental benefits for the residents of the Great Lakes basin. The proposed activities will help the region attract businesses and retain talented workers, increase opportunities for recreation and tourism, reduce drinking water treatment costs, and potentially raise coastal property values and therefore the tax base. Michigan is the only state located almost entirely within the Great Lakes basin, thus much of the responsibility and benefit of the restoration will ultimately fall to Michigan.

Following the development of the Great Lakes Regional Collaboration restoration strategy, a team led by John Austin (2007) estimated the potential economic benefits of restoring the Great Lakes.³ Michigan Sea Grant convened a panel of scientists who identified and quantified eight specific environmental improvements that are likely to result from the proposed restoration plan. Subsequently, a team of economists calculated the value of these improvements, using present day values with future benefits discounted at a conservative six percent rate. Austin and his team (2007) found that environmental improvements resulting from restoration could be valued at \$18-31 billion for the Great Lakes region. Including short term multiplier effects, the total benefits are estimated at \$30-50 billion. This estimate includes quantifiable environmental services, but does not incorporate the less tangible benefits of an improved environment- such as enhanced quality of life, improved human health, increased business investment, and avoidance of other losses associated with further environmental degradation.

¹ The Great Lakes Regional Collaboration (GLRC) was convened by EPA following a mandate from the president in May 2004. The Collaboration's framework of priority areas and necessary actions for restoring the Great Lakes is presented in the report, *The GLRC Strategy to Restore and Protect the Great Lakes*.

² The Michigan Office of the Great Lakes is housed within the Department of Environmental Quality in Lansing, MI. At the request of Lt. Governor Cherry in 2008, they developed a restoration plan for Michigan with significant input from key stakeholders. The report, *Michigan-Great Lakes Plan: Our Path to Protect, Restore, and Sustain Michigan's Natural Treasures*, was released in January 2009.

³ Austin, J. C., S. Anderson, P. N. Courant, and R. E. Litan. (2007). *America's North Coast. A Benefit Cost Analysis of A Program to Protect and Restore Great Lakes*. Washington, DC: Brookings Institution.

OBJECTIVES AND APPROACH

The analysis presented here is intended to highlight the economic value of the Great Lakes restoration strategy for Michigan, specifically. Austin's team (2007) predicted the economic benefits of restoration for the entire US side of the Great Lakes basin. Michigan is home to 41 percent of the US Great Lakes basin population,⁴ 58 percent of the US Great Lakes shoreline (excluding connecting rivers and islands),⁵ and 43.5 percent of the US Areas of Concern (AOC).⁶ Therefore, Michigan should experience a large portion of the benefits expected for the Great Lakes basin.

This analysis estimates Michigan's proportion of the basin-wide benefits for each of the eight anticipated environmental improvements, as outlined by Austin (2007), assuming the full GLRC restoration strategy is implemented. For 7 of the 8 projected environmental improvements, we estimated the percentage that would accrue to the state of Michigan based on Michigan's population size relative to the rest of the Great Lakes basin (41 percent) (Table 1). To estimate the benefit of treating the AOCs we assumed that 43.5 percent of the benefit would fall to Michigan because it is home to 14 of the 31 US and binational AOCs.⁶

The assumption that the benefits will be proportional to the size of a state's population residing within the Great Lake basin is reasonable because most of the environmental improvements are likely to affect how people use a resource (e.g., by hunting, boating, swimming), and a state with a larger population close to the coast will benefit more- through direct participation and indirectly as environmental quality improves. This approach does not take into account the current size of these lake-related industries or the number of visitors from out of state. Given Michigan's long coast line, the state may have a larger proportion of the Great Lakes outdoor recreation market than indicated by its population, therefore the values presented here are likely underestimates of Michigan's true percentage of the Great Lakes wide benefits.

The size of a state's Lake-basin population may also correspond to the amount of environmental degradation and thus the future cost of restoration. Although the implementation strategy for the MI-Great Lakes Plan involves substantial federal investment, the state of Michigan, municipalities, and businesses will also need to contribute. This examination of the projected benefits is meant to help justify, not ignore, the total cost of restoration and the investment required from Michigan.

The value of each environmental improvement for the Great Lakes and for Michigan is described below. Unless otherwise stated, all projections, except Michigan specific estimates, are based entirely on the work of Austin (2007). It is important to note that this list only includes the benefits of restoration that are relatively certain and easy to quantify. For example, near shore habitat restoration will increase the abundance of many types of wildlife; however, not all of the benefits have a clear "price tag". While the economic value of increased opportunities for hunting and fishing can be determined by conducting surveys about the costs of hunting and fishing trips, the value of enhanced biodiversity and improved survival of endangered species is much harder to quantify and is thus left out of this analysis.⁷

⁴ Based on 2000 Census data compiled by the Great Lakes Information Network. (2008). *People in the Great Lakes Region*. Retrieved November 30, 2008 from www.great-lakes.net/envt/flora-fauna/people.html.

⁵ Michigan Department of Environmental Quality. (Nov. 2005). *Shorelines of the Great Lakes*. Retrieved November 2008, from http://michigan.gov/deq/0,1607,7-135-3313_3677-15959--,00.html.

⁶ Of the 31 US or binational AOCs, 10 are fully within Michigan, 3 large sites are along the Michigan-Ontario boundary, and 1 is on the border of Michigan and Wisconsin (the Menominee River). The three binational sites are large and thus their impacts on the US side are equal to or greater than other AOC sites; however, we estimate that the Michigan portion of the Menominee River remediation is equivalent to only half a typical AOC site. If Michigan is home to 13.5 of 31 US AOCs, we assume that it will experience 43.5% of the impacts estimated for the whole Great Lakes basin. Data is from: Environmental Protection Agency. (2008). *Areas of Concern*. Retrieved December 5, 2008, from www.epa.gov/glnpo/aoc.

⁷ For a more thorough discussion of the limitations of this ecosystem valuation, see Austin et al., 2007, pp 25-28, and 43-45.

Anticipated Improvement	Effect (relative to baseline)	Affected value	Present value benefit for the GL region (relative to baseline)	Present value for Michigan (relative to baseline)
Increased fish abundance	30–75 percent increase ^a	Improved catch rates for anglers	\$1.1 – 5.8 billion or higher	\$0.5 – 2.4 billion or higher
Avoided dislocation of sport-fishery workers and assets	20 percent reduction or higher	Maintenance of sport-fishery wages and profits	\$100 – 200 million or higher	\$41 – 82 million
Reduced sedimentation	10–25 percent reduction	Lower water treatment costs for municipalities	\$50 – 125 million	\$21 – 51.3 million
Reduced bacterial and other contamination leading to fewer beach closings and advisories	20 percent reduction	More swimming activity	\$2 – 3 billion	\$0.8 – 1.2 billion
Improved water clarity at beaches	5 percent improvement or higher	More swimming and improved enjoyment of swimming activity	\$2.5 billion or higher	\$1 billion or higher
Improved wildlife habitat leading to more birds	10–20 percent improvement ^a	Improved opportunities for birding ^b	\$100 – 200 million or higher	\$41 - 82 million
Improved wildlife habitat leading to more waterfowl	10–20 percent improvement ^a	Improved opportunities for waterfowl hunting ^c	\$7 – 100 million	\$2.9 - 41 million
Removed contaminated sediment in Areas of Concern (AOC)	All toxic sediment contamination remediated	Basin residents benefit directly or indirectly from AOC restoration	\$12 – 19 billion	\$5.2 – 8.3 billion
Total			\$18 - 31 billion or higher	\$7.6 – 13.2 billion or higher

Table 1: Summary of the economic benefits of the restoration plan for the Great Lakes and Michigan, as outlined by Austin (2007).

- a. Equals the sum of eventual avoided percent decreases and eventual percent increases in population levels, where percent changes are relative to current levels. We assume that avoided decreases and potential increases would occur gradually over 20 years and 10 years, respectively.
- b. Based on the estimate of one birding trip to the Great Lakes per year per birder.
- c. Based on the estimate that 5 percent of waterfowl hunting trips in Great Lakes states depend on the Great Lakes either directly or indirectly

THE BENEFITS OF RESTORATION

The following environmental improvements and economic benefits are expected if the GLRC's or Michigan's restoration strategy is fully implemented.

1. INCREASED FISH ABUNDANCE AND A SUSTAINED SPORT FISHING INDUSTRY ⁸

Restoration of near shore wetland habitats will increase spawning activity, thereby increasing fish abundance. The restoration plan is expected to prevent a 25-50 percent decrease in fish abundance which would otherwise result if no action was taken, and increase fish abundance by 5-25% relative to current populations. **Restoration would provide benefits of \$0.5 –\$2.4 billion for Michigan when compared to inaction.**

The economic benefit of increased fish abundance in the Great Lakes was evaluated based on its value to recreational anglers, as measured by a variety of studies. We can estimate that anglers make 23.1 million fishing trips annually to the Great Lakes.⁹ Austin's (2007) review of angler studies reveals that anglers value a one percent increase in a multi-species fishery at \$0.15 - \$0.30 per fishing day. The range in total value reflects the uncertainty in fish abundance projections and the value of fishing to future anglers.

2. AVOIDED DISLOCATION OF SPORT FISHERY WORKERS AND JOBS ¹⁰

The proposed restoration of near shore habitats would maintain a healthy sport fishery and avoid a 20 percent reduction in fishing-related jobs that would otherwise occur if no action is taken. In addition to fishing, anglers also contribute to the state's economy by purchasing equipment and bait, as well as through transportation and lodging expenses. A reduction in fish abundance would result in loss of jobs and wages in these industries. **The present value of a 20 percent reduction in wages in these fishing-related jobs is estimated to be \$41 –\$82 million in Michigan.**

3. REDUCED SEDIMENTATION AND REDUCED WATER TREATMENT COSTS ¹¹

The proposed plan to reduce non-point contamination sources in urban, suburban, and agricultural areas would reduce the sediment load in tributaries and near shore waters by 10-25 percent. Reduction in the amount of sediment and associated nutrients, pathogens, pesticides, and heavy metal contaminants in the water reduces water treatment costs for facilities that draw water from the Great Lakes.

Austin (2007) estimated that the operating costs for Lake-associated water treatment plants is \$600 million annually and that a one percent decrease in sediment load leads to a 0.05 percent decrease in treatment costs.¹² **These estimates lead to a total \$21 – \$52.5 million reduction in water treatment costs over the long term for municipalities in Michigan.**

4. REDUCED BEACH CLOSINGS AND BACTERIAL CONTAMINATION ¹³

By improving municipal wastewater treatment facilities and reducing other non-point contamination sources, the restoration plan could reduce beach closings by at least 20 percent. This would enhance swimming opportunities and coastal tourism.

The various beaches in the Great Lakes region were closed for a total of 3,000 days in 2005, due to effective monitoring and untreated storm-water and sewage overflow contaminating beaches. Surveys of swimmers found the value of beaches to be between \$1.50 and \$23 per visit. **With an assumption of 8 million swimmers and 80 million swimming days annually, a 20 percent reduction in beach closings should provide economic benefits of \$2 –\$3 billion for the Great Lakes basin and \$0.8 –\$1.2 billion for Michigan.**

⁸ Austin et al., 2007, pp. 28-32.

⁹ Based on survey data from: U.S. Department of the Interior, Fish and Wildlife Service (2002) *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Washington, D.C.: U.S. Census Bureau.

¹⁰ Austin et al., 2007, pp. 32-33.

¹¹ Austin et al., 2007, pp. 33-34.

¹² The operating cost estimates rely on U.S. Census data that municipalities in Great Lakes states spent \$4.5 billion on operation and maintenance of water supply systems in 2002 (in 2006 dollars). Austin calculates that 13% of the residents in the Great Lakes states rely on water from the Lakes. (Austin et al., 2007, p. 77, footnote 46). The cost reduction estimates were developed using data from 400 of the country's largest utilities, as presented by: Holmes, T. P. (1988). *The Offsite Impact of Soil Erosion on the Water Treatment Industry*, Land Economics 64, no. 4: 356–366.

¹³ Austin et al., 2007, pp. 34-35.

5. IMPROVED WATER CLARITY AT BEACHES AND ENHANCED PROPERTY VALUES ¹⁴

The proposed restoration efforts will reduce the amount of sediments, nutrients, and other contaminants reaching the Great Lakes, limiting algae blooms and improving water clarity at beaches by at least five percent. Reduced growth of the nuisance algae *Cladophora* should lower the risk of toxic bacteria and minimize potential management costs.

Although it's hard to predict changes in algae growth and associated costs, a few studies have looked at the connection between water clarity and property values. A study in Ohio found that a one percent increase in water clarity at the nearest Lake Erie beach raised residential property values in the adjacent county by \$60/unit.¹⁵ **Therefore, a five percent improvement in water clarity should raise property values by \$300/unit in coastal counties, resulting in benefits of \$1 billion for Michigan.**

6. IMPROVED WILDLIFE HABITAT LEADING TO MORE BIRDS AND IMPROVED BIRDING OPPORTUNITIES ¹⁶

The proposed restoration of wetland habitats is predicted to increase opportunities for birding by 10-20 percent in the next 10 years. An estimated 5 million bird watchers live in the Great Lakes basin. On average, 40 percent of all birders make at least one birding trip a year and spend \$50 per trip.¹⁷ **Therefore, improved birding opportunities would result in \$41- \$82 million of additional spending by birders within Michigan.**

7. IMPROVED WILDLIFE HABITAT LEADING TO MORE WATERFOWL HUNTING ¹⁸

Coastal habitat restoration would benefit waterfowl populations and expand hunting opportunities in the Great Lakes region. Although there are roughly 20,000 hunters who take 200,000 hunting trips annually, suitable habitat is being lost at a rate of 5-10 percent every 20 years. The restoration plan is projected to prevent future losses and increase waterfowl habitat by an additional 5-10 percent relative to current conditions. **Improved waterfowl hunting opportunities is expected to lead to \$2.9 –\$41 million of additional spending by hunters in Michigan.**

8. REMOVED CONTAMINATED SEDIMENT IN AREAS OF CONCERN (AOC) ¹⁹

Analysis of past remediation projects reveals that property values of homes within two miles of an AOC increase in value by 5-10 percent after contaminant removal. Treating all the US and binational AOCs would result in property value increases ranging from \$6-14 billion in vicinity of the AOC sites.

An alternative method of estimating economic value relies on direct “stated preference” surveys of residents basin-wide. Survey results demonstrate that, on average, households within the basin are willing to pay \$150 per year to clean up the contaminated sediments,²⁰ which indicates that the 10-20 year remediation effort is valued at \$12-19 billion in total. **Of the 31 AOCs that are within the US or shared between the US and Canada, 14 are fully or partially within Michigan; therefore, we estimate that Michigan will experience 43.5 percent, or \$5.2 - \$8.3 billion, of the predicted economic gain.**²¹

¹⁴ Austin et al., 2007, pp. 35-37.

¹⁵ Shihomi, A. (2007). *The influence of water quality on the demand for residential development around Lake Erie*. PhD Dissertation, Ohio State University, Columbus, OH.

¹⁶ Austin et al., 2007, pp. 37-38.

¹⁷ Data is from La Rouche, G. P. (2003) *Birding in the United States: A Demographic and Economic Analysis. Addendum to the 2001 National Survey of Fishing, Hunting and Wildlife- Associated Recreation* [Report 2001-1]. Washington, DC: U.S. Fish and Wildlife Service.

¹⁸ Austin et al., 2007, pp. 38-39.

¹⁹ Austin et al., 2007, pp. 39- 41.

²⁰ Stoll, J. R., R.C. Bishop, and J. P. Keillor. (2002). *Estimating economic benefits of cleaning up contaminated sediments in Great Lakes areas of concern*. Madison, WI: University of Wisconsin Sea Grant Institute.

²¹ See foot note #6 for further discussion. Data is from: Environmental Protection Agency. (2008). *Areas of Concern*. Retrieved December 5, 2008, from www.epa.gov/glnpo/aoc.

A SPECIFIC EXAMPLE: HOW MUCH WOULD THE DETROIT AREA BENEFIT?

In collaboration with the Brookings Institution, John Austin (2008) led a team that conducted a supplemental analysis of the total economic benefit of the GLRC restoration strategy for specific metropolitan areas.²² In their report, they predict that the Detroit metropolitan area would gain **\$3.7 - \$7 billion** as property values increase after the GLRC restoration strategy is implemented.

This estimate is based on studies of property values surrounding other restoration projects. These comparison restoration projects are smaller in scale and thus provide a conservative reference for the Great Lakes restoration plan. Austin (2008) assumed that all metropolitan property values would increase by one to two percent on average and coastal property values would increase by 10 percent. The projected \$3.7- \$7 billion increase is a conservative estimate for several

reasons: the anticipated percent increase in property values is small; the estimate includes only residential properties and ignores the benefits for commercial properties; and this analysis used Census figures from 2000, and thus does not take into account development since 2000.²³

Austin (2008) estimated property value changes relative to inflation-adjusted values of owner-occupied properties documented in the 2000 Census. The projected increase assumes that other economic factors affecting property values remain stable. Although the current economic downturn will confound actual increases, it should not affect the percent increase relative to a current baseline. In addition, many hope that restoration efforts will further enhance the region and support the growth of specialized industries, mitigating other economic challenges.

CONCLUSION

Protecting and restoring the Great Lakes will provide enormous economic benefits to Michigan by expanding the tourism and recreation industry, raising coastal property values, and reducing water treatment costs. In addition to the quantifiable benefits to specific Lake-related industries, remediating pollution and enhancing natural areas will have less tangible benefits - such as enhancing quality of life, encouraging a healthier lifestyle, and attracting businesses and talented workers to the region. As with all federal investment, the federal and state dollars spent directly on restoration will be magnified as companies and cities spend additional

resources, money, and time on restoration projects. This multiplier effect could add an additional \$7-12 billion dollars of benefits for Michigan.²⁴ Coordinated investment could also help the region develop specialized new industries – in water technology, contaminant remediation, and habitat enhancement – which could help rebuild Michigan's economy. Although the federal and state commitment necessary to restore the Great Lakes is substantial, this analysis reinforces the conclusions of John Austin's team: the benefits of restoration far exceed the costs for Michigan and the country.

²² Austin, J., S. Anderson, P. Courant, & R. Litan. (2008). *Place-Specific Benefits of Great Lakes Restoration*. Washington, DC: Brookings Institution.

²³ Austin et al., 2008, pp. 2.

²⁴ One dollar invested by the federal government usually results in 1.5 to 2.5 dollars of additional spending based on the multiplier effect. The GLRC estimates that full restoration would require \$20 billion of federal investment for the region or at least \$5 billion for Michigan.

WORKS CITED

- Austin, J. C., S. Anderson, P. N. Courant, and R. E. Litan. (2007). *America's North Coast. A Benefit Cost Analysis of a Program to Protect and Restore the Great Lakes*. Washington, DC: Brookings Institution. Retrieved from www.healthylakes.org/site_upload/upload/America_s_North_Coast_Report_07.pdf.
- Austin, J., S. Anderson, P. Courant, & R. Litan. (2008). *Place-Specific Benefits of Great Lakes Restoration*. Washington, DC: Brookings Institution. Retrieved from www.brookings.edu/reports/2008/0324_greatlakes_supplement_austin.aspx.
- Environmental Protection Agency. (2008). *Areas of Concern*. Retrieved December 5, 2008, from www.epa.gov/glnpo/aoc.
- Great Lakes Information Network. (2008). *People in the Great Lakes Region*. Retrieved November 30 2008 from: www.great-lakes.net/envt/flora-fauna/people.html.
- Great Lakes Regional Collaboration (GLRC). (2005). *The GLRC Strategy to Restore and Protect the Great Lakes*. Chicago, IL: Author. Retrieved from www.glrc.us.
- Holmes, T. P. (1988). *The Offsite Impact of Soil Erosion on the Water Treatment Industry*, Land Economics 64, no. 4: 356–366.
- La Rouche, G. P. (2003) *Birding in the United States: A Demographic and Economic Analysis. Addendum to the 2001 National Survey of Fishing, Hunting and Wildlife- Associated Recreation* [Report 2001-1]. Washington, DC: U.S. Fish and Wildlife Service. Retrieved from http://library.fws.gov/nat_survey2001_birding.pdf.
- Michigan Department of Environmental Quality. (Nov. 2005). *Shorelines of the Great Lakes*. Retrieved November 25, 2008, from http://michigan.gov/deq/0,1607,7-135-3313_3677-15959--,00.html.
- Michigan Office of the Great Lakes. (2009). *The MI-Great Lakes Plan: Our Path to Protect, Restore, and Sustain Michigan's Natural Treasures*. Lansing, MI. Retrieved from www.michigan.gov/deqgreatlakes.
- Shihomi, A. (2007). *The Influence of Water Quality on the Demand for Residential Development Around Lake Erie*. PhD Dissertation, Ohio State University, Columbus, OH. Retrieved from, www.ohiolink.edu/etd/view.cgi?acc_num=osu1184599591.
- Stoll, J. R., R.C.. Bishop, and J. P. Keillor. (2002). *Estimating Economic Benefits of Cleaning up Contaminated Sediments in Great Lakes Areas of Concern*, Madison, WI: University of Wisconsin Sea Grant Institute.
- Talhelm, D. R. (1988) *Economics of Great Lakes Fisheries: A 1985 Assessment*, Great Lakes Fishery Commission Technical Report No. 54. Retrieved from www.glfc.org/pubs/pub.htm#tech_reports.
- U.S. Department of the Interior, Fish and Wildlife Service (2002) *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Washington, DC: U.S. Census Bureau. Retrieved from www.census.gov/prod/2002pubs/FHW01.pdf.