Measuring the Economic Impact of Water Quality Initiatives

A study of the Fund for Lake Michigan: 2014-2015 Update

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Fund for Lake Michigan Economic Impact

The primary finding of this study is that the Fund for Lake Michigan ("FFLM" or "the Fund) has had a very positive, demonstrable economic impact in the southeastern region of Wisconsin. Our findings also suggest that, if funded in the same manner, the Fund should continue to have a similar level of economic impact for the foreseeable future. This paper is an update of the original paper which discussed the economic impact findings between 2011 and 2013. Based on the outcomes of both studies, the following represents the total economic impact the Fund for Lake Michigan has provided in its first five years of grant making (2011-2015):

- **Creation of over 822 full-time equivalent jobs, providing employees with $25 million in labor income**
- **Stimulating the economy with over $65 million in economic output**
- **Increase in property values by over $131 million**
- **Leveraging of an additional $26 million from private and public sources for Fund-supported projects**

The following economic impacts were from the original paper which found that the Fund's grant making between 2011 and 2013 had the following economic impact:

- **Creation of over 480 full-time equivalent jobs, providing employees with $13 million in labor income**
- **Stimulating the economy with over $35 million in economic output**
- **Increase in property values by over $45 million**
- **Leveraging of an additional $13 million from private and public sources for Fund-supported projects**

This updated paper is based on projects the Fund for Lake Michigan supported between 2014 and 2015. The following economic impacts were derived from the new projects:

- **Creation of over 342 full-time equivalent jobs, providing employees with $12 million in labor income**
- **Stimulating the economy with over $30 million in economic output**
- **Increase in property values by over $86 million**
- **Leveraging of an additional $13 million from private and public sources for Fund-supported projects**

While the main focus of this report is on the economic impact of the Fund for Lake Michigan's grants on southeast Wisconsin, these benefits are not limited to that region. Noting that our economic infrastructure and environmental infrastructure are ultimately interconnected, projects that promote environmental benefits in the southeastern part of the state will ultimately help the rest of Wisconsin as they encourage tourism and contribute to economic development throughout the state. Furthermore, the Fund for Lake Michigan has begun to expand its grant making beyond southeast Wisconsin to include a number of projects in Dane County, the Green Bay area, Door County and other communities along the Lake Michigan coastline. As the Fund expands its programming, the direct economic benefits extend to these and other communities and areas. Finally, these investments will have a statewide impact as tourists will travel throughout Wisconsin to visit these sites.

Executive Summary

Although the Clean Water Act[1] is over 40 years old, there is still work left to be done on restoring many of the United States' waterways. The Great Lakes, an area close to home for many of us, has been improving over the years, but there are still concerns with the "leveling off or even reversal of reductions in toxic chemicals such as mercury and nutrient loadings in the past decade and earlier".[2] In Wisconsin, for instance, there are plenty of new bodies of water being listed as "impaired" based on standards set by the Department of National Resources. The cost of improving these waterways is estimated to be $4 billion over the next 20 years.[3] This is a

[1] For more information on the Clean Water Act, see http://www2.epa.gov/laws-regulations/summary-clean-wateract

[2] Source: Egan, D. (2013, May 14). Great Lakes water quality improved, but there are still issues, report says. *Milwaukee Journal Sentinel*.

[3] Source: Bergquist, L. (2013, June 12). Wisconsin set to list 150 more water bodies as impaired. *Milwaukee Journal Sentinel*.

challenging proposition, as waterway restoration can take many years for the initial plans to come to fruition. This is where organizations, such as the Fund for Lake Michigan, come in.

The Fund for Lake Michigan provides grants to nonprofit and government organizations to conduct projects aimed at improving water quality. The main goal of the Fund for Lake Michigan is to enhance the health of Lake Michigan and the life of its communities. By providing funding to achieve this goal, the Fund for Lake Michigan can help us achieve higher standards of water quality in the southeastern Wisconsin region.

The University of Wisconsin-Whitewater's Fiscal and Economic Research Center (FERC) and the Institute for Water Business were tasked with conducting an analysis of the total economic impact of all FFLM-funded projects between 2014 and 2015. In order to do this, we used IMPLAN, an input-output method of analysis. 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.

Introduction

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 Fund for Lake Michigan grants awarded in 2014 and 2015 had in the southeastern Wisconsin. This was done using IMPLAN, an input-output method of economic modeling that will be discussed in detail later in this report.

Main findings indicate the Fund had, and will continue to have, a tremendous impact on the southeastern Wisconsin area. Grants awarded by the Fund in 2014 and 2015 created over 342 jobs, provided employees with over $12 million in labor income, increased property values by over $86 million and generated over $30 million in economic output in the region.

Background

The mission of the Fund for Lake Michigan is to support efforts, in particular those in southeastern Wisconsin, that improve the water quality of Lake Michigan, its shoreline and tributary river systems for the benefit of the people and 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 Fund for Lake Michigan awarded 79 grants totaling roughly $4.4 million in 2014 and 2015. The Fund generally solicits grants twice a year. Grants are highly competitive; the Fund has received more than $55 million in grant requests since 2011. Roughly 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. Grants in 2014 and 2015 ranged from $9,375 to $200,000 with an average grant award of roughly $56,000. The Fund's grantees were able to leverage an additional $13 million for Fund-supported projects.

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 provided a variety of environmental benefits.

These benefits include:

- Improving state and local parks, swimming beaches and other tourist destinations along the Lake Michigan coastline
- Transforming miles of degraded waterways into popular locations for fishing, boating and other recreational activities
- Restoring hundreds of acres of wetland creating high-quality habitat and reducing flooding downstream
- Revitalizing waterfronts and transforming polluted and neglected land into parks and sites for new development
- Advancing locally-developed technologies and products to reduce flooding and keep polluted runoff from entering our waterways.

Literature Review

In order to properly measure the total economic impact of the FFLM, it is necessary to analyze the impact that the completion of every FFLM-funded project is expected to have. Many of the 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. For brevity's sake, only the most impactful

studies are discussed below. However, all studies employed are properly cited at the end of this report (see **References**).

Lutzenhiser and Netusil (*Contemporary Economic Policy*, 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 (*Journal of Water Resources Planning and Management*, 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 (*Journal of Environmental Economics and Management*, 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; we used this estimate 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 (*Canadian Journal of Agricultural Economics*, 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 (*Journal of Environmental Management*, 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, the categories 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.

Methodology

To calculate the economic impact of all Fund for Lake Michigan 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. These categories are defined as follows:

- **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.

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.

Data

There were two datasets used in our impact analysis of the Fund for Lake Michigan'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.

Results

Table 1 displays the economic impact of the funding provided by the Fund for Lake Michigan only. No outcome measures or leveraged funds are included. By helping fund 79 projects, the FFLM is responsible for creating over 57 jobs, providing these employees with over $2 million in total income, and infusing the economy of southeastern Wisconsin with over $6 million in economic output.

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 195 jobs, provide their employees with over $4 million in total income, and generate over $14 million in economic output[4]. The main driving force of the economic impacts due to FFLM project outcomes is the increase in property values.

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 90 jobs, provided over $4 million in labor income, and created

[4] 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.

over $9 million in economic output. The funds analyzed in **Table 3** represent the funds that would not have been obtained without direct funding of the FFLM.[5]

Conclusion

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 342 jobs, providing employees over $12 million in labor income, increasing property values by over $86 million, and stimulating the economy of southeastern Wisconsin with over $30 million of economic output. These estimates represent all FFLM-funded projects from 2014 until 2015, with the assumption that they will be completed on time.

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 report. Overall, the Fund for Lake Michigan has had a tremendous impact on the economy of southeastern Wisconsin.

Estimates provided in this report 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 Wisconsin's economy.

[5] These are also referred to as "leveraged funds". The funds under consideration here are non-Wisconsin and/or federal sources of funds.

Appendices

Appendix A: Tables

Table 1: Economic Impact of FFLM Grant-Making

Impact Type	Employment	Labor Income	Output
Direct Effect	36	$1,925,760	$3,401,538
Indirect Effect	7	$314,310	$914,696
Induced Effect	14	$586,753	$1,839,326
Total Effect	57	$2,826,822	$6,155,560

Table 2: Economic Impact of Project Outcomes based on FFLM Investment

Impact Type	Employment	Labor Income	Output
Direct Effect	150	$3,016,661	$8,515,408
Indirect Effect	20	$942,158	$3,184,980
Induced Effect	25	$1,038,811	$3,256,049
Total Effect	195	$4,997,632	$14,956,435

Table 3: Economic Impact of Leveraged Funds from Federal and Non-WI Sources

Impact Type	Employment	Labor Income	Output
Direct Effect	57	$3,040,415	$5,370,392
Indirect Effect	10	$496,237	$1,444,133
Induced Effect	22	$926,373	$2,903,951
Total Effect	90	$4,463,024	$9,718,479

Table 4: Total Impact of FFLM Monies

Impact Type	Employment	Labor Income	Output
Direct Effect	243	$7,982,835	$17,287,337
Indirect Effect	37	$1,752,705	$5,543,809
Induced Effect	62	$2,551,936	$7,999,327
Total Effect	342	$12,287,476	$30,830,473

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

Appendix B: List of Approved 2014-2015 FFLM-Funded Projects

Project Title	Organization	Cycle
Veterans Memorial Park Milwaukee Riverbank Restoration	Village of Grafton	2015 Fall
Design Services & Plan Preparation for Pike River Bank Stabilization and Restoration	Kenosha County Division of Parks	2015 Fall
Building the Capacity and Delivery of LNRP's Stewardship Fund	Lakeshore Natural Resource Partnership	2015 Fall
Coastal Assessment of Southeastern Wisconsin Lake Michigan Shoreline	Natural Resources Foundation of Wisconsin	2015 Fall
Root River Floodplain Restoration Project	Hunger Task Force	2015 Fall
Next-Generation Water Conservationists	Great Lakes Community Conservation Corps	2015 Fall
Mequon Preservation Partners	Ozaukee Washington Land Trust	2015 Fall
Milwaukee River Greenway bluff and trail project	River Revitalization Foundation	2015 Fall
Harrington Beach - E.coli Source Identification & Assessment	Ozaukee County	2015 Fall
Sweet Water Mini-Grant Program: Improving Water Quality Through Local, Grassroots Efforts	Sweet Water: The Southeastern Wisconsin Watersheds Trust, Inc.	2015 Fall
Production of the Milwaukee Harbor Habitat Map	UWM Foundation on behalf of the UWM School of Freshwater Sciences	2015 Fall
Oak Creek Watershed Restoration Plan	The Milwaukee County Department of Parks, Recreation & Culture	2015 Fall

The Forest Exploration Center - Phase 1 Site Development	Forest Exploration Center	2015 Fall
A Collaborative Effort to Restore Urban Green Spaces Through Expanded Community-based Stewardship	The Milwaukee County Department of Parks, Recreation & Culture	2015 Fall
Envisioning the Future of Milwaukee's Harbor District	Harbor District, Inc.	2015 Fall
North Avenue Corridor Restoration: GI Implementation Solution for Privately-Owned Parking Lots	City of Milwaukee Office of Environmental Sustainability	2015 Fall
Water Quality Impact of Windrow Manure Composting	Clean Lakes Alliance	2015 Fall
Woodland Dunes Forget Me Not Creek Restoration 1	Woodland Dunes Nature Center and Preserve, Inc.	2015 Fall
Corporate Water Stewardship Demonstration Site	The Water Council	2015 Fall
Bioswale BMP at Glendale Nicolet Recreational Park	City of Glendale	2015 Fall
Crescent Beach - Storm Water Collection and Outfall Redesign - Algoma, WI	City of Algoma	2015 Fall
Racine County Harbor Monitoring Study	Racine County Department of Public Works	2015 Fall
Keeping Tabs on the Sturgeon of the Menominee River	River Alliance of Wisconsin	2015 Fall
Evaluating the Effectiveness of Beach Redesign and Remediation Projects	University of Wisconsin - Sea Grant Institute	2015 Fall
Beerline Trail Neighborhood Development Project in the Riverworks area	Greater Milwaukee Committee	2015 Fall

The Ridges Sanctuary's Living Laboratory for Protection & Sustainability Along Lake Michigan	The Ridges Sanctuary	2015 Spring
Green Schools Consortium of Milwaukee	Reflo: Sustainable Water Solutions	2015 Spring
Galvanizing Water Stewardship in Milwaukee Neighborhoods	Milwaukee Environmental Consortium	2015 Spring
Breakwater Gateway Water Quality Improvement & Habitat Restoration	City of Port Washington	2015 Spring
Tractor Road Stormwater Diversion	Friends of Hawthorn Hollow	2015 Spring
Milwaukee River Watershed: Planning for Watershed Restoration	Sweet Water: The Southeastern Wisconsin Watersheds Trust, Inc.	2015 Spring
Camp Evelyn Dam Removal and River Restoration	Girl Scouts of Manitou Council	2015 Spring
Amsterdam Dunes Restoration Planning, Design & Implementation	Sheboygan County Planning & Conservation	2015 Spring
Alverno College West Campus Stormwater/Subwatershed Study	Alverno College	2015 Spring
Stormwater Management Planning at Schlitz Audubon Nature Center	Schlitz Audubon Nature Center	2015 Spring
Putting Milwaukee’s Rivers on a Low-Salt Diet	Milwaukee Riverkeeper	2015 Spring
Farmstead to Wetlands at MNP	Mequon Nature Preserve, Inc.	2015 Spring
Milwaukee River Lake Sturgeon Rehabilitation	Wisconsin Department of Natural Resources	2015 Spring
North Point Lighthouse Green Infrastructure Treatment Train	North Point Lighthouse Friends	2015 Spring

Implementing Near Term Priorities of the Pulaski Park Neighborhood Stormwater Plan	Sixteenth Street Community Health Center	2015 Spring
City of Oak Creek Lake Vista Green Infrastructure	City of Oak Creek	2015 Spring
Innovation through Implementation: Creating a Green Infrastructure Campus in Milwaukee's Central Ci	Walnut Way Conservation Corp.	2015 Spring
Lake Michigan Wildlife and Water Quality Improvement Project	Ducks Unlimited Inc.	2015 Spring
Freshwater Sustainability Lab Educational Outreach	Discovery World	2015 Spring
Prioritization of Restoration in the Oak Creek Watershed via Water Quality and Habitat Assessment	City of Racine	2015 Spring
Great Rivers / Great Lakes	Ozaukee Washington Land Trust	2015 Spring
Enhancing Utilities' Water Efficiency: A Water Loss Audit Pilot Training Program	City of Cudahy Water Utility	2015 Spring
Restoring Silver Creek for the Health of Green Bay and Lake Michigan	The Nature Conservancy	2015 Spring
Developing a Framework for Prioritization of Action Areas Suitable for the AMO in LFR	Alliance for the Great Lakes	2015 Spring
Addressing storm water impact on public safety, dune habitat, and water quality at KASP	Friends of Kohler-Andrae Inc.	2015 Spring
Samuel Myers Park Restoration	City of Racine	2015 Spring
Sweet Water's 2014 Water Quality Mini-Grant Program	Sweet Water: The Southeastern Wisconsin	2014 Fall

	Watersheds Trust, Inc.	
Alverno College West Campus Stormwater/Subwatershed Study	Alverno College	2014 Fall
Dam Removal and Fish Passage Restoration - Mineral Springs Creek	Ozaukee Planning and Parks Department	2014 Fall
Machinery Row Stormwater Planning	Racine County Economic Development Corporation	2014 Fall
Wetland Expansion & Enhancement at MNP	Mequon Nature Preserve, Inc.	2014 Fall
Milwaukee Riverbank Restoration	Riveredge Nature Center	2014 Fall
Milwaukee World Festival, Inc Administration Office Building	Milwaukee World Festival, Inc	2014 Fall
Watershed-Based Grant Program and Resource Group Evaluation	Root-Pike Watershed Initiative Network	2014 Fall
Port Exploreum: Lake Michigan Permanent Exhibit	Port Washington Historical Society	2014 Fall
Transform Milwaukee Strategic Action Plan	WHEDA Foundation, Inc.	2014 Spring
Freshwater Way Permeable Pavement	Redevelopment Authority of the City of Milwaukee	2014 Spring
Adaptive Management in Three Bridges Park	UEC/MVP Project Inc.	2014 Spring
Little Manitowoc Coastal Wetland Restoration	Lakeshore Natural Resource Partnership	2014 Spring
Strategic Land Planning: Protecting the Milwaukee River Watershed	Ozaukee Washington Land Trust	2014 Spring
City of Brookfield - 124th Street Commerce District - Road	City of Brookfield	2014 Spring

Reconstruction/Stormwater Project		
Fund for Lake Michigan Freshwater Sustainability Lab	Discovery World	2014 Spring
Harrington Beach Stormwater Remediation	Ozaukee County	2014 Spring
Rain Garden Initiative - An Effort to Improve Water Quality	Ozaukee County	2014 Spring
Scenario-Based Green Infrastructure Planning and Implementation in the KK Watershed	Sixteenth Street Community Health Center	2014 Spring
Addressing Fish Passage Impediments in the Menomonee River Watershed	Milwaukee Riverkeeper	2014 Spring
Implementation of recommended reclamation directives from the eco-hydrological analysis	Somers Town Park Committee	2014 Spring
Green Infrastructure for Johnsons Park	Center for Resilient Cities	2014 Spring
RootWorks 2014 Projects - Belle Harbor	Racine County Economic Development Corporation	2014 Spring
MES Stormwater Re-Use Project	Milwaukee Teacher Education Center (MTEC)	2014 Spring
Bradley Lake Water Quality Improvement & Habitat Restoration	City of Sturgeon Bay	2014 Spring
United Watershed AmeriCorps Project	Great Lakes Community Conservation Corps	2014 Spring

Reducing Watershed Pollution Through Dynamic Stormwater Retention on the Roof	The Water Council	2014 Spring
Ecological Restoration of Lake Michigan Wetlands	Ducks Unlimited Inc.	2014 Spring

References

Bin, O., & Polasky, S. Effects of Flood Hazards on Property Values: Evidence Before and After Hurricane Floyd.

Bolitzer, B., & Netusil, N. R. (2000). The impact of open spaces on property values in Portland, Oregon. *Journal of Environmental Management, 59*, 185-193.

Braden, J. B., & Johnston, D. M. (2004). Downstream Economic Benefits from Storm-Water Management. *Journal of Water Resources Planning and Management, 130*, 498-505

Brander, L. M., Florax, R. J. G. M., & Vermaat, J. E. (2006). The Empirics of Wetland Valuation: A Comprehensive Summary and a Meta-Analysis of the Literature. *Environmental & Resource Economics, 33*, 223-250.

Collins, A., Rosenberger, R., & Fletcher, J. (2005). The economic value of stream restoration. *Water Resources Research, 41*.

Doss, C. R., & Taff, S. J. (1996). The Influence of Wetland Type and Wetland Proximity on Residential Property Values. *Journal of Agricultural and Resource Economics, 21*, 120-129.

Hanley, N., Bell, D., & Alvarez-Farizo, B. (2003). Valuing the Benefits of Coastal Water Quality Improvements Using Contingent and Real Behaviour. *Environmental and Resource Economics, 24*, 273-285.

Legget, C. G., & Bockstael, N. E. (2000). Evidence of the Effects of Water Quality on Residential Land Prices. *Journal of Environmental Economics and Management, 39*, 121-144.

Loomis, J., Kent, P., Strange, L., Fausch, K., & Covich, A. (2000). Measuring the total economic value of restoring ecosystem services in an impaired river basin: results from a contingent valuation survey. *Ecological Economics, 33*, 103-117.

Lutzenhiser, M., & Netusil, N. R. (2001). The Effect of Open Spaces on a Home's Sale Price. *Contemporary Economic Policy, 19*, 291-298.

Murray, C., Sohngen, B., & Pendleton, L. (2001). Valuing water quality advisories and beach amenities in the Great Lakes. *Water Resources Research, 37*, 2583-2590.

O'Gorman, S., Bann, C., & Caldwell, V. (2009). The Benefits of Inland Waterways.
Pimentel, D., et al (1995). Environmental and Economic Costs of Soil Erosion and Conservation Benefits. *Science, 267*, 1117-1122.

Pimentel, D., Zuniga, R., & Morrison, D. (2005). Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics, 52*, 273-288.

Sheeran, K., & Hesselgrave, T. (2012). Analysis of the Economic Benefits of Salmon Restoration Efforts on the Lower Coquille River and Associated Economic Impacts. *Report to the Nature Conservancy*.

Sumaila, U. R., & Suatoni, E. (2005). Fish Economics: The Benefits of Rebuilding U.S. Ocean Fish Populations.*Fisheries Economics Research Unit*.

The Wisconsin Department of Natural Resources. (2012). *Phosphorus Reduction in Wisconsin Water Bodies: An Economic Impact Analysis*.

Thibodeau, F. R., & Ostro, B. D. (1981). An Economic Analysis of Wetland Protection. *Journal of Environmental Management, 12*, 19-30.

Whitelaw, E., & MacMullan, E. (2002). A Framework for Estimating the Costs and Benefits of Dam Removal.*BioScience, 52*, 724-730. Retrieved February 16, 2014

Wise, S., Braden, J., Ghalayini, D., Grant, J., Kloss, C., MacMullan, E., Morse, S., & al. (2008). *Integrating Valuation Methods to Recognize Green Infrastructure's Multiple Benefits*. Chicago, IL: Center for Neighborhood Technology.

Yang, W., & Weersink, A. (2004). Cost-effective Targeting of Riparian Buffers. *Canadian Journal of Agricultural Economics, 52*, 17-34.

Young, R. F. (2011). Planting the Living City. *Journal of the American Planning Association, 77*, 368-381.