

**Final Report:**  
*An Economic Impact Assessment of  
Sanford Lake, Midland County, Michigan*

---

December 2013

***Prepared for***

The Sanford Lake Association and  
the Sanford Lake Preservation Association

***Submitted by***

Public Sector Consultants Inc.  
Lansing, Michigan  
[www.pscinc.com](http://www.pscinc.com)

***In collaboration with***

Center for Economic Analysis  
Michigan State University  
East Lansing, Michigan

***Acknowledgements***

*Public Sector Consultants, Inc. and the property owners around Sanford Lake who have sponsored this assessment would like to express their appreciation for the cooperation and assistance provided by Jerome and Edenville township officials and those in Midland County who provided access to tax assessment and tax payment information essential to the preparation of this report. In addition, we would like to thank the marina operations near Sanford Lake for their willingness to share business information for this study and the Midland County Parks Department for providing valuable information on the use of the Sanford Lake County Park.*

# Contents

---

<b>Introduction .....</b>	<b>1</b>
Study Purpose .....	1
Sanford Dam.....	1
Federal Energy Regulatory Commission (FERC) and Boyce Hydro LLC .....	2
<b>Findings .....</b>	<b>3</b>
Property Tax Impacts.....	3
Visitor Expenditures.....	4
Marina Impacts .....	6
Seasonal Home Visitor Expenditure Impacts .....	6
Direct Impact on Schools.....	7
<b>Summary .....</b>	<b>9</b>
The Economic Impact of Sanford Lake .....	9
The Future of Sanford Dam.....	9
<b>References .....</b>	<b>10</b>
<b>Appendix: <i>Methodology</i>.....</b>	<b>11</b>
Data Analysis and Modeling .....	11
Property Tax Impacts.....	11
Visitor Expenditures.....	12
Seasonal Home Visitor Expenditure Impacts .....	13
The IMPLAN Economic Impact Model.....	16

# Introduction

---

## STUDY PURPOSE

Public Sector Consultants Inc. (PSC), working with Michigan State University’s Center for Economic Analysis (CEA), was hired by the Sanford Lake Association and the Sanford Lake Preservation Association to assess the economic contributions of Sanford Lake, located in Midland County, to the surrounding area. The lake is impounded by a hydroelectric dam, owned by Boyce Hydro LLC. The team sought to quantify the direct and indirect economic impacts of the lake, focusing on lake front and back lots with deeded access property values, the local tax base, and recreational expenditures.

The purpose of this analysis is to help inform the ongoing public discussions on how to address the long-term costs of preserving the impoundment and associated structures for the benefit of property owners on or with deeded access to the lake, as well as county residents and visitors who use the lake for recreation. This report does not assess the various funding options or the cost/benefits associated with continued hydroelectric generation at the Sanford Dam. This analysis focuses on existing information from public sources, including attendance data at the county-owned Sanford Lake Park, local tax and assessment data for properties directly on Sanford Lake, as well as interviews with marina operators serving watercraft users on the lake. Through the use of economic models and relevant studies previously conducted in nearby counties, and the site-specific information cited above, a conservative estimate of the annual economic contributions of Sanford Lake was calculated.

The current hydroelectric generation at Sanford Dam and at upstream dams has raised issues related to stream-flow regimes in the river. Ecological benefits related to restoring natural stream-flow regimes in downstream areas are issues being assessed under the federal hydroelectric operating license. Control of accelerated bank erosion of historically contaminated sediments due to hydroelectric operations below the Dow Chemical Company complex in Midland are being evaluated as part of the remedial action directed by the U.S. Environmental Protection Agency and were not evaluated in this economic analysis.

## SANFORD DAM

The property owners on Sanford Lake, nearby residents, and those who regularly use the lake for recreation have grown concerned over the last several years about the future of the impoundment created by the construction of a hydroelectric dam on the Tittabawassee River completed in 1924. The hydroelectric dam creating the lake has had many owners in the past 89 years and is the farthest downstream in a series of four hydroelectric dams located on the river. All four hydroelectric facilities are now owned and operated by the same company and have been regulated by federal government licenses since the 1970s. The Sanford Dam and three others (Wixom, Smallwood, and Secord) were built by local entrepreneur Frank Wixom in 1924–1925 for the purpose of power generation.<sup>1</sup> Wixom founded the company he named Wolverine Power. The Sanford Dam is 40 feet long, with a levee 1,200 feet long. The water depth at the dam is approximately 20 feet. Water flow rates range over the year from about 100,000 gallons/minute to more than 4 million gallons/minute, depending on the season and rainfall. Wolverine operated all the dams until they were sold to a Canadian company in 2004, which established the Synex–Wolverine Corporation. In 2006, Synex–Wolverine was sold to W.D. Boyce Trust, a Chicago-based family trust. The current owners created Boyce Hydro LLC.

---

<sup>1</sup> Historical information adapted from Sanford Lake Association Newsletter, P.O. Box 212, Sanford, Michigan, 48657-0212, August 1, 2009.

The Sanford Dam and the three others produce electricity that is sold to Consumers Energy under a long-term contract. The power produced is used locally, with Sanford Dam producing enough to supply 1,200 homes; the entire system is able to supply power to 5,000 homes.

## **FEDERAL ENERGY REGULATORY COMMISSION (FERC) AND BOYCE HYDRO LLC**

One of the primary responsibilities of the Federal Energy Regulatory Commission (FERC), which oversees the Sanford Dam's federal license, is to ensure the safety of licensed hydroelectric facilities to prevent catastrophic failure and downstream flood damage and loss of life by requiring routine maintenance, repairs, and reconstruction of critical elements of dam structures as part of periodic license reviews and reissuance. When dam structures are relatively new and built at, or close to, present-day engineering standards, the costs of maintenance and repair are minimal compared to revenues generated in the sale of electricity. However, as dam structures deteriorate with age, safety/environmental requirements increase and revenues from hydroelectric generation decrease. Consequently, in Michigan as well as in other states, many owners of dams that are 50 years old or more are forced to consider other options such as dam removal or, in some cases, abandonment.

In 2002, users of Sanford Lake were alerted to financial problems associated with maintaining the dam when the then owner, Wolverine Power, was reported to have financial problems so severe they could lead to bankruptcy. A subsequent stock/loan exchange with another company allowed Sanford and other upstream dams to continue to operate. All four hydroelectric dams were eventually sold to Boyce Hydro LLC. In 2011, Boyce Hydro LLC announced it had run out of funds to continue the repairs on Sanford Dam ordered by federal regulators. The dam owner subsequently failed to pay taxes on certain lands required to be under company control, as a condition of the dam's federal license. While short-term financial commitments by third parties have allowed Boyce Hydro LLC to continue to operate the four dams, the future viability of the company and the options available to raise the funds needed to address repairs required by federal regulators are uncertain. If Boyce Hydro LLC opts to surrender its license, and no entity steps forward to operate the facility under the federal license, federal regulators will require the owner to take any actions needed to ensure that the dam will not be in violation of state dam safety requirements upon surrender. The Michigan Department of Environmental Quality determines the state safety requirements for dams no longer regulated under federal hydroelectric licenses.

# Findings

---

While the economic benefits described in this analysis would be lost if the dam is removed, the impacts to individual property owners and the region after removal go beyond those described here. Should the lake no longer exist, the potential loss of personal assets due to a drop in property values, the increased number of property mortgage defaults, the number of failed businesses dependent on direct or indirect revenue generated from Sanford Lake, and changes in population in the local area are difficult to predict and measure, but are important considerations in determining the future of Sanford Dam.

This economic analysis does provide a process for identifying and measuring the outcomes of dam retention, and for helping to clarify tradeoffs. Based on the property values and tax base from extensive residential development, and recreational opportunities, along with secondary economic impacts, the project team concludes there are substantial economic benefits from Sanford Lake that justify a thorough examination of alternatives to ensure the dam's retention and long-term maintenance.

## PROPERTY TAX IMPACTS

Lakefront property commands higher values and provides greater tax revenue than inland property; allowing local governments to make expenditures that would not otherwise be possible. We estimated the contribution of tax revenues around the lake and compared it with average property tax revenues in Midland County as a whole. We broke out sources of revenue differences using Midland County assessor tax records, as outlined in the Appendix.

The median value of front lot properties on Sanford Lake was determined using actual township assessments. Since tax assessment values of back lots were not immediately available, a range of median values for back lots with deeded access on Sanford Lake was estimated based on the differences found in similar lakes between front and back lot property values, and the allocation of costs between front and back lot owners for weed control on Sanford Lake. This analysis uses the low estimate for the median value of back lots. Tables showing the range of values for back lots are in the Appendix.

According to the 2010 U.S. Census, the median housing unit value in Midland County was \$131,900. This contrasts with a median value of \$195,800 for lakefront homes on Sanford Lake based upon local property assessments—a difference of \$63,900. In addition, the low estimate of the median home value for Sanford Lake back lots was \$163,556, a difference of \$31,656 to the county median. Since taxable value is generally half of the home's market value, calculating the additional tax revenue requires dividing the difference by two and multiplying the result by the average millage rate for lakefront and back lot residential properties. These properties are subject to the median millage rate of 32.684 for 2012. With this millage rate, the annual median additional tax paid per lakefront property is \$1,044. The low estimate annual median tax impact per back lot is \$517. The approximately 1,550 front and back lot properties generate an estimated \$1,271,135 in annual property tax revenues attributable to increased property values of lakefront and back lot properties on the lake.

Using the IMPLAN model (see Appendix) we took the estimated tax revenue from the lakefront and back lots with deeded access and calculated the additional local government spending that resulted.. Exhibit 1 shows the estimated economic effects—direct and secondary—of the government spending. Note that the total government spending is not equal to the actual tax receipts, since some government purchases are not made in the local economy. Regardless, the \$1,271,135 in government spending in the local economy is sufficient to generate three direct Midland County jobs. Adding secondary transactions, the total county-wide impact is seven (7) additional jobs, with total sales of \$1,427,611.

**EXHIBIT 1. Impact of Government Expenditures from  
Higher Property Tax Revenues 2013**

<b>Impact type</b>	<b>Employment</b>	<b>Labor income</b>	<b>Value added</b>	<b>Sales</b>
Direct effect	3	\$220,053	\$244,843	\$888,360
Indirect effect	2	\$128,992	\$186,069	\$355,141
Induced effect	2	\$60,809	110,987	\$184,110
<b>Total effect</b>	<b>7</b>	<b>\$409,854</b>	<b>\$541,899</b>	<b>\$1,427,611</b>

SOURCE: PSC/CEA analysis using IMPLAN model.

**VISITOR EXPENDITURES**

Visitor expenditures make up a significant component of the economic impact of Sanford Lake. Recreation visitors contribute spending within and around their recreation destination. Trips often entail spending in local restaurants, shops, and fuel stations.

Visitor counts are necessary to estimate total visitor expenditures at Sanford Lake County Park. Visitor counts were generated from county staff using park entry receipts. Using receipt counts for 2011 and 2012, the total annual vehicle gate entries are estimated as 30,275. It is further estimated that the average party size, as measured by occupancy of entry vehicles, is 3.5 persons. Based on party size, it is estimated that Sanford Lake County Park receives 105,963 visits per year by vehicle. Another approximately 4,000 visitors enter the park on foot, county staff report.

Visitor expenditures are estimated using the National Visitor Survey<sup>2</sup>. Expenditures are broken out into distinct categories, as shown in Exhibit 2. All expenditures in Exhibit 2 represent average party expenditures per party-visit and are adjusted to 2013 prices using the Consumer Price Index.

**EXHIBIT 2. Day Trip Visitor Party Expenditures per Visit**

	<b>Non-Boater</b>	<b>Boater</b>
Grocery	\$11.81	\$12.92
Restaurant	21.14	7.01
Auto and RV	12.65	13.15
Boat	0.00	15.03
Fish and hunt	0.18	2.84
Entertainment	0.68	1.48
Miscellaneous	11.05	1.73
<b>Total spending (within 30 miles)</b>	<b>\$57.51</b>	<b>\$54.16</b>

SOURCE: 1998 National Visitor Survey (*adjusted for inflation*).

<sup>2</sup> In 2011, there were 32,404 vehicle entries and 28,146 in 2012.

<sup>3</sup> The National Visitor Survey is the United States' primary measure of domestic tourism activity and the major source of information on the characteristics and travel patterns of domestic tourists within the U.S..

As spending profiles of those visiting the park for boating and those visiting the park for other recreational activities differ, an estimate of the share of visitor parties with boats is needed to complete the expenditure estimates. Sanford Lake Park does not collect boat launch fees during the boating season, so receipts cannot be used to delineate the share of non-resident visitors that are boaters. However, the local park staff estimates that about 15 percent to 20 percent of visitors have boats. It is likely that visitors with boats tend to be local residents. Hence, the lower figure of 15 percent is used to estimate the share of out-of-county visitors boating on Sanford Lake. We estimate 2,316 boating parties and 13,124 non-boating parties from outside Midland County visit Sanford Lake Park per year.

Using the expenditure breakouts from Exhibit 2, we can estimate total expenditures of these visitors by expenditure category. Exhibit 3 shows the estimated total expenditures of non-boater and boater visitors to Sanford Lake Park by multiplying the per-party expenditures in each category by the number of outside visitor parties. Visitors spent nearly \$900,000 in 2012.

### EXHIBIT 3. Total Sanford Lake County Park Visitor Expenditures, 2012

	Non-boater	Boater	Total recreation
Visitor parties	13,124	2,316	
<b>Expenditures</b>			
Grocery	\$155,048	\$29,928	\$184,976
Restaurant	277,491	16,226	293,717
Auto and RV	166,072	30,466	196,538
Boat	0	34,812	34,812
Fish and hunt	2,346	6,582	8,928
Entertainment	8,913	3,436	12,349
Miscellaneous	144,961	4,015	148,976
<b>Total spending (within 30 miles)</b>	<b>\$754,831</b>	<b>\$125,465</b>	<b>\$880,296</b>

SOURCE: PSC/CEA analysis.

Exhibit 4 shows the resulting direct and secondary impacts of visitor expenditures. Only \$501,639 of the \$880,296 in direct expenditures give rise to a direct infusion into the local economy, once netting out the cost of the goods to the retailer. This direct expenditure is sufficient to give rise to an estimated 10 direct jobs in Midland County. These direct expenditures and earnings lead to secondary transactions that, when combined with direct impacts, support 12 Midland County jobs, and generate \$702,949 in sales and \$21,271 in sales tax revenues.

### EXHIBIT 4. Economy-wide Impacts of Sanford Lake County Park Visitors, 2012

	Employment	Labor income	Value added	Sales	Sales tax
Direct effect	10	\$197,641	\$306,368	\$501,639	
Indirect effect	1	\$27,930	\$48,402	\$82,059	
Induced effect	1	\$39,378	\$71,910	\$119,251	
<b>Total effect</b>	<b>12</b>	<b>\$264,949</b>	<b>\$426,680</b>	<b>\$702,949</b>	<b>\$21,271</b>

SOURCE: PSC/CEA analysis.

## MARINA IMPACTS

There are three marinas on or around Sanford Lake. These marinas generate revenues through retail sales, rental income, and boat repair and maintenance services. Operators of the three marinas discussed their operations with us. In these conversations, marina operators were asked what services they provide and the scope of their sales. They also were asked to provide employee counts, both during the boating season and during the off-season. These estimates were used to drive a macroeconomic impact simulation model for estimating total economic effects of marina operations that includes direct activities of the marinas, as well as secondary economy-wide activities that take place because of the marina.

Two marinas provide repair services on boats. They reported 1,000 repair services over the course of a year. Two of the three also winterize a total of 800 boats each year. Two of the three marinas employ a total of 13 people in the off-season and 17 during the peak season. Hence, the boating season adds four seasonal or part-time jobs. Employment was used as an indicator of direct economic activities giving rise to sales and the purchases of services necessary for operating the marinas. We estimate that year-round direct employment is 15 people, which is the total value of the off-season employment plus half of the seasonal employment. Marinas were not asked to provide actual revenue figures. However, IMPLAN provides sales estimates based on the number of workers. The resulting direct, indirect, and induced effects, along with total sales tax impacts are presented in Exhibit 5.

**EXHIBIT 5. Economic Impacts of Sanford Lake Marina Activities**

	Employment	Labor income	Value added	Sales	Sales tax
Direct effect	15	\$390,753	\$945,910	\$1,523,919	
Indirect effect	2	\$103,553	\$149,626	\$259,094	
Induced effect	2.4	\$86,293	\$157,586	\$261,330	
<b>Total effect*</b>	<b>19.4</b>	<b>\$580,599</b>	<b>\$1,253,122</b>	<b>\$2,044,343</b>	<b>\$76,825</b>

SOURCE: PSC/CEA analysis.

## SEASONAL HOME VISITOR EXPENDITURE IMPACTS

Seasonal homeowners around Sanford Lake largely work outside the community, although they generate direct economic expenditures within the community via such purchases as groceries, fuel and meals out. These expenditures have a direct effect on the local economy. Estimating these effects first requires an estimate of the number of seasonal lakefront households around Sanford Lake (172, see Appendix) and the occupancy of those seasonal lakefront homes (see Exhibit 10 in the Appendix). As described in the Appendix, we estimate that seasonal homeowners generate a total of 7,138 visitor days. Expected daily expenditures are estimated from a prior survey of seasonal homeowners, described in the Appendix. Exhibit 6 shows estimated daily expenditure estimates arising from seasonal homes.

**EXHIBIT 6. Spending on Trips to Seasonal Lakefront Homes#**

Expenditure	Per day expenditures	
	Per party	Total spending*
Grocery	\$25.39	\$181,266.65
Restaurants	12.71	90,688.29
Gas, oil	11.89	84,862.25

Expenditure	Per day expenditures	
	Per party	Total spending*
Auto repair	\$1.00	\$7,145.14
Boat repair	4.79	34,186.74
Recreation fees	1.76	12,531.47
Hotel, camping	0.37	2,638.20
Local services	0.77	5,496.26
Other goods	15.26	108,935.87
<b>Total</b>	<b>\$73.94</b>	<b>\$527,750.89</b>

SOURCE: Stynes, Zheng, and Stewart 1995. (adjusted for inflation)

# Dollars per day in local area

\* Calculated as the per-party, per-day expenditure multiplied by total number of days ( 7,138). (See Appendix.)

NOTE: Data may not sum due to rounding.

Exhibit 7 shows the estimated direct, indirect, and induced impacts of total community expenditures. Seasonal homeowners and their visitors spend an estimated \$527,751 in goods and services around Sanford. About half (\$249,692) of these expenditures give rise to direct economic activity in Midland County and directly support five local jobs. Once accounting for secondary impacts, Midland County's economy experiences a gain in total sales of \$350,404 that equates to six jobs, with labor income of \$144,527.

### EXHIBIT 7. Economic Impacts of Sanford Lakefront Seasonal Homeowners' Expenditures

Impact type	Employment	Labor income	Value added	Output	Total sales tax
Direct effect	5	\$110,765	\$165,575	\$249,692	
Indirect effect	0	12,263	21,200	35,594	
Induced effect	1	21,500	39,274	65,119	
<b>Total effect*</b>	<b>6</b>	<b>\$144,527</b>	<b>\$226,049</b>	<b>\$350,404</b>	<b>\$12,355</b>

SOURCE: PSC/CEA analysis.

\*Figures may not sum due to rounding.

If the contribution of seasonal owners of deeded back lots on Sanford Lake were added, the values in Exhibit 7 would increase in the range of 42 percent to 82 percent. The number of seasonal owners of back lots was not calculated from tax records, but was estimated to be 10 percent to 20 percent of all back lots. (See Appendix.)

## DIRECT IMPACT ON SCHOOLS

In Michigan the operating funds for K–12 schools are provided by the state, with minor exceptions. The annual state contribution is based on the student count in each district and a per pupil allocation is made to each district from state funds from a variety of revenue sources. Certain expenditures, primarily capital improvements, are paid for through local taxes on property. There are two school districts encompassing the front and back lot properties surrounding Sanford Lake, Coleman Community Schools and Meridian Public Schools. Coleman Community Schools has 1.9151 mills for debt retirement and Meridian Public

Schools has 5.3 mills for debt retirement, according to the State Aid Financial Report for the Tax Year 2012. The effect of property tax changes relative to the Intermediate School District funding was not considered in this analysis.

The estimated 1,558 properties with either lakefront or deeded lake access to Sanford Lake represent 21 percent of the 7,534 housing units in the districts. The median taxable property value (State Equalized Value) for front lots was calculated at \$97,500 (50% of median market value). The low estimate for the median value of taxable property for back lots was estimated at \$81,778. The total tax revenue from front and back lots to debt reduction in 2012 for the two school districts was estimated to be \$509,199. The added value of front and back lots due to the proximity of Sanford Lake was estimated to provide an additional \$156,809 a year in taxes for debt reduction. In the absence of Sanford Lake, the taxable value of these properties in both school districts would drop to at least the median county value, thereby triggering an increase in property tax assessments in both districts to make up for the loss of the \$156,809 in current revenue.

# Summary

## THE ECONOMIC IMPACT OF SANFORD LAKE

Combining the impact of government expenditures from increased residential property tax revenues, visitor expenditures, and marina operations forms the picture of Sanford Lake’s overall impact on Midland County’s economy<sup>3</sup>. Exhibit 8 shows the combined direct and total impacts of Sanford Lake to Midland County’s economy using the low estimate for back lot values. We estimate that direct expenditures in the county attributed to the lake amount to just over \$3 million per year, giving rise to nearly \$4.5 million in total sales transactions. More than 30 jobs are directly attributed to the lake, while another 11 jobs are supported indirectly by direct expenditures. In total, about \$1.4 million in household income can be attributed to the lake, giving rise to some \$153,912 in sales tax revenues.

**EXHIBIT 8. Combined Economic Impact of Sanford Lake to Midland County#**

Impact type	Employment	Labor income	Value added	Output	Sales tax
Direct effect	32	\$910,286	\$1,642,089	3,128,800	
Indirect effect	5	\$270,372	\$401,880	\$725,969	
Induced effect	6	\$206,008	\$376,158	\$623,841	
<b>Total effect</b>	<b>43</b>	<b>\$1,386,667</b>	<b>\$2,420,127</b>	<b>\$4,478,610</b>	<b>\$153,912</b>

SOURCE: PSC/CEA analysis.

\*Figures may not sum due to rounding.

#Using the low median property estimate for lake back lots.

## THE FUTURE OF SANFORD DAM

There are many stakeholders to consider when making a decision regarding dam removal or reinvestment, and each entity may find different economic and social values in keeping or removing the dam. The costs and benefits of retaining a dam are not just economic, and are not always borne equally among the parties, often making it difficult to determine who should be the responsible party to take the lead. Generally, decisions and leadership fall on the dam owner, but often watershed groups, fisheries professionals, or recreational interests come forward to advocate for action. If, however, the dam fails, is abandoned, or becomes tax-reverted property, the costs of removal or repair fall to the government and are borne by the taxpayers of the municipality and/or state. State and federal agencies have different and sometimes conflicting interests in dam retention—public safety, wetland protection, wildlife habitat, fish passage, water quality, sediment management, and recreation are all concerns. Understanding the full range of economic impacts of a dam is necessary to address the numerous issues that emerge when long-term preservation of a structure is the primary goal.

Nevertheless, dams may require considerable maintenance and significant reinvestment as they age.

<sup>3</sup> However, there is a potential of double counting when combining marina operations with visitor expenditures, as the marinas operate in the area because of these expenditures. Hence, when combining impacts, visitor expenditures at marinas should be removed from the overall estimate. That is, the \$34,812 in boater party expenditures in the boat category is removed.

## References

---

- Blakely, Edward J., and Ted K. Bradshaw. 2002. *Planning Local Economic Development: Theory and Practice*. 3rd ed. Thousand Oaks, Cal.: Sage Publications.
- Cabrera, V.E., R. Hagevoort, D. Solis, R. Kirksey, and J.A. Diemer. 2008. Economic Impact of Milk Production in the State of New Mexico. *Journal of Dairy Science* 91: 2144–2150.
- Coughlin, Cletus C., and Thomas B. Mandelbaum. 1991. A Consumer's Guide to Regional Economic Multipliers. *Review* 73 (1): 19–32.
- Isard, Walter, Iwan J. Azis, Matthew P. Drennan, Ronald E. Miller, Sidney Saltzman, and Erik Thorbecke. 1998. *Methods of Interregional and Regional Analysis*. Brookfield, Vt.: Ashgate.
- Leontief, W.W. 1960. *The Structure of the American Economy, 1919–1939*. New York, N.Y.: Oxford University Press.
- Matthiessen, Lisa Fay, and Peter Morris. 2004. *Costing Green: A Comprehensive Cost Database and Budgeting Methodology*. Washington, D.C.: Davis Langdon.
- Miller, Ronald E., and P.D. Blair. 1985. *Input-Output Analysis: Foundations and Extensions*. New York, N.Y.: Oxford University Press.
- Stynes, Daniel J., JiaJia Zheng, and Susan I. Stewart. 1995. Seasonal Homes in Michigan. Department of Park, Recreation & Tourism Resources, Michigan State University, East Lansing, Mich. Accessed 11/21/13: <https://www.msu.edu/user/stynes/seashm/fshfw2.htm>

## Appendix: *Methodology*

---

### **DATA ANALYSIS AND MODELING**

Standard economic impact modeling techniques were used to estimate direct, indirect, and induced impacts that, in sum, represent estimates of the macroeconomic value of Sanford Dam operating at designed capacity within the current economy. Tax records from the Midland County Assessor's Office were used, along with existing literature on property valuation of riparian land, to develop a tax incidence model, with and without lake impoundment of the Sanford Dam. Local tax revenue impacts were similarly modeled within a standard economic impact framework to estimate direct and secondary macroeconomic impacts of resulting tax revenues. Secondary data from the county and state were the principal data sources for specifying direct effects.

Further detailed surveys of other businesses, lake users and property owners on and with deeded access also could enhance the understanding of the economic value of the Sanford Lake to the region and may be appropriate in the future. The Sanford Dam, and other dams upstream (Wixom, Smallwood, and Secord), also have some flood prevention benefits to downstream flood-prone areas of the Tittabawassee and Saginaw rivers during the early spring prior to refilling of the impoundments following winter drawdowns. However, the design of the dams and the related impoundment areas of the series of hydroelectric dams at Sanford and upstream have limited flood prevention attributes and the hydrologic studies needed to assess this potential flood prevention benefit to downstream properties is beyond the scope of this analysis.

### **PROPERTY TAX IMPACTS**

Residential property tax rates are largely a product of the region's residential property millage rates and the share of housing units that fall under primary (homestead) versus secondary (seasonal) ownership. A secondary residence can be a vacation home, rental property or any other residential property not serving as the owner's primary residence, as defined by state law. Residential millage rates in Midland County as a whole vary between 22.9 mills and 41.3 mills for primary residential homes and 33.3–59.3 mills for secondary residences. In the two townships bordering Sanford Lake, the average millage is 29.4874 for homesteads and 47.4874 for non-homesteads. Using Midland County assessor records, the median millage rate on lakefront and back lot residential property is 32.684. This rate was used to value the residential property tax impacts on local government revenues.

The median value for front lot properties was determined using locally assessed values. Since the actual median values of back lots with deeded access were not immediately available, a range was estimated using comparable information from a lake of similar size where the value of lakefront and deeded back lots were known, and by using the difference in assessments between front and back lots for weed control on Sanford Lake, as shown in Exhibit 9. The estimated low median value for back lots was used for the property tax impacts in the body of the report. The following tables show the calculated values for both the high and low estimates of back lots with deeded access.

## EXHIBIT 9. Property Tax Effects of Added Property Values

### Direct Effect Calculations

	Lakefront lots	High back lots	Low back lots
Number of properties	869	703	703
<b>Per-Property Average</b>			
Value differential	\$63,900	\$34,530	\$31,656
Taxable value diff.	\$31,950	\$17,265	\$15,828
Average millage rate	32.684	32.684	32.684
Property tax contribution	\$1,044	\$564	\$517
Aggregate tax collection	\$907,457	\$396,695	\$363,678

### Tax Expenditure Impacts Based on Lakefront and Lake Back Lots

Impact type	Employment	Labor income	Value added	Sales
<b>High Estimates</b>				
Direct effect	3	\$225,769	\$251,202	\$911,435
Indirect effect	2	\$132,343	\$190,902	\$364,366
Induced effect	2	\$62,388	\$113,870	\$188,892
<b>Total effect (high estimates)</b>	<b>7</b>	<b>\$420,500</b>	<b>\$555,974</b>	<b>\$1,464,693</b>
<b>Low Estimates</b>				
Direct effect	3	\$220,053	\$244,843	\$888,360
Indirect effect	2	\$128,992	\$186,069	\$355,141
Induced effect	2	\$60,809	\$110,987	\$184,110
<b>Total effect (low estimates)</b>	<b>7</b>	<b>\$409,854</b>	<b>\$541,899</b>	<b>\$1,427,611</b>

SOURCE: PSC/CEA analysis using IMPLAN model.

## VISITOR EXPENDITURES

When estimating tourism impacts it is important to delineate purchases made by local residents from those made by out-of-town visitors. Economists generally perceive recreation expenditures of local residents at tourism destinations to substitute for other expenditures that would have taken place in the absence of the tourism destination. That is, instead of generating expenditures while visiting the lake, they would likely spend the same amount on other recreational activities in the region. Alternatively, expenditures of out-of-town visitors visiting a tourism destination would likely not have occurred in the region without the recreation opportunity. Hence, out-of-town expenditures are relevant as a basis for an economic impact of the tourism.

Visitor expenditures were estimated using the National Visitor Survey. This survey provides estimates of visitor expenditures by party and by party-visitor for day trips. Day trips are trips that do not lead to overnight lodging. While it is believed that some out-of-region visitors to Sanford Lake do generate overnight stays, many visitors stay at private homes and do not generate lodging expenditures. While

overnight visits may generate lodging expenditures, we were not able to estimate the number of park visitors that made overnight stays and the number that generated lodging expenditures.

With per-party expenditure estimates, visitor counts are necessary to estimate total visitor expenditures at Midland County's Sanford Lake Park. Visitor counts were generated from park entry receipts. While visitors can visit Sanford Lake Park with no fee, the park charges motorists for entry. Thus, vehicle entry receipts are used to estimate total visitors, and because entry fees differ for resident visitors and out-of-town visitors, entry receipts can be used to determine visitors' area of residence.

This approach has some shortcomings, though. First, car entry counts do not reflect how many individual visitors came by car, but does provide estimates of the number of parties that arrived by car. Hence, an estimate of party size is necessary to estimate the total number of visitors. Second, receipts are generated by those paying an entry fee. Visitors with season passes can enter without generating a receipt. However, we have assumed that most season pass holders are local residents. Third, while receipts identify those visiting from out of town, it is reasonable to assume that, since out-of-town visitor fees are higher than for those for local residents, out of town friends and family members visiting residents will enter using a local entry pass rather than a visitor pass. It is believed that using park entry receipts to count visitors will undercount both the total number of visitors and the number of visitors from out of town. Therefore, the economic impact estimates of park visitors in this report underrepresent the true economic value of tourism associated with Sanford Lake Park.

As only expenditures of visitors from outside the county contribute a direct economic infusion into the region, visitor counts are scaled to reflect only out-of-county visits. First, we assume only local visitors walk into the park without parking on site. Based on parking receipts for 2012, 51 percent of park visitors originated from outside the county. As of mid-2013, 55 percent of vehicle entrants originated from outside the county. Because the off-season likely generates fewer out-of-town visitors, the 2013 estimate is likely to decrease before year's end. Hence, the 2012 estimate of 51 percent is the most complete estimate of the share of visitors arriving from outside Midland County, suggesting that Sanford Lake Park generates approximately 15,440 out-of-region visitor parties per year.

Using the expenditure breakouts in Exhibit 2 (see page 4), we estimated total expenditures of these visitors by expenditure category. Exhibit 3 (see page 5) shows the estimated total expenditures of non-boater and boater visitors to Sanford Lake Park by multiplying the per-party expenditures in each category by the number of outside visitor parties. Accordingly, visitors spent an estimated \$880,296 in 2012. Each expenditure category in Exhibit 2 represents a separate component in the IMPLAN model, which provided economy-wide impact estimates. However, not all expenditures give rise to direct economic benefits in the region. Expenditures are largely adjusted to reflect the share of the value of expenditures that accrue locally. For example, grocery expenditures represent the purchase of merchandise made up of two values. Part of the value is how much the grocer had to pay to acquire the merchandise sold. This is largely value attributed to national wholesaler food providers and does not represent an impact to the local economy. The second value is the margin the grocers earn on the goods they sell. This includes wages, rent, electricity, other expenditures and profit earned by the grocers. This component leads to a direct infusion into the local economy that gives rise to secondary transactions. Hence, on the purchase of goods such as gasoline, groceries, and other merchandise, only the margins are recorded. On the purchases of services, such as restaurants and entertainment, the full value of the purchase is considered a direct infusion into the local economy.

## **SEASONAL HOME VISITOR EXPENDITURE IMPACTS**

Estimates of the number of homes surrounding Sanford Lake that are secondary, or seasonal, homes are derived from Midland County assessor records, where seasonal homes are subject to a higher property tax millage rate (18 mils) than primary residence (homestead) properties. The 2012 residential millage rates

in the two townships within which Sanford Lake is located vary between 23.9809 mills and 47.4874 mills for residential property, depending on the township and school district in which the property is located and whether or not the property is within the Village of Sanford. In addition, Midland County assessed an additional 3.94 mills for county-wide services. Using information on taxes paid on lakefront properties and assessed values, it was assumed that those residential properties with millage rates in excess of 33 mills were non-homestead residential properties. Of the 833 lakefront properties with complete information on taxes paid in 2012, 163 properties, or 20 percent, were identified as seasonal.

In 1995, MSU conducted a study of seasonal homeowners in Michigan for the purpose of measuring the economic contribution of seasonal homeowners to their respective communities. This survey not only indicated the typical occupancies of seasonal homes, but also the size of visiting parties, visitor party expenditures, and other characteristics. Exhibit 9 summarizes the summertime seasonal home use patterns, indicating that, on average, seasonal homes are occupied 41.5 days a year.

The MSU study estimates of seasonal home visitor expenditures, adjusted for inflation, are provided in Exhibit 6 (see page 7). The first column of Exhibit 6 is derived from a 1995 survey of seasonal homeowners' local expenditure and breaks out party expenditures by day of stay into broad expenditure categories after adjusting for inflation. To get a total annual expenditure profile of lake front seasonal home visits, these expenditures must be multiplied by the number of visitor party days. This is estimated as the typical number of days of seasonal home occupation (41.5) multiplied by the number of seasonal homes (172), or as 7,138 total visitor party days. Column 2 of Exhibit 7 shows the total value of direct expenditures of seasonal homeowners in the surrounding community. Seasonal homeowners of lakefront properties on Sanford Lake spend \$525,192 on services and merchandise in the local community.

Total community expenditures by spending category are included in the Midland County IMPLAN impact simulation model to estimate the economy-wide contribution of seasonal front lot homeowner expenditures. As discussed above, retail expenditures are modified to capture only local shares of total expenditures, and each expenditure category is modeled separately to capture the true contribution of each expenditure class to the larger economy.

Seasonal residents also occupy back lots and the number of seasonal back lot owners were estimated to be between 10 percent and 20 percent of the total back lots with deeded access, or 63 to 139 homes. Back lot seasonal homeowners would have the same use patterns and expenditures patterns described for seasonal front lot owners. The contributions of Sanford Lake back lot seasonal homeowners would add an additional 42 percent to 82 percent to the contributions of Sanford Lake seasonal lakefront property owners.

### **EXHIBIT 10. Seasonal Home Use Patterns, Summer**

	<b>June</b>	<b>July</b>	<b>August</b>	<b>Summer total</b>
<b>Days Occupied</b>				
Mean	11.4	19.4	15.6	46.4
Median	9.0	19.0	13.5	41.5
Standard Deviation	7.8	8.5	8.2	
1–7 days	30%	8%	16%	
8–14 days	42%	24%	40%	
15–21 days	17%	30%	17%	
More than 21 days	11%	39%	28%	

	June	July	August	Summer total
<b>Occupancy rate</b>				
Weekends	55%	73%	64%	64%
Weekdays	27%	53%	40%	40%
<b>Total</b>	<b>38%</b>	<b>63%</b>	<b>50%</b>	<b>50%</b>
<b>Number of Trips</b>				
Owner's family	2.6	3.0	2.9	8.5
Other families	1.5	2.9	1.6	6.0
<b>Total</b>	<b>4.1</b>	<b>5.9</b>	<b>4.5</b>	<b>14.5</b>
<b>Owner's family</b>				
1–2 trips	53%	39%	58%	50%
3–4 trips	39%	42%	32%	38%
More than 4 trips	8%	19%	10%	12%
<b>Other family</b>				
0 trip	38%	19%	34%	31%
1–2 trips	38%	32%	44%	38%
3–4 trips	13%	30%	17%	12%
More than 4 trips	11%	19%	5%	12%
<b>Recent trip</b>				
Nights of stay*	4.0	5.1	5.2	4.8
1–3 nights	53%	42%	39%	44%
4–7 nights	22%	25%	18%	22%
8–14 nights	11%	12%	25%	16%
15–25 nights	6%	6%	5%	5%
More than 25	8%	15%	13%	12%
<b>Primary party size</b>				
Adults	2.5	2.6	2.7	2.6
Children	0.6	0.7	0.9	0.7
<b>Total</b>	<b>3.1</b>	<b>3.3</b>	<b>3.6</b>	<b>3.3</b>
1–2 persons	51%	58%	48%	53%
3–5 persons	36%	32%	37%	34%
More than 5	13%	11%	15%	13%
<b>Other visitors</b>				
Adults	1.4	2.3	2.1	1.9
Children	0.8	0.9	1.0	0.9
<b>Total</b>	<b>2.2</b>	<b>3.2</b>	<b>3.1</b>	<b>2.8</b>
0 visitors	67%	47%	55%	56%
1–2 visitors	5%	16%	13%	11%
3–5 visitors	17%	19%	15%	17%
More than 5	12%	18%	17%	15%

SOURCE: Stynes, Zheng, and Stewart, 1995.

## DIRECT IMPACT ON LOCAL SCHOOLS

### EXHIBIT 11. School Tax Calculations

#### School District Millage Rates:

School District	Homestead HH	Non-homestead basic	Dual	Sinking fund	Debt retirement	Other debt
Coleman Community Schools	0.0	18.0	0.0	0.0	1.9151	0.0
Meridian Public Schools	0.0	18.0	0.0	0.0	5.3	0.0

SOURCE: State Aid Financial Report, LEA Millage Report for Fiscal Year 2013 (Tax Year: 2012). June 17, 2013.

#### School District Housing Data:

School district	Total housing units#	Total occupied housing units/total households	Total owner occupied units	Total units with a mortgage	Percent of owner occupied units with a mortgage
Coleman Community Schools	2,651	2,386	1,959	1,121	57%
Meridian Public Schools	4,883	4,235	3,682	2,237	61%
<b>Total for both districts</b>	<b>7,534</b>	<b>6,621</b>	<b>5,641</b>	<b>3,358</b>	<b>60%</b>

SOURCE: #U.S. census data

- Using a total estimate of 1,558 housing units on or with direct access to Sanford Lake, this represents a total of 21 percent of the properties within the two school districts.

#### Estimated School Capital Contribution Change:

School district	Total housing units in school district	Median residential taxable value (SEV)		Debt retirement mills	Dollar value of mills, per median SEV (SEV*mills* # properties)	
		Lakefront	Back lot low estimate		Lakefront\	Back lot
Coleman Community Schools	2,651	\$97,500	\$81,778	1.9151	\$88,888	\$60,750
Meridian Public Schools	4,883	\$97,500	\$81,778	5.3	\$245,996	\$113,565
<b>Total for both districts</b>	<b>7,534</b>	<b>\$97,500</b>	<b>\$81,778</b>	<b>NA</b>	<b>\$334,884</b>	<b>\$174,315</b>

- The millage dollars from both school districts' by lake front and back lot properties toward debt reduction was approximately \$ 509,199 in 2010.

SOURCE: PSC/CEA analysis.

## THE IMPLAN ECONOMIC IMPACT MODEL

The Minnesota IMPLAN Group Inc. model for economic impact evaluation, IMPLAN Pro. 3 (Minnesota IMPLAN Group Inc. 2004), is a general application economic impact evaluation model based on a common economic construct known as a social accounting matrix (SAM). The SAM is a comprehensive accounting system that identifies all the monetary transactions between the sectors in an economy. The SAM comprises a square matrix (number of columns equals number of rows) that represents individual sectors as both buyers and sellers. Each row represents the revenue earned by the corresponding sector while each column represents its expenditures (Isard et al. 1998, p. 283). This construct builds a closed system that represents transactions within and amongst all sectors: inter-industry transactions; transactions between industries and government; transaction between industries and households; transaction between households and government; and the purchases and sales between the state economic sectors and the rest of the world.

IMPLAN provides industry detail for 440 different industry categories, including agricultural, goods-producing, and service-providing industries. Institutions are broken out into households by income group, federal, state and local government sectors, and by import and export markets. The SAM also provides household and government purchases of goods and services. Additional transactions are recorded within the SAM including transactions across households, government transfers to households and household transactions to government in the form of taxes and fees. Because the social accounting system examines all the aspects of a local economy, it provides a comprehensive snapshot of the economy and its spending patterns.

The Input-Output (I-O) framework was first described by Francois Quesnay in 1758 and developed by Wassily Leontief (1960). The structure supports demand-driven responses, where changes in output demand in one industry materializes in changes in the demand for production of other industries. For example, an increase in local demand for printing services will spur demand for feed paper, ink, printer repair services, and other goods and services required by printing companies. The beneficiaries of these direct transactions will increase the demand for inputs used in their respective production processes. Households that enjoy enhanced employment opportunities earn and spend more on goods, services, and taxes. Such household impacts generate additional direct and secondary transactions across the economy. The extent to which initial stimulus generates such secondary transactions is hindered by the degree of purchases made outside the modeled region. Industries that purchase inputs from local suppliers generate greater secondary transactions than industries that tend to purchase inputs produced outside the state, holding all else constant.

I-O models have become staple economic impact models for regional analysis (Blakely and Bradshaw 2002). I-O models provide a systematic and intuitive approach to estimating economy-wide impacts of a change in the local economy. This approach uses linear relationships to reflect production processes that equate industry inputs and outputs. The linear transactions that define a SAM are generalized in a set of multipliers that capture the full extent of transactions associated with any changes in the level of production in an industry (Cabrera et al. 2008). To exemplify, within the I-O analysis, the total impact is specified in value of transactions as,

$$\text{Total Effect} = \text{Direct Effect} + \text{Indirect Effect} + \text{Induced Effect} \quad (1)$$

The I-O model takes changes in demand called direct effect and relates them to overall economic impact, called total effect, through a set of mathematical equations described above. In this analysis, the direct effect is the value of transactions generated from horse ownership and equine-related activities. The indirect effect is the value of secondary inter-industry transactions in response to direct effects. The

induced effect is the value of transactions resulting from changes in income in response to direct effects. Because the relationships are linear, the direct, indirect and induced effects can be specified as multiples of the direct effect and equation (1) can be restated as,

$$Total\ Effect = (1 + k_1 + k_2) \cdot Direct\ Effect, \quad (1.1)$$

where  $k_1$  and  $k_2$  are greater than or equal to zero. More simply, Equation (1.1) can be restated as,

$$Total\ Effect = k \cdot Direct\ Effect \quad (2)$$

where  $k = (1 + k_1 + k_2)$ . Equation (2) says the economy-wide impact (total effect) is some multiple of the direct effect, where the multiplier takes a positive value equal or greater than one. The minimum value the multiplier can take, one, reflects the intuitive result that if the economy's output of agricultural products – for example – expands by \$1 million, the economy will expand at least by \$1 million. However, if the indirect and induced effects are not equal to zero, this \$1 million increase in output will spur other industries to expand output of goods and services; and it will generate household income that is applied to the purchase of goods and services in the economy, thereby generating a total economic impact greater than the initial \$1 million expansion.

Generally, the economic multiplier is specified as a ratio of the total to direct effects. Rearranging equation (2) provides,

$$k = \frac{Total\ Effect}{Direct\ Effect} \quad (3)$$

where the multiplier  $k$  encompasses all the direct, indirect and induced effects for a given industry and denotes the impact of a change in direct effects on the total economic system. Each industry in a region is characterized by its own multiplier  $k$ . Industries with expansive localized production chains will tend to have higher multipliers than industries that rely on suppliers outside of the modeling region. When there is adequate supply within the state, the state has more potential to retain the total effects of the industry. However, when producers have to depend on supplies outside the state, leakage occurs and part of the total effect is lost.

The I-O impact evaluation model requires several restrictive assumptions. First, the model imposes constant returns to scale, such that a doubling of output requires a doubling of all inputs. Second, technology is fixed with no substitution. These two assumptions impose that an increase in industry output requires an equal and proportionate increase in all inputs. Additionally, supply is assumed perfectly elastic such that there are no supply constraints. This final assumption also asserts that all prices are fixed, such that an increase in demand for any commodity will not result in a price changes for that industry. I-O models have been criticized on the grounds that some of these assumptions are overly restrictive and the magnitude of the bias generated by these assumptions is greater the larger the industry direct effects are, relative to the overall size of the industry (Coughlin and Mandelbaum 1991). Despite this criticism, I-O models have become one standard by which economic impact assessments are generated.