

WILDLIFE MANAGEMENT AREAS

VISITOR USE AND ECONOMIC IMPACT OF MICHIGAN'S COASTAL WILDLIFE MANAGEMENT AREAS



Photos: MISG



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EXECUTIVE SUMMARY

The objectives of this project were to determine the scope of recreation occurring on coastal Wildlife Management Areas (WMA), understand and characterize visitors and visitor use, and determine the economic impact of WMA visitors. The WMAs of interest included five state-owned WMAs and one federally owned National Wildlife Refuge (hereafter WMAs). The areas are located in southeastern Michigan from Lake Huron's Saginaw Bay region south to western Lake Erie. Data, including trip expenditures, was collected via intercept surveys completed in spring (March 26 – May 27, 2018), summer (June 11 – August 19, 2018), and fall (September 4 – November 24, 2018). A total of 701 surveys were completed. Visitor estimates were calculated and used to determine economic impacts using IMPLAN, a standard economic impact simulation model.

Demographics of WMA visitors differed by season and area. WMA visitors were mostly White (> 82%), male (> 76%), and college educated (> 47%). The average age of visitors during spring, summer, and fall was between 45-50 years old and Facebook was the social media platform used most by visitors (>58%). Primary recreational activities were similar across WMAs with the predominant activity being fishing in the spring and summer, and waterfowl hunting in the fall. Time spent on the WMA differed by season with visitors spending the most time on WMAs in the fall. Most WMA visitors were returning users that had visited in the past 12 months (>74%).

Average visitor expenditures differed by area and ranged from approximately \$19 to \$40 per trip. These dollars generated economic multiplier effects that collectively ranged from an estimated \$110,913 and \$360,208 in new expenditures in their respective local economies. These results demonstrate that WMAs are providing economic benefits to local communities that could be increased through strategic partnerships between wildlife agencies and local communities that result in increased use of WMAs and visits to local communities.

INTRODUCTION

Great Lakes coastal wildlife management areas (WMA) are generally purchased and managed with funds from hunting licenses, however these areas are also destinations for non-hunting recreation (e.g., bird and other wildlife watching, fishing, paddling, hiking, etc.). Coastal communities benefit from these recreational visits, yet these economic contributions have not been measured. There have been several analyses of economic impacts of national wildlife refuges on local communities (Carver & Caudill 2007; Carver & Caudill 2013) and the effect of national wildlife refuges on nearby property values (Taylor, Liu, & Hamilton 2012). However, there is only one known study (Poudyal et al. 2020) that has attempted to estimate economic impacts of WMAs. As numbers of non-hunting recreational users increase and waterfowl hunter numbers decrease, it is unclear how the current model of conservation and the economies of coastal communities will be impacted by the changing nature of investments in wildlife management (Avers 2022).

The Coastal Wildlife Management Area Visitor Use, Expenditures, and Economic Impact Fact Sheet (Appendix A) provides a summary of key metrics that WMA managers (i.e., state and federal wildlife agencies) and local community leaders seek to understand the type and diversity of visitors using WMAs, as well as how those visitors impact local economies through expenditures associated with their visits. This information helps to inform goals and strategies for diversifying WMA users, as well as provide insights into benefits to local communities resulting from those outdoor recreation activities. Wildlife agencies may see increased support for WMAs if local communities understand the economic benefits, such as expenditures and jobs, that WMAs contribute to local economies. This knowledge can provide the basis for local communities and WMA managers to engage in coordinated planning and develop mutual goals and opportunities for wildlife management and coastal community development.

Objectives:

- Determine relative amount and type of recreation occurring on WMAs in different seasons.
- Understand and characterize WMA visitors.
- Determine expenditures of visitors using WMAs and the resulting economic impact to communities.

METHODS

Study Area

The study area included five Michigan Department of Natural Resources (MDNR) WMAs and one U.S. Fish and Wildlife Service National Wildlife Refuge (NWR) located in southeastern Michigan from Lake Huron's Saginaw Bay region south to western Lake Erie (Figure 1). The WMAs included the following:

- Nayanquing Point State Wildlife Area (SWA)
- Fish Point SWA
- Shiawassee River State Game Area (SGA)
- St. Clair Flats SWA-Harsens Island Unit
- Pointe Mouillee SGA
- Shiawassee NWR

While the five MDNR WMAs are managed primarily to provide wetland habitat for waterfowl and waterfowl hunting opportunities, these areas provide ample non-hunting-related wildlife recreation opportunities (e.g., wildlife watching, hiking, paddling sports). The NWR is primarily managed for wildlife habitat for migratory birds but also provides hunting and non-hunting recreation. Several of these WMAs are considered top bird watching areas in Michigan (White 2016). Wildlife agencies invest significantly in water management infrastructure at these WMAs to achieve wetland habitat, migratory bird, and recreation management objectives.

Figure 1. Study area including five Michigan Department of Natural Resources Wildlife Management Areas (WMAs) and one U.S. Fish and Wildlife Service National Wildlife Refuge.



VISITOR USE SURVEYS

Appendices B and C (the reports describing the Visitor Use Survey during the spring/summer and fall) provide a detailed description of the visitor use survey methodology. The survey approach was adapted from the United States Geological Survey National Wildlife Refuge Visitor Survey (Sexton et al. 2012). WMA managers were consulted to identify survey periods in spring, summer, and fall that best represented visitation patterns from their perspective. A stratified sampling design by 2018 season (spring March - May; summer June - August; and fall September - November) and day of week (weekday or weekend), resulted in data collection during a seven-week sampling period per season with two weekdays (either Monday/Wednesday or Tuesday/Thursday) and two weekend days per period. Simple random sampling was used to select specific survey dates and back-up dates for each WMA and each season. Visitors intercepted by a survey team were invited to complete a survey using tablets equipped with Qualtrics survey software. Surveys were conducted in two three-hour sampling shifts (8:00-11:00 AM and 1:00-4:00 PM). Survey teams attempted to conduct 10 surveys during the morning sampling shift and 10 during the afternoon shift.

The survey consisted of 23 questions (Appendix D) including details of their WMA visit, trip expenditures on standard spending sectors, demographics, and potential for future visits. Respondents received a small token gift at the completion of the survey. The survey instrument was pilot tested with Michigan State University (MSU) graduate students and MDNR Wildlife Division staff to improve validity. This study was approved by the MSU Institutional Review Board as project #435.

Spending profiles were compiled to represent average per-visitor-party expenditures during the site's use. Spending profiles are used in modeling the economic impacts and account for how visitors infuse dollars into the local economy when visiting WMAs. Expenditure profiles were compiled as average party expenditures by category for each of the six WMAs. There were fourteen expenditure categories. Within the survey, respondents were requested to indicate travel distance and whether an overnight stay was part of their visit. Overnight stays were relatively rare, and accordingly, it was decided not to

break out overnight stays from day use expenditures. Parties with overnight stays spent over 3.5 times more than day visit parties. However, the average party expenditure for overnight accommodations reflects the low count of visitors staying overnight.¹ Survey responses also indicated the season of the visit and included MDNR Wildlife Division use categories – wildlife viewing, hunting, fishing, all others. Accordingly, another expenditure category by season/use was created – Spring, Fall and Fall Extractive (hunting, fishing). Sampling limitations allowed for expenditure profiles by site and by season/use, but not by both. To seasonalize site-specific expenditures, season/use expenditure profiles were scaled (extrapolated) to fit the overall site expenditure profile in the aggregate.

VISITATION ESTIMATES

Visitation estimates were made for each WMA and two seasons: (1) spring-summer defined as March to August 2018 and (2) fall defined as September to November 2018. In the fall, estimates were made separately for waterfowl hunters and for other visitors. The approach for estimating visitors to each site was adapted from existing methods for estimating visitor counts using on-site samples of visitors (Leggett 2017; Leggett 2015; Pollack et al. 1994). The method expands the sampled number of visitors at each site to the estimated number of visitors in a season. In addition, administrative records on the number of waterfowl hunters that hunted at each MDNR WMA were available for the 2018 fall waterfowl hunting season. The final visitation estimates utilize both the survey data and the hunter registration data. The estimation process for visit counts involved two steps: an initial set of visitation estimates, and a calibration of the estimates. Specifically, initial visitation estimates were made for all visitors in spring-summer, for non-hunters in the fall, and for hunters in the fall following Leggett (2015). Then the initial estimates for fall hunters were compared to the available hunter registration data and site-specific adjustment factors were derived so that final fall hunter estimates would match the hunter registrations at each site. Finally, these adjustment factors were applied to non-hunters in the fall and to all visitors in the spring-summer to arrive at the final visitation estimates.

THE IMPLAN ECONOMIC IMPACT MODEL

The Minnesota IMPLAN Group Inc. model for economic impact evaluation, IMPLAN (Minnesota IMPLAN Group Inc. 2004), is a general application economic impact simulation 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 of 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, pp. 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 with over 500 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.

Using the SAM to simulate economic impact is called input-output (I-O) modeling. The I-O framework has a long history and was first described by Francois Quesnay in 1758 and developed into its modern form by Wassily Leontief (1960). The structure supports demand-driven responses, where changes in output demand in one industry materialize as changes in the demand for production of other industries. For example, an increase in local demand for printing services will spur demand for paper, ink, electricity, printer repair services and other goods and services required by printing companies. The companies that provide goods and services to the printer will also purchase other goods and services used in their

¹ Blanks and “Not Applicable” were treated as \$0.00.

respective production processes. In addition, households that enjoy enhanced employment opportunities earn and spend more on goods and services and taxes. Such household impacts generate additional direct and secondary transactions across the economy. The extent to which initial stimulus generates secondary transactions is hindered by the degree of purchases made outside the modeled region. That is, once a dollar leaves the local economy, it ceases to be re-spent and therefore no longer contributes to subsequent rounds of expenditures. More succinctly, industries and households that purchase goods and inputs from local suppliers generate greater economic effects than industries and households that tend to purchase goods and inputs produced outside the local area, holding all else constant.

I-O models have become staple economic impact models for regional analysis (Blakely & Bradshaw 2002). They 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. 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,

$$\text{Total Effect} = (1 + k_1 + k_2) \cdot \text{Direct Effect} \quad (1.1)$$

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

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

where $k = (1 + k_1 + k_2)$. Equation (2) says that the economy-wide impact, Total Effect, is some multiple of the direct effect, where the multiplier takes a positive value equal to 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 dollars, the economy will expand at least by \$1 million dollars. 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 will generate household income that are applied to the purchase of goods and services in the economy: 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,

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

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 aggregate economy. 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 region, the region has more potential to retain the total effects of the industry. However, when producers must use supplies outside the region, leakage occurs, resulting in smaller total effects.

The SAM transactions are measured in dollar value of sales transactions. Therefore, the standard economic impact estimates are measured in changes in sales (also called output) in the region. It is standard practice to report economic impact estimates in employment and income terms as well. The standard approach to converting impacts into employment and income terms is to use fixed ratios of employment and income to sales from baseline years and apply them to the industry-specific estimated impacts. IMPLAN uses such an approach to report employment, labor income and regional income (gross regional product) impacts.

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, inputs in the production of any industry are in fixed proportion to the level of output. 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 change 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 are greater the larger the industry direct effects are relative the overall size of the industry (Coughlin & Mandelbaum 1991). Despite this criticism, I-O models have become a standard by which economic impact assessments are generated.

RESULTS

Visitors and Visitor Use

A total of 701 Visitor Use Surveys were completed. This consisted of 225 spring surveys (122 weekday and 103 weekend), 193 summer surveys (67 weekday and 126 weekend), and 283 fall surveys (112 weekday and 171 weekend). Appendices A-C provide detailed summaries of survey responses and Table 1 below highlights some of these results. Time spent on the WMA differed by season (ranging from 2.28-4.1 hours/trip) with visitors spending the most time on WMAs in the fall. Most WMA visitors were returning users that had visited in the past 12 months (ranging from 74%-87% by season). While demographics of WMA visitors differed by season and area, WMA visitors were mostly male (ranging from 76-95% by season), college educated (ranging from 47-52% by season), and White (ranging from 82-90% by season) with an average age between 45-50 years old. Respondents were asked if their annual household income before taxes and deductions was above or below \$57,000, the mean for U.S. households in 2016 (Guzman 2017). The majority of visitors reported household income > \$57,000 (ranging from 51-74% by season) with visitors in the fall reporting higher incomes. While Facebook was the social media platform used most by visitors (>58%), 31-33% of respondents reported that they did not use social media.

Table 1. Characteristics and demographics of Visitor Use Survey respondents at coastal WMAs during spring, summer, and fall 2018.

	Spring	Summer	Fall
Average hours/trip	2.47	2.28	4.1
Returning visitors in last 12 months	80%	74%	87%
Average age	49	50	45
Gender: Male	85%	76%	95%
Completed college, technical school, graduate, or professional degree	48%	47%	52%
Race: White	82%	85%	90%
Annual household income before taxes and deductions >\$57,000	53%	51%	74%
Top social media use: Facebook	58%	64%	64%
Do not use social media	31%	31%	33%

Many WMA visitors traveled 50 miles or less to recreate on the WMAs (Table 2). During spring, the percentage of visitors that resided within 50 miles of the WMA ranged from 61-87%. The range for summer visitors was 42-96% and 40-83% for fall visitors. Overall, Shiawassee NWR, Fish Point SWA, and Nayanquing Point SWA had the lowest proportion of local visitors (i.e., residing within 50 miles) and Shiawassee River SGA, Pointe Mouillee SGA, and St. Clair Flats SWA had the highest proportion of local visitors.

Table 2. Percentage of Visitor Use Survey respondents that reported residing within 50 miles of the coastal WMA they were recreating at during spring, summer, and fall 2018.

	% Visitors residing within 50 miles			
	Spring	Summer	Fall	Average
Shiawassee River SGA	87%	96%	77%	87%
Pointe Mouillee SGA	85%	87%	81%	84%
St. Clair Flats SWA-Harsens Island Unit	78%	64%	83%	75%
Nayanquing Point SWA	68%	62%	62%	64%
Fish Point SWA	82%	67%	40%	63%
Shiawassee NWR	61%	42%	73%	59%

Primary recreational activities were similar across WMAs. During spring, fishing was the predominant activity (62%, n=138), followed by birdwatching (13%, n=28) and hiking/walking (10%, n=22). Fishing was also the predominant activity in the summer (45%, n=84) followed by wildlife observation (14%, n=26) and birdwatching (12%, n=23). Not surprisingly, the activity in the fall with the great majority of participation was waterfowl hunting (73%, n=203). This was followed by small percentages of fishing (5%, n=14) and hiking/walking (4%, n=12).

Economic Contributions

Appendix A summarizes economic contributions. The average visitor expenditures and the seasons of those expenditures varied across the six WMAs. Table 3 includes the adjusted average total spent economic contributions per trip of visitors by WMAs. Visitors to Shiawassee NWR had the highest average trip expenditures and Pte. Mouillee SGA had the lowest average trip expenditures. Appendix E includes detailed expenditure profiles. The highest spending sectors were fuel for automobile and/or boat, restaurants and bars, sporting goods and equipment, and groceries and beverages.

Fish Point SWA, St. Clair Flats SWA-Harsens Island Unit, and Shiawassee River SGA had the largest share of trip expenditures during the fall hunting period. This is unsurprising as these areas are all established waterfowl hunting destinations. However, Nayanquing Point SWA and Pointe Mouillee SGA are also well-known waterfowl hunting areas and yet the largest share of trip expenditures occurred during the spring/summer period, suggesting that these two areas are providing important non-hunting recreation opportunities during other parts of the year. Both Nayanquing Point SWA and Pointe Mouillee SGA are popular areas for spring and summer birdwatching, and Pointe Mouillee SGA provides a boating access site to Lake Erie that is used extensively in the spring and summer. For Shiawassee NWR, the largest share of annual expenditures occurs in the spring/summer period and the lowest occurs in the fall hunting period. This is not surprising as this is the only NWR in the study and is widely promoted for its non-hunting recreation (e.g., wildlife viewing, hiking) and is not as well-known as the MDNR lands for hunting.

Table 3. Adjusted average total spent economic contributions per trip of visitors using coastal WMAs, including the seasonal (spring/summer, fall non-hunting, and fall-hunting) share of annual expenditures.

WMA	Share of Annual Expenditures			
	Average trip expenditures	Spring/Summer	Fall (Non-hunting)	Fall (Hunting)
Shiawassee NWR	\$40.08	67.5%	29.5%	3.1%
Fish Point SWA	\$36.33	33.9%	19.3%	46.8%
Nayanquing Point SWA	\$35.78	44.6%	27.5%	27.9%
St. Clair Flats SWA-Harsens Island Unit	\$33.90	25.6%	24.1%	50.3%
Shiawassee River SGA	\$31.01	30.1%	18.6%	51.3%
Pointe Mouillee SGA	\$19.03	44.6%	27.5%	27.9%

Visitor expenditures promote economic growth in the hosting communities. As these new dollars are spent and re-spent in the local economy, they generate economic multiplier effects that ranged from an estimated \$110,913 and \$360,208 in new expenditures, including income earned by workers and businesses (Table 4).

Table 4. Total effect economic impact estimates given state averages per coastal WMA and across spring through fall. The sum of the economic impact estimates are based on the seasonal (spring/summer, fall non-hunting, and fall hunting) visitor counts.

Area	Labor Income	Regional Income	Total Transactions
Shiawassee NWR	\$117,185	\$198,879	\$360,208
Pointe Mouillee SGA	\$112,223	\$181,966	\$341,203
St. Clair Flats SWA-Harsens Island Unit	\$47,940	\$80,987	\$150,685
Nayanquing Point SWA	\$40,173	\$69,981	\$130,205
Fish Point WMA	\$35,018	\$61,525	\$119,018
Shiawassee River SGA	\$36,326	\$61,323	\$110,913

DISCUSSION

Understanding recreational use and economic contributions of WMAs is a first step for state and federal wildlife agencies to educate local governments on the benefits these areas provide to local community development. This is increasingly important as wildlife agencies seek broader and more diversified political and funding support for wildlife management. Agencies may see increased support for WMAs if local communities understand the economic benefits these resources can generate.

Results indicated that there were generally few visitors to the WMAs during the spring and summer with fishing being the predominant recreational activity. Surprisingly few visitors were birdwatching in the spring and summer despite several of the WMAs recognized as top birding areas in Michigan. As expected for these WMAs, waterfowl hunting was by far the predominant activity during the fall and there were few visitors participating in other recreation. It may be that visitors are either largely unaware that these areas are open for non-hunting opportunities or that there are perceived safety concerns during the hunting season. State and federal wildlife agencies and local communities can use this information to better understand visitors and develop strategies to increase and diversify visits and recreational opportunities. Particularly, communication and marketing strategies to educate the public about access to these WMAs and the recreational opportunities available may be effective. Because a number of these areas are already recognized for their excellent birdwatching, agencies could consider promotional campaigns that highlight these opportunities, as this appears to be a potential that is not being fully realized. Knowing the social media use of WMA visitor is an important consideration in communication and outreach strategies. Because Facebook is the predominant social media platform used by WMA users, agencies and local communities could develop educational

and promotional messages that use this platform. However, about a third of WMA visitors don't use social media. So, using a diversity of communication and outreach strategies is recommended.

Travel distance is an important metric when considering the socio-economic values and use of WMAs. St. Clair Flats SWA – Harsens Island Unit, Pointe Mouillee SGA, and Shiawassee River SGA had some of the highest percentages of local visitors, suggesting that they primarily serve the local population. This may be because they are located in closer proximity to densely populated metropolitan areas (e.g., Detroit, Flint, and Saginaw). In contrast, Nayanquing Point SWA and Fish Point SWA drew more non-local visitors from outside their communities and are located in lesser populated rural areas. Shiawassee NWR is the only NWR in the study and is likely more widely known than the other WMAs. The NWR also drew the most non-local visitors in spring and summer. Average trip expenditures were also greater for those WMAs that had a higher percentage of non-local visitors.

The results from the economic impact analysis demonstrate that WMAs are yielding benefits to the local communities. The estimated visitor expenditures ranged from approximately \$19 to \$40 per trip per area, with a range of economic impact between approximately \$110,000 and \$360,000, depending on the number of visitors the site generates, the expenditures those visitors generate and the structure of the local economy. These benefits could be increased through strategic partnerships between wildlife agencies and local communities to increase visitation and recreational venues available to visitors of the WMAs and their communities. Collaboration could yield mutual goals and strategies for implementation, such as promotion of the areas and the local community's assets to residents and visitors that could bolster local economic development and potentially provide more political and financial support for WMAs.

We were limited in this study by the resources available to survey visitors across the six WMAs and across three seasons. Intercepting visitors and estimating visitor numbers is very challenging on areas such as these that have multiple entry locations and unregulated entry outside of hunting seasons. A more intensive survey design that includes additional days per WMA as well as more survey staff to account for visitors on the WMAs would be beneficial. The visitation estimates were derived from the Visitor Use Survey samples and contain uncertainty relating to the sample frequency and procedures. Any future improvements or data on the number of visitors to each WMA would yield more precise economic contribution numbers. Also, sample size limited the granularity of expenditure profiles. For instance, the sample size allowed for measures of average party expenditures by WMA, and average party expenditure by season/use, but not for both. For future research, we recommend utilizing a more robust survey design to increase the number of visitors intercepted.

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APPENDICES

Appendix A (next page)

COASTAL WILDLIFE MANAGEMENT AREA VISITOR USE, EXPENDITURES, AND ECONOMIC IMPACT



Photos: MDNR

Why?

Wildlife managers and local leaders seek to understand the type and diversity of visitors using wildlife management areas (WMAs), as well as their visitor expenditures and estimates of economic impacts from their visits. This information provides a snapshot and informs goals and strategies for diversifying WMA uses and users, as well as insights into impacts to communities resulting from those uses and users. Together local leaders and WMA managers can determine mutual goals and opportunities for wildlife management and coastal community development.

Objectives

- Determine relative amount and type of recreation occurring on WMAs, including different seasons.
- Determine visitor expenditures using WMAs.
- Determine economic impact to communities of visitors using WMAs.

Background

The study area included five state-owned WMAs, which included State Wildlife Areas (SWAs) and State Game Areas (SGAs), and one federally-owned National Wildlife Refuge (hereafter WMAs) located in southeastern Michigan from Lake Huron's Saginaw Bay region south to western Lake Erie (Figure 1). While the five state-owned lands are managed primarily for wetlands conservation for waterfowl and waterfowl hunting, these lands provide ample non-hunting-related wildlife recreation opportunities. The federally owned lands are primarily managed for wildlife habitat for migratory birds. Three of the state WMAs are in top bird watching areas in Michigan. State and federal investment in infrastructure for wetland and habitat management is directed at meeting WMA-specific objectives.

Methods

This study was approved by the Michigan State University Institutional Review Board #435. This visitor use survey approach was adapted, in consultation with WMA managers, from the United States Geological Survey National Wildlife Refuge Visitor Survey. A stratified sampling design by season (spring March - May; summer June - August; and fall September - November) and day of week (weekday or weekend), resulted in data collection during a seven-week sampling period per season and two weekdays (either Monday/Wednesday or Tuesday/Thursday) and two weekend days per period in 2018. Simple random sampling was used to select specific days, as well as back-up dates, for each WMA and each season.

Visitors leaving the WMAs were intercepted by the research team and invited to complete the 20-question survey via Qualtrics on tablet computers. Respondents were asked about their WMA visit such as trip expenditures, demographics, potential for future visits, etc. and received a small incentive at the completion of the survey. The survey instrument was pilot tested with graduate students and Michigan Department of Natural Resources Wildlife Division staff to improve validity. Stata, Excel, and IMPLAN, were used to complete the descriptive statistics, visitor estimates, expenditure profiles, hunter site registrants, and input-output modeling.

Results

A large share of WMA visitors traveled 50 miles or less to arrive at the site. During spring, the percentage of visitors that said they resided within 50 miles of the WMA ranged from 61-87%. The range for summer surveys was 42-96% and 40-83% for fall.

	Spring	Summer	Fall
Average hours/trip	2.47	2.28	4.1
Returning visitors in last 12 months	80%	74%	87%
Top social media use: Facebook	58%	64%	64%
Average age	49	50	45
Gender: Male	85%	76%	95%
Completed college, technical school, graduate, or professional degree	48%	47%	52%
Race: White	82%	85%	90%
Annual household income before taxes and deductions >\$57,000	53%	51%	74%

The top recreational activities occurring on the study area WMAs in different seasons are as follows.

Spring:

- Fishing 62% (n=138)
- Birdwatching 13% (n=28)
- Hiking/walking 10% (n=22)

Summer:

- Fishing (n=45%)
- Wildlife observation 14% (n=26)
- Birdwatching 12% (n=23)

Fall:

- Waterfowl hunting 73% (n=203)
- Fishing 5% (n=14)
- Hiking/walking 4% (n=12)

Average visitor expenditures varied across the six WMAs.

- Fish Point SWA \$36.33
- Nayanquing Point SWA \$35.78
- Pointe Mouillee SGA \$19.03
- Shiawassee National Wildlife Refuge \$40.08
- Shiawassee River SGA \$31.01
- St. Clair Flats SWA-Harsens Island Unit \$33.90

Visitor expenditures promote economic growth in the hosting communities. As these new dollars are spent and re-spent in the local economy, they generate economic multiplier effects that ranged from an estimated \$110,931 to \$360,208 in new expenditures, including income earned by workers and businesses.

Figure 1. Lake Huron's Saginaw Bay region south to western Lake Erie



Table 1. Total effect economic impact estimates given state averages by season per area.

Area	Labor Income	Regional Income	Total Transactions
Fish Point WMA	\$35,018	\$61,525	\$119,018
Nayanquing Point SWA	\$40,173	\$69,981	\$130,205
Pointe Mouillee SGA	\$112,223	\$181,966	\$341,203
Shiawassee National Wildlife Refuge	\$117,185	\$198,879	\$360,208
Shiawassee River SGA	\$36,326	\$61,323	\$110,913
St. Clair Flats SWA-Harsens Island Unit	\$47,940	\$80,987	\$150,685

Discussion

Facebook is the predominant social media platform used by WMA users that are characterized as White, male, college educated, and 45-50 years old. Fishing was the predominant activity in spring and summer with waterfowl hunting the dominant fall activity, as expected. Even though three of six study areas are recognized as top birding areas in Michigan, few respondents report bird watching as their activity.

As is, without any specific integration of wildlife management with coastal community development, the WMAs do yield benefits to communities. The estimated visitor expenditures of visitors ranged from approximately \$19 to \$40 per area, with a range of economic impact between approximately \$110,000 and \$360,000 per area. However, this could be enhanced if communities and WMAs collaborated to identify desired goals, and strategies for implementation, such as promotion of areas to increase visitation.

Adapted from original research: Avers, B.A. (2022). Exploring stakeholders' support for and stewardship of Michigan's coastal wildlife management areas. [Doctoral dissertation, Michigan State University]

Avers, B.A., S.R. Miller, F. Lupi, and H.A. Triezenberg. (2023). Visitor use and economic impact of Michigan's coastal wildlife management areas. Department of Fisheries and Wildlife; MSU Extension, Michigan Sea Grant, Michigan State University.

Key findings

- WMA visitors were mostly White, male, and college educated, with an average age between 45-50 years old. Most WMA visitors were returning users that had visited in the past 12 months. Facebook was the social media platform used most by visitors.
- Primary recreational activities were similar across WMAs with fishing as the predominant activity in the spring and summer and waterfowl hunting in the fall.
- Time spent on the WMA differed by season with visitors spending the most time on WMAs in the fall.
- The estimated visitor expenditures of visitors ranged from approximately \$19 to \$40 per area.
- The overall annual economic impact to communities from WMA visitors is estimated between \$110,913 and \$360,208.
- WMAs are yielding benefits to the local communities. These benefits could be increased through strategic partnerships between wildlife agencies and local communities to increase visitation and recreational venues available to visitors of the WMAs and their communities.

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Appendix B (next page)

Coastal Wildlife Management Area Visitor Use Surveys

Spring and Summer 2018 Preliminary Results

(A Preliminary Report of Phase I of Project: A Stakeholder-Engaged Framework for Great Lakes Coastal Wildlife Management Areas for Waterfowl Hunting, Bird Watching, and Community Development)



September 24, 2018

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Visitor Use Survey Objectives:

Phase I of the research project titled “A Stakeholder-Engaged Framework for Great Lakes Coastal Wildlife Management Areas for Waterfowl Hunting, Bird Watching, and Community Development” includes preliminary on-site recreational use surveys. These surveys are being conducted during spring, summer, and fall 2018 at six coastal wildlife management areas (WMAs) to explore the relative amount and type of recreation occurring at each site. This preliminary step is important to identify key recreational users of the WMAs and to inform survey questionnaires that will be developed for each of the five stakeholder groups (waterfowl hunters, bird watchers, other key recreational users, local community leaders, and local community residents) during Phase II of the research. The objectives of the preliminary visitor surveys are to:

- Determine the scope of recreation occurring on WMAs
- Understand and characterize visits and visitors of WMAs during spring, summer, and fall
- Determine economic impacts of visitor uses of WMAs

Methods Review:

Surveys take place at six state and federally owned and managed aquatic-based coastal wetland sites from Lake Huron’s Saginaw Bay to western Lake Erie. Michigan Department of Natural Resources (MDNR) lands include five managed waterfowl hunting areas: Nayanquing Point State Wildlife Area (SWA), Fish Point SWA, Shiawassee River State Game Area (SGA), St. Clair Flats SWA-Harsens Island Unit, and Pointe Mouillee SGA. U.S. Fish and Wildlife Service (USFWS) lands will include the Shiawassee National Wildlife Refuge.

The visitor use survey design and methodology is largely based on the USGS National Wildlife Refuge Visitor Survey (Sexton et al. 2012). WMA managers were interviewed to identify potential survey periods in each of three seasons (spring, summer, and fall) that best represented the visitation patterns and diversity of use on the WMA. These manager-selected time frames were used to develop a calendar of sampling periods for each WMA. A stratified design with strata by season (spring, summer, fall), WMA, and day of week (weekend day or weekday) is used for improved precision, benefits to scheduling survey teams, and estimates that can be calculated by strata. Seven weeks per season were selected based on the input from WMA managers. The seven-week sampling period per season allows for each WMA to be surveyed two weekdays and two weekend days per period. Surveys conducted on weekdays alternate by sampling week between Monday/Wednesday and Tuesday/Thursday to improve representativeness and for ease of scheduling survey teams. Simple random sampling is used to select the days (two weekdays and two weekend days) each WMA is surveyed within the WMA manager selected time frames. Survey back up dates are scheduled as close to the randomly selected survey date as possible to replace selected survey dates in cases of inclement weather or other unforeseen events that prohibit the visitor use survey from taking place. Visitors are intercepted by a survey team as they are leaving the WMA, and surveys are administered using tablets equipped with Qualtrics survey software. One member of the survey team is responsible for tallying the total number of visitors leaving the sampling site. On the selected days, surveys

are conducted in two sampling shifts 3 hours long; one in the morning (8:00-11:00) and the other in the afternoon (1:00-4:00). Survey teams attempt to conduct 20 surveys per area per day sampled (10 in the morning shift and 10 in the afternoon shift), for a total of 80 surveys per season per area. All seasons combined, this would provide a total of 240 surveys per WMA.

In addition to sampling periods, WMA managers were also asked to identify all potential locations for surveys. Simple random sampling is used to select locations for visitor use surveys on each selected day. Because of low visitation rates during spring and summer 2018, all survey locations at each area were used for sampling. A small token of appreciation for completing the survey is offered at the conclusion of the survey.

The survey instrument is a brief questionnaire of approximately 20 questions asking about the participant's visit to the WMA, trip expenditures, demographics, and the potential for future visits. Questions were pre-tested by three MSU graduate students and seven MDNR Wildlife Division professionals for validity. The visitor use survey was approved by MSU IRB (STUDY00000435) prior to conducting surveys.

This preliminary report includes summary statistics for survey participation, trip and visitor characteristics, primary recreational activities, social media use and provision of emails, residence, and demographics. A summary of two open-ended questions is also included. A final report including statistical analysis will be made available after the conclusion of the fall surveys. The trip expenditure data from the surveys will be used for an economic impact analysis and will be included in a future report.

Preliminary Results:

Survey Participation

Spring surveys began March 26, 2018 and ran through May 27, 2018. A total of 225 surveys were conducted at all six WMAs (Table 1), with 122 weekday surveys and 103 weekend surveys. Summer surveys began June 11, 2018 and ran through August 19, 2018. A total of 193 surveys were conducted during the summer (Table 2), with 67 weekday surveys and 126 weekend surveys. The total number of surveys differed by area during both seasons and ranged from 15 to 69 during spring, with Shiawassee River SGA having the least number of surveys and Pte. Mouillee having the greatest number of surveys. During summer, the total number of surveys ranged from 21 to 57, with Fish Point having the least number of surveys and Pte. Mouillee having the greatest number of surveys. The percentage of visitors surveyed ranged from 24-42% during spring and 16-37% during summer. Survey teams only approached visitors that parked and exited their vehicle. Teams noted that it is common for people drive through parking lots or down roads on the WMAs but don't actually stop and get out. Teams attempted to count all of these vehicles as total visitors on the area, and felt generally confident that most visitors were accounted for because all survey locations were visited at each area each day. All survey locations were visited because of the small number of visitors encountered during the spring and summer. Overall, the visitor use of WMAs during spring and summer 2018 was very low and teams had difficulty finding visitors. Only one survey date achieved the goal of 20 surveys, and eleven survey dates had less than four surveys during spring and summer. The cold

early spring weather could have contributed to reduced visitation at the WMAs during that period.

Trip and Visitor Characteristics

For the spring surveys, visitors reported spending an average of 2.47 hours at WMAs per trip, ranging from a low of 1.68 hours at Nayanquing Point to a high of 4.91 hours at Harsens Island. Most respondents (80%) were returning visitors that had been to the WMA in the last 12 months. This ranged from a low of 58% at Shiawassee NWR to a high of 95% at Harsens Island. The average number of days visited in the last 12 months for these returning visitors ranged from 26 (Fish Point) to 79 (Harsens Island). The higher number at Harsens Island is likely because a small number of respondents reported coming to the area nearly daily because they lived nearby and walked their dog daily on the WMA. For the summer surveys, visitors reported spending an average of 2.28 hours at WMAs per trip, ranging from a low of 1.14 hours at Fish Point to a high of 3.39 hours at Harsens Island. Most respondents (74%) were returning visitors that had been to the WMA in the last 12 months. This ranged from a low of 60% at Shiawassee NWR to a high of 86% at Shiawassee River SGA. The average number of days visited in the last 12 months for these returning visitors ranged from 14 (Nayanquing Point) to 52 (Shiawassee River SGA).

Survey participants were also asked about how many total outdoor recreation trips they've taken in the last 12 months at least one mile from their home. Spring survey responses ranged from an average of 59.74 (Fish Point) to 95.64 (Harsens Island), and summer survey responses ranged from 56.09 (Harsens Island) to 74.56 (Shiawassee River SGA).

Primary Recreational Activity

Early spring fishing seems to be an important activity with nearly 62% of spring survey participants responding that fishing was their primary activity (Table 3). This was followed by bird watching (12.5%), hiking/walking (9.8%), and wildlife observation (4.0%). Other activities noted by spring respondents included photography, paddling sports, dog training, biking, and mushrooming. The trends in primary activities were quite similar across the state-owned and managed WMAs in the spring, with fishing being the most frequent use across all areas but one (Table 4). Hiking/walking was the most prevalent use at Shiawassee NWR, with only three respondents reporting fishing as their primary activity (bird watching, wildlife observation, and photography were all more prevalent than fishing). Surprisingly, despite the WMAs being known as important spring birding destinations, survey teams encountered few bird watchers.

Although it was not as prominent as it was in the spring, fishing was the most frequent primary activity reported during the summer (45%) (Table 5). This was followed by wildlife observation (14.1%), bird watching (12.4%), and hiking/walking (9.7%). Other activities noted by summer respondents included paddling sports, motorized boating, biking, photography, dog training, auto tour route, a special event, and other. The trends in primary activities were quite similar across the state-owned and managed WMAs in the summer, with fishing being the most frequent use across all areas but two (Table 6). Wildlife observation was more prevalent than fishing at Nayanquing point and bird watching was more prevalent than fishing at Shiawassee NWR. Shiawassee NWR is the only WMA with an auto tour route. Surprisingly there was only one

response that the auto tour was the primary activity, however 20 respondents reported the auto tour route as a secondary activity.

Social Media Use and Emails

Visitors were asked about their social media use. Spring respondents reported using Facebook most (58%), followed by Instagram (20%), Snapchat (17%), and Twitter (12%). Thirty-one percent reported that they did not use social media. Summer respondents showed very similar trends in social media use with Facebook being the most prominent (64%), followed by Instagram (23%), Snapchat (13%), and Twitter (11%). Thirty-one percent of summer respondents reported that they did not use social media. We also asked participants about their use of eBird because we have an interest in using eBird to draw a sample of bird watchers. During spring, of the 28 participants that reported bird watching as their primary activity, 50% of them reported using eBird. During summer, 43% of the 23 participants that reported bird watching as their primary activity also reported using eBird.

Respondents were asked to provide an email address for a potential follow-up survey regarding their recreational use of the WMA. In the spring, the percentage of respondents that provided an email address ranged from 43% (Harsens Island) to 75% (Shiawassee NWR) (Table 1), with a total of 131 participants providing an email address. For summer surveys, the percentage of respondents that provided an email address ranged from 51.92% (Pointe Mouillee) to 69.7% (Shiawassee NWR), with a total of 115 participants providing an email address.

Demographics

Table 7 (spring) and Table 8 (summer) summarize the demographics of survey respondents. The average year of birth for respondents was 1969 for spring surveys and 1968 for summer surveys. Males made up the majority of respondents during spring (85.3%) and summer (75.7%) surveys. 14.7% (spring) and 24.3% (summer) of respondents were female. 48.4% (spring) and 51.1% (summer) respondents reported completing a college degree, technical school degree, graduate degree, or professional school degree; 49.3% (spring) and 47.3% (summer) respondents reported completing a high school degree; and 2.2% (spring) and 1.7% (summer) reported completing elementary or middle school. Participants were asked about their race and ethnicity and most were White for both the spring (82.2%) and summer (84.8%) surveys. Spring survey participants also included 7.6% Black/African American, 2.2% American Indian, 2.2% Multiracial, and 1.8% Hispanic/Latino. 3.6% of spring participants either refused to answer the race and ethnicity question or didn't know. Summer survey participants also included 6.5% Black/African American, 3.3% Multiracial, 1.6% Hispanic/Latino, and 0.5% American Indian. 3.3% of summer participants either refused to answer the race and ethnicity question or didn't know. Participants were also asked if their household income in the last year before taxes and other deductions was above or below \$57,000, the mean for U.S. households in 2016 (Guzman 2017). 53.3% (spring) and 51.4% (summer) reported that their income was >\$57,000, and 41.8% (spring) and 43.2% (summer) reported that it was <\$57,000. 4.9% (spring) and 5.4% (summer) either refused to answer this question or didn't know.

Residence

Visitors were asked if they reside within 50 miles of the WMA to determine if they were a local resident or not. The percentage of spring respondents that lived within 50 miles are as follows: 61% at Shiawassee NWR, 68% at Nayanquing Point, 78% at Harsens Island, 82% at Fish Point, 85% at Pointe Mouillee, and 87% at Shiawassee River SGA. The percentage of summer respondents that lived within 50 miles are as follows: 42% at Shiawassee NWR, 62% at Nayanquing Point, 64% at Harsens Island, 67% at Fish Point, 87% at Pointe Mouillee, and 96% at Shiawassee River SGA. Visitors were also asked for the zip code of their residence. Figures 1-6 display the zip codes of residence for spring and summer survey participants for each WMA.

Open-ended Questions

Participants were asked two open-ended questions about what the MDNR or USFWS could do to improve their visits and what they loved most about the area they were visiting. Responses were grouped into categories and are summarized in tables 9 and 10 (spring) and 11 and 12 (summer). The most frequent categories for improving visits during spring for all areas combined were clean up garbage/provide garbage cans (41 responses), provide more or better access to area (24 responses), improve or install toilets (21 responses), improve or maintain roads (9 responses), improve or increase trails (7 responses), improve signage or provide more information (7 responses), improve or increase parking (7 responses), and provide benches/tables (7 responses). The most frequent categories for improving visits during summer surveys were provide more or better access to the area (40 responses), improve or install toilets (16 responses), clean up garbage/provide garbage cans (13 responses), improve or maintain roads (12 responses), and improve signage or provide more information (8 responses).

Survey participants reported what they loved most about the area they were visiting and responses were similar for both spring and summer survey periods. The most frequent responses for all areas combined (for spring and summer, respectively) were quiet/peaceful/relaxing (86, 66), wildlife/nature/being outdoors (67, 50), hunting/fishing opportunities (47, 37), location/access (25, 34), and bird watching opportunities (18, 16).

Discussion:

Overall, results indicated that there were few visitors to the WMAs during the spring and summer surveys. On only one day was the desired number of surveys met, and on all other survey dates, survey teams had to visit all of the survey locations on a WMA to find visitors.

Fishing was the predominant recreational activity during both the spring and summer and the survey team noted that if it weren't for early spring fishing, it would have been difficult to find any visitors on certain survey dates. Only 12-13% of visitors reported that birdwatching was their primary recreational activity. This was surprising as three of the six WMAs (Pte. Mouillee SGA, Shiawassee NWR, and Nayanquing Point SWA) are recognized as several of the top birding areas in Michigan (White, 2016). The WMAs were similar in the predominant types of recreational activities that visitors reported with the exception of Shiawassee NWR and Nayanquing Point (during summer). After fall surveys are completed, I plan to test for

differences between WMAs. The spring and summer visitor use surveys were informative in the types of recreation occurring at the WMAs and will help identify the key recreational users for future stakeholder surveys. For example, based on the spring and summer survey efforts, anglers would be an important stakeholder group to consider.

When visitors were asked what the MDNR could do to improve their visit to state owned WMAs, several response categories included a desire for amenities that would typically be found in a park or recreation area (e.g., improving or installing toilets, providing tables and benches, and improving access for non-hunting recreation). This suggests that there may be a lack of understanding by visitors of the funding mechanism and management objectives of state game and wildlife areas (i.e., Pittman-Robertson funds from hunters are used to purchase many state game and wildlife areas and are managed primarily to provide wildlife habitat and hunting opportunities).

The spring and summer surveys will provide an interesting contrast to the upcoming fall surveys in the types of recreation occurring. Hunting and trapping activities begin in September and it is expected that use will increase during the fall season.

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Table 1. Summary of Spring 2018 Coastal WMA Visitor Use Surveys.

	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR
# surveys completed (weekday/weekend)	38 (23/15)	37 (17/20)	31 (14/17)	69 (41/28)	15 (7/8)	37 (21/16)
% visitors surveyed	29.46	42.53	24.22	24.29	25.00	28.35
Ave. hours spent at WMA	2.78	4.91	1.68	2.78	2.72	1.94
% returning visitors	65.79	94.59	80.65	88.24	86.67	58.33
Ave. # days visited in the last 12 months	26.33	79.50	39.92	30.55	55.85	30.43
% providing email addresses	68.42	43.24	58.06	54.41	46.67	75.00

Table 2. Summary of Summer 2018 Coastal WMA Visitor Use Surveys.

	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR
# surveys completed (weekday/weekend)	21 (5/16)	23 (8/15)	34 (12/22)	57 (21/36)	24 (5/19)	34 (16/18)
% visitors surveyed	35.0	31.08	28.33	37.01	29.63	16.83
Ave. hours spent at WMA	1.14	3.39	1.79	2.64	2.48	2.21
% returning visitors	66.67	86.36	64.71	80.77	86.96	60.61
Ave. # days visited in the last 12 months	35.21	38.58	14.32	31.21	52.05	16.55
% providing email addresses	66.67	59.09	67.65	51.92	65.22	69.70

Table 3. Primary recreational activities reported by Coastal WMA Visitor Use Survey respondents during spring 2018, across all WMAs.

Primary Activity	# Responses	% of Responses
Fishing	138	61.60%
Bird Watching	28	12.50%
Hiking/Walking	22	9.80%
Wildlife Observation	9	4.00%
Photography	8	3.60%
Other	7	3.10%
Paddling Sports	6	2.70%
Dog Training	4	1.80%
Biking	1	0.40%
Mushrooming	1	0.40%

Table 4. Primary recreational activities reported by Coastal WMA Visitor Use Survey respondents during spring 2018, by individual WMA.

Primary Activity (# responses)	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR
Fishing	29	28	12	55	11	3
Bird Watching	6	1	11	3	0	7
Hiking/Walking	1	4	2	3	0	12
Wildlife Observation	1	0	3	0	0	5
Photography	1	0	0	2	0	5
Other	0	2	0	2	0	3
Paddling Sports	0	1	1	1	4	0
Dog Training	0	1	1	2	0	0
Biking	0	0	0	0	0	1
Mushrooming	0	0	1	0	0	0

Table 5. Primary recreational activities reported by Coastal WMA Visitor Use Survey respondents during summer 2018, across all WMAs.

Primary Activity	# Responses	% of Responses
Fishing	84	45.41%
Wildlife Observation	26	14.05%
Bird Watching	23	12.43%
Hiking/Walking	18	9.73%
Paddling Sports	8	4.32%
Motorized Boating	6	3.24%
Other	6	3.24%
Photography	5	2.70%
Biking	5	2.70%
Dog Training	2	1.08%
Auto Tour Route	1	0.54%
Special Event	1	0.54%

Table 6. Primary recreational activities reported by Coastal WMA Visitor Use Survey respondents during summer 2018, by individual WMA.

Primary Activity (# responses)	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR
Fishing	6	20	9	29	15	5
Bird Watching	3	0	8	2	0	10
Hiking/Walking	2	1	3	6	1	5
Wildlife Observation	4	0	10	2	1	9
Photography	1	0	0	1	1	2
Other	2	0	2	1	1	0
Paddling Sports	0	1	1	5	1	0
Dog Training	1	0	0	0	1	0
Biking	2	0	0	2	0	1
Auto Tour Route	0	0	0	0	0	1
Motorized Boating	0	0	0	4	2	0
Special Event	0	0	1	0	0	0

Table 7. Demographics of Spring 2018 Visitor Use Survey respondents.

	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR	All Areas
Average Year of Birth	1961	1967	1968	1971	1977	1971	1969
% Female	13.16% (5) 86.84%	8.11% (3)	12.9% (4)	14.71% (10)	13.33% (2)	25% (9)	14.67% (33)
% Male	(33)	91.89% (34)	87.1% (27)	85.29% (58)	86.67% (13)	75% (27)	85.33% (192)
% Elementary Grads	2.632%	0.000%	6.452%	0.000%	0.000%	2.778%	2.22%
% High School Grads	68.421%	58.333%	25.806%	54.412%	40.000%	41.667%	49.33%
% College/Technical School Grads	15.890%	33.333%	54.839%	3.235%	53.333%	47.222%	39.11%
% Graduate/Professional School Grads	13.158% 94.737%	8.333%	12.903%	7.353%	6.667%	8.333%	9.33%
% White, non Hispanic	(36)	75.676% (28)	83.871% (26)	75% (51)	86.667% (13)	86.111% (31)	82.22 (185)
% Hispanic/Latino/Spanish	2.632% (1)	0% (0)	0% (0)	4.412% (3)	0% (0)	0% (0)	1.78 (4)
% Black/African American	0% (0)	21.626% (8)	0% (0)	10.294% (7)	0% (0)	5.556% (2)	7.56 (17)
% American Indian	0% (0)	0% (0)	0% (0)	4.412% (3)	13.333% (2)	0% (0)	2.22 (5)
% American/Pacific Islander	2.632% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0.44 (1)
% Multiracial	0% (0)	0% (0)	6.452% (2)	1.471% (1)	0% (0)	5.556% (2)	2.22 (5)
% Didn't Know/Refused to Answer	0% (0)	2.703% (1)	9.677% (3)	4.412% (3)	0% (0)	2.778% (1)	3.56 (8)
% > \$57,000 Household Income	42.105%	56.757%	48.487%	61.765%	46.667%	52.778%	53.33%
% < \$57,000 Household Income	55.263%	40.541%	38.709%	33.824%	53.333%	41.667%	41.78%
% Didn't Know/Refused to Answer	2.632%	2.703%	12.903%	4.412%	0.000%	5.556%	4.89%

Table 8. Demographics of Summer 2018 Visitor Use Survey respondents.

	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR	All Areas
Average Year of Birth	1967	1967	1965	1968	1975	1966	1968
% Female	28.57% (6) 71.43%	31.82% (7)	26.47% (9)	17.31% (9)	17.39% (4)	30.30% (10)	24.32% (45) 75.68%
% Male	(15)	68.18%(15)	73.53% (25)	82.69% (43)	82.61% (19)	69.70% (23)	(140)
% Elementary Grads	0%	0%	0%	2.04%	4.35%	3.03%	1.65%
% High School Grads	66.67%	63.64%	44.12%	51.02%	43.48%	24.24%	47.25%
% College/Technical School Grads	28.57%	36.36%	41.18%	34.69%	43.48%	48.49%	39.01%
% Graduate/Professional School Grads	4.76%	0%	14.70%	12.25%	8.69%	24.24%	12.09%
	95.24%						84.78%
% White, non Hispanic	(20)	54.54% (12)	94.12% (32)	80.39% (41)	95.65% (22)	87.88% (29)	(156)
% Hispanic/Latino/Spanish	0% (0)	0% (0)	0% (0)	1.97% (1)	4.35% (1)	3.03% (1)	1.63% (3)
% Black/African American	0% (0)	31.82% (7)	0% (0)	9.80% (5)	0% (0)	0% (0)	6.52% (12)
% American Indian	0% (0)	0% (0)	2.94% (1)	0% (0)	0% (0)	0% (0)	0.54% (1)
% American/Pacific Islander	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (1)
% Multiracial	0% (0)	13.64% (3)	0% (0)	3.92% (2)	0% (0)	3.03% (1)	3.26% (6)
% Didn't Know/Refused to Answer	4.76% (1)	0% (0)	2.94% (1)	3.92% (2)	0% (0)	6.06% (2)	3.26% (6)
% > \$57,000 Household Income	47.62%	59.09%	52.94%	57.69%	34.78%	48.49%	51.35%
% < \$57,000 Household Income	47.62%	40.91%	38.24%	36.54%	60.87%	45.45%	43.24%
% Didn't Know/Refused to Answer	4.76%	0%	8.82%	5.77%	4.35%	6.06%	5.41%

Table 9. A summary of the categories of responses to the question, “Is there anything that the Michigan DNR or U.S. Fish and Wildlife Service could do to improve your visit to this WMA?” for the Spring 2018 Coastal WMA Visitor Use Survey.

Suggested Improvements	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR	All Areas
Clean up garbage/provide garbage cans	1	14	3	21	2	3	41
Provide more or better access to area	3	4	3	5	3	6	24
Improve or install toilets	3	2	5	7	2	2	21
Improve or maintain roads	-	-	4	3	2	-	9
Improve or increase trails	1	2	-	1	-	3	7
Improve signage or provide more information	1	-	1	-	-	5	7
Improve or increase parking lots	6	-	1	-	-	-	7
Provide benches/tables	2	1	-	3	1	-	7
Improve fishing	1	-	-	3	-	1	5
Increase law enforcement presence	-	-	3	1	-	-	4
Maintain or increase observation towers	1	1	1	-	-	-	3
Reduce cost of fishing licenses	-	2	-	-	-	-	2
Increase pheasants	2	-	-	-	-	-	2
Remove Phragmites	-	2	-	-	-	-	2
More businesses/supplies nearby	-	1	-	-	1	-	2
Improve Field Office services	1	-	-	-	-	-	1
Improve food plots	1	-	-	-	-	-	1
Don't spray Round-Up	-	1	-	-	-	-	1
Provide guided tours	-	-	1	-	-	-	1
Legalize cormorant/swan hunting	-	-	1	-	-	-	1
Decrease insects	-	-	-	1	-	-	1
Provide off-road trails	-	-	-	1	-	-	1
Provide drinking fountains	-	-	-	-	-	1	1
Ban dogs	-	-	-	-	-	1	1
More trees	-	-	-	1	-	-	1
Change deer hunting licenses	-	1	-	-	-	-	1

Table 10. A summary of the categories of responses to the question, “What is one thing that you love about this WMA?” for the Spring 2018 Coastal WMA Visitor Use Survey.

What Respondents Love	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR	All Areas
Quiet/Peaceful/Relaxing	7	18	8	28	7	18	86
Wildlife/Nature/Being Outdoors	14	8	9	18	4	14	67
Hunting/Fishing Opportunities	12	9	3	18	5	-	47
Location/Access	8	4	3	4	2	4	25
Bird Watching Opportunities	6	-	8	1	-	3	18
Family Ties/Historic Meaning	-	1	-	4	1	-	6
Boating Opportunities	-	1	-	4	-	-	5
Hiking Opportunities	-	-	-	-	-	2	2
DNR Presence	-	2	-	-	-	-	2
Photography Opportunities	-	-	-	-	-	2	2
Well-Maintained	-	-	-	1	-	1	2
Special Events	-	-	-	1	-	-	1

Table 11. A summary of the categories of responses to the question, “Is there anything that the Michigan DNR or U.S. Fish and Wildlife Service could do to improve your visit to this WMA?” for the Summer 2018 Coastal WMA Visitor Use Survey.

Suggested Improvements	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR	All Areas
Provide more or better access to area	1	12	4	6	10	7	40
Improve or install toilets	1	3	-	6	3	3	16
Clean up garbage/provide garbage cans	-	-	-	7	4	2	13
Improve or maintain roads	-	-	3	7	2	-	12
Improve signage or provide more information	1	-	-	2	1	4	8
Provide benches/tables	1	-	1	1	-	1	4
Reduce cost of fishing licenses/More Options	-	-	-	3	1	-	4
Improve fishing	-	1	-	1	-	-	2
Improve or increase parking lots	-	2	-	-	-	-	2
Improve or increase trails	-	-	2	-	-	-	2
Maintain or increase observation towers	-	-	2	-	-	-	2
Improve or increase crops	-	-	-	1	-	-	1
More businesses/supplies nearby	-	1	-	-	-	-	1
Decrease cost of car ferry	-	1	-	-	-	-	1
Clean up contamination in river	-	-	-	-	-	1	1

Table 12. A summary of the categories of responses to the question, “What is one thing that you love about this WMA?” for the Summer 2018 Coastal WMA Visitor Use Survey.

What Respondents Love	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee River	Shiawassee NWR	All Areas
Quiet/Peaceful/Relaxing	10	11	11	17	8	9	66
Wildlife/Nature/Outdoors	2	7	9	11	3	18	50
Hunting/Fishing Opportunities	3	6	7	9	11	1	37
Location/Access	4	2	3	12	5	8	34
Bird Watching Opportunities	-	-	9	6	-	1	16
Family Ties/Historic Meaning	2	-	1	-	3	-	6
Boating Opportunities	-	1	-	1	-	-	2
Photography Opportunities	-	-	1	-	-	-	1
Well-Maintained	-	-	-	-	-	1	1

Figure 1.

Visitor use survey respondents' zip codes of residence for 2018 Spring and Summer surveys conducted at Pte. Mouillee State Game Area

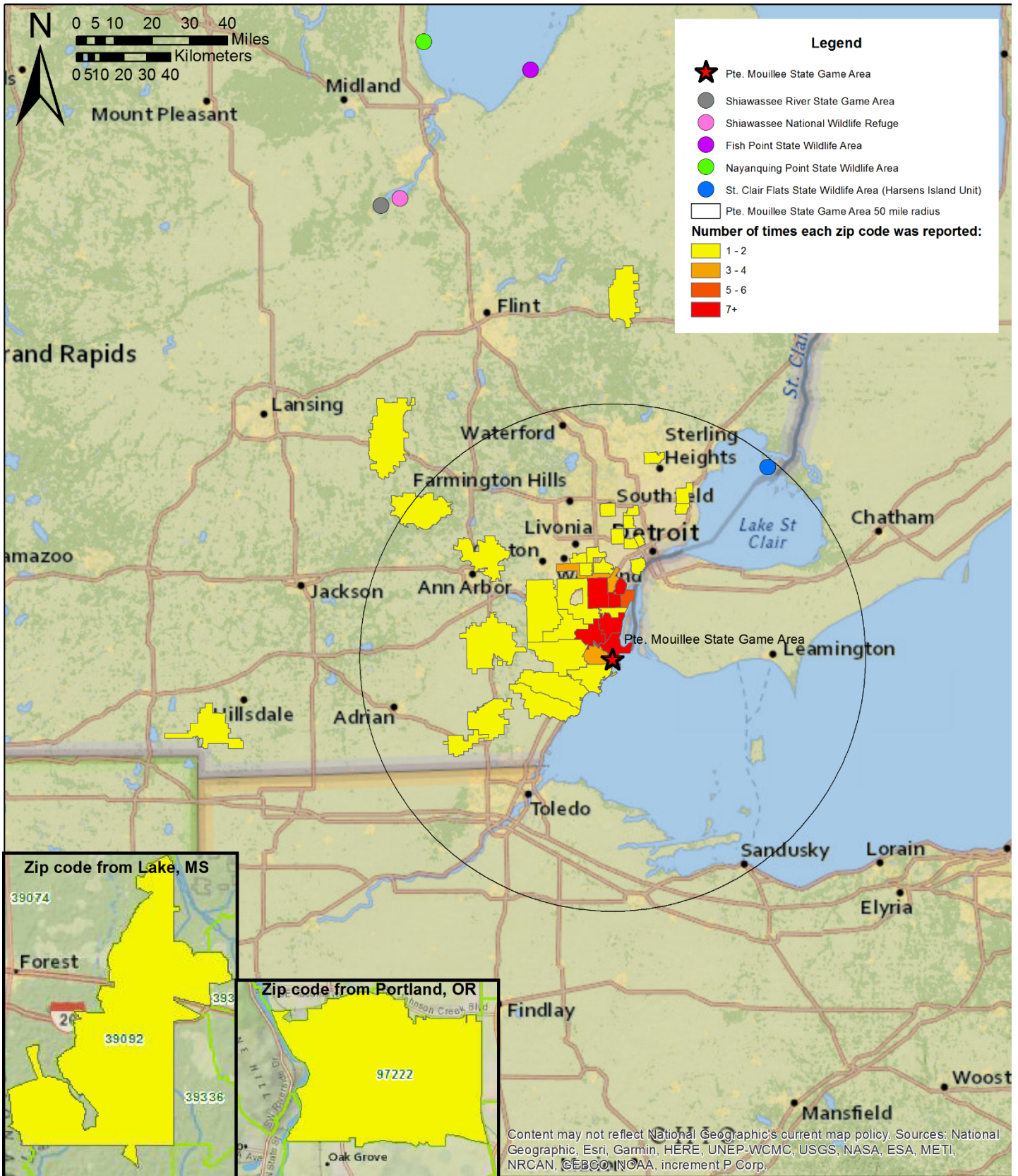


Figure 3.

Visitor use survey respondents' zip codes of residence for 2018 Spring and Summer surveys conducted at Nayanquing Point State Wildlife Area

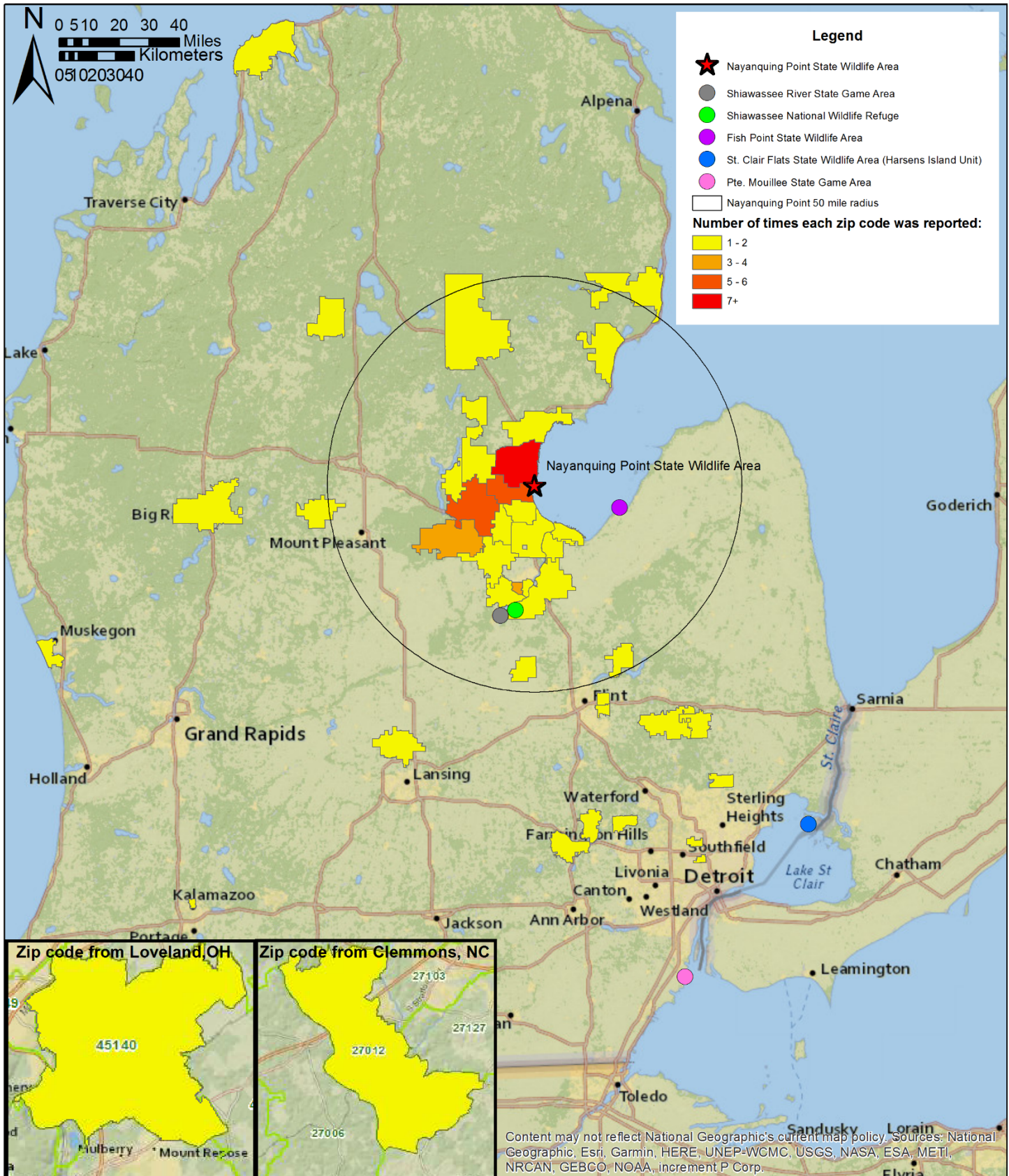


Figure 4.

Visitor use survey respondents' zip codes of residence for 2018 Spring and Summer surveys conducted at Fish Point State Wildlife Area

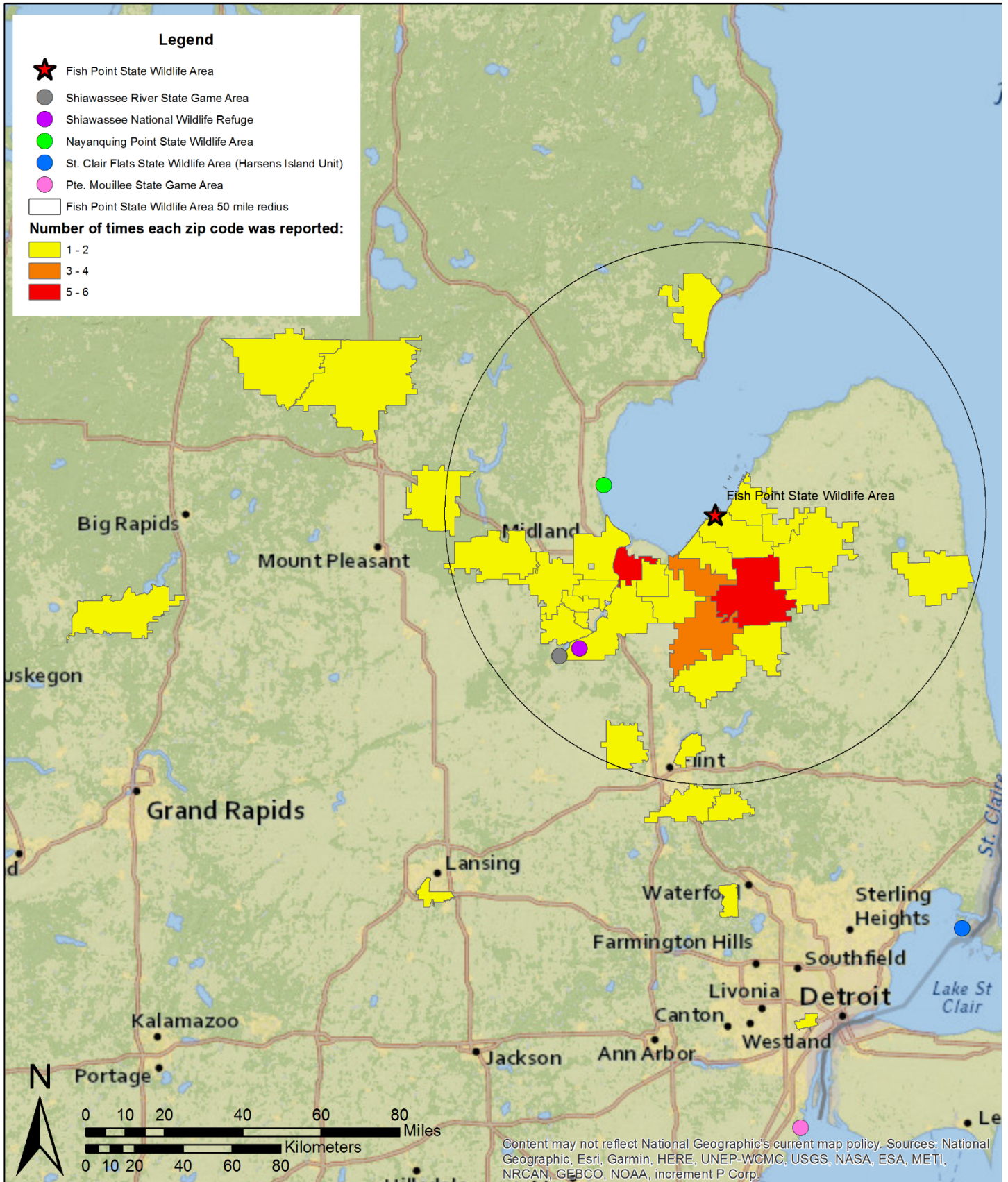


Figure 5.

Visitor use survey respondents' zip codes of residence for 2018 Spring and Summer surveys conducted at Shiawassee River State Game Area

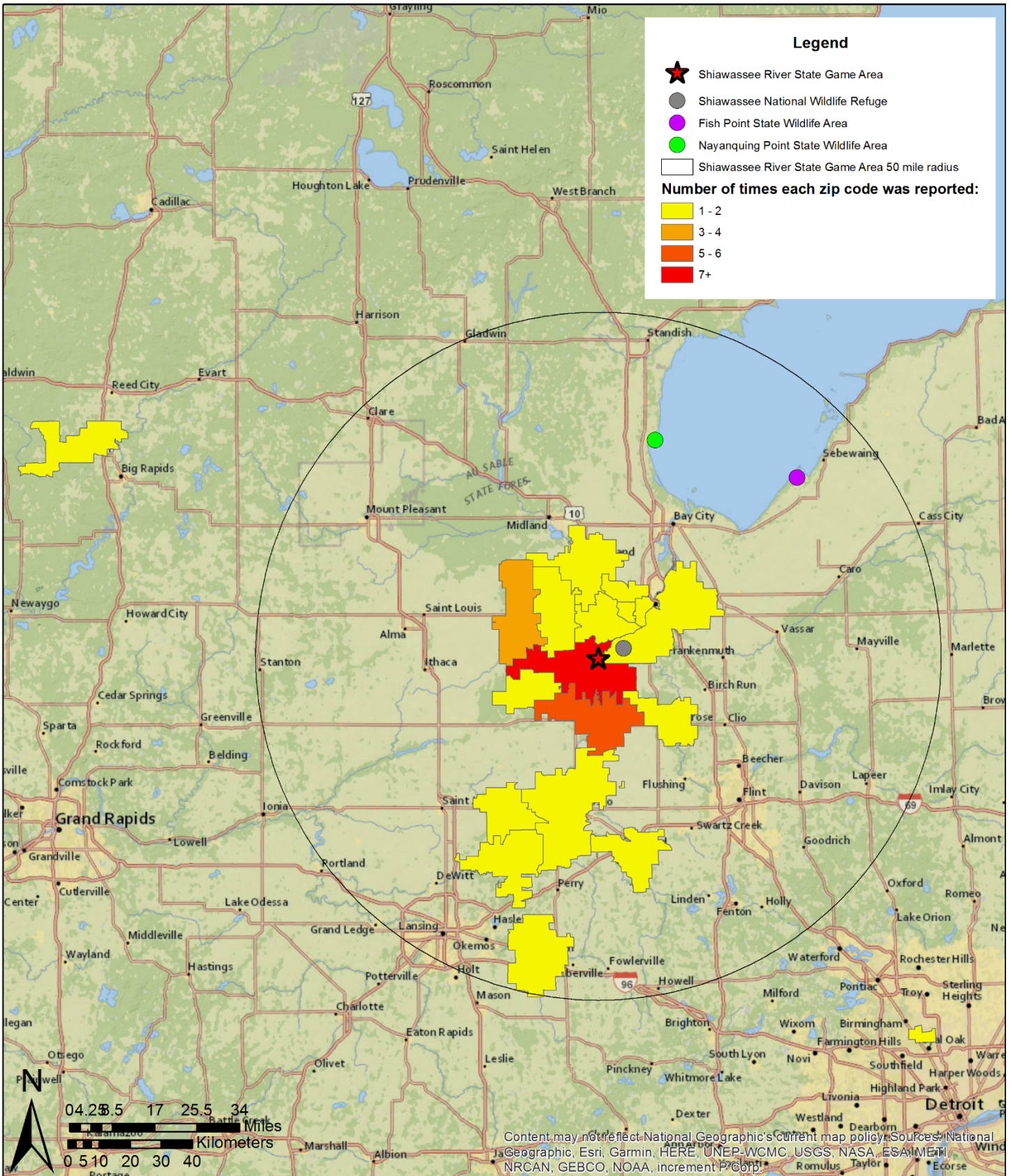
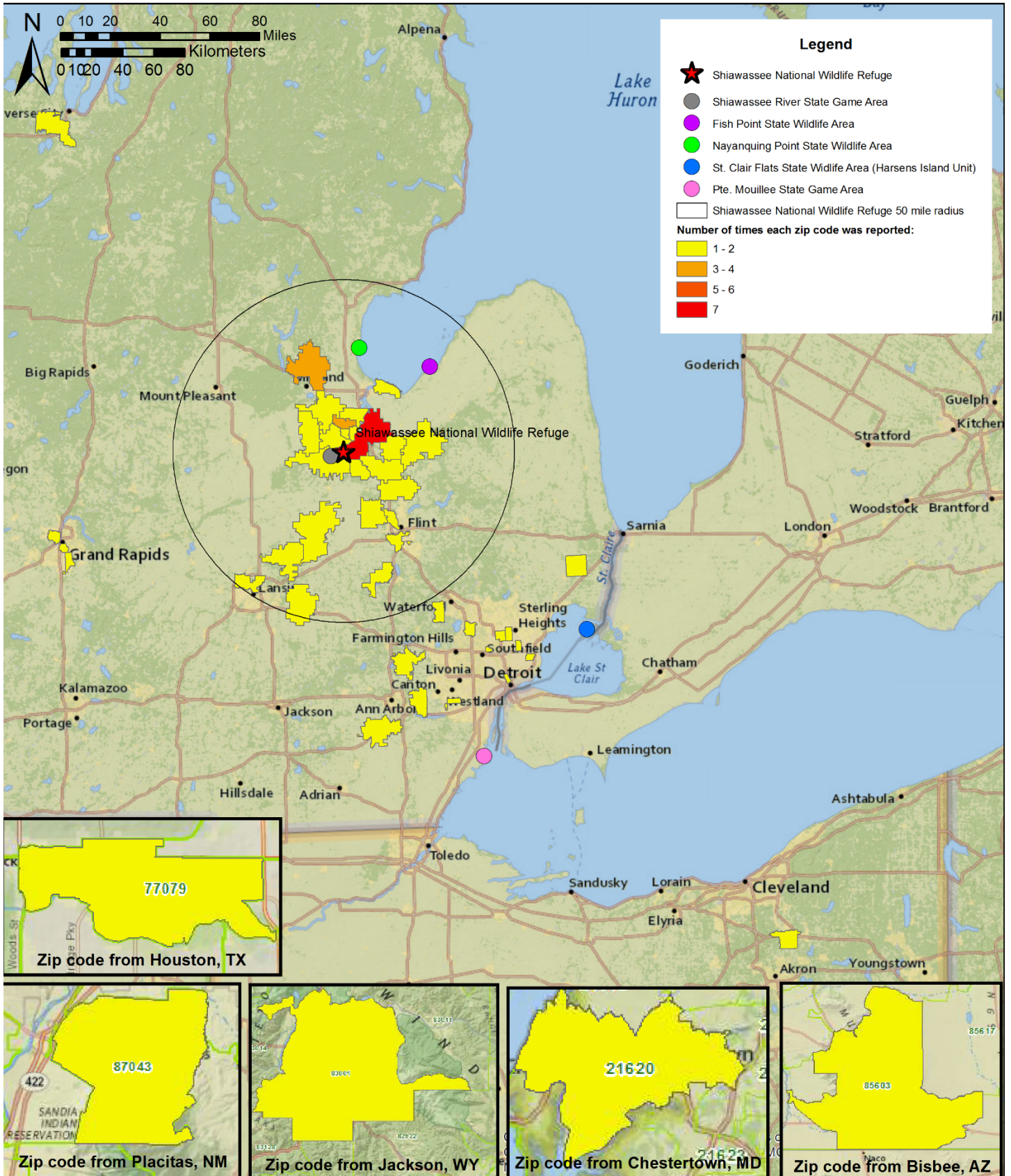


Figure 6.

Visitor use survey respondents' zip codes of residence for 2018 Spring and Summer surveys conducted at Shiawassee National Wildlife Refuge



Appendix C (next page)

Coastal Wildlife Management Area Visitor Use Surveys

Fall 2018 Preliminary Results

(A Preliminary Report of Phase I of Project: A Stakeholder-Engaged Framework for Great Lakes Coastal Wildlife Management Areas for Waterfowl Hunting, Bird Watching, and Community Development)



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Visitor Use Survey Objectives:

Phase I of the research project titled “A Stakeholder-Engaged Framework for Great Lakes Coastal Wildlife Management Areas for Waterfowl Hunting, Bird Watching, and Community Development” included preliminary on-site recreational use surveys. These surveys were conducted during spring, summer, and fall 2018 at six coastal wildlife management areas (WMAs) to explore the relative amount and type of recreation occurring at each site. This preliminary step is important to identify key recreational users of the WMAs and to inform survey questionnaires that will be developed for each of the five stakeholder groups (waterfowl hunters, bird watchers, other key recreational users, local community leaders, and local community residents) during Phase II of the research. The objectives of the preliminary visitor surveys are to:

- Determine the scope of recreation occurring on WMAs
- Understand and characterize visits and visitors of WMAs during spring, summer, and fall
- Determine economic impacts of visitor uses of WMAs

Methods Review:

Surveys took place at six state and federally owned and managed aquatic-based coastal wetland sites from Lake Huron’s Saginaw Bay to western Lake Erie. Michigan Department of Natural Resources (MDNR) lands include five managed waterfowl hunting areas: Nyanquing Point State Wildlife Area (SWA), Fish Point SWA, Shiawassee River State Game Area (SGA), St. Clair Flats SWA-Harsens Island Unit, and Pointe Mouillee SGA. U.S. Fish and Wildlife Service (USFWS) lands will include the Shiawassee National Wildlife Refuge.

The visitor use survey design and methodology was largely based on the USGS National Wildlife Refuge Visitor Survey (Sexton et al. 2012). WMA managers were interviewed to identify potential survey periods in each of three seasons (spring, summer, and fall) that best represented the visitation patterns and diversity of use on the WMA. These manager-selected time frames were used to develop a calendar of sampling periods for each WMA. A stratified design with strata by season (spring, summer, fall), WMA, and day of week (weekend day or weekday) was used for improved precision, benefits to scheduling survey teams, and estimates that can be calculated by strata. Seven weeks per season were selected based on the input from WMA managers. The seven-week sampling period per season allows for each WMA to be surveyed two weekdays and two weekend days per period. Surveys conducted on weekdays alternate by sampling week between Monday/Wednesday and Tuesday/Thursday to improve representativeness and for ease of scheduling survey teams. Simple random sampling was used to select the days (two weekdays and two weekend days) each WMA is surveyed within the WMA manager selected time frames. Survey back up dates were scheduled as close to the randomly selected survey date as possible to replace selected survey dates in cases of inclement weather or other unforeseen events that prohibit the visitor use survey from taking place. Visitors were intercepted by a survey team as they left the WMA, and surveys were administered using tablets equipped with Qualtrics survey software. One member of the survey team was responsible for tallying the total number of visitors leaving the sampling site. On the selected days, surveys were conducted in two sampling shifts 3 hours long; one in the morning (8:00-

11:00) and the other in the afternoon (1:00-4:00). Survey teams attempted to conduct 20 surveys per area per day sampled (10 in the morning shift and 10 in the afternoon shift), for a total of 80 surveys per season per area. All seasons combined, this would provide a total of 240 surveys per WMA.

In addition to sampling periods, WMA managers were also asked to identify all potential locations for surveys. Simple random sampling was used to select locations for visitor use surveys on each selected day. Because of low visitation rates, all survey locations at each area were used for sampling. A small token of appreciation for completing the survey was offered at the conclusion of the survey.

The survey instrument is a brief questionnaire of approximately 20 questions asking about the participant's visit to the WMA, trip expenditures, demographics, and the potential for future visits. Questions were pre-tested by three MSU graduate students and seven MDNR Wildlife Division professionals for validity. The visitor use survey was approved by MSU IRB (STUDY00000435) prior to conducting surveys.

This preliminary report includes summary statistics for fall 2018 surveys including participation, trip and visitor characteristics, primary recreational activities, social media use and provision of emails, residence, and demographics. A summary of two open-ended questions is also included. A separate preliminary report for spring and summer 2018 surveys was submitted to the MDNR on September 24, 2018. A final report including statistical analysis and comparisons of all WMAs and seasons will be made available at a later date. The trip expenditure data from the surveys will be used for an economic impact analysis and will be included in a future report.

Preliminary Results:

Survey Participation

Fall surveys began September 4, 2018 and ran through November 24, 2018. A total of 283 surveys were conducted at all six WMAs, with 112 weekday surveys and 171 weekend surveys (Table 1). The total number of surveys differed by area during the fall and ranged from 22 to 69, with Shiawassee National Wildlife Refuge (NWR) having the least number of surveys and Harsens Island having the greatest number of surveys. The percentage of visitors surveyed ranged from 16-32% during the fall. Survey teams only approached visitors that parked and exited their vehicle. Teams noted that it is common for people to drive through parking lots or down roads on the WMAs but don't actually stop and get out. Teams attempted to count all of these vehicles as total visitors on the area and felt generally confident that most visitors were accounted for because all survey locations were visited at each area each day. We continued to survey all locations in the fall because of the small numbers of visitors encountered during the spring and summer surveys. On several occasions, there were numerous waterfowl hunters at a survey location at the same time (e.g., at the check station during a waterfowl hunt drawing or at a boat launch at the end of a waterfowl hunt period). In these situations, the survey team was only able to survey a small number of hunters but attempted to count all hunters that were leaving the area. Overall, the visitor use of WMAs during fall 2018 was very low prior to the opening day of the regular duck hunting season (October 14) and use picked up after the duck

hunting season opened. We found visitor use at Shiawassee NWR to be quite low throughout the fall despite the refuge providing managed duck hunts for the first time. Only five survey dates achieved the goal of 20 surveys, and 13 survey dates had less than 10 surveys during fall.

Trip and Visitor Characteristics

For the fall surveys, visitors reported spending an average of 4.1 hours at WMAs per trip, ranging from a low of 2.84 hours at Shiawassee NWR and a high of 4.8 hours at Harsens Island (Table 1). Most respondents (87%) were returning visitors that had been to the WMA in the last 12 months. This ranged from a low of 81% at Fish Point and a high of 97% at Harsens Island. The average number of days visited in the last 12 months for these returning visitors ranged from 8.4 at Shiawassee NWR to 42.5 at Harsens Island (Table 1).

Survey participants were also asked about how many total outdoor recreation trips they've taken in the last 12 months at least one mile from their home. The average number of trips was 66.6 across all areas and responses ranged from an average of 46.5 (Shiawassee NWR) to 91.1 (Harsens Island).

Primary Recreational Activity

In the fall, waterfowl hunting is an important activity with nearly 73% of fall survey participants responding that waterfowl hunting was their primary activity (Table 2). This was followed by fishing (5%), hiking/walking (4.3%), big game hunting (3.6%), and wildlife observation (3.2%). Other activities noted by fall respondents included small game hunting, trapping, dog training, bird watching, biking, auto tour route/driving, paddling sports, and other. The trends in primary activities were similar across the state-owned and managed WMAs in the fall, with waterfowl hunting being the most frequent use across all areas except for Shiawassee NWR (Table 3). Hiking/walking was the most prevalent use at Shiawassee NWR, with only 3 respondents reporting waterfowl hunting as their primary activity. Nayanquing Point had more visitors reporting small game hunting (6) and wildlife observation (6) as primary activities than the other WMAs. Harsens Island had more visitors reporting fishing (7) than the other WMAs.

Social Media Use and Emails

Visitors were asked about their social media use. Fall respondents reported using Facebook most (64%), followed by Instagram (25%), Snapchat (13%), and Twitter (10%). Thirty-three percent reported that they did not use social media. We also asked participants about their use of eBird because we have an interest in using eBird to draw a sample of bird watchers. During fall, of the 7 participants that reported bird watching as their primary activity, 4 of them reported using eBird (57%).

Respondents were asked to provide an email address for a potential follow-up survey regarding their recreational use of the WMA. Fifty-seven percent of the fall survey respondents provided an email address, ranging from a low of 48% at Nayanquing Point to a high of 72% at Pointe Mouillee (Table 1), with a total of 161 respondents providing an email address.

Demographics

Table 4 summarizes the demographics of survey respondents. The average year of birth for respondents was 1973. Males made up the majority of respondents during the fall surveys (95%). Fifty-two percent of respondents reported completing a college degree, technical school degree, graduate degree, or professional school degree; 47% of respondents reported completing a high school degree; and 1% respondents reported completing elementary or middle school. Participants were asked about their race and ethnicity and most (254 participants) were White for the fall surveys (90.4%), followed by 2.1% Black/African American (6 participants), 1.4% Hispanic/Latino/Spanish (4 participants), 1.1% Multiracial (3 participants), 0.7% American/Pacific Islander (2 participants), and 0.4% American Indian (1 participant). A few participants (3.9%) either refused to answer the race and ethnicity question or didn't know their race or ethnicity. Participants were also asked if their household income in the last year before taxes and other deductions was above or below \$57,000, the mean for U.S. households in 2016 (Guzman 2017). Most (73.9%) respondents reported their household income was greater than \$57,000 and 24.7% reported it was less than \$57,000. Another 1.4% either refused to answer this question or did not know.

Residence

Visitors were asked if they reside within 50 miles of the WMA to determine if they were a local resident or not. Based on this question, the percentage of fall respondents that said they lived within 50 miles of the WMA where they were surveyed are as follows: 40% at Fish Point, 62% at Nayanquing Point, 73% at Shiawassee NWR, 77% at Shiawassee River SGA, 81% at Pointe Mouillee, and 83% at Harsens Island. Visitors were also asked for their zip code of their residence so future analyses will determine local residency based on zip code data. Figures 1-6 display the zip codes of residence for fall survey participants for each WMA.

Open-ended Questions

Participants were asked two open-ended questions about what the MDNR or USFWS could do to improve their visits and what they loved most about the area they were visiting. Responses were grouped into categories and are summarized in Tables 5 and 6. The most frequent categories for improving visits during fall for all areas combined with the number of responses in parentheses were clean up garbage/provide garbage cans (9), improve signage (9), improve or increase crops/cover (9), improve or maintain roads/parking (9), more enforcement of area (8), improve or maintain trails (8), and provide more or better access (8).

Some participants also reported what they loved most about the area they were visiting. The most frequent responses for all areas combined with the number of responses in parentheses were birds/wildlife/nature (81), recreation/hunting/fishing (74), easy access/close proximity/convenience (65), and peace/quiet/calm/beautiful (35).

Discussion:

Overall, results indicated that there were few visitors to the WMAs during the fall surveys prior to the opening day of the regular duck hunting season (October 14). Visitor use appeared to increase after that except for the Shiawassee NWR. There were only five survey dates that achieved the goal of 20 surveys during the fall and on all other survey dates, survey teams visited all of the survey locations on a WMA to find visitors. However, on several occasions at the state WMAs, there were too many waterfowl hunters exiting the area at the same time for survey teams to meet the minimum number of surveys. This happened both at the check stations after a waterfowl hunt drawing completed and at boat launches at the end of a waterfowl hunt period. In these situations, the survey team was only able to survey a small number of hunters but attempted to count all hunters that were leaving the area.

Waterfowl hunting was the predominant recreational activity during the fall and the survey team noted that if it weren't for waterfowl hunting in the fall, it would have been difficult to find visitors on certain survey dates as there were very few visitors doing anything else. The WMAs were similar in the predominant types of recreational activities that visitors reported with the exception of Shiawassee NWR where the primary activity most frequently reported was hiking/walking. This was surprising because 2018 was the first year that the refuge allowed duck hunting and survey teams expected to find more waterfowl hunters. The spring, summer, and fall visitor use surveys were informative in the types of recreation occurring at the WMAs and have informed key stakeholder groups for stakeholder surveys being conducted in Phase II of the research project.

When visitors were asked what the MDNR could do to improve their visit to state owned WMAs, several response categories included actions that may be easy for WMA managers to implement such as cleaning up garbage and improving signage. Maintaining roads, parking lots, and trails may be more difficult for managers to address, and some items identified such as improving and increasing crops, increasing enforcement, and increasing access are even more difficult for managers to address.

The next steps for the visitor use survey data include statistical analyses and comparisons of all WMAs and seasons. These results will be made available in a future MDNR report. The trip expenditure data from the surveys is being used for an economic impact analysis that will also be a future MDNR report.

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<https://www.audubon.org/news/birding-michigan>

Table 1. Summary of Fall 2018 Coastal WMA Visitor Use Surveys.

	Fish Pt.	Harsens Island	Nayanquing Pt.	Pte. Mouillee	Shiawassee NWR	Shiawassee River
# surveys completed (weekday/weekend)	67 (16/51)	69 (27/42)	50 (29/21)	36 (22/14)	22 (5/17)	39 (13/26)
% visitors surveyed	67	69	50	36	22	39
Ave. hours spent at WMA	4.57	4.8	3.07	3.64	2.84	4.59
% returning visitors	80.60	97.10	82	88.89	81.82	87.18
Ave. # days visited in the last 12 months	18.61	42.48	28.98	28.09	8.44	39.26
% providing email addresses	56.72	57.97	48	72.22	63.64	48.72

Table 2. Primary recreational activities reported by Coastal WMA Visitor Use Survey respondents during fall 2018, across all WMAs.

Primary Activity	# Responses	% of Responses
Waterfowl hunting	203	73.02%
Fishing	14	5.04%
Hiking/walking	12	4.32%
Big game hunting	10	3.6%
Wildlife observation	9	3.24%
Other	9	3.24%
Bird watching	7	2.52%
Small game hunting	7	2.52%
Auto tour route/driving	2	0.72%
Biking	1	0.36%
Trapping	1	0.36%
Motorized boating	1	0.36%
Paddling sports	1	0.36%
Dog training	1	0.36%

Table 3. Primary recreational activities reported by Coastal WMA Visitor Use Survey respondents during fall 2018, by individual WMA

Primary Activity (# responses)	Fish Point	Harsens Island	Nayanquing Point	Pointe Mouillee	Shiawassee NWR	Shiawassee River
Waterfowl hunting	57	59	29	22	3	33
Fishing	1	7	1	3	1	1
Hiking/walking	2	0	1	2	7	0
Big game hunting	1	1	1	3	2	2
Wildlife observation	1	0	6	1	1	0
Other	2	0	1	3	0	3
Bird watching	0	0	3	0	4	0
Small game hunting	1	0	6	0	0	0
Auto tour route/driving	0	0	0	0	2	0
Biking	0	0	0	0	1	0
Trapping	0	0	0	0	1	0
Motorized boating	0	0	1	0	0	0
Paddling sports	0	1	0	0	0	0
Dog training	0	0	0	1	0	0

Table 4. Demographics of Fall 2018 Visitor Use Survey respondents .

	Fish Point	Harsens Island	Nayanquing Point	Pointe Mouillee	Shiawassee NWR	Shiawassee River	ALL AREAS:
Average Year of Birth	1972	1974	1975	1978	1966	1972	1973
% Female	2.99% (2)	2.90% (2)	8% (4)	2.78% (1)	22.73% (5)	0% (0)	4.95% (14)
% Male	97.01% (65)	97.10% (67)	92% (46)	97.22% (35)	77.27% (17)	100% (39)	95.05% (269)
% Elementary Grads	4.55% (3)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1.06% (3)
% High School Grads	46.97% (31)	47.83% (33)	48% (24)	47.22% (17)	40.91% (9)	46.15% (18)	46.81% (132)
% College/Technical School Grads	40.91% (27)	46.38% (32)	46% (23)	52.78% (19)	50% (11)	46.15% (18)	46.10% (130)
% Graduate/Professional School Grads	7.58% (5)	5.80% (4)	6% (3)	0% (0)	9.10% (2)	7.69% (3)	6.03% (17)
% White, non Hispanic	91.04% (61)	84.06% (58)	94% (47)	85.71% (30)	90.48% (19)	100% (39)	90.39% (254)
% Hispanic/Latino/Spanish	2.99% (2)	0% (0)	2% (1)	2.86% (1)	0% (0)	0% (0)	1.42% (4)
% Black/African American	0% (0)	8.70% (6)	0% (0)	0% (0)	0% (0)	0% (0)	2.14% (6)
% American Indian	0% (0)	0% (0)	0% (0)	2.86% (1)	0% (0)	0% (0)	0.36% (1)
% American/Pacific Islander	1.49% (1)	0% (0)	0% (0)	2.86% (1)	0% (0)	0% (0)	0.71% (2)
% Multiracial	1.49% (1)	2.90% (2)	0% (0)	0% (0)	0% (0)	0% (0)	1.07% (3)
% Didn't Know/Refused to answer	2.99% (2)	4.35% (3)	4% (2)	5.71% (2)	9.52% (2)	0% (0)	3.91% (11)
% > \$57,000 Household Income	64.18% (43)	81.16% (56)	78% (39)	72.22% (26)	54.55% (12)	84.62% (33)	73.85% (209)
% < \$57,000 Household Income	34.33% (23)	18.84% (13)	22% (11)	25% (9)	36.36% (8)	15.38% (6)	24.73% (70)
% Didn't Know/Refused to answer	1.49% (1)	0% (0)	0% (0)	2.78% (1)	9.09% (2)	0% (0)	1.41% (4)

Table 5. A summary of the categories of responses to the question, "Is there anything that the Michigan DNR or U.S. Fish and Wildlife Service could do to improve your visit to this WMA?" for the Fall 2018 Coastal WMA Visitor Use Survey.

Suggested Improvements	Fish Point	Harsens Island	Nayanquing Point	Pointe Mouillee	Shiawassee NWR	Shiawassee River	ALL AREAS:
Clean up garbage/provide garbage cans	1	2	1	4	1	-	9
Improve or maintain roads/parking	1	-	1	5	1	1	9
Improve or increase crops/cover	2	3	1	1	1	1	9
Improve signage	3		2	1	1	2	9
Provide more or better access	1	1	1	3		2	8
Improve or maintain trails	-	-	3	-	4	1	8
More enforcement of area	-	3	4	-	-	1	8
Fix or maintain dikes/ditches	1	3	1	1	-	1	7
Improve or maintain restrooms	-	4	-	1	1	-	6
Longer hunting season/more birds	3	1	-	2	-		6
Improve or maintain boat launches	1	1	-	2	-	2	6
Remove weeds/phragmites/invasives	1	3	-	1	-	-	5
Funding/fees/free entrance	-	3	1	1	-	-	5
Hunter education/hunter mentoring	-	2	-	1	-	1	4
Change draws	1	3	-	-	-		4
Lower ferry prices	-	3	-	-	-	-	3
Water levels (more water)	2	-		1	-	-	3
More land	1	-	2	-	-	-	3
Improve corn strips	2	1					3
Flood earlier	1	1	1				3
Better/more staff	-	1	1	-	-		2
Improve/add campgrounds	1	-	-	-	-	1	2
Water levels (less water)	1						1
Less hunting	-	-	-	-	1		1
More shoreline fishing spots	-	-	1		-	-	1
Harvest reports	-	-	1	-	-	-	1
Water testing reports	-	-	-	1	-	-	1
More nature center hours	-	-	-	-	1	-	1
Add shore bird habitat	-	-	-	-	1	-	1
Improve or maintain blinds	1						1
Allow pets					1		1
Stock fish						1	1
Ban chainsaw winches						1	1
Implement antler point restrictions						1	1

Table 6. A summary of the categories of responses to the question, "What is one thing that you love about this WMA?" for the Fall 2018 Coastal WMA Visitor Use Survey.

What Respondents Love	Fish Point	Harsens Island	Nayanquing Point	Pointe Mouillee	Shiawassee NWR	Shiawassee River	ALL AREAS:
Birds, Wildlife, Nature	20	21	17	5	10	8	81
Recreation--Hunting, Fishing	21	17	10	10	2	14	74
Easy Access, Close Proximity, Convenience etc.	14	10	13	14	3	11	65
Peace, Quiet, Calm, Beautiful	7	12	7	5	4	-	35
Staff	4	1	4	2	-	-	11
Heritage/Tradition	4	4	1	-	-	1	10
Not crowded	-	1	1	-	2	4	8
Diversity of recreation	-	1	-	2	2	-	5

Figure 1.

Visitor use survey respondents' zip codes of residence for 2018 Fall surveys conducted at Pte. Mouillee State Game Area

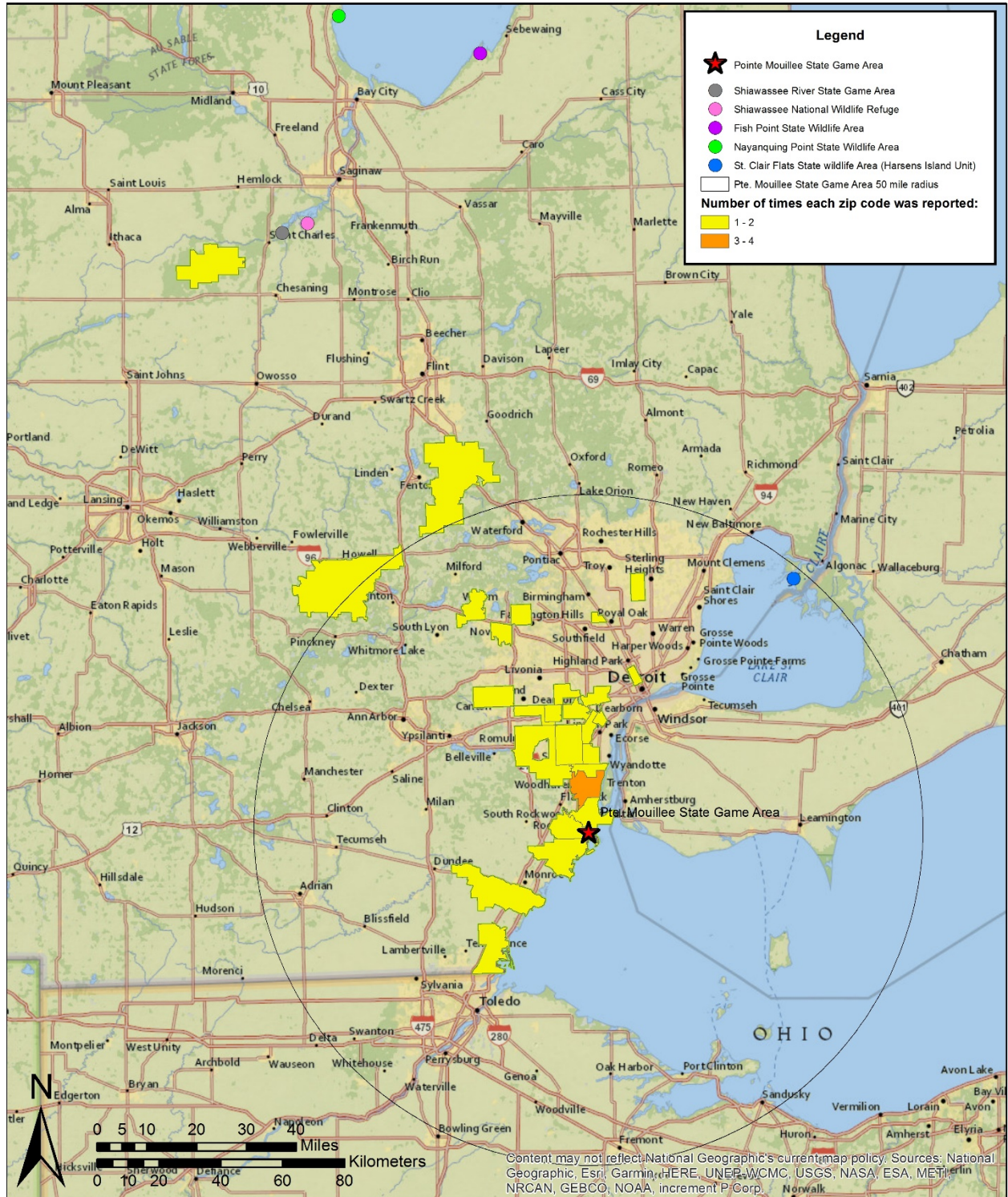


Figure 2.
 Visitor use survey respondents' zip codes of residence for 2018 Fall surveys conducted at St. Clair Flats State Wildlife Area (Harsens Island Unit)

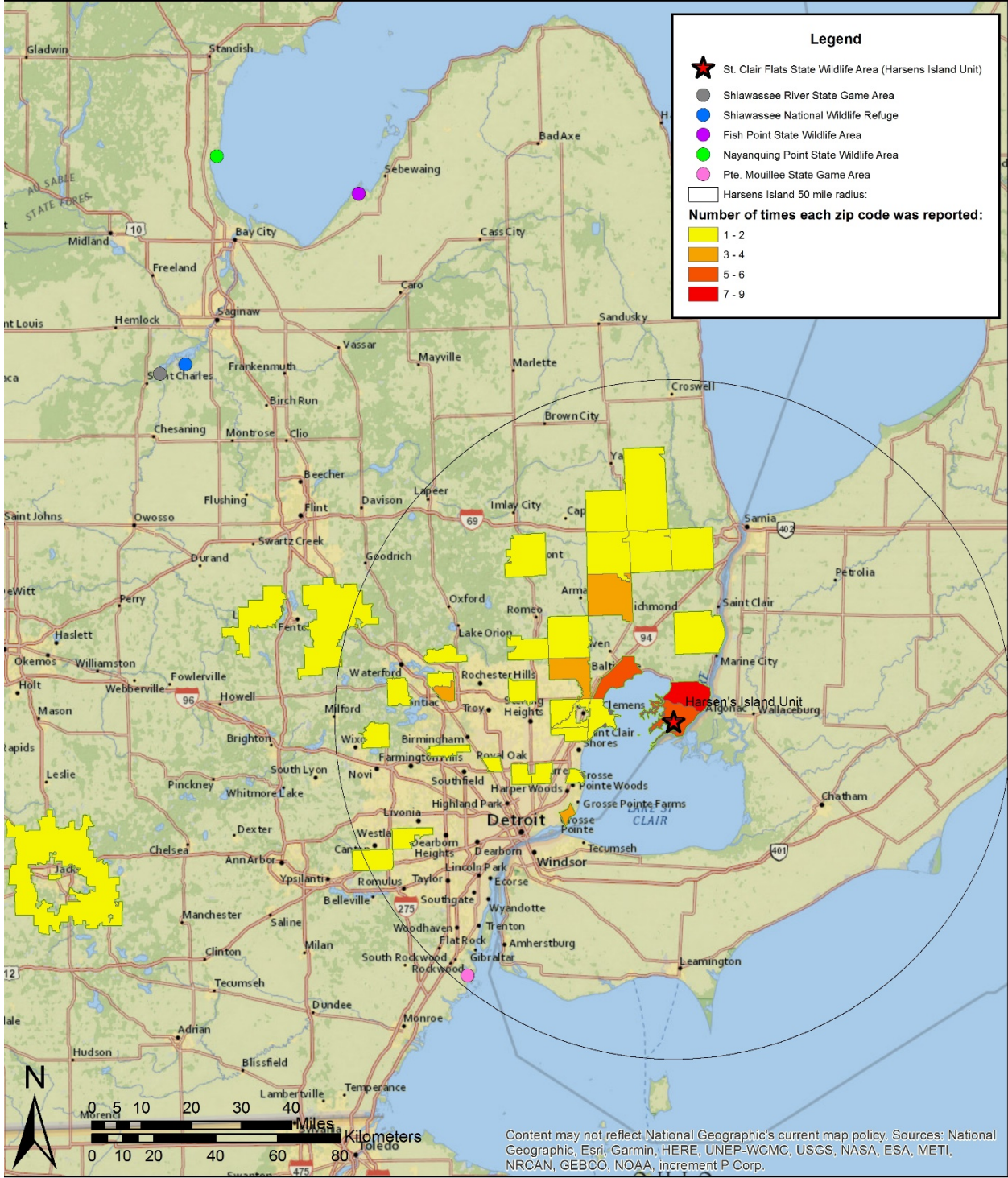


Figure 3.

Visitor use survey respondents' zip codes of residence for 2018 Fall surveys conducted at Nayanquing Point State Wildlife Area

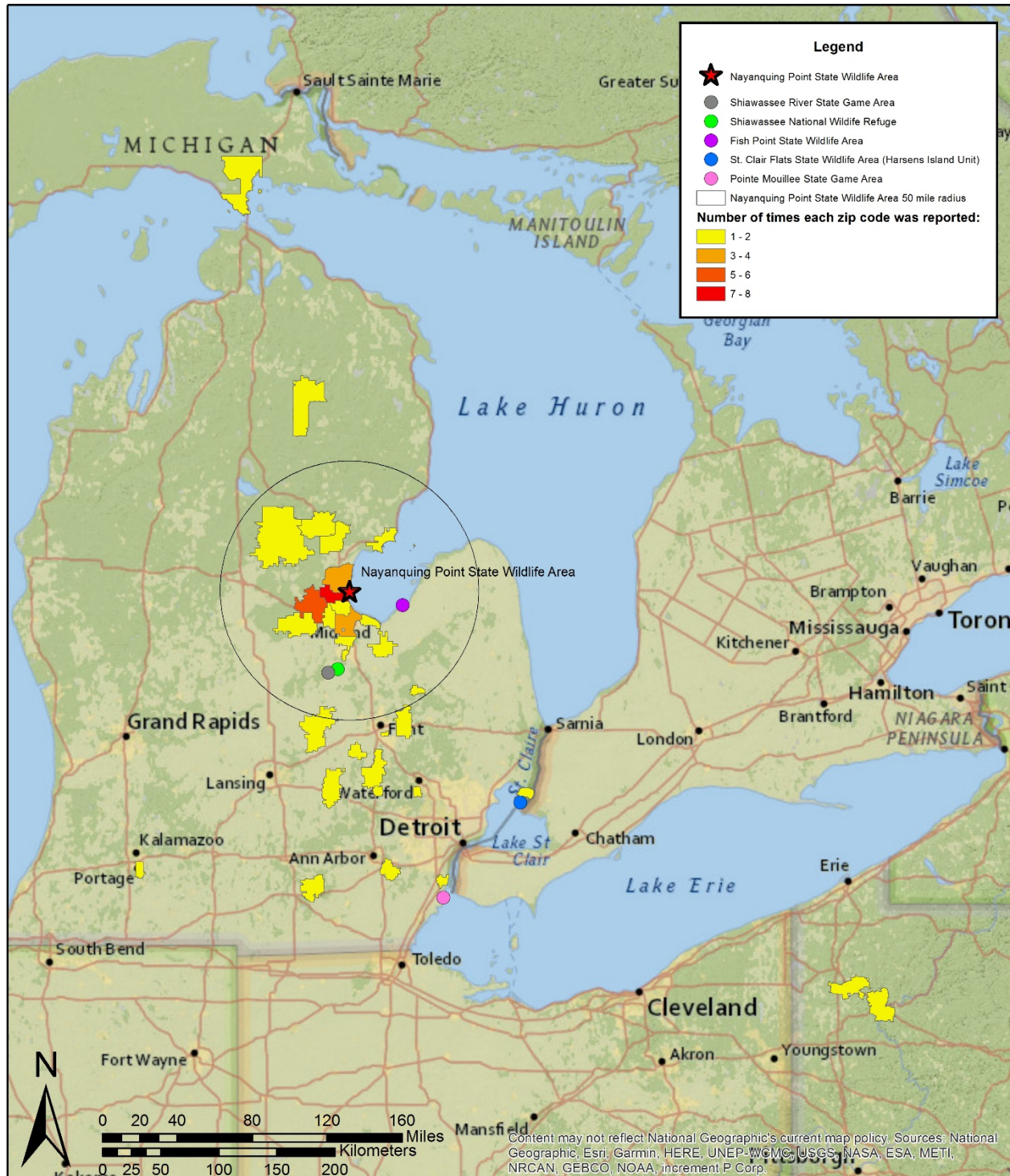


Figure 4.

Visitor use survey respondents' zip codes of residence for 2018 Fall surveys conducted at Fish Point State Wildlife Area

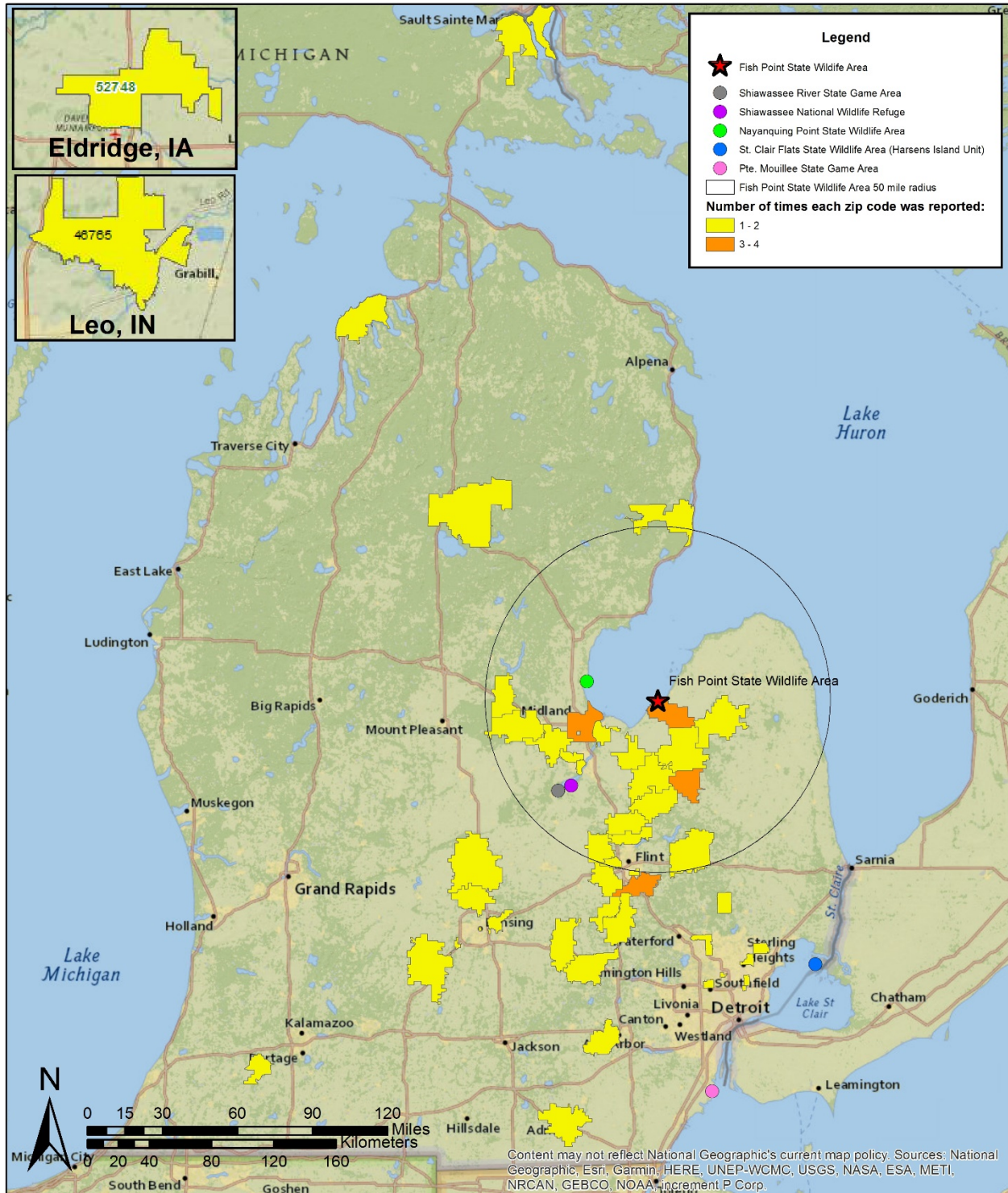


Figure 5.

Visitor use survey respondents' zip codes of residence for 2018 Fall surveys conducted at Shiawassee River State Game Area

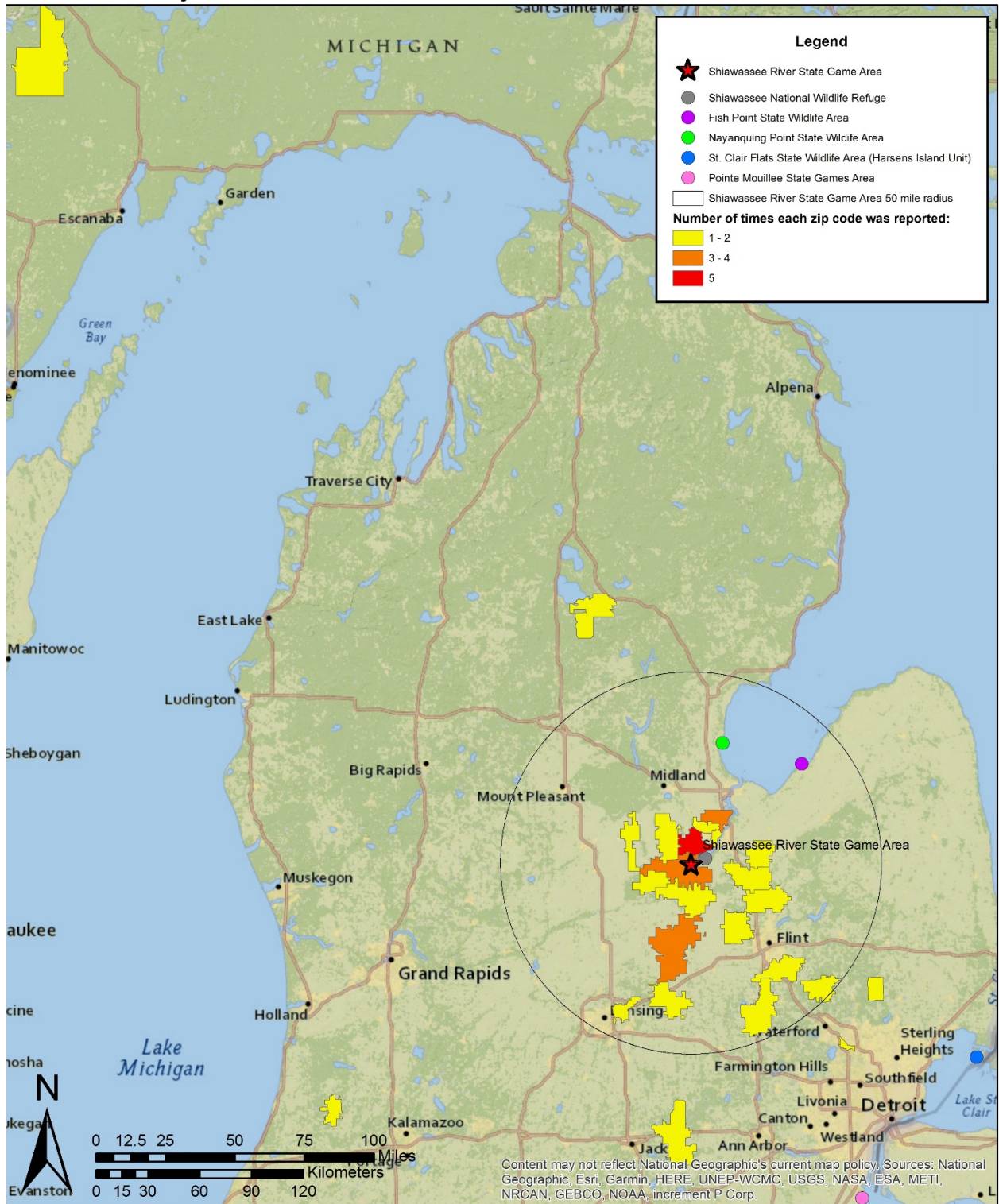
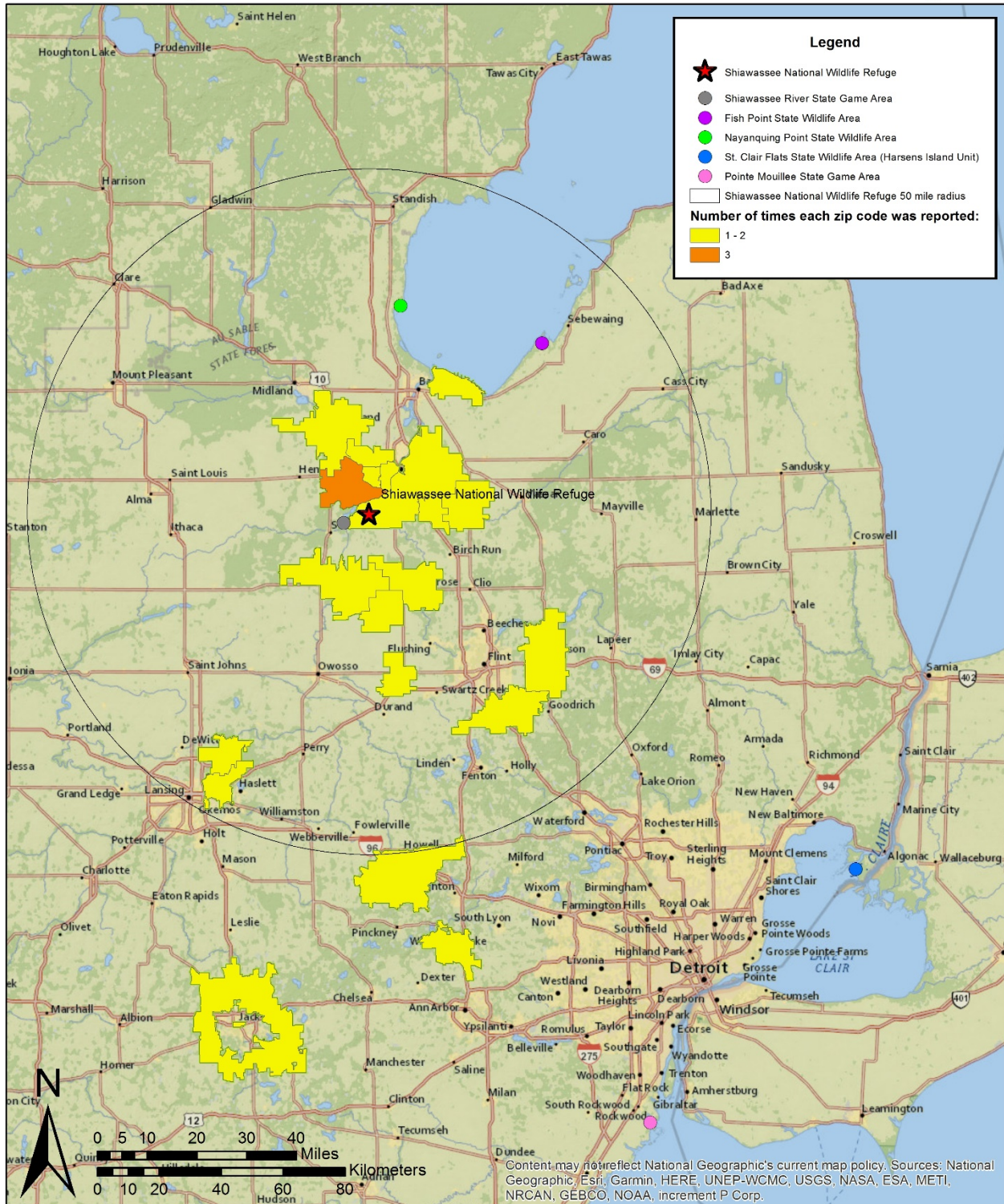


Figure 6.

Visitor use survey respondents' zip codes of residence for 2018 Fall surveys conducted at Shiawassee National Wildlife Refuge



Appendix D (next page)

Appendix D: Coastal Wildlife Management Area Visitor Use Survey Questionnaire

Date: ____/____/____	AM/PM:	Surveyor Initials:
Area Name:	Survey Location:	

For surveyor use only.

Coastal Wildlife Management Area Visitor Use Survey Questionnaire

This is for a research project at Michigan State University that aims to better understand recreational uses of coastal wildlife management areas. Would you please help us by taking a brief survey?

1. You must be at least 18 years old to participate. Are you at least 18?

- Yes, please continue with survey
- No, thank you for your time but we need participants 18 and older.

2. Have you already taken this survey?

- Yes (see question 2.a.)

2.a. Was it today?

- Yes, thank you for your time (end of survey)
 - No, please continue with the survey (go on to question 3)
- No, please continue with the survey.

The research project aims to determine the type of recreation occurring at this area, better understand visitors here, and determine economic impacts of visitor uses at this area. Your input is very important to provide feedback for managers of this area to help them better serve the needs of visitors.

This short survey should take about 10 minutes to complete. We will not collect any personal information (unless you agree to share an email with us at the conclusion of the survey) so your

identity will not be revealed through this survey. Your participation is strictly voluntary and you can refuse to complete any or all of the questions. You have the right to withdraw at any time.

3. Do you agree to participate in this research study?

- Yes
- No, thank you for your time (end of survey)

4. Your visit to this area today:

Activity:	Which activity was your primary purpose for your visit today? (select only <u>ONE</u> box):	While you were doing your primary activity today, did you also participate in any other activities? (select <u>ALL</u> boxes that apply):
Big Game Hunting (Fall Only)		
Small Game Hunting (Fall Only)		
Waterfowl Hunting (Fall Only)		
Furbearer Hunting		
Trapping (Fall Only)		
Dog Training		
Fishing		
Bird Watching		
Wildlife Observation		
Photography		
Hiking/Walking/Running		
Biking		
Auto Tour Route/Driving		
Motorized Boating		
Paddling Sports		
Mushrooming/Berry Picking/Foraging for Food		
Shed Antler Hunting (Spring Only)		

Informational Exhibits (Displays, Special Signage, Kiosks)		
Outdoor/Environmental Education (Classrooms, Labs, Tours)		
Special Event (please specify):		
Other (please specify):		

5. Was coming to this wildlife management area the main purpose of your trip today?

Yes

No

6. Approximately how much time did you spend at this wildlife management area during your visit today?

Hours

7. Are you traveling alone today?

Yes (skip to Question 8)

No (continue to Questions 7.a and 7.b below)

7.a. How many individuals are in your group, including yourself? (Only include individuals whose expenses you account for).

of people in your group 18 and older:

people in your group 17 and younger:

7.b. Which one of the following best describes your group? (select only one)

Family

Friends

Organized club or school group

Commercial tour group

Other

8. Have you visited this wildlife management area in the last 12 months, not counting today?

- No (skip to Question 9)
- Yes (continue to Questions 8.a and 8.b below)

8.a. How many days have you visited this wildlife management area in the last 12 months, not counting today?

Days:

8.b. During what seasons have you visited this wildlife management area in the last 12 months? (select all that apply)

- Spring (March – May)
- Summer (June – August)
- Fall (September – November)
- Winter (December – February)

9. About how many outdoor recreation trips did you take in the last 12 months that were at least one mile from your home (for activities such as hunting, fishing, wildlife viewing, hiking, camping, etc.)?

Trips:

10. Do you live more than 50 miles from this wildlife management area?

- Yes
- No

11. How many nights did you or will you spend away from home within 50 miles of this wildlife management area as a result of your visit today?

Nights:

We would like to collect information on your spending while you are in the local area for your trip to this wildlife management area.

12. Below is a list of spending categories. Please give your best guess of the total expenses that your group will spend in the local 50-mile area during your trip to this area? Include spending for all days and nights spent in the local area related to this visit.

Expenditure:	Amount Spent (In Dollars):
Motel, hotel, B&B, cabin, etc.	
Camping	
Restaurants and bars	
Fuel for auto/truck/boat	
Auto/truck/boat expenses other than fuel	
Local transportation (bus, shuttle, rental car, etc.)	
Recreation guide fees and tips (hunting, fishing, wildlife viewing, etc.)	
Equipment rental (canoe, kayak, bike, etc.)	
Groceries and beverages	
Sporting goods and equipment purchases	
Hunting or fishing licenses	
Souvenirs, clothing, other retail	
Entertainment	
Other (please specify):	
Total Expenditures:	

13. Does the total amount of expenditures previously estimated seem accurate?

- Yes
 No

14. About how much of that total would you say you spent in the immediate local community?

\$

Next, we have a few questions about yourself:

15. Record your gender:

16. Enter zip code of residence:

17. In what year were you born:

18. What is the highest grade or year of formal schooling you completed? (select one)

- Did not attend school
- Elementary or middle school
- High school
- College or technical school
- Graduate or professional school

19. Which best describes your race/ethnicity? (select one)

- American Indian
- Asian or Pacific Islander
- Black or African American
- Hispanic, Latino, or Spanish origin
- White, non-Hispanic
- Multiracial
- Other
- Don't know/Refused

20. Was your household income greater or less than \$57,000 last year (before taxes and other deductions)? (select one)

- >\$57,000
 - <\$57,000
 - Don't know/refuse to answer
-

21. Do you use any of the following types of social media? (select all that apply)

I don't use social media

Facebook

Twitter

Snapchat

Instagram

eBird

Other

Future Visits:

22. Do you intend to visit this wildlife management area again in the next 12 months?

(select only one)

Yes

No

Not sure

23. Is there anything that the Michigan DNR or U.S. Fish and Wildlife Service could do to improve your visit to this wildlife management area?

24. What is one thing that you love about this wildlife management area?

Email address:

Are you willing to provide your email address so that Michigan State University researchers may send you a follow up survey to further understand your opinions about Great Lakes coastal wildlife management areas?

Yes

No

Thank you for your time and participation. Your responses are valuable for the success of this research project. Enjoy the rest of your day.

Appendix E (next page)

Appendix E: Economic Impact Data Tables

Table 1. Expenditure Profiles by WMA used in Economic Impact Analysis

Values	Fish Point SWA	Nayanqing Point SWA	Pointe Mouillee SGA	Shiawasse National Wildlife Refuge	Shiawasse River SGA	St. Clair Flats SWA-- Harsens Island Unit
Count of Season	126	115	156	91	77	128
Average of TotalGroupSize	2.2	2.3	1.9	2.1	2.1	2.0
Average of Daysvisited	16.9	21.7	25.9	12.3	40.3	51.9
Average of NumberNights	0.6	0.5	0.0	0.5	0.2	0.1
Average of Mainpurpose	0.8	0.8	1.0	0.9	0.9	1.0
Average of Expense_MotelhotelBBcabin	\$1.90	\$4.09	\$0.00	\$11.76	\$1.30	\$0.00
Average of Expense_Camping	\$1.55	\$0.65	\$0.00	\$0.00	\$0.00	\$0.00
Average of Expense_Restaurantsandbars	\$7.17	\$5.98	\$2.49	\$9.27	\$9.69	\$3.93
Average of Expense_Fuelforautotruckboat	\$15.71	\$13.97	\$7.92	\$13.71	\$14.31	\$11.09
Average of Expense_Autotruckboatexpensesotherthanfuel	\$1.55	\$0.00	\$0.31	\$0.33	\$0.26	\$0.00
Average of Expense_Localtransportationbusshuttlerentalcar	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$7.86
Average of Expense_Recreationguidefeesandtips	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Average of Expense_Equipmentrentalcanoekayakbikeetc	\$0.00	\$0.00	\$0.00	\$0.00	\$0.78	\$0.27
Average of Expense_Groceriesandbeverages	\$3.02	\$2.36	\$2.85	\$2.00	\$2.95	\$4.77
Average of Expense_Sportinggoodsandequipmentpurchases	\$5.12	\$8.30	\$5.37	\$1.56	\$1.73	\$5.79
Average of Expense_Huntingorfishingslicenses	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Average of Expense_Souvenirsclathingotherretail	\$0.32	\$0.43	\$0.00	\$1.31	\$0.00	\$0.18
Average of Expense_Entertainment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Average of Expense_Other	\$0.00	\$0.00	\$0.10	\$0.14	\$0.00	\$0.00
Average of totalspent	\$36.33	\$35.78	\$19.03	\$40.08	\$31.01	\$33.90

Table 2. Annual Economic Impacts per Coastal WMA Based on Alternative, Annual Visitor Counts.

Spending profiles were per-party estimates of averages over all WMAs. Counts were derived by estimated visitor counts adjusted to party counts by segment party counts.

Spring					Fall					Fall Extraction					Total Annual Impact Given State Averages by Season				
Fish Point SWA					Fish Point SWA					Fish Point SWA					Fish Point SWA				
Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales
Direct Effect	0.4	\$10,100	\$17,025	\$30,186	Direct Effect	0.2	\$5,427	\$9,524	\$17,270	Direct Effect	0.6	\$12,757	\$22,673	\$41,683	Direct Effect	1.2	\$28,284	\$49,222	\$89,139
Indirect Effect	0.1	\$1,228	\$1,915	\$5,668	Indirect Effect	0.0	\$718	\$1,117	\$3,300	Indirect Effect	0.1	\$1,798	\$2,789	\$8,370	Indirect Effect	0.1	\$3,744	\$5,821	\$17,338
Induced Effect	0.1	\$1,061	\$2,300	\$4,449	Induced Effect	0.0	\$572	\$1,241	\$2,401	Induced Effect	0.1	\$1,357	\$2,942	\$5,690	Induced Effect	0.1	\$2,990	\$6,483	\$12,540
Total Effect	0.5	\$12,388	\$21,240	\$40,303	Total Effect	0.3	\$6,718	\$11,882	\$22,972	Total Effect	0.7	\$15,912	\$28,403	\$55,743	Total Effect	1.4	\$35,018	\$61,525	\$119,018
Nayanquing Point SWA					Nayanquing Point SWA					Nayanquing Point SWA					Nayanquing Point SWA				
Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales
Direct Effect	0.5	\$12,776	\$22,405	\$39,602	Direct Effect	0.3	\$7,743	\$13,616	\$24,399	Direct Effect	0.3	\$7,948	\$13,759	\$24,533	Direct Effect	1.1	\$28,467	\$49,780	\$88,534
Indirect Effect	0.1	\$2,379	\$3,917	\$8,984	Indirect Effect	0.1	\$1,479	\$2,440	\$5,630	Indirect Effect	0.1	\$1,506	\$2,493	\$5,782	Indirect Effect	0.2	\$5,364	\$8,850	\$20,396
Induced Effect	0.1	\$2,840	\$5,084	\$9,528	Induced Effect	0.1	\$1,729	\$3,094	\$5,799	Induced Effect	0.1	\$1,773	\$3,174	\$5,949	Induced Effect	0.2	\$6,342	\$11,352	\$21,276
Total Effect	0.6	\$17,995	\$31,405	\$58,113	Total Effect	0.4	\$10,950	\$19,150	\$35,828	Total Effect	0.4	\$11,228	\$19,426	\$36,264	Total Effect	1.4	\$40,173	\$69,981	\$130,205
Pointe Mouillee SGA					Pointe Mouillee SGA					Pointe Mouillee SGA					Pointe Mouillee SGA				
Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales
Direct Effect	1.8	\$48,546	\$79,337	\$141,005	Direct Effect	0.7	\$17,212	\$28,215	\$51,756	Direct Effect	0.5	\$13,395	\$21,685	\$39,486	Direct Effect	3.0	\$79,153	\$129,237	\$232,247
Indirect Effect	0.3	\$12,331	\$16,993	\$38,628	Indirect Effect	0.1	\$4,643	\$6,412	\$14,581	Indirect Effect	0.1	\$3,601	\$4,968	\$11,353	Indirect Effect	0.5	\$20,575	\$28,373	\$64,562
Induced Effect	0.2	\$7,631	\$14,876	\$27,114	Induced Effect	0.1	\$2,736	\$5,334	\$9,723	Induced Effect	0.1	\$2,127	\$4,147	\$7,559	Induced Effect	0.3	\$12,494	\$24,357	\$44,396
Total Effect	2.3	\$68,508	\$111,205	\$206,747	Total Effect	0.8	\$24,591	\$39,961	\$76,059	Total Effect	0.6	\$19,124	\$30,800	\$58,397	Total Effect	3.7	\$112,223	\$181,966	\$341,203
Shiawassee National Wildlife Refuge					Shiawassee National Wildlife Refuge					Shiawassee National Wildlife Refuge					Shiawassee National Wildlife Refuge				
Impact Type	Employment	Labor Income	Value Added	Output	Impact Type	Employment	Labor Income	Value Added	Output	Impact Type	Employment	Labor Income	Value Added	Output	Impact Type	Employment	Labor Income	Regional Income	Sales
Direct Effect	2.1	\$55,606	\$94,687	\$163,695	Direct Effect	0.9	\$24,668	\$41,736	\$71,816	Direct Effect	0.1	\$2,599	\$4,348	\$7,469	Direct Effect	3.0	\$82,873	\$140,771	\$242,980
Indirect Effect	0.3	\$11,378	\$17,945	\$40,259	Indirect Effect	0.1	\$4,825	\$7,622	\$17,140	Indirect Effect	0.0	\$507	\$801	\$1,813	Indirect Effect	0.4	\$16,710	\$26,368	\$59,212
Induced Effect	0.3	\$11,837	\$21,343	\$39,015	Induced Effect	0.1	\$5,215	\$9,404	\$17,190	Induced Effect	0.0	\$550	\$991	\$1,813	Induced Effect	0.4	\$17,602	\$31,738	\$58,018
Total Effect	2.6	\$78,821	\$133,975	\$242,968	Total Effect	1.1	\$34,708	\$58,763	\$106,146	Total Effect	0.1	\$3,656	\$6,141	\$11,094	Total Effect	3.8	\$117,185	\$198,879	\$360,208
Shiawassee River SGA					Shiawassee River SGA					Shiawassee River SGA					Shiawassee River SGA				
Impact Type	Employment	Labor Income	Value Added	Output	Impact Type	Employment	Labor Income	Value Added	Output	Impact Type	Employment	Labor Income	Value Added	Output	Impact Type	Employment	Labor Income	Regional Income	Sales
Direct Effect	0.3	\$7,648	\$13,023	\$22,515	Direct Effect	0.2	\$4,791	\$8,106	\$13,949	Direct Effect	0.5	\$13,324	\$22,290	\$38,290	Direct Effect	0.9	\$25,763	\$43,419	\$74,754
Indirect Effect	0.1	\$1,565	\$2,468	\$5,537	Indirect Effect	0.0	\$937	\$1,480	\$3,329	Indirect Effect	0.1	\$2,599	\$4,108	\$9,294	Indirect Effect	0.1	\$5,101	\$8,056	\$18,160
Induced Effect	0.1	\$1,628	\$2,935	\$5,366	Induced Effect	0.0	\$1,013	\$1,827	\$3,339	Induced Effect	0.1	\$2,820	\$5,084	\$9,294	Induced Effect	0.1	\$5,461	\$9,846	\$17,999
Total Effect	0.4	\$10,841	\$18,427	\$33,418	Total Effect	0.2	\$6,742	\$11,414	\$20,617	Total Effect	0.6	\$18,743	\$31,482	\$56,878	Total Effect	1.2	\$36,326	\$61,323	\$110,913
St. Clair Flats SWA--Harsens Island Unit					St. Clair Flats SWA--Harsens Island Unit					St. Clair Flats SWA--Harsens Island Unit					St. Clair Flats SWA--Harsens Island Unit				
Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales	Impact Type	Employment	Labor Income	Regional Income	Sales
Direct Effect	0.3	\$9,053	\$15,499	\$27,339	Direct Effect	0.3	\$8,651	\$14,585	\$25,798	Direct Effect	0.7	\$18,318	\$30,376	\$53,437	Direct Effect	1.3	\$36,022	\$60,460	\$106,574
Indirect Effect	0.1	\$1,417	\$2,151	\$5,393	Indirect Effect	0.1	\$1,290	\$1,962	\$4,968	Indirect Effect	0.1	\$2,725	\$4,141	\$10,589	Indirect Effect	0.2	\$5,432	\$8,254	\$20,950
Induced Effect	0.1	\$1,637	\$3,097	\$5,844	Induced Effect	0.1	\$1,555	\$2,942	\$5,553	Induced Effect	0.1	\$3,294	\$6,233	\$11,764	Induced Effect	0.2	\$6,486	\$12,272	\$23,161
Total Effect	0.4	\$12,107	\$20,747	\$38,577	Total Effect	0.4	\$11,496	\$19,489	\$36,318	Total Effect	0.8	\$24,337	\$40,751	\$75,790	Total Effect	1.7	\$47,940	\$80,987	\$150,685

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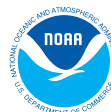
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