

# Measuring the Economic Impact of Water Quality Initiatives: A Case Study of the Fund for Lake Michigan

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## Abstract

The Fund for Lake Michigan is an organization that invests in nonprofit and government organizations which conduct projects intended to clean up the environment. The main goal of the Fund for Lake Michigan is to improve the quality of Lake Michigan and the life of its communities. This paper conducts an analysis of the total economic impact of all Fund for Lake Michigan-funded projects between 2011 and 2013. The methodology used is IMPLAN, an input-output method of analysis that estimates to what extent different spending categories affect the local economy in terms of direct, indirect, and induced spending. Both primary impacts (those impacts that are directly caused by the Fund for Lake Michigan) and secondary impacts (those impacts that are indirectly caused by the Fund for Lake Michigan) were considered. The primary finding of this study is that the Fund for Lake Michigan has had a very positive, demonstrable economic impact in the southeastern region of Wisconsin including, but not limited to, creation of over 480 full-time equivalent jobs and increasing property values by over \$45.5 million. Our findings also suggest that, if funded in the same manner, the Fund for Lake Michigan should continue to have a similar level of economic impact for the foreseeable future.

## 1. Introduction

The Fund for Lake Michigan (“FFLM” or “the Fund”), in collaboration with the University of Wisconsin Whitewater’s Fiscal and Economic Research Center (FERC) and the Institute for Water Business analyzed and estimated the economic impact that all FFLM supported projects had in the southeastern Wisconsin area between the years 2011 and 2013. This was done using IMPLAN, an input-output method of economic modeling that will be discussed in detail later in this paper. Main findings indicate the Fund had, and will continue to have, a tremendous impact on the southeastern Wisconsin area by creating over 480 jobs, providing employees with over \$13 million in labor income, increasing property values by over \$45.5 million and generating over \$35 million in economic output.

### 1.1 Background

The Fund for Lake Michigan was established in 2008 as a resolution for a dispute concerning the Oak Creek Power Plant and Elm Road Generating Station in southeastern Wisconsin. The agreement establishing the Fund provided payments of \$4 million dollars a year from 2011 through 2035 to fund projects to improve water quality in Lake Michigan subject to approval by the Public Service Commission. According to the Wisconsin Electric Power Company (WEPCO), the settlement saved rate payers hundreds of millions of dollars, which is what it would have cost to construct cooling towers or continue litigating the environmental issues at Oak Creek (Note 1).

An oversight committee with responsibility for managing the Fund, establishing grant making priorities and guidelines, and making funding decisions was also created. Members of the Oversight Committee (Trustees) include utility representatives (WEPCO, Madison Gas & Electric Company and Wisconsin Public Power Inc.), and representatives from Clean Wisconsin, the Sierra Club, and the Wisconsin Department of Natural Resources. In order to avoid the costs associated with establishing an independent organization, the Fund elected to use the Greater Milwaukee Foundation as its fiscal sponsor and grant administrator.

The mission of the FFLM is to support efforts, in particular those in southeastern Wisconsin, that enhance the health of Lake Michigan, its shoreline and tributary river systems for the benefit of the communities that depend

upon the system for water, recreation and commerce. When possible, the Fund invests in projects that provide multiple community benefits, such as economic development, job creation, enhanced recreational opportunities for local residents, and increased tourism. The vast majority of the Fund's grants support on-the-ground projects that have direct, near-term and quantifiable impacts on water quality and the communities served by the Fund.

The FFLM awarded 71 grants totaling roughly \$7.5 million between 2011 and 2013. The Fund generally solicits grants twice a year. Grants are highly competitive; the Fund received 225 requests for funding totaling \$38.3 million from 2011 to 2013. Half of the Fund's grants have supported local governments. Other grantees include: not-for-profit organizations, state agencies, utilities, and faith groups. While for-profit businesses are not directly eligible for grants, many local companies have partnered with government agencies or non-profit organizations to advance projects or have otherwise benefitted from Fund-supported projects. The Fund also awarded a major \$500,000 grant to University of Wisconsin-Milwaukee. Grants range from \$13,800 to \$500,000 with an average grant award of roughly \$100,000. The Fund's grantees have been able to leverage an additional \$35 million for Fund-supported projects, including \$12 million in federal funds.

The Fund requires grantees to submit both interim and final reports and tracks qualitative and quantitative accomplishments for each project. Overall, the Fund's grants have restored over 70 miles of degraded waterways to popular locations for fishing and other recreation; restored 100 acres of wetland creating high-quality habitat and reducing flooding downstream; made improvements at 25 public parks; revitalized waterfronts and transformed polluted and neglected land into parks and sites for new development; and advanced locally-developed technologies and products to reduce flooding and keep polluted runoff from entering our waterways.

## 2. Literature Review

In order to properly measure the total economic impact of FFLM, it is necessary to analyze the impact that the completion of every FFLM-funded project is expected to have. Many of FFLM's projects have ancillary benefits to their surrounding areas; an example being the increase in the value of affected properties. A review of academic studies is necessary in order to put numeric values on the benefits from the outcomes realized once each FFLM-funded project is completed. After each individual outcome was measured and assigned a dollar amount, a total dollar amount was calculated by adding up the dollar amount each outcome provided. This is the dollar amount that was used to estimate the impact of project outcomes based on FFLM investment. In the rest of this section, we give a brief summary of each study employed and apply the study to one or more of FFLM's projects. Additional studies used include Bolitzer and Netusil (2000) and Doss and Taff (1996) which contain helpful insight on property values. Brander, Florax and Vermaat (2006), Collins, Rosenberger and Fletcher (2005), Hanley and Alvarez-Farizo (2003) and Loomis, Kent, Strange, Fausch and Covich (2000) all examine the value of restoration ranging from streams to wetlands. Murray, Sohngen and Pendleton (2001) studies visitor spending based on water quality at the Great Lakes. Pimentel, Zuniga and Morrison (2005) look into the losses that are incurred when invasive species cause environmental damage. Lastly Young, R. F. (2011) provided useful information on the formation of green infrastructure. For brevity's sake, only the most impactful studies are discussed below. However, all studies employed are properly cited at the end of this paper (see References).

Lutzenhiser and Netusil (2001) studied the relationship between a home's sale price and its proximity to different types of open land, such as parks. They found that housing prices of properties within a 1,500-foot radius of open land were positively affected. This radius is used to determine how many properties were affected by an FFLM-funded project. Once we determined where the project took place, we used the 1,500-foot radius measure to determine which properties were affected; i.e., had property values increase.

Projects with the expected outcome of increasing native plantings in an area were measured in a study titled "Integrating Valuation Methods to Recognize Green Infrastructure's Multiple Benefits," by the Center for Neighborhood Technology. In this study, property values were estimated to increase by 2–10% in areas where new plantings took place. For the purpose of measuring outcomes of FFLM's projects, we scaled down this range to 2–8% and averaged it out to 5%. We found average property value and the number of properties affected in each area, which enabled us to determine the increase in property values realized by the completion of native plantings projects.

Stormwater management is the biggest project grouping of all FFLM-funded project outcomes. The goal of these projects is to improve and/or prevent stormwater runoff. Braden and Johnston (2004) estimate that property owners who undertake stormwater management improvement projects increase their property value by 2–5%. This range was averaged to 3.5% in efforts to conservatively address home values in the FFLM project area.

Leggett and Bockstael conducted a study using hedonic techniques to show that water quality has a significant

effect on property values (2000). They determined that an increase in the water quality of an area led to a 2% increase in the values of properties in that area; this estimate we used to calculate a total impact value for all projects planned for water quality improvement in a given area. We began by determining the average property value and the number of properties affected. Following these calculations, the number of properties impacted was multiplied by the average property value in the area. This result was multiplied by 0.02 (2%) in order to determine the final impact number for all FFLM projects leading to improved water quality.

The FFLM also funded a few projects with the goal of riparian buffer installation. Yang and Weersink (2004) estimated the economic return on riparian buffers to be 14% on the investment; i.e. \$1,000 invested is expected to return \$140. This return on investment estimate was used to calculate a total dollar amount of the benefit associated with installing riparian buffers. Projects that installed riparian buffers were analyzed by taking their FFLM funding and multiplying it by 0.14 (14%) to calculate the return on FFLM's investment.

Thibodeau and Ostro (1981) studied the effects of wetlands on property values. Since wetlands provide natural water storage, they often act as a flood prevention measure in nearby areas Thibodeau and Ostro estimated the savings from flood damage to properties near wetlands to be approximately \$2,000 per acre. We determined the number of acres affected by a FFLM wetland restoration project in order to calculate the total dollar amount saved.

After the monetary value of each outcome category was calculated, they were aggregated together to determine the numerical dollar value of all FFLM-funded project outcomes. We then used IMPLAN analysis to determine the total economic impact of FFLM.

### 3. Methodology

To calculate the economic impact of all FFLM project funding, an IMPLAN input-output model economy was utilized. The IMPLAN model is designed to determine the ultimate economic impact that initial spending by the organization has on the local economy using the funding data obtained by this research. IMPLAN estimates to what extent different spending categories affect the local economy in terms of direct spending, indirect spending, and induced spending. Determining the extent of each of the spending categories is critical to measuring the extent of the impact that various forms of funding have on the local economy, thus utilizing the IMPLAN model seemed most appropriate for this study. The input-output analysis uses an economic model that traces the flow of goods and services, income, and employment among related sectors of the economy. The approach triggers a flow of activities. This paper uses IMPLAN Pro 3.0 software to evaluate the economic impact of the FFLM. The USDA Forest Service originally developed IMPLAN in 1979 and it has witnessed several generations of improvements in the model over the ensuing years. It is a sophisticated software package that makes regional input-output models and forecasts regional economic impact based on those models. It is widely used by government agencies to develop regional economic forecasts. This evolution of the I/O model, developed by Wassily Leontief, its evolution through the University of Minnesota and the US Forest Service, and its application by IMPLAN is explained clearly in prior literature (for example, Miller and Blair, 1985; Bonn and Harrington, 2008). However, the following includes a short description of the three components of the final impact. The Input/Output (I/O) Model provides a means to capture and measure these effects. It uses the following three effects to measure economic impact.

- **Direct Spending:** Initial FFLM-provided funds.
- **Indirect Spending:** Spending brought on by organizations that received those FFLM funds.
- **Induced Spending** The additional spending by employees of the organizations who have more labor income due to putting in more hours.

Direct effect refers to production change associated with a change in demand for the good itself. It is the initial impact to the economy, which is exogenous to the model. Indirect effect refers to the secondary impact caused by changing input needs of directly affected industries (e.g., additional input purchases to produce additional output). Induced effect is caused by changes in household spending due to the additional employment generated by direct and indirect

#### 3.1 Data

There were two datasets used in our impact analysis of the FFLM's projects. These two datasets were used in order to differentiate between the impact of FFLM funding and the impact that FFLM-funded projects had on their surroundings once completed.

From the first dataset, a measure of the total amount of money the Fund granted was calculated. This number

was used to estimate the economic impact of the Fund's grant making. The second dataset used was comprised of each FFLM-funded project's intended outcomes. In order to conduct this type of analysis, the data were further broken down into the expected outcomes each project intended to yield upon completion. Included in this dataset are things like how many acres of land were restored or were expected to be restored, how many native species were planted, how many stream miles of waterway were restored or were expected to be restored, etc. From these outcomes, a total dollar amount of the effects of these projects was calculated. This number was used to determine the total economic impact that would be realized upon completion of all FFLM-funded projects.

#### 4. Results

Table 1 displays the economic impact of the funding provided by the FFLM only. No outcome measures or leveraged funds are included. By helping fund 71 projects, the FFLM is responsible for creating over 150 jobs, providing these employees with over \$6 million in total income, and infusing the economy of southeastern Wisconsin with over \$14 million in economic output.

Table 1. Economic impact of FFLM grant-making

Impact Type	Employment	Labor Income	Output
<b>Direct Effect</b>	104.5	\$4,244,847	\$8,094,620
<b>Indirect Effect</b>	19.3	\$885,476	\$2,512,490
<b>Induced Effect</b>	34.7	\$1,345,368	\$4,150,848
<b>Total Effect</b>	158.5	\$6,475,691	\$14,757,958

In Table 2, estimates are provided for the impact that completing all FFLM-funded projects will have on the southeastern Wisconsin region. Once completed, all of the FFLM-funded projects will have combined to create over 120 jobs, provide their employees with over \$2 million in total income, and generate over \$7 million in economic output (Note 2). The main driving force of the economic impacts due to FFLM project outcomes is the increase in property values.

Table 2. Economic impact of project outcomes based on FFLM investment

Impact Type	Employment	Labor Income	Output
<b>Direct Effect</b>	101.7	\$1,739,804	\$4,601,023
<b>Indirect Effect</b>	10.1	\$458,238	\$1,493,961
<b>Induced Effect</b>	14.6	\$575,932	\$1,786,210
<b>Total Effect</b>	126.4	\$2,773,974	\$7,881,194

Table 3. Economic impact of leverage funds from federal and Non-WI funds

Impact Type	Employment	Labor Income	Output
<b>Direct Effect</b>	163.6	\$2,798,267	\$7,400,195
<b>Indirect Effect</b>	16.3	\$737,021	\$2,402,858
<b>Induced Effect</b>	23.5	\$926,317	\$2,872,905
<b>Total Effect</b>	203.4	\$4,461,605	\$12,675,958

In addition to analyzing the funding provided by the FFLM only, Table 3 also displays the funding all organizations were able to obtain due to the initial FFLM-funding. This act, also known as leveraging, created over 200 jobs, provided over \$4 million in labor income, and created over \$12 million in economic output. The funds analyzed in Table 3 represent the funds which would not have been obtained without direct funding of the FFLM (Note 3).

The total economic impact of the Fund for Lake Michigan is displayed in Table 4. This was measured by adding together all estimates of the previous three tables. When analyzed as a whole, the FFLM is responsible for creating over 480 jobs, providing employees over \$13 million in labor income, increasing property values by over \$45.5 million, and stimulating the economy of southeastern Wisconsin with over \$35 million of economic output. These estimates represent all FFLM-funded projects from 2011 until 2013, with the assumption that they will be completed on time.

Table 4. Total impact of FFLM monies

<b>Impact Type</b>	<b>Employment</b>	<b>Labor Income</b>	<b>Output</b>
<b>Direct Effect</b>	369.8	\$8,782,918	\$20,095,838
<b>Indirect Effect</b>	45.7	\$2,080,735	\$6,409,309
<b>Induced Effect</b>	72.8	\$2,847,617	\$8,809,963
<b>Total Effect</b>	488.3	\$13,711,270	\$35,315,110

Note. These numbers are a summation of Tables 1, 2, and 3.

## 5. Conclusion

Projecting the future is always difficult, as there are inherent uncertainties in doing so. However, if the Fund for Lake Michigan continues, it is anticipated the return on the FFLM's investment will be similar to the returns of the projects analyzed for this paper. Overall, the Fund for Lake Michigan has had a tremendous impact on the economy of southeastern Wisconsin. Estimates provided in this paper show the numerical values of the Fund's projects, but it is often forgotten that there is a "double bottom line" in the outcomes of these projects. Not only does FFLM-funding create jobs, provide labor income, and stimulate the economy, but it also provides a better environment and a higher quality of life. These factors, although not entirely quantifiable, must be taken into consideration when analyzing the total effect the Fund for Lake Michigan has had, and will continue to have, on the southeastern Wisconsin economy.

Table 5. List of approved FFLM-Funded projects

<b>Project Title</b>	<b>Organization</b>	<b>Cycle</b>
Reducing Polluted Stormwater in the Wilson Park Creek Subwatershed of the Kinnickinnic River	American Rivers Inc.	2011 Winter
Evaluation of a Leaf Collection Program as a Means to Reduce Nutrient Loads from Urban Basins	City of Madison	2012 Spring
Porous Walks	City of Milwaukee Department of Public Works	2012 Fall
Green Infrastructure Baseline Study	City of Milwaukee Office of Environmental Sustainability	2012 Spring
Fish Barrier Removal and Habitat Restoration on Lake Michigan Coast	City of Port Washington	2011 Winter
Baseline Assessment of Water Quality in Support of the Root River Watershed Restoration Plan	City of Racine	2011 Winter
Root River Bank Stabilization and Riparian Habitat Restoration Project	City of Racine	2012 Fall
Multijurisdictional implementation of beach redesigns to improve water quality and restore habitat	City of Racine	2013 Spring
City of West Allis - Rain Gardens	City of West Allis	2013 Spring
City of Oak Creek Drexel Town Square - Floating Wetland Island	City of Oak Creek	2013 Spring
Kinnickinnic River Upper Estuary Restoration and Naturalization	Groundwork Milwaukee	2011 Winter
Gateway to Improved Long-term Spawning (GILS)	Groundwork Milwaukee	2011 Fall
Westlawn Partnership to Restore the Lincoln Creek Watershed	Housing Authority of the City of Milwaukee	2011 Fall
Pike River Fish Passage Dam Removal Design & Engineering	Kenosha County Division of Parks	2011 Winter
Pike River Fish Passage Dam Removal, Bridge Construction, and Stream Bed and Bank Restoration	Kenosha County Division of Parks	2011 Fall
Baseline Assessment of Water Quality in Support of the Pike River Watershed Restoration Plan	Kenosha Storm Water Utility	2011 Fall
Stormwater Treatment Demonstration Project: Industrial-size Rain Barrels	Menomonee Valley Partners, Inc.	2011 Fall
Mequon Nature Preserve Land Restoration Program	Mequon Nature Preserve, Inc.	2012 Spring
Restoration of Forest and Wetland Habitat	Mequon Nature Preserve, Inc.	2013 Spring
Milwaukee Estuary Wetland Restoration - Former Grand Trunk Site	Milwaukee Department of City Development	2011 Fall

Bluff restoration in the Milwaukee River Greenway	Milwaukee Environmental Consortium	2012 Spring
Milwaukee Metropolitan Sewerage District's Hydric Soil Reforestation	Milwaukee Metropolitan Sewerage District	2011 Winter
Mequon Marsh	Milwaukee Metropolitan Sewerage District	2011 Fall
Burnham Canal Wetland	Milwaukee Metropolitan Sewerage District	2012 Fall
Remove Five Fish Passage Barriers in Menomonee River	Milwaukee Metropolitan Sewerage District	2012 Fall
Green Rivers and Green Beaches: Monitoring Phosphorus Loading in the Milwaukee River Basin	Milwaukee Riverkeeper	2011 Fall
Menomonee River Stabilization Project in Rotary Park	Milwaukee Riverkeeper	2011 Fall
Assessment of Urban Stormwater Infrastructure Using Molecular Tools for Human Bacteria	Milwaukee Riverkeeper	2012 Spring
Financing Stormwater Retrofits in Milwaukee	Natural Resources Defense Council	2012 Spring
Sauk and Sucker Creeks Coastal Watershed Buffer Initiative	Ozaukee County	2011 Winter
Zeroing in on Sources of Phosphorus from Farm Fields in a Milwaukee River Watershed	Ozaukee County	2012 Spring
Milwaukee Estuary Area of Concern Fish Passage Restoration	Ozaukee Planning and Parks Department	2012 Spring
Fish and Wildlife Habitat Restoration – Milwaukee River Watershed	Ozaukee Planning and Parks Department	2013 Spring
Lake Michigan Shoreline Restoration Project	Ozaukee Washington Land Trust	2011 Winter
Partners in Preservation	Ozaukee Washington Land Trust	2013 Spring
Root River Redevelopment Implementation Initiative	Racine County Economic Development Corporation	2012 Fall
Riparian Buffer Installation in the Root River Watershed & Lake Michigan Watershed in Racine County	Racine County Land Conservation Division	2011 Fall
Menomonee Valley Riverbank Stabilization Project	Redevelopment Authority of the City of Milwaukee	2012 Spring
Water Technology and Research Park Stormwater and Greywater	Redevelopment Authority of the City of Milwaukee	2012 Fall
Riparian Buffers: A Learning Lab	River Network	2011 Fall
Planning, Feasibility, and Outreach for Restoration at Granville Park	River Revitalization Foundation	2011 Fall
Wheelhouse Shoreline Restoration	River Revitalization Foundation	2012 Fall
Watershed Based Grant Program	Root-Pike Watershed Initiative Network	2011 Winter
Pike River Watershed Restoration Plan	Root-Pike Watershed Initiative Network	2011 Winter
Watershed-based Grant Program	Root-Pike Watershed Initiative Network	2012 Spring
Wind Point Watershed Restoration Plan & Water Quality Monitoring	Root-Pike Watershed Initiative Network	2012 Spring
Watershed-based Grant Program	Root-Pike Watershed Initiative Network	2013 Spring
Planning for Trial Point/Non-point Water Quality Market	Sand County Foundation	2011 Fall
Implementing On-the-Ground Residential Stormwater BMP's in Southeastern Wisconsin	Sixteenth Street Community Health Center	2011 Winter
Scaling Up Water Resource Investments in the Pulaski Park Neighborhood	Sixteenth Street Community Health Center	2013 Spring
Somers Branch of Pike River: Eco-hydrological Analysis & Restoration Planning	Somers Town Park Committee	2012 Fall
Root River Watershed Restoration Plan Project	Sweet Water: The Southeastern Wisconsin Watersheds Trust, Inc.	2011 Winter
Sweet Water's Water Quality Mini-grant Program Expansion	Sweet Water: The Southeastern Wisconsin Watersheds Trust, Inc.	2011 Winter
Sweet Water's Water Quality Mini-grant Program Expansion	Sweet Water: The Southeastern Wisconsin Watersheds Trust, Inc.	2012 Spring
Sweet Water's Water Quality Mini-grant Program Expansion	Sweet Water: The Southeastern Wisconsin Watersheds Trust, Inc.	2013 Spring
Sweet Water Riparian Prioritization & Design Project	Sweet Water: The Southeastern Wisconsin Watersheds Trust, Inc.	2013 Spring
McKinley Marina BMPs and Lake Michigan Water Quality Improvements Phase 1	The Milwaukee County Department of Parks, Recreation & Culture	2012 Spring

The Menomonee River Parkway Wetlands Restoration Initiative	The Milwaukee County Department of Parks, Recreation & Culture	2012 Spring
Green Infrastructure Improvements at Lake Michigan Shoreline Parks-Bender Park & Grant Park	The Milwaukee County Department of Parks, Recreation & Culture	2012 Fall
Estabrook Dam Environmental Analysis	The Milwaukee County Department of Parks, Recreation & Culture	2012 Fall
The Shul's Green Infrastructure Project	The Shul Center	2013 Spring
Global Water Center - Research Vegetated Roof Laboratory	The Water Council	2013 Spring
Tippecanoe Rooftop Pantry Garden	Tippecanoe Presbyterian Church	2013 Spring
Menomonee Valley Stormwater Treatment and Riverbank Stabilization Project	UEC/MVP Project Inc.	2012 Spring
Milwaukee Rotary Centennial Arboretum	Urban Ecology Center	2011 Fall
National Center for Great Lakes Genomics	UWM Foundation on behalf of the UWM School of Freshwater Sciences	2011 Fall
Frontier Park - Menomonee River Bank Stabilization, Village of Butler	Village of Butler	2012 Fall
Pike River Improvements--Phase 7a	Village of Mount Pleasant	2013 Spring
Atwater Park and Beach Native Plant Installation, Maintenance, and Invasive Species Removal Project	Village of Shorewood	2012 Fall
Milwaukee River Fish Habitat Enhancement and Expansion	Wisconsin Department of Natural Resources	2013 Spring
Advancing Green Infrastructure Through Ordinance Revision	1000 Friends of Wisconsin	2012 Spring

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### Notes

Note 1. Source: Docket No. 05-UR-104, Direct Testimony of Frederick D. Kuester, Wisconsin Energy Corporation, at SD.10 (Wis. Pub. Serv. Comm'n, Jul. 3, 2009).

Note 2. It should be noted that some of the project outcomes could not be quantified; therefore, these estimates represent just over 80% of all FFLM project outcomes.

Note 3. These are also referred to as “leveraged funds”. The funds under consideration here are non-Wisconsin and/or federal sources of funds.

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