

SECTION A. SUMMARY

Title of Project: Integrated assessment of the economic value of Lake Michigan recreational fishing in Illinois: a mixed methods approach

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Abstract:

Quantifying the economic value of recreational fishing in Lake Michigan helps to justify research, inform management, and predict the impact of fishery changes. This study aimed to estimate the total economic impact of recreational fishing in the Illinois waters of Lake Michigan, compare expenditure estimates from the creel survey with those from a mail and internet survey, and assess the economic impact of several fisheries within the Illinois and Indiana Lake Michigan fishery. Anglers contacted during Lake Michigan creel surveys were sent a mail or internet follow-up questionnaire and asked to provide their typical fishing trip

expenditures. Expenditure data was entered into IMPLAN to model the economic impact. Direct expenditures were estimated at \$26,128,296, with average trip expenditures at approximately \$54 for pedestrian anglers and \$226 for boating anglers. The total economic output of the Illinois Lake Michigan fishery on Cook and Lake Counties was estimated at \$22,452,805 for the 2015 fishing season, providing 231 jobs, and \$1,713,301 in state and local taxes. The charter fishing component of the Illinois Lake Michigan fishery was estimate to contribute an additional \$22,452,805 in economic output. For the combined Illinois-Indiana fishery, an economic output of \$44,431,774 was generated, with the majority coming from salmonid angling (75%), and the remainder from yellow perch (6%) and minor species - most commonly bass - angling (18%). These results reveal the importance of the Illinois Lake Michigan fishery in quantifiable economic terms, reflecting economic benefits that extend beyond sectors directly related to fishing.

Keywords: economic value, expenditures, recreational fishing, surveys, human dimensions

Lay Summary:

While fishing is personally important to many people, it can be hard to describe that importance without a numerical value. We know Lake Michigan fishing is important to the Illinois economy, so we wanted to come up with a numerical estimate of that importance. First, we talked to people while they were fishing on Lake Michigan and asked if they would take our survey. If they agreed, we sent them the survey over mail or email. On the survey, they filled out how much they usually spend on a variety of items when they go fishing.

We determined that in 2015, people spent \$26,128,296 on Lake Michigan fishing trips in Illinois. People who fished from a boat spent an average of \$226 per trip, and people who fished from the shore spent an average of \$54 per trip. Using an economic analysis software, we

determined that fishing trip spending generated 231 jobs and \$1,713,301 in state and local taxes in Cook County and Lake County. We combined the data from people fishing in Illinois with data from people fishing in Indiana and estimated that the total contribution to the local economy in both states was \$44,431,774. The economic value of Lake Michigan fishing shows the importance of this activity to people directly involved with fishing and to people in the local community who don't necessarily go fishing. These results can be used as support for research about Lake Michigan fishing and to predict the broad effect that any fishing changes may cause.

SECTION B. ACCOMPLISHMENTS

Introduction

Recreational fishing is an important consideration in fisheries management in the Great Lakes region (GLFC 2007), having been shown to have a large economic impact (e.g., \$4 billion in economic activity; Talhelm 1988) to the surrounding states, and to draw anglers from long distances (e.g., Palla 2011). Understanding the economic value of these fisheries can assist with making informed decisions (e.g., changes to regulations or license fees), justifying funding for research and management, and understanding impacts of ecosystem change, all vital to current fisheries management activities in the Great Lakes. Furthermore, economic information may help identify possibilities for development of new or overlooked opportunities for recreational fishing and related businesses.

The recreational fishery in Illinois waters of Lake Michigan is a unique and important component of Illinois fisheries. Representing over half of the total surface water in Illinois, Lake Michigan receives a substantial amount of fishing effort (Roswell and Czesny 2014), and therefore contributes a potentially large amount of tourism dollars to the economy. Complicating management, much of the Illinois shoreline is heavily urbanized, and thus, angler opportunities, demographics, and behaviors are likely much different than much of the rest of the state of Illinois, as well as most of the Great Lakes region.

Since 1986, the Illinois Natural History Survey (INHS) has conducted a contact creel survey for anglers accessing Lake Michigan's Illinois waters, generating a large, consistently-collected, long-term dataset on angler harvest, effort, and expenditures (Roswell and Czesny 2014). Data generated by the creel survey have documented important trends in angler effort and harvest, and have been used to support fishing regulation changes. While the creel survey

includes questions that allow the estimation of direct, fishing-related expenditures and vehicle fuel expenditures, the survey has excluded several key components of trip costs, including food, boat maintenance, boating (non-fishing) gear, and other travel expenses (excepting vehicle fuel). Additionally, the traditional creel survey does not include charter fishing activity, likely an important segment of recreational fishing on Lake Michigan (Robillard 2014). Moreover, the total economic impact of recreational fishing in Illinois waters of Lake Michigan, including indirect impacts (e.g., induced costs, jobs generated, etc.) has not been estimated.

The economic impact of fishing activity in Illinois was included in the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation conducted by the U.S. Fish and Wildlife Service (2012). However, that survey did not include sufficient respondents (i.e., <10) to evaluate Great Lakes (i.e., Lake Michigan) fishing in Illinois. The INHS creel survey generates annual estimates of direct expenditures based on approximately 3,000 interviews each year (e.g., Roswell and Czesny 2014). However, charter fishing and indirect economic impacts are not measured in the current creel survey, and may require alternate methods (e.g., mail surveys) and supplement creel survey data; Grado et al. 2001). Combining data generated by alternate methods with creel survey data could illuminate patterns in expenditures across various components of the Lake Michigan fishery in Illinois (e.g., boat vs. pedestrian anglers, perch vs. salmon anglers, etc.). Charter fishing operations play an important role in angling opportunities in southern Lake Michigan, but it is not understood to what extent or how these anglers differ from other anglers (Ditton, Gill, and MacGregor 1991). Gaining better understanding of the charter fishing market and role it plays in Lake Michigan fisheries management will allow for planning and management of potential demands from this important sector.

An understanding of the value of the recreational fishery in Illinois waters, and potential factors that may affect the fishery's value, are of critical importance for planning and managing the Lake Michigan fishery in light of ongoing ecosystem change. Declines in the yellow perch population, the most-harvested fish in Illinois waters of Lake Michigan, have led to regulation changes, reduced angling effort, and reduced harvest by anglers targeting yellow perch (Dub et al. 2014). Additionally, the potential for a collapse of prey fish abundance is a significant concern among Lake Michigan fisheries managers (Claramunt et al. 2012). Similar collapse in Lake Huron led to drastic reductions in abundance of economically-valuable salmonid populations, which, in turn, caused a reduction in fishing effort of 67% at some Lake Huron ports (Johnson and Gonder 2013). Lake Michigan has recently become more oligotrophic (Barbiero et al. 2012), which may affect its capacity to produce large abundances of some fish. Work in other areas of the Great Lakes region suggests that large differences may exist in the value/expenditures by anglers targeting different species (e.g., yellow perch vs. lake trout vs. Chinook salmon; Melstrom and Lupi 2013). As different species are more or less desirable to large groups of anglers (influencing levels of angling effort), and require different methods to successfully target (influencing expenditures), shifts in interest in various species may also contribute to changes in the economic value of the fishery.

Societal and other human factors can potentially influence the value of the fishery as well. In Illinois waters, large portions of fishing effort occur via pedestrians using shore access sites. Thus, effort (and in turn, expenditures) may be particularly sensitive to changes in accessibility of fishing sites. Timing of seasonal closures may also influence effort. For example, a recent regulation change opened yellow perch fishing during the month of July, when school is not generally in session, which may have contributed to a disproportionate increase in effort

(INHS unpublished data). A consumption advisory exists for many species on Lake Michigan due to contaminant levels (IDPH 2014), which may influence whether anglers decide to fish for some species from Lake Michigan. Shifting demographics of anglers, in response to both ecosystem and societal factors, will likely influence the economic value of the recreational fishery in Illinois waters of Lake Michigan. Understanding demographic changes may be especially important for planning and management in light of forecast of major changes in US population demographics in the next half-century (e.g., Ortman et al. 2014).

To assess these important questions, we developed four main objectives: (1) Estimate the total economic impact of recreational fishing in the Illinois waters of Lake Michigan, and (1b) the economic impact of the Illinois charter fishery; (2) Compare direct expenditure estimates between the Illinois Lake Michigan creel survey and the mail and internet survey; (3) Describe the economic activity generated by sub-sections of the fishery. This work complements the 28 years of consistently-collected creel survey data and expands on the close relationship between INHS and the Illinois DNR (ILDNR), which facilitates informing of stakeholders and decision-makers.

Methods

Data was obtained via a mixed methods approach (on-site intercept surveys followed by self-administered return mail surveys) of randomly sampled resident and non-resident anglers accessing sites on Lake Michigan in Illinois and Indiana. The population was be all individuals who used access sites and facilities beginning early spring 2015 through winter 2015-16. Sites are those used for the Lake Michigan creel survey conducted annually by the Illinois Natural History Survey, specifically sites in Lake and Cook counties along the length of the 63-mile shoreline in the state (Fig. 1), as well as sites surveyed by Indiana Department of Natural

Resources in Lake, Porter, and La Porte Counties. Both pedestrian and boat anglers were sampled for this study.

Noncharter Anglers

Methods followed those recommended by Dillman, Smyth, and Christian (2014) and Malvestuto (1996). For non-charter fishing, anglers were randomly sampled at selected public access sites based on a schedule that randomizes times of day, days of week, and include holidays. Randomly selected anglers were approached by trained field researchers who explained the

purpose of the study and asked for their participation. To avoid group leader bias, one angler from each party was randomly selected by asking that the angler in the party whose birthday falls closest to the date of that specific creel survey event complete the questions and participate in the follow-up survey. Each individual selected was explained the need and purpose for the survey, and asked for their consent to take part in the study. Individuals giving informed consent were asked to complete a short intercept survey questionnaire and for agreement to complete a survey following the close of the season. Anglers were given the choice of delivery for the follow-up survey via either mail or Internet.

Participants preferring to take part in an internet survey were asked for their email addresses. Internet survey access codes were sent by email to those individuals after the conclusion of the angling season, and anglers accessed the questionnaire through Qualtrics online survey software. Anglers requesting the mail survey were presented a mailing label and asked to write their name and address on the label; this approach serves as a reminder of the social contract anglers made in agreeing to complete the mail survey, thus increasing response



Figure 1. Sites used for the contact creel survey. From Roswell and Czesny (2014).

rate. These participants were mailed a follow-up survey questionnaire packet (consisting of a cover letter explaining the study, questionnaire, and stamped return envelope) following the conclusion of the angling season. Both the mail and internet surveys asked the same questions, regarding trip expenditures, perception of angling and fisheries quality, and awareness of and attitudes toward management programs. Nonrespondents were mailed a postcard reminder or sent an email reminder two weeks after the questionnaire mailing. A second questionnaire or email reminder was mailed to nonrespondents two weeks after the postcard reminder, with a second postcard mailing or email reminder to nonrespondents two weeks following the second questionnaire. Following the same two-week interval, a third mailing or email format was mailed to non-respondents. This method follows procedures used to determine wildlife harvest in Illinois (see, for example, Alessi, Miller, and Campbell 2011). The survey was also distributed to a random sample (N=1000) of anglers who had purchased a fishing license in Cook County, Illinois license list, but these respondents were ultimately discarded due to low response rate (<15%).

Charter Anglers

To collect data from anglers on charter fishing trips, we partnered with charter captains to gather data from their clients. Using a random sample of charter captains, a member of the creel survey team met with the anglers at arrival in port following the trip. We used the same method as described above (i.e., nearest birthday to the date surveyed) to randomize anglers selected. Selected anglers were then provided an option for either internet or mail survey, with methods as described above for non-charter anglers.

Questionnaire Design

As an intercept survey, the creel survey contained questions related to trip-specific information about fishing activity (total catch, species, effort, species targeted), site experience, and trip-related activities (e.g., miles traveled to arrive at that site). The follow-up mail/Internet survey consisted of items related to fishing experience, preferences for species and fishing methods, perceived quality of the Lake Michigan fishery and water quality, and perceived trends in the fishery during the prior 5 years. Anglers were also asked to respond to items related to constraints (barriers) to angling opportunities (e.g., access, site amenities, etc.). Moreover, we included self-reported measures of level of activity during the 5-year period prior to the survey (fishing activity increased, decreased, stayed same) and reasons for changes in activity selected from a list provided. In addition, anglers were also asked to think of their typical fishing trip to Lake Michigan and provide expenditure information for certain expenditure categories provided. This method followed that used by Grado, et al. (2011). This method is useful when no adequate sample frame exists from which to draw a sample in order to provide participants with a pre-season form on which to record expenditures. Asking to recall a typical trip helps reduce recall bias associated with asking for a specific trip at the end of the season.

Data Analysis

Creel and mail survey data were coded and entered into SPSS 24.0, and Internet data was imported from Qualtrics into SPSS for statistical analysis. Expenditure data was entered into IMPLAN, which provided 2015 economic data at the level of each county in Illinois (Lake and Cook) and Indiana (Lake, Porter, and LaPorte).

Objective 1: To calculate the total economic value of the Illinois fishery, all respondents contacted during the Illinois creel survey were included. Anglers were identified as either pedestrian anglers or boating anglers, based on their response to a categorical question asking

where they fished most often. Average expenditures (per angler per trip) for each category were calculated separately for pedestrian anglers and boating anglers, due to the distinction in the types of expenditures for each group (e.g. launch fees, boat fuel). These averages were then multiplied by the total number of trips for each angler group that was estimated from creel survey data (Roswell and Czesny 2016). We then input this estimate of total yearly expenditures for all pedestrian anglers and all boating anglers into IMPLAN. IMPLAN uses social matrix accounting methods which allowed us to determine the total value of the Lake Michigan recreational fishery in Illinois by calculating the total direct and indirect economic activity, total jobs generated, contributions to larger economic sectors, and local, state, and federal taxes.

Objective 1b: To calculate the charter fishing component of the Illinois fishery, all anglers who reported guide expenditures and no expenditures associated with a boat (launch fees, boat fee, boat gas) were assumed to be reporting expenditures for an average charter fishing trip. The average of these anglers' expenditures was multiplied by the total number of Illinois charter trips, 18,445, as reported by the DNR charter fishing report (Robillard 2016). These values were input into IMPLAN to calculate the total direct and indirect economic activity and total jobs generated.

Objective 2: The creel survey conducted by the Illinois Natural History Survey asks anglers to report their major expenditures (boat, motor, and trailer), their minor expenditures (bait, tackle, and rods), and their distance traveled, with which fuel expenditures are calculated (Roswell and Czesny 2016). We compared these estimates with the estimates generated from the mail/internet survey. In the mail/internet survey, major expenditures were "boat/motor" expenditures, and minor expenditures were the sum of "rods/reels," "bait," and "other tackle." To estimate fuel expenditures, the creel survey "distance traveled" data is multiplied by \$0.1121 per mile for

vehicles without trailers and an increased rate of \$0.1621 per mile for vehicles towing trailers. With the mail/internet survey data, we used \$0.1121 for pedestrian anglers and \$0.1621 for all boating anglers, as we cannot be sure who is or is not transporting their boat with a trailer. We also produced an additional estimate of fuel expenditures from the mail survey, based on the anglers' reported "automobile gas/oil" expenditures, and compared this estimate with the estimates calculated from distance traveled.

Objective 3: To estimate the economic value of the Indiana component of the fishery, all respondents recruited from the Indiana creel survey were used. For each expenditure item on the questionnaire, the average expenditures for boat anglers and pedestrian anglers were calculated separately. The average was then multiplied by the total number of trips, as estimated by the Indiana creel survey (Dickinson 2017). These totals were input into IMPLAN, and the economic impact was modeled. Using the same methods, but including all survey respondents, the economic impact of the entire Illinois and Indiana fishery was estimated. Several components of the combined Illinois and Indiana fishery were also modeled, again using all survey respondents. To assess the economic value of the boat and pedestrian fisheries, the average expenditures for all boat anglers and for all pedestrian anglers were each calculated, multiplied by the total number of trips, and input into IMPLAN. To assess the species-specific fisheries, the anglers were first divided into groups based on the species they reported targeting most often. Anglers targeting salmon or trout species were termed "salmonid anglers," anglers targeting yellow perch were termed "perch anglers", and anglers targeting bass, drum, or other species were termed "minor species anglers." For each of these three groups, average expenditures were calculated separately for boat and pedestrian anglers, before being multiplied by the total number of days

fished for that angler subgroup, as estimated by the creel surveys, and input into IMPLAN for economic modeling.

Results

Objective 1: During the Illinois creel survey, 1632 anglers were intercepted, and 616 (37.7%) agreed to provide contact information. Of those anglers, 168 (27.3%) completed the survey, including responses to the economic questions, and were included in this study. Pedestrian anglers made up 57 (34%) of these respondents, and boating anglers made up 111 (66%). Pedestrian and boating anglers were estimated to take roughly the same number of trips, but expenditures for boating anglers were much higher (Table 1.2). For pedestrian anglers, the largest proportion of expenditures were for car fuel (17.18%), while for boat anglers, the largest proportion went to boat purchase and maintenance (21.03%), and boat fuel (11.21%), corresponding to the additional needs of boating anglers (Table 1.2). For all anglers, other large expenditure categories were guide fees (9.76%), groceries (7.08%), lodging (6.53%), and meals (5.35%). The estimated total output of the Illinois Lake Michigan recreational fishery was \$22,452,805 (Table 3). Taxes attributed to Lake Michigan recreational fishing in Illinois (considering direct, indirect, and induced effects) were \$974,510 in local taxes, \$738,790 in state taxes, and \$2,110,219 in federal taxes. Effects on other sectors of the local economy were most pronounced in the amusement and recreation sector and sporting goods retail sector, with additional benefits seen in various sectors related to travel and tourism (Table 1.3).

Objective 1b: Anglers spent approximately \$8,752,681 on charter fishing trips with the majority of those expenditures (69%) being charter guide fees (Table 1.4). These expenditures resulted in an economic output of \$22,452,805 and generated 232 jobs (Table 1.5).

Objective 2: The mail/internet survey estimates of major expenditures were similar to those of the creel survey, but the estimate for minor expenditures was much higher (Table 2.1). The fuel expenditure estimate based on distance driven was similar for both survey types, but much lower than the estimate produced by asking anglers to report their fuel expenditures (Table 2.1).

The mail/internet estimation was higher for pedestrian anglers in all categories, capturing those anglers that may also spend time and money on angling from boats (Table 2.2). For boating anglers, the mail/internet and creel estimates were closer, but much higher with the mail/internet survey for total minor expenditures (Table 2.2).

Objective 3: Indiana anglers took an estimated 51,389 fishing trips during the 2015 fishing season, spending a total of \$18,185,320 (Table 3.5). These expenditures resulted in an economic output of \$12,740,889 (Table 3.1). Total number of trips and total expenditures were smaller in Indiana than in Illinois. Combining all fishing trips taken in the Illinois and Indiana Lake Michigan fisheries, the total estimated expenditures were \$50,861,064 (Table 3.5). The Illinois and Indiana fisheries combined economic output was estimated at \$44,431,774, providing a total of 470 jobs (Table 3.2). Boating anglers had higher average trip expenditures (Table 3.4), as well as a greater number of trips (Table 3.5), resulting in a greater economic impact than pedestrian anglers (Table 3.3). The majority of angler trips (71.3%) were for salmonid fishing, therefore salmonid anglers were responsible for the majority of the economic output (75%). The yellow perch fishery had the lowest angling activity, with 15,640 trips, resulting in \$3,092,669 total expenditures (Table 3.5), and the lowest economic output (Table 3.3).

Conclusions

This study provided a detailed analysis of the economic impacts of recreational fishing in the Illinois waters of Lake Michigan, including estimates of trip and season expenditures, and

direct, indirect, and induced effects on the local economy. The expenditure results for Illinois anglers reveal some information about angler behavior. For example, the fact that some expenditures for launch fees and boats are present in the pedestrian angler category reflects that some anglers who spend most of their time fishing from shore also partake in boat fishing trips. The impact of the fishery on economic sectors reveals additional stakeholders in the fishery, including some that are not directly related to fishing, such as travel and tourism. The estimated impact of the Illinois charter fishing component was close to that of the non-charter Illinois fishery. Due to the low number of charter anglers included in this study, a more complex analysis of the charter fishery could not be conducted, but is an important avenue for future research.

The comparison between the creel estimations and the mail/internet survey estimations suggest that creel estimations are relatively reliable. The fuel estimation determined by the question that directly asked for expenditures was much greater than the estimation calculated from miles driven. There are a number of possibilities for this distinction, such as the possibility that anglers are using less fuel-efficient vehicles (e.g. trucks) than are reflected in the mileage estimate, or that they may have included other car-related expenditures in addition to gas. One possibility is that anglers recorded the cost of a full tank of gas, even if they didn't require a full tank to reach their fishing site. In that case, if the goal is to determine the gas expenditures that are directly related to the fishing trip, mileage estimates may be more accurate.

The impact of the Indiana fishery is seemingly smaller than that of Illinois, but these cannot be directly compared because it is the impact on their own local economies, at the county level. In combined fisheries, boating trips resulted in much higher expenditures than pedestrian trips, which is expected, due to the additional costs associated with boating, including boat fuel and launch or mooring fees. Salmonid angling trips also resulted in much higher expenditures

and impact than the other fishery components, which is related to the much higher number of fishing trips these anglers took during 2015. A close examination of the expenditures by each angling group in each category may help to inform management, as well as local industries, as they aim to meet angler needs. Though the methods used in this study are applicable to a wide range of similar fisheries, the economic impacts described by this study are specific to the Illinois and Indiana waters of Lake Michigan and should not be generalized to represent other fisheries.

Applications, benefits, and impacts

There are a number of applications and benefits provided by this project. Fisheries managers can use this information to help allocate resources and research, and sharing results of this project with anglers may assist communication between management and anglers and to better identify fishery goals and objects which are mutually beneficial. The economic benefits provided by the fishery can be used to justify research and management activity. Additionally, the expenditure descriptions for each of the sub-fisheries in this region can help managers make decisions, and can help fishing-related businesses, such as bait shops, to better target and meet the needs of the angling community. Charter captains can also benefit from having data on the economic importance of the charter component of the Illinois Lake Michigan fishery, and can use the typical expenditures of their customers to inform future business decisions.

Future research conducted by INHS biologists, economists at Purdue University, and other scientists working in Lake Michigan will be improved by the outcomes of this work. The documented value of the fishery provided by this report may facilitate funding for future research in this fishery. The comparison of estimates provided by the creel and mail survey may help with adjustments to survey methods and serve as a reference as modifications and expansions to the

creel survey are considered. Justification of funding for fishery research may be facilitated with a documented, quantifiable value of the fishery. Finally, in addition to the economic valuation project outlined by this grant, the numerous other data collected by the questionnaire has led to a variety of other outputs (outlined in Part C of this report), which contribute to the growing body of human dimensions research in this region and provide managers with additional information about the angling population.

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Table 1.1 Total 2015 season expenditures for anglers in the Illinois Lake Michigan fishery.

	Pedestrian	Boating	Total
Car Gas	\$1,048,463	\$1,865,050	\$2,913,513
Boat Gas	\$89,767	\$2,244,908	\$2,334,674
Lodging	\$496,704	\$1,210,102	\$1,706,806
Parking	\$113,702	\$138,130	\$251,832
Launch	\$65,827	\$416,146	\$481,974
Groceries	\$495,507	\$1,354,085	\$1,849,592
Meals	\$422,499	\$975,983	\$1,398,482
Entertainment	\$132,852	\$128,765	\$261,618
Guide	\$748,047	\$1,802,716	\$2,550,763
Packages	\$179,533	\$65,846	\$245,379
Tournament Fees	\$59,844	\$643,827	\$703,671
Bait	\$400,354	\$759,713	\$1,160,067
Ice	\$176,538	\$316,646	\$493,184
Tackle	\$342,712	\$1,024,298	\$1,367,011
Rods	\$455,794	\$697,781	\$1,153,575
Clothing	\$102,846	\$163,392	\$266,239
Electronics	\$118,053	\$1,149,493	\$1,267,545
Boat	\$654,031	\$4,210,698	\$4,864,729
Mooring	\$0	\$640,051	\$640,051
Boat maintenance	\$0	\$23,323	\$23,323
Fishing licenses	\$1,308	\$99,667	\$100,975
Other	\$0	\$93,292	\$93,292
Total	\$6,104,383	\$20,023,913	\$26,128,296
Total Trips	34,111	32,484	66,595

Table 1.2 Economic impact of Illinois Lake Michigan anglers on the local economy (Cook and Lake counties, Illinois) during 2015.

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	173.8	5,488,951	8,233,402	12,756,319
Indirect Effect	24.2	1,569,289	2,969,088	4,555,204
Induced Effect	33.7	1,812,712	3,213,188	5,141,282
Total Effect	231.7	8,870,952	14,415,679	22,452,805

Table 1.3 Impact of angler expenditures on several sectors of the local economy (Cook and Lake counties, Illinois) during the 2015 fishing season.

Sector	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Amusement and recreation	77.8	\$2,116,232	\$2,895,581	\$4,998,917
Sporting goods retail	36.4	\$1,026,345	\$1,494,122	\$2,210,441
Limited-service restaurants	17.0	\$402,098	\$983,094	\$1,572,007
Hotels and lodging	11.3	\$620,009	\$1,263,926	\$1,717,779
Food and beverage	10.2	\$336,734	\$500,965	\$721,922
Gasoline	7.7	\$358,220	\$400,312	\$575,988
Motor vehicle and parts	7.5	\$480,843	\$741,868	\$937,251
Real estate	4.8	\$114,731	\$1,116,983	\$1,374,197

Table 1.4 Total expenditures corresponding to 2015 charter angling trips in the Illinois waters of Lake Michigan.

	Expenditures (\$)
Car Gas	661,622
Lodging	799,222
Parking	9,831
Groceries	425,465
Meals	319,707
Guide	6,049,960
Bait	24,587
Ice	22,134
Rods	222,949
Tackle	113,773
Clothing	45,969
Misc.	57,461
Total	8,752,681
Number of Trips	18,445
Average trip expenditures	\$474

Table 1.5 Economic impact of the charter angling component of the Illinois Lake Michigan fishery during the 2015 fishing season.

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	173.8	5,488,951	8,233,402	12,756,319
Indirect Effect	24.2	1,569,289	2,969,088	4,555,204
Induced Effect	33.7	1,812,712	3,213,188	5,141,282
Total Effect	231.7	8,870,952	14,415,679	22,452,805

Table 2.1. Comparison of angler expenditure estimates generated by creel survey data and mail/internet survey data.

	Mail/internet	Creel
Major expenditures (Boat, motor, trailer)	\$4,888,052	\$3,377,158
Minor expenditures (Rods, bait, tackle)	\$3,680,653	\$878,221
Fuel expenditures estimated by reported expenditures	\$2,913,513	n/a
estimated by distance driven	\$248,865	\$307,842

Table 2.2. Comparison of expenditure estimates for each angler group by survey type.

Pedestrian Anglers		
	<u>Creel Estimate</u>	<u>Mail/Internet Estimate</u>
Total Major Expenditures	NA	\$654,031
Total Minor Expenditures	\$302,143	\$1,198,861
Average trip expenditures	\$8.85	\$54.32
Boat Anglers		
	<u>Creel Estimate</u>	<u>Mail/Internet Estimate</u>
Total Major Expenditures	\$3,377,158	\$4,850,749
Total Minor Expenditures	\$576,078	\$2,481,792
Average trip expenditures	\$121.70	\$225.73

Table 3.1 Economic impact of the Indiana Lake Michigan fishery on the local economy (Lake, Porter, and LaPorte County).

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	139.6	3,243,079	4,680,526	8,178,475
Indirect Effect	14.8	559,008	1,041,878	1,964,142
Induced Effect	21.5	804,515	1,446,778	2,598,272
Total Effect	175.9	4,606,602	7,169,181	12,740,889

Table 3.2 Economic impact of the Illinois-Indiana Lake Michigan fishery on the local economy (Lake and Cook County, Illinois, and Lake, Porter, and LaPorte County, Indiana).

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	351.1	10,735,540	15,557,011	24,418,655
Indirect Effect	49.0	3,108,744	5,911,790	9,211,956
Induced Effect	70.8	3,749,889	6,672,270	10,801,164
Total Effect	470.9	17,594,174	28,141,071	44,431,774

Table 3.3 Total economic impact, including direct, indirect, and induced effects, of five components of the Illinois-Indiana Lake Michigan fishery on the local economy (Lake and Cook County, Illinois, and Lake, Porter, and LaPorte County, Indiana).

Fishery Component	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Boat Angling	346.2	13,095,823	21,060,183	33,122,533
Pedestrian Angling	124.7	4,498,351	7,080,889	11,309,241
Salmonid Angling	374.0	13,765,112	22,004,215	34,967,548
Perch Angling	32.4	1,236,746	1,848,548	2,905,516
Minor Species Angling	81.0	3,380,872	5,648,289	8,608,647

Table 3.4 Average trip expenditures for components of the Illinois-Indiana Lake Michigan fishery.

	Pedestrian Anglers	Boat Anglers
Illinois	\$54	\$226
Indiana	\$66	\$149
Salmonid	\$52	\$237
Yellow Perch	\$42	\$136
Minor Species	\$137	\$734
Total	\$56	\$255

N	Total	IL Anglers		IN Anglers		Boating		Pedestrian		Salmonid		Perch		Minor Species	
		168	66,595	172	51,389	195	68,404	143	49,580	243	84,127	49	15,640	34	18,221
Total trips	343														
Car Gas	\$5,627,245	\$2,913,513	\$2,401,659	\$3,602,613	\$2,024,632	\$4,550,792	\$359,389	\$766,582							
Boat Gas	\$4,501,154	\$2,334,674	\$2,064,419	\$4,336,465	\$1,664,689	\$3,935,807	\$326,428	\$306,485							
Lodging	\$2,505,586	\$1,706,806	\$461,932	\$1,541,724	\$963,863	\$1,461,047	\$4,992	\$1,206,020							
Parking	\$863,653	\$251,832	\$441,467	\$327,635	\$536,019	\$537,141	\$95,749	\$89,956							
Launch	\$1,677,390	\$481,974	\$1,077,506	\$1,192,685	\$484,705	\$1,134,724	\$260,859	\$204,190							
Groceries	\$3,162,647	\$1,849,592	\$1,159,456	\$2,350,991	\$811,656	\$2,485,533	\$261,173	\$592,516							
Meals	\$2,239,675	\$1,398,482	\$585,215	\$1,394,388	\$845,287	\$1,786,326	\$106,900	\$418,107							
Entertainment	\$407,101	\$261,618	\$91,195	\$154,347	\$252,754	\$328,467	\$0	\$112,984							
Guide	\$3,491,302	\$2,550,763	\$826,459	\$2,676,525	\$814,776	\$3,443,570	\$0	\$204,523							
Packages	\$218,023	\$245,379	\$42,762	\$114,009	\$104,014	\$121,826	\$0	\$165,343							
Tournament	\$1,477,540	\$703,671	\$676,097	\$1,240,041	\$237,499	\$1,200,306	\$86,043	\$290,149							
Bait	\$2,533,301	\$1,160,067	\$1,058,002	\$1,391,228	\$1,142,074	\$1,793,627	\$379,796	\$332,162							
Ice	\$897,683	\$493,184	\$380,927	\$615,458	\$282,225	\$634,914	\$103,318	\$125,356							
Tackle	\$2,732,029	\$1,367,011	\$838,621	\$1,973,761	\$758,268	\$2,188,511	\$128,409	\$599,380							
Rods	\$1,991,570	\$1,153,575	\$588,988	\$1,493,823	\$497,747	\$1,536,056	\$158,151	\$405,598							
Clothing	\$535,542	\$266,239	\$186,942	\$402,578	\$132,964	\$394,193	\$50,419	\$94,758							
Electronics	\$2,450,696	\$1,267,545	\$635,589	\$2,353,685	\$97,011	\$1,930,712	\$135,472	\$510,324							
Boat	\$11,311,983	\$4,864,729	\$3,878,249	\$10,910,274	\$401,709	\$7,181,651	\$608,427	\$5,102,338							
Mooring	\$1,716,534	\$640,051	\$623,929	\$1,714,877	\$1,657	\$1,897,031	\$13,170	\$34,316							
Insurance	\$31,371	\$0	\$21,878	\$31,371	\$0	\$16,298	\$0	\$20,590							
Boat Maintenance	\$148,302	\$23,323	\$82,540	\$148,302	\$0	\$136,902	\$13,577	\$0							
Fishing Licenses	\$215,251	\$100,975	\$57,511	\$132,245	\$83,006	\$196,861	\$396	\$0							
Other	\$125,486	\$93,292	\$3,978	\$125,486	\$0	\$143,421	\$0	\$0							
Total	\$50,861,064	\$26,128,296	\$18,185,320	\$40,224,511	\$10,636,553	\$39,035,719	\$3,092,669	\$11,581,678							

Table 3.5 Total season expenditures for the Illinois-Indiana Lake Michigan fishery, including total expenditures, and expenditures for seven components of the fishery.

SECTION C. OUTPUTS

Journal publications

Will be submitted as they become available.

Conference presentations

Golebie, Elizabeth J., Miller, Craig A., and Czesny, Sergiusz J. Differences in angling survey respondents captured by varying contact methods and survey modes. Northeastern Recreation Research Symposium. April 2017. Annapolis, Maryland.

Golebie, Elizabeth J., Miller, Craig A., and Czesny, Sergiusz J. Angler perceptions and management preferences in the southern Lake Michigan fishery. Annual Meeting of the Illinois Chapter of the American Fisheries Society. February 2017. Moline, Illinois.

Golebie, Elizabeth J., Miller, Craig A., and Czesny, Sergiusz J. Contributors to angler satisfaction in the southern Lake Michigan fishery. Midwest Fish and Wildlife Conference. February 2017. Lincoln, Nebraska.

PDF copies attached

Graduate student

Elizabeth J. Golebie

Thesis: Angler satisfaction and management preferences at the southern Lake Michigan Fishery

M.S. Natural Resources and Environmental Science 2017

University of Illinois at Urbana-Champaign

Thesis document attached

Project partnerships

Recreational valuation and management implication for the southern Lake Michigan fishery

Principal investigator: Mitchell Zischke

Start Date: February 2015