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Walleye and Yellow Perch Recreational Management Plan for Saginaw Bay

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Walleye and Yellow Perch Recreational Management Plan for Saginaw Bay

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EXECUTIVE SUMMARY

Vision

This management plan is written to achieve the following vision for Saginaw Bay:

- A Walleye *Sander vitreus* population that: 1) provides abundant and diverse angling and harvest opportunities; 2) is self-sustaining; and 3) remains in balance with the prey base.
- A Yellow Perch *Perca flavescens* population that: 1) supports diverse angling and harvest opportunities; 2) is self-sustaining; and 3) contributes to a balanced prey base while not being the dominant prey item.

The purpose of this plan is to update the Saginaw Bay Walleye and Yellow Perch Management to reflect new goals, the current status of the populations, and the values surrounding them. It also aims to provide a framework and direction for managing these populations into the future.

Background and Current Status

The Saginaw Bay Walleye population has recovered from historic low abundance after collapsing in the mid-1940s due to overexploitation, habitat degradation, and the negative effects of invasive species. This population is now self-sustaining and continues to expand after profound ecosystem changes in

Lake Huron, including the collapse of the Alewife population which freed Walleye fry from predation and competition. The Yellow Perch population remains at an all-time low abundance and is suppressed by high predation rates, principally from the Walleye population. Contemporary Walleye management efforts have progressed from recovery-focused actions like stocking to liberalization of harvest opportunities with hopes of mitigating predation of Yellow Perch. Those management actions, intended to improve the Yellow Perch fishery, have not had the intended effects as Walleye recruitment has remained relatively high. Current and future management approaches are entering a new era with an abundant, expanding, and valuable Walleye population that will be the management focus until conditions change to better favor Yellow Perch survival.

New management approaches and options are necessary to fit the current state of the bay's ecology and fish community. The Michigan Department of Natural Resources (DNR) continues to work with stakeholders, including the Lake Huron Citizens Fishery Advisory Committee (LHCFAC) and a community-based Walleye and Yellow Perch Workgroup, to gather diverse perspectives and values and to incorporate stakeholder recommendations into the fishery management planning process. This plan builds on previous management approaches and high-quality monitoring data to recommend specific science-based goals, objectives, and management actions aimed at achieving the vision for the Walleye and Yellow Perch population and recreational fisheries in Saginaw Bay. This approach also parallels similar fishery management plans in Michigan (i.e., Chinook Salmon *Oncorhynchus tshawytscha* in Lake Michigan and Walleye in Little Bay de Noc). The approach uses measures of sustainability, recruitment, fishery quality, and an index that integrates a suite of biological and population demographic indicators to gauge the status and health of the populations and recreational fisheries.

Population Goals and Objectives

Walleye

Walleye Vision: A Walleye population that: 1) provides abundant and diverse angling and harvest opportunities; 2) is self-sustaining; and 3) remains in balance with the carrying capacity of the bay.

Goal 1. Maintain a Walleye population that maximizes sustainable recreational angling and harvest opportunity and is in equilibrium with the carrying capacity of the habitat and prey-base.

Objectives:

- *Integrated index score:* A score of 40 or greater which contains important metrics of sustainability, recruitment, and fishery quality. Metrics are detailed in Appendix 2.
- *Recruitment*: Mean catch-per-unit-effort of age-0 Walleye greater than 20 fish/10 min bottom trawl tow in at least 3 of 5 consecutive years.
- *Growth*: Mean length of age-3 Walleye is no greater than 424 mm (16.7 in), which is 110% of the statewide average length at age 3, at least 3 of 5 consecutive years.
- *Reproductive potential*: Spawning stock biomass (i.e., total weight of spawning age fish in the population) is greater than 20% of the unfished level.
- *Angler-targeted catch rate*: Open water targeted catch rate of Walleye greater than or equal to 0.4 fish/hr.

Goal 2. Protect or restore connectivity to spawning and nursery habitats, like estuaries and nearshore areas, in the bay and tributary rivers essential to supporting a self-sustaining population.

- Conserve existing spawning habitat and reduce sedimentation in Saginaw Bay tributaries.
- Restore connectivity to spawning habitat with dam removals and fish passage improvements, particularly at Dow Dam on the Tittabawassee River.
- Restore offshore spawning habitat in Saginaw Bay by constructing rock reefs.

Goal 3. Maintain and expand fishing opportunities where feasible to maximize fishery participation.

- Preserve, maintain, and renovate existing state-owned access sites and other public areas to keep them accessible and functional.
- Increase the number of fishery access points.
- Disseminate an index of fishery access points to public.

Goal 4. Pursue and advocate for current and new research that addresses information gaps and is needed to inform fishery management and policy.

- Evaluate fish passage improvements in the Saginaw Bay watershed and their effects on the Walleye population.
- Identify and quantify Walleye spawning locations at tributaries and reefs.
- Determine if the Saginaw River is a significant rearing location for juvenile Walleye.
- Estimate Walleye predation thresholds on the Yellow Perch population that would result in realized Yellow Perch fishery benefits.

Yellow Perch

Yellow Perch Vision: A Yellow Perch population that: 1) supports diverse angling and harvest opportunities; 2) is self-sustaining: and 3) contributes to a balanced prey base while not being the dominant prey item.

Goal 1. Promote a resilient Yellow Perch population that has recreational angling and harvest opportunity, consistent recruitment to age-1, and acceptable size-structure.

Objectives:

- *Integrated index score:* A score of 20 or greater which contains important metrics of sustainability, recruitment, and fishery quality. Metrics are detailed in Appendix 1.
- *Recruitment*: Mean CPUE of age-1 and older Yellow Perch above 200 fish/10 min bottom trawl tow in at least 3 of 5 consecutive years.
- *Growth*: Mean length of age-3 Yellow Perch is no greater than 201 mm (7.9 in), which is 110% of the statewide average length at age-3, at least 3 of 5 consecutive years.
- *Angler catch-rate*: Mean angler-nontargeted catch rate is greater than 1 fish/hr in the open water and ice fishery combined.

Goal 2. Protect or restore connectivity to essential spawning and nursery habitats.

- Restore coastal wetlands to improve foraging habitat and predator refugia for juvenile Yellow Perch in Saginaw Bay and tributaries.

Goal 3. Pursue and advocate for current and new research that addresses information gaps and is needed to inform fishery management and policy.

- Determine magnitude of fish and bird predation on Yellow Perch.
- Determine population-level implications of early Yellow Perch maturation.
- Determine effects of food web changes on larval and adult Yellow Perch population dynamics.
- Develop Yellow Perch statistical catch-at-age model.
- Incorporate Yellow Perch into the Walleye stochastic simulation model.
- Determine spatial distribution of Yellow Perch in Saginaw Bay.

INTRODUCTION

Vision

This management plan is written to achieve the following vision for Saginaw Bay:

- A Walleye *Sander vitreus* population that: 1) provides abundant and diverse angling and harvest opportunities; 2) is self-sustaining; and 3) remains in balance with the prey base.
- A Yellow Perch *Perca flavescens* population that: 1) supports diverse angling and harvest opportunities; 2) is self-sustaining; and 3) that contributes to a balanced prey base while not being the dominant prey item.

Background and Current Status

The Saginaw Bay Walleye population has recovered from historic low abundance after collapsing in the mid-1940s due to overexploitation, habitat degradation, and the negative effects of invasive species. This population is now self-sustaining and continues to expand after profound ecosystem changes in Lake Huron, including the collapse of the Alewife *Alosa pseudoharengus* population which released Walleye fry from predation and competition. However, the adult Yellow Perch population remains at an all-time low abundance and is suppressed by heavy predation, principally from the abundant Walleye population. Contemporary management efforts of Walleye have progressed from recovery-focused actions like stocking to liberalization of harvest opportunities for Walleye with hopes of mitigating predation on Yellow Perch.

Walleye abundance increased from 2015 to 2021 despite the liberalization of the recreational fishery. Age-2 and older abundance estimates increased from 3.57 million Walleye in 2015 to more than 10 million Walleye in 2022. Predation on Yellow Perch remained high, and survival did not improve. Analyses concluded that the Walleye population was now following a population dynamic where recruitment was driven in a compensatory response to changes in stock size. As harvest increased, the population responded positively with the production of larger year classes, which in turn failed to reduce predatory demand on young Yellow Perch. This compensatory response is indicative that current harvest rates are significant and impacting the recently recovered population. While this response could be interpreted as the population being capable of supporting a significantly higher total harvest, which in turn will result in even higher recruitment, that paradigm is solely dependent on the frequency and relative size of year classes produced. Specifically, if further significant increases in harvest occur in concert with poor recruitment across consecutive year classes, the risk of recruitment overfishing (harvesting fish before they have successfully produced new recruits to the population) and returning towards a collapsed state is enhanced. This mechanism is how the Walleye population and its fishery collapsed in the shared fishery of the 1,150 km^2 (444 mi^2) Red Lakes, Minnesota. Management tools used in recovery efforts included a complete fishery closure for nearly a decade, Walleye stocking, and very conservative harvest restrictions when the fishery re-opened (Barnard et al. 2019).

Yellow Perch are a highly sought and important component to both the recreational and commercial fisheries in Saginaw Bay. However, their abundance and associated harvest has remained low since the Walleye population has recovered and may remain in that state until alternate prey sources sufficiently buffer Walleye predation on young Yellow Perch or until weak Walleye year classes provide sufficient relief in annual predatory demand to facilitate recruitment. The available management actions to improve the Yellow Perch fishery have not had the intended effects for these reasons. Current and future management approaches are entering a new era with an abundant, expanding, and valuable Walleye population that will be the management focus in Saginaw Bay until conditions change that will favor

better Yellow Perch survival. This recognition led to the current effort to craft a new management plan for the Saginaw Bay Walleye and Yellow Perch recreational fisheries.

New management approaches and options are necessary to reflect the current state of a recovered Walleye population, and the associated opportunities sought by the angling public. The Michigan DNR continues to work with stakeholders, including the LHCFAC and a citizen-based Walleye and Yellow Perch Workgroup, to gather diverse perspectives and values, incorporate stakeholder recommendations into the fishery management planning process, and provide perspective on management changes such as regulations. For example, the LHCFAC was supportive of the new expansion of recreational opportunity by opening the lower Saginaw River to year-round Walleye harvest which began in 2023. Tributary streams to the lower Saginaw River were recently included in this new Walleye possession season where Walleye possession remains open year-round. This plan builds on previous management approaches and high-quality monitoring data to recommend specific science-based goals, objectives, and management actions aimed at achieving the vision for the Walleye and Yellow Perch populations in Saginaw Bay.

Fishery Management History

Saginaw Bay is a 2,947 km^2 (1,138 mi^2), embayment in the Michigan waters of Lake Huron, with average depths that range from 5.1 m (16.7 ft) within the inner bay to 13.7 m (44.9 ft) in the outer bay (DeBruyne et al. 2017; Figure 1). The Saginaw River is the largest tributary to the bay with a drainage area of 16,680 km^2 (6,440 mi^2), comprising almost three-quarters of the 23,300 km^2 (8,996 mi^2) watershed (Johengen et al. 2000). The bay is warmer and more productive than the main basin of Lake Huron and percids are the dominant species of the fish community. Walleye are the dominant predatory species while Yellow Perch are less abundant but ecologically important as a trophic link as well as contributing to the recreational (Fielder et al. 2022) and commercial fisheries (Fielder et al. 2014). The Saginaw Bay fish community contains other important resident recreational fish species like Northern Pike *Esox lucius*, Smallmouth Bass *Micropterus dolomieu,* and panfish (Centrarchidae) as well as seasonally available species including Lake Whitefish *Coregonus clupeaformis*, Cisco *Coregonus artedi*, steelhead *Onchorhynchus mykiss*, and Lake Trout *Salvelinus namaycush*. Saginaw Bay has also served as a spawning and nursery ground for species that otherwise were regarded as more characteristic of the main basin community such as Cisco, Lake Whitefish, Lake Sturgeon *Acipenser fulvescens*, and Lake Trout (Organ et al. 1979; Goodyear et al. 1982).

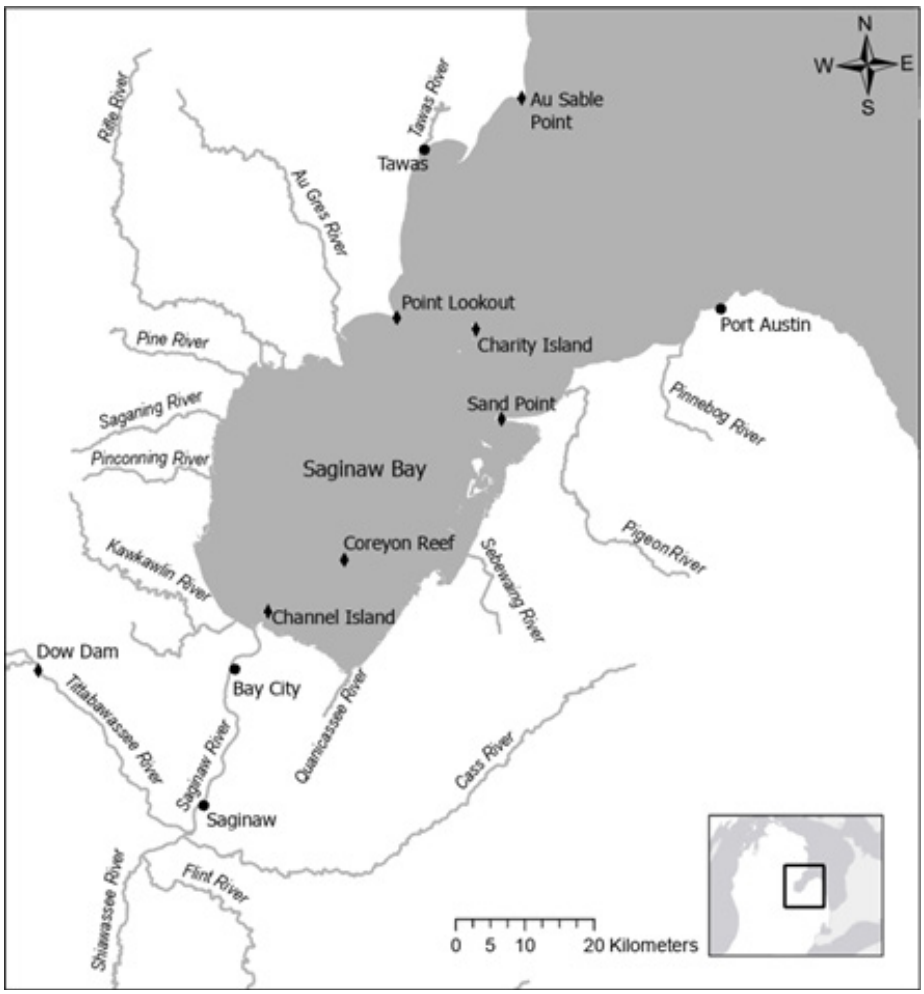

FIGURE 1. Major spawning tributaries and reefs (black diamonds) in Saginaw Bay, Lake Huron. The small map (bottom right) shows the relative location of Saginaw Bay (inside box) in the Great Lakes region.

The exploitation of the Walleye and Yellow Perch populations of Saginaw Bay had three distinct periods (Fielder and Thomas 2006). The earliest period was characterized by unrestrained commercial exploitation that began in the 1830s (Lanman 1839; Bogue 2000; Baldwin et al. 2009) and yielded an average of 495 metric tons of fish per year during 1885–1944, which was the second largest yield in the Great Lakes after Lake Erie (Schneider and Leach 1977; Baldwin et al. 2009). The second period was the mid-1940s through the early-1970s and was largely defined by the collapse of the commercial Walleye fishery (Figure 2). The fishery collapse was attributed to habitat degradation, water quality degradation, and invasive species (Fielder and Baker 2019). The proliferation of dams prevented access to riverine spawning grounds used by species such as Walleye and Lake Sturgeon, and offshore spawning reefs were smothered by sediment from erosion related to deforestation and intensive agriculture. Water quality also became degraded because of eutrophication and the discharge of industrial pollutants and lack of sewage treatment (Schneider 1977). Other profitable fisheries such as Cisco also greatly declined or collapsed around the same time due to similar adverse habitat impacts. Focus of the commercial fishery of that era shifted to Yellow Perch because it was one of the only remaining economically valuable fish populations in Saginaw Bay (Fielder at el. 2014).

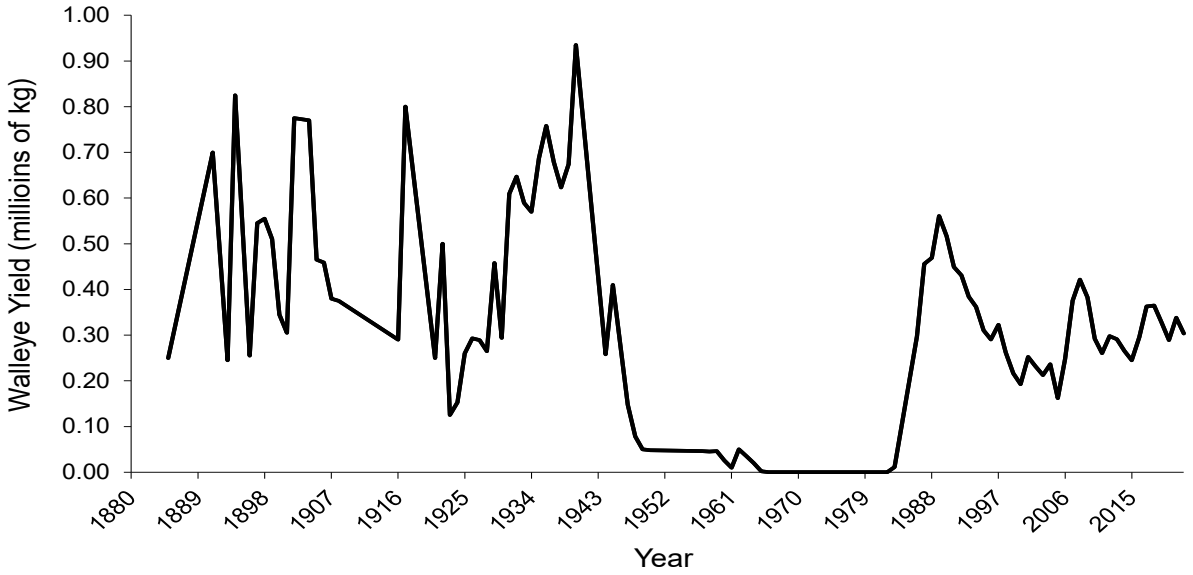

FIGURE 2. Annual yield of Walleye in Saginaw Bay from recreation and commercial fisheries, 1885–2021 (Source: Baldwin et al. 2009; Fielder et al. 2014).

The initiation of fishery management in Saginaw Bay also began during this second period. It included various attempts at regulations, such as gear restrictions on commercial fisheries and catch limits, first imposed in the early 20th century by the United States Bureau of Fisheries (Koelz 1926). The same era saw attempts to supplement the declining fishery with stocking of newly hatched Walleye fry from eggs collected by commercial fishers. Between 1924 and 1935, an average of 82 million fry were reared and released each year. These early efforts had little or no effect in improving the declining fishery (Hile 1937) as the low recruitment was being driven by year class failures owing mainly to degraded habitat and water quality.

The arrival of invasive species in Lake Huron and Saginaw Bay was one of the most damaging events of this period (Figure 3; Schneider 1977; Schneider and Leach 1977; Fielder and Baker 2019) and influential invasion events continued into the third period of recovery. Most notably, the nonnative Alewife became abundant in Lake Huron by the late 1950s. This greatly affected Saginaw Bay Walleye and Yellow Perch populations because Alewives prey on the larvae of these species and compete for planktonic food resources (Fielder and Baker 2004; Creque and Czesny 2012). Another damaging invasion of the era was the Sea Lamprey *Petromyzon marinus* that became abundant in Lake Huron by the 1950s and led to the decline of native Lake Trout, which in turn caused Alewives to become hyperabundant in the absence of a predator. Later, in the 1980s and 1990s, the invasion of the zebra mussel *Dreissena polymorpha* and quagga mussel *Dreissena bugensis* (hereafter referred to as dreissenid mussels) caused a momentous shift in the trophic structure of Saginaw Bay and Lake Huron. Their highly efficient filter feeding has led to declines in main basin productivity and a shift to a more benthic-oriented food web from the former pelagic food web (Fahnenstiel et al. 1995; Tang et al. 2014). The establishment of the invasive benthic Round Goby *Neogobius melanostomas*, also in the 1990s, further drove this shift. These species invasions and subsequent resource-driven food web alterations have likely affected species dependent on planktonic food resources (e.g., Yellow Perch) although the mechanisms are complex.

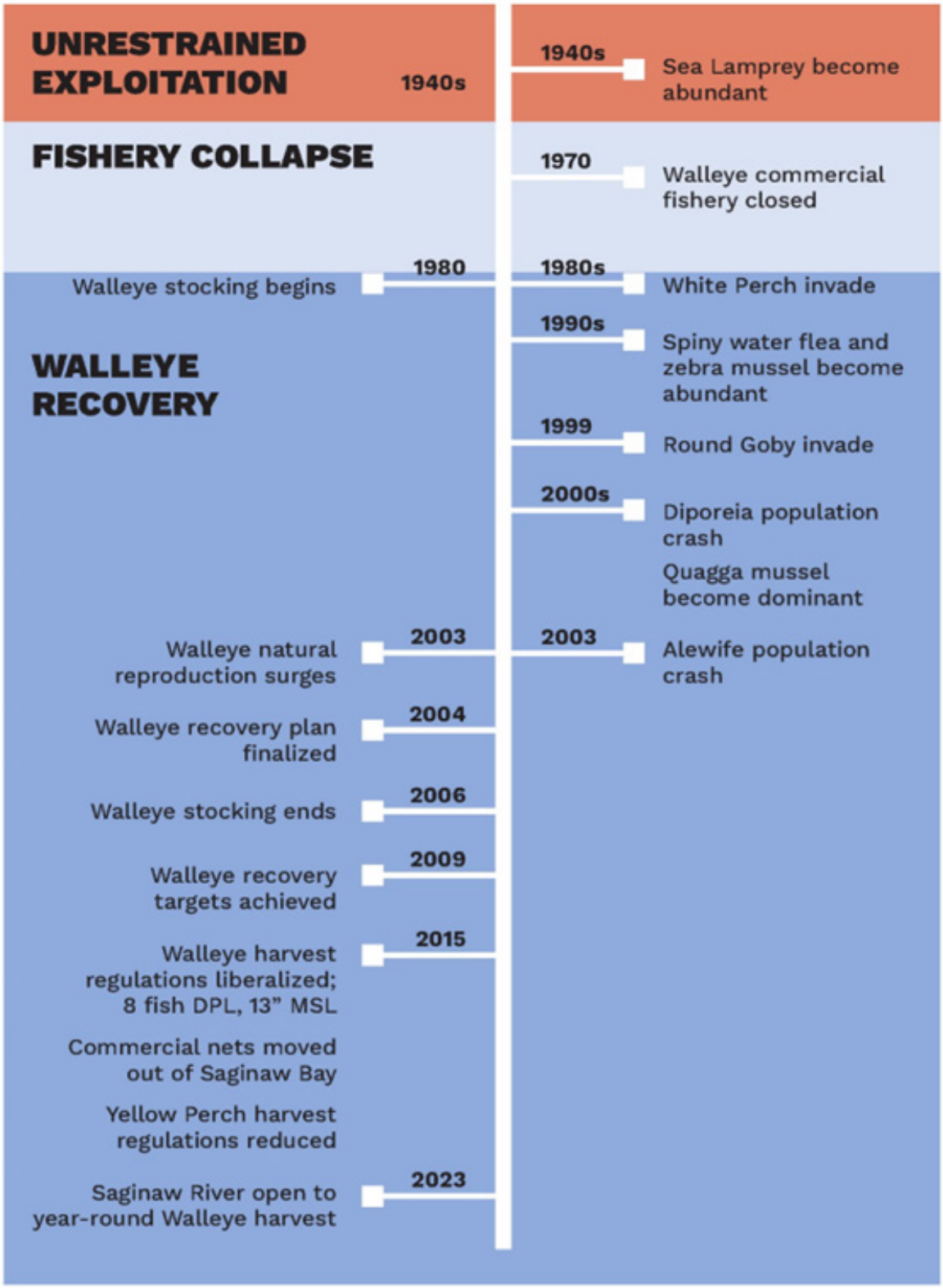

FIGURE 3. Timeline of important milestones in the history of Saginaw Bay Walleye and Yellow Perch fisheries management. DPL=daily possession limit; MSL=minimum size limit.

The last period has been an era of ecosystem recovery. It began with the passage of the Clean Water Act of 1972 and the Great Lakes Water Quality Agreement of 1978 (Haas and Schaeffer 1992; Fielder and Baker 2004) which led to marked improvements in water quality. Habitat improvements such as the modification of several terminal dams, including Chesaning Dam on the Shiawassee River and Frankenmuth Dam on the Cass River, to nature-like fishways that improved fish passage on important spawning tributaries also occurred during this time.

Although the State of Michigan had fisheries management authority in Michigan waters of the Great Lakes since statehood, the federal government led fisheries management efforts in those waters until 1968 when the State formally began exercising their management authority (Fielder and Baker 2019). The DNR then limited the number of commercial licenses allowed in Saginaw Bay. The number of licenses was reduced from 318 to 58 by 1971 and harvest mostly consisted of Lake Whitefish, Yellow Perch, Channel Catfish *Ictalurus punctatus*, and Common Carp *Cyprinus carpio*. The Walleye commercial fishery was formally closed in 1970, but the Yellow Perch commercial fishery endured with greatly reduced yields (Figure 2; Fielder et al. 2014). Walleye culture methods improved in the late 1970s. The DNR began rearing and stocking spring fingerling Walleye with regularity by the early 1980s with releases often exceeding 700,000 spring fingerlings per year (Fielder and Baker 2004). The stocking resulted in a recreational fishery, but that fishery was reliant on annual stocking.

The first attempt to craft a vision for recovery of Walleye in Saginaw Bay began in the 1970s in the form of a DNR research report (Schneider 1977) that identified key obstacles and associated needs. The needs were (1) rehabilitation of spawning substrates through pollution control (i.e., reduced sedimentation), (2) recovery of a Walleye spawning stock through the stocking of fingerlings, and (3) mitigate the low survival of Walleye fry in the presence of Alewives. The Yellow Perch population and fisheries persisted during this period but showed signs of strain. In the 1980s, the Yellow Perch population was abundant but had poor growth rates, likely indicating insufficient prey resources for an abundant population (Salz 1989; Haas and Schaeffer 1992). Recreational and commercial harvest of Yellow Perch declined steadily since the 1980s with the most drastic decline occurring in the early 1990s, which coincided with the invasion of dreissenid mussels (Figure 2; Nalepa et al. 1995, Fielder and Thomas 2006). Insufficient food availability for young fish exacerbated the era of depressed Yellow Perch abundance in Saginaw Bay in the 1990s although the direct mechanisms were not clear.

The DNR crafted a Walleye recovery plan for Saginaw Bay in 1999 that built on decades of research and monitoring and included strategies to address limiting factors and identify key reference points to gauge progress and recognize recovery (Fielder and Baker 2004). Expanded Walleye stocking was promoted to provide a predation barrier to Alewives and to promote Walleye reproductive success and subsequent recruitment in the bay. A growth rate objective was established at no greater than 424 mm (16.7 in) for age-3 fish (110% of the statewide average growth rate (Schneider et al. 2000) as an indicator the Walleye population was nearing the carrying capacity of the bay. A population capable of sustaining an annual harvest of 0.45 million kg (1 million pounds) was a final objective. Criteria were established that would result in the cessation of the stocking program if the ratio of naturally recruited wild fish to stocked fish was ≥1.0 for three year-classes within five years. The recovery plan also encouraged efforts focusing on enhancing natural Walleye production from riverine sources through improvements in riverine connectivity and dam removals. Other habitat improvements, namely the creation of inshore and offshore rock spawning reefs, were also identified.

The most significant event in the recovery period of Saginaw Bay was the collapse of the Alewife population in 2003 and a large decline in the Rainbow Smelt *Osmerus mordax* population (Figure 3; Riley et al. 2008; Riley and Roseman 2013), which imposed similar effects on the Walleye population. These declines were serendipitous to the percid populations, allowing improved Walleye and Yellow Perch natural reproduction and survival. Fishery monitoring efforts revealed that the annual catch rate of fall age-0 Walleye increased 1,600% in the bottom trawling survey time series (Fielder et al. 2022) in 2003. Yellow Perch reproductive success similarly increased. The disappearance of Alewives and reduction of

Rainbow Smelt in Lake Huron resulted from a cascade of food web changes precipitated by the effects of invasive dreissenid mussels (Barbiero et al. 2011) and increased predation from species such as Chinook Salmon and Lake Trout (He et al. 2016). Subsequent research confirmed the resurgence of Walleye was fueled principally by the absence of Alewives (Fielder et al. 2007) and the corresponding release from predation and competition on newly hatched Walleye fry. These events led to the cessation of stocking in 2006, triggered by the criteria identified by the Walleye recovery plan (Fielder and Baker 2004).

Walleye age-3 growth rate declined as predicted, and criteria in the recovery plan proposed by Fielder and Baker (2004) were first attained in 2009 (Fielder and Thomas 2014). Angler harvest rates of Walleye increased by 490% in the years after recovery was achieved (Figure 4; Fielder and Baker 2019; DNR unpublished data). The Yellow Perch recreational and commercial fisheries did not improve, however. Mortality rates of juvenile Yellow Perch were documented as high as 99% (Figure 5; Fielder et al. 2022; Pothoven et al. 2017) and principally attributed to predation on Yellow Perch between age-0 and age-1 by the now abundant Walleye population. The decline of Yellow Perch populations due to predation has become recognized as a common problem in other populations (Lyons and Magnuson 1987; Koenig 2020; Holbrook et al. 2022).

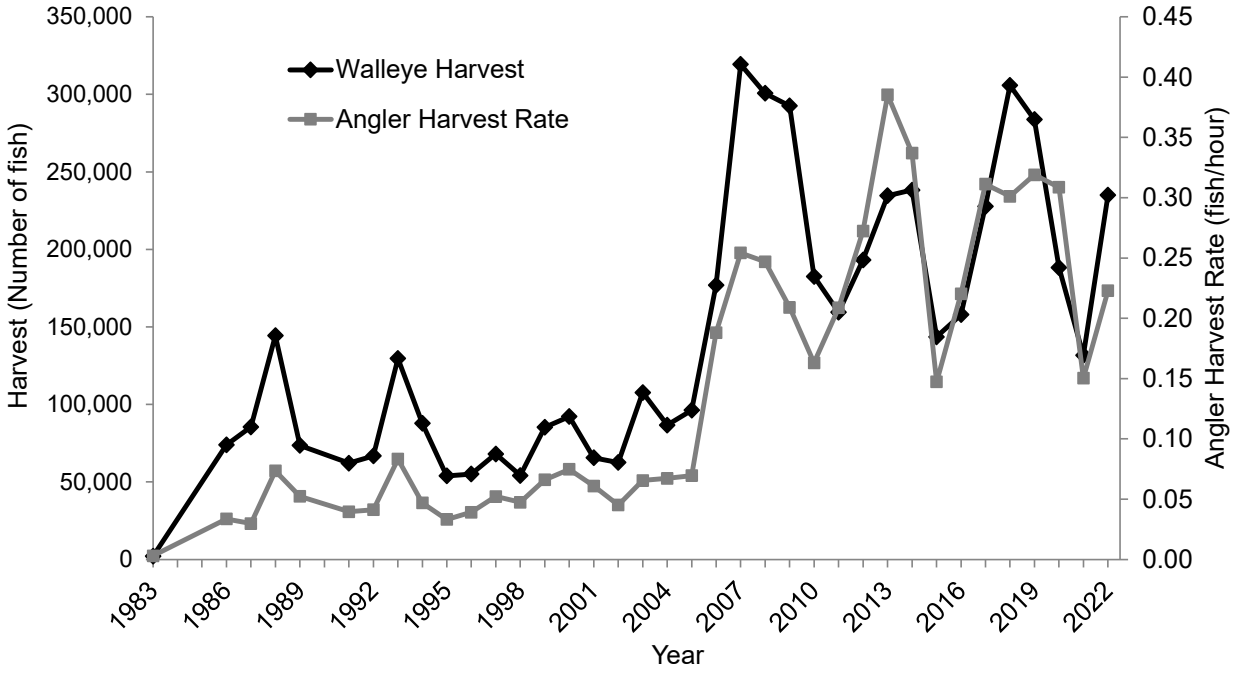

FIGURE 4. Walleye recreational harvest (left y-axis) and angler harvest rate (fish / hour of effort) (right y-axis) in Saginaw Bay and its tributaries, 1983–2022. Values include the open water fishery, winter ice fishery, and charter harvest and are based on a calendar year.

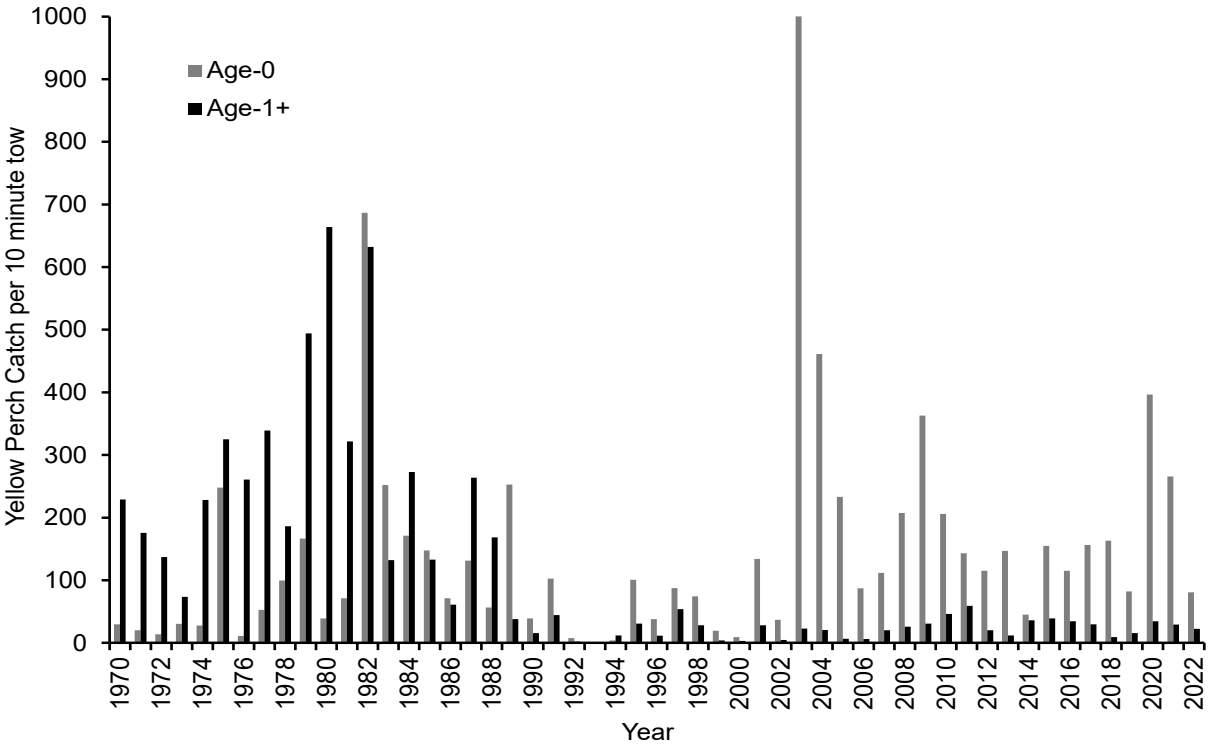

FIGURE 5. Catch rate of age-0 and age-1 and older Yellow Perch from bottom trawling during the Michigan Department of Natural Resources Saginaw Bay fish community survey, 1970–2022.

Fishery managers and stakeholders remained dissatisfied with the state of the Yellow Perch fisheries despite the Walleye population recovery. After 2003, Yellow Perch were reproducing well but failed to recruit to the age-1 and older population and the fisheries declined further. Therefore, fishery managers crafted a new Saginaw Bay Walleye and Yellow Perch management strategy in the mid-2010s. Key new objectives, based on the results of new research and the development of computer models to characterize and simulate the populations and fisheries, were developed (Figure 3). The objectives were to increase recreational harvest opportunity of the recovered Walleye population and improve survival and increased abundance of Yellow Perch by addressing the recreational, commercial, and ecological (predation by fish and birds) aspects of the issue. It was hypothesized that if recreational harvest could be increased enough, it may reduce the Walleye population thereby reducing the predation on juvenile Yellow Perch and subsequently increase their survival and recruitment to older ages. Management actions to address these objectives were enacted in 2015. The Walleye harvest limit was increased from five to an eight fish daily possession limit (DPL) and the minimum harvestable size limit (MSL) was decreased from 381-mm (15.0-in) to 330-mm (13.0-in). The implementation of liberalized Walleye harvest included the adoption of an additional sustainability criterion for maintaining a minimum spawning stock biomass (i.e., total weight of fish in a population that are spawning age) to ensure the population was not overharvested. In addition, Yellow Perch DPL was reduced from 50 fish with no MSL to 25 fish with no MSL in 2015. In 2023, the Saginaw River was open to year-round Walleye harvest. In a further effort to reduce overall mortality on Yellow Perch an agreement was negotiated to relocate one commercial license out of inner Saginaw Bay to a new location in Southern Lake Huron with a concurrent goal of exploring new Lake Whitefish fishing grounds. Lastly, culling and egg oiling of double-crested cormorant *Nannopterum auritum* were prescribed in the bay to reduce avian predation mortality of both juvenile and adult Yellow Perch. Collectively these efforts have yet to have a positive effect on Yellow Perch recruitment but will be maintained to retain this potential under more favorable conditions.

Prior to the changes in the Saginaw Bay food web, availability of quality spawning habitat was deemed a limiting factor for the Walleye population (Fielder 2002; Fielder and Baker 2004). The recovery plan of Fielder and Baker (2004) called for restoration of access to spawning grounds through dam removal or fish passage in tributaries and the restoration of some offshore rock spawning reefs. Walleye spawning was historically split between tributaries and open-water reefs and the diversity of sources was critical to the sustainment of the population and fisheries (Schneider 1977). The diversity creates a portfolio effect such that if one source fails, the other may succeed whereby ensuring some stability to reproduction and recruitment (Hilborn et al. 2003, Schindler et al. 2015). This prescription was realized in 2019 with the construction of Coreyon Reef in Saginaw Bay (Figure 1; Kalejs et al. 2022). The two-acre reef required 22,500 tons of limestone cobble and cost $1.2 million USD. Subsequent monitoring has documented use by spawning Walleye and Lake Whitefish (MI DNR, unpublished data). Coreyon Reef is one of several efforts envisioned to recreate or rehabilitate historic reef habitat in Saginaw Bay.

Cisco were once a major component of the Lake Huron fish community and one of the primary forage items prior to being outcompeted by Alewife (Eshenroder et al. 2021; Zimmerman and Krueger 2011). To restore the native food web, a Cisco rehabilitation project has been underway since 2018. The goal of the project is to reestablish adult brood in the lake which is the principal limiting factor for the population. The objective is to stock a minimum of 1,000,000 fingerlings each year for 10 years with approximately an equal proportion of spring fingerlings and fall fingerlings to evaluate life stage relative performance. By diversifying the prey base available to Walleye, juvenile Yellow Perch survival should increase from the broader predation buffer if Cisco restoration is successful.

STATUS AND RECENT TRENDS OF THE WALLEYE FISHERY

The current status of the Saginaw Bay Walleye recreational fishery is exceptional. Walleye abundance is high and there is evidence of additional substantial year-classes produced in 2021 and 2022 (Figure 6). The current estimated population size of age-2 and older Walleye is over 10 million, which was boosted by a large 2019 year-class. The mean age-0 Walleye catch from the bottom trawling survey in 2022 was the highest since 2009 and the second highest since monitoring efforts began in 1971 (Figure 7). Recreational angler-targeted catch rate was stable in 2021–2022 at 0.4 Walleye per hour. Walleye mean length at age-3 has averaged 423 mm (16.7 in), which was consistent with the target of 424 mm (16.7 in; 110% of the statewide average), indicating no imbalance between Walleye and prey availability. Age-3 Walleye mean length in Saginaw Bay has remained similar to, or below the target since 2017. The current unfished spawning stock biomass (i.e., total weight of fish in a population that are of spawning age) is high indicating a significant number of sexually mature individuals in the population.

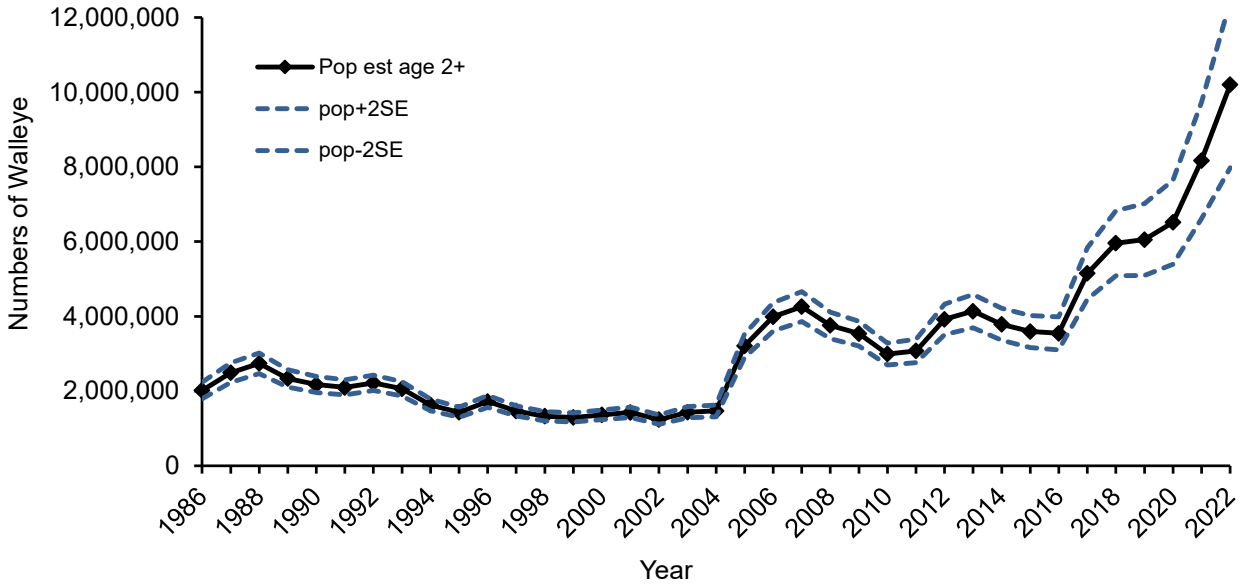

FIGURE 6. Population estimate (+/- 2 standard errors, dashed lines) of age-2 and older Saginaw Bay Walleye from the Michigan Department of Natural Resources statistical catch-at-age model (Fielder and Bence 2014).

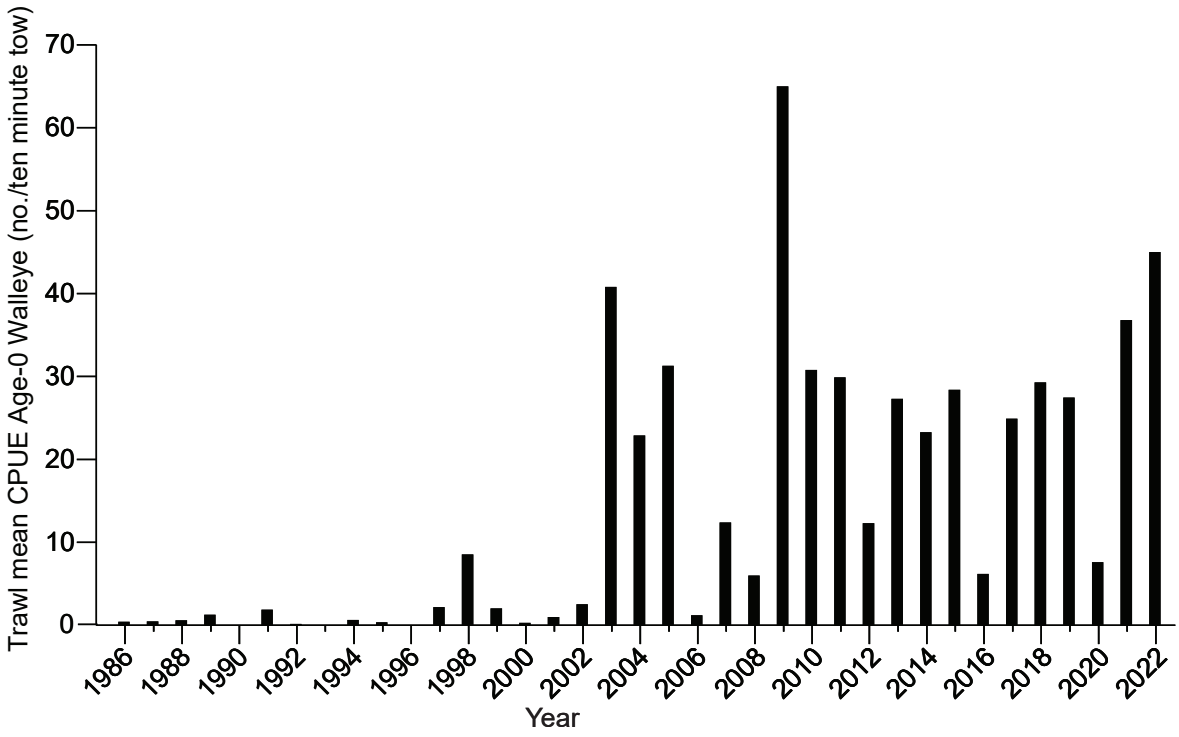

FIGURE 7. Trends in abundance of fall young-of-the-year (age-0) Walleye in Saginaw Bay as indicated by mean catch per unit of effort (CPUE, number/10 min tow) in the bottom traveling survey series since 1986.

STATUS AND RECENT TRENDS OF THE YELLOW PERCH FISHERY

The Yellow Perch population continues to remain depressed. Adult abundance is at historic lows. Mean CPUE of age-1 and older Yellow Perch in survey trawls is low (mean = 26.0/10-min tow) since 2003 compared to the average of 162.9 from 1970–2003, when the bay had a different trophic structure where the nonnative Alewives provided a predation buffer benefiting Yellow Perch. Annual commercial landings of Yellow Perch, which were often over 100,000 kg in the 1990s and early 2000s, mirror the low abundance observed in the survey data. For example, the commercial harvest of Yellow Perch in 2022 was only 5,530 kg (Figure 8). Recreational harvest is similarly at all-time lows (Figure 8).

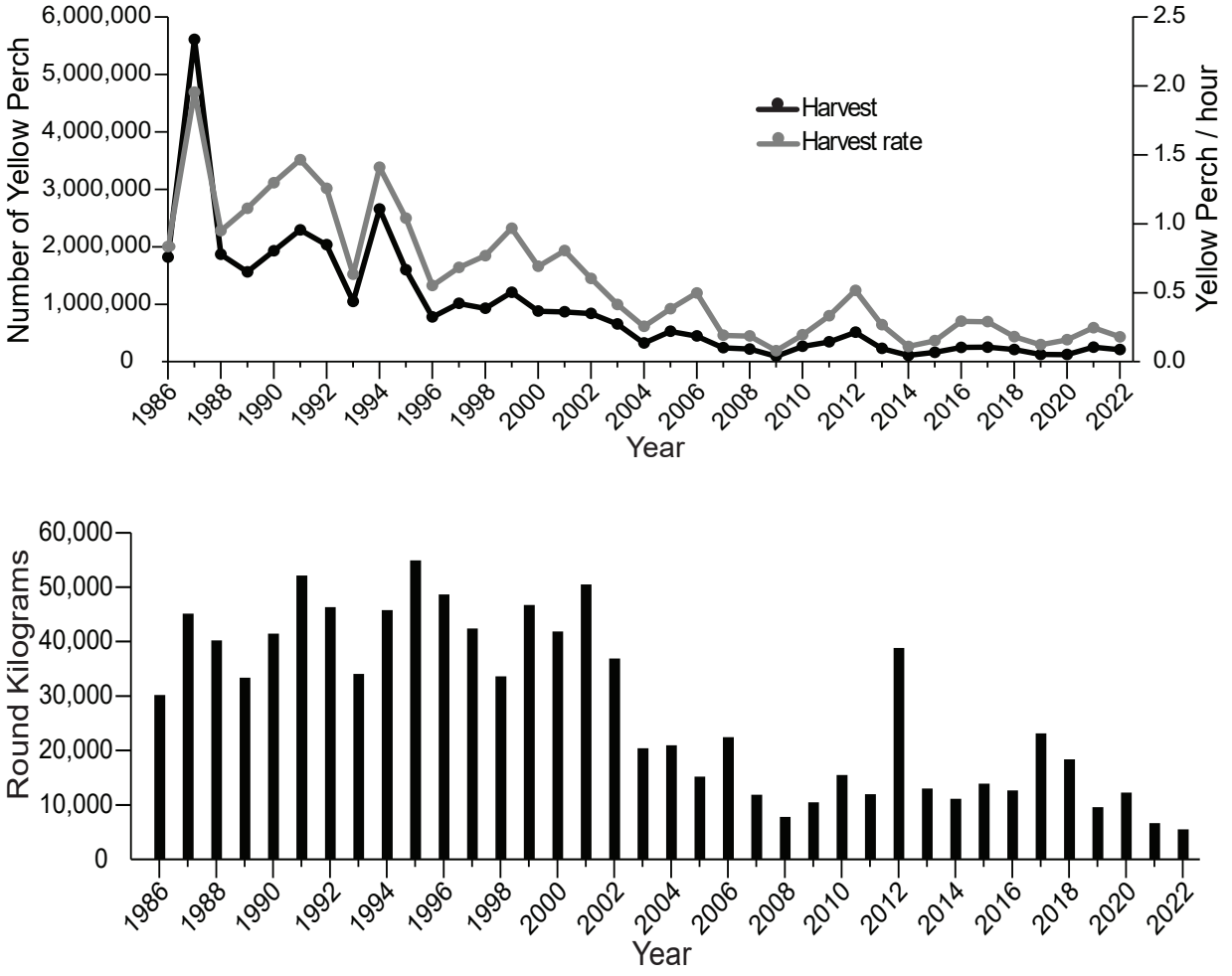

FIGURE 8. Yellow Perch recreational harvest (top panel) (left y-axis) and angler catch rate (right y-axis) in Saginaw Bay, 1986–2022. Values include the open water fishery, winter ice fishery, and charter harvest and are based on a calendar year. Yellow Perch commercial yield in kilograms from Saginaw Bay (bottom panel) 1986 - 2022.

In the face of low abundance, Yellow Perch are growing fast. The mean length of age-3 Yellow Perch in Saginaw Bay is currently 255 mm (10 in), which is more than 39% larger than the 183 mm (7.2 in) statewide average (Schneider et al. 2000). The total annual mortality of age-1 and older Yellow Perch is 68%, commensurate with other Yellow Perch populations (Schneider et al. 2000). This suggests that the

principal factor limiting Yellow Perch abundance is not occurring at the adult level but rather between age-0 and age-1. The Saginaw Bay bottom trawl survey has consistently collected Yellow Perch since monitoring began in 1970 (Figure 5). However, since 1993 the average annual mortality rate between age-0 and age-1 for Saginaw Bay Yellow Perch was 85%, with some years as high as 99%. This indicates a recruitment bottleneck is responsible for low Yellow Perch abundance in Saginaw Bay, not reproduction. Another indicator of a Yellow Perch population experiencing high mortality is early maturation of female fish (Feiner et al. 2017). Roughly 60% of age-1 and nearly 100% of age-2 female Yellow Perch were sexually mature in 2022, compared to an average age-1 maturity of 30% and age-2 maturity of 54% for females prior to 2003. Therefore, current growth and maturity metrics reflect the high mortality experienced at young ages whereby competition within and among year classes of Yellow Perch is reduced. Assuming no other changes to the ecosystem occur, when strong year classes of Yellow Perch recruit and enter the population both metrics can be expected to return to levels more consistent with the statewide average.

CURRENT FISHERY MANAGEMENT, MONITORING, AND DATA COLLECTION

Recreational Fishery Management

The Walleye and Yellow Perch population and fisheries of Saginaw Bay are monitored with a variety of approaches. The Saginaw Bay Walleye stock is highly mobile, which results in the stock being exploited by several fisheries around Lake Huron including recreational fisheries outside of the bay (i.e., northern Lake Huron, southern Lake Huron, Ontario portions of Lake Huron) and commercial fisheries (i.e., Ontario commercial fishery, 1836 Treaty Tribal waters). Therefore, management of the recreational fishery in Saginaw Bay is affected by other fisheries and the recreational fishery in turn affects them.

The demographics of Walleye and Yellow Perch in the bay are assessed through an annual fish community survey performed each September. There are two components to this survey; an annual gill netting assessment performed each year since 1989, and an annual bottom trawling survey performed each year since 1971 (Fielder et al. 2022). In addition to supporting the metrics included in this plan to gauge the status of the Walleye and Yellow Perch populations, this fish community survey also helps monitor the status of other fish, including prey, invasive species, and Lake Sturgeon and Cisco restoration efforts.

An annual creel survey of the recreational fishery has estimated angler effort, catch rates, and harvest since 1986, while charter fishing operators have mandatory harvest reporting requirements. These data illustrate how the Walleye and Yellow Perch recreational fisheries trend over time and in response to ecological and management changes. The combined population modeling, fishery-independent stock assessment, and fishery reporting all constitute essential elements of information to not only gauge status, but to provide essential feedback on management effects and to inform decision making.

The status of the Walleye population and recreational exploitation is assessed by two approaches. First, a statistical catch-at-age model (Fielder and Bence 2014), which is an age-structured population model that draws upon the fish community and creel surveys as inputs, is calculated and run each year. Second, a mark and recapture analysis using a Brownie Model 1 design (Brownie et al. 1985) from jaw-tagged adult Walleye that are caught and reported by the recreational fishery provides year-specific exploitation rate and population metrics (Fielder et al. 2014). These two models provide population and mortality rate estimates, so there is overlap between their output statistics, but together they provide independent results using different theoretical approaches to help characterize current population status. Model-based predictive fishery forecasting under different management scenarios are also used. That

model was developed to conduct a decision-analysis driven assessment of management strategies that led to the 2015 liberalized management redesign (Fielder et al. 2016).

Surveys and model outputs are summarized annually. A comprehensive review of the status of the Walleye and Yellow Perch populations occur in August at the DNR Lake Huron Basin Team meeting, and potential management and regulation changes are discussed internally. This information is then shared at the August LHCFAC meeting. Here, fishery advisors have the opportunity to view fishery status and monitoring data, ask the DNR questions, and ultimately make management recommendations. These recommendations are taken under consideration by the DNR. If the DNR decides that management changes are warranted, they are crafted into a proposal and further input is sought from the public at large. Fisheries Orders are then forwarded to the Fisheries Division Chief for approval, and then advanced to the Natural Resources Commission (NRC) which has the decision-making authority related to the method and manner of the take of sportfish.

Commercial Fishery Management

The state-licensed commercial fishery of Saginaw Bay includes 22 licenses, of which 5–9 have been actively fished in recent years. Currently, 8 of the 22 licenses are owned by a single licensee, and that licensee's operational decisions largely drive the number of licenses that are actively fished in any given year. The state-licensed commercial fishery is managed by limited entry, meaning no new licenses are awarded and existing licenses are the property of the holder and can be bought and sold. The state retains certain authorities that are in statute as law and those include the suspension of commercial harvest for some species. The commercial harvest of Walleye was closed in 1970 and has not been reopened. Yellow Perch are commercially permitted within Saginaw Bay only (216-mm [8.5-in] MSL). The other primarily sought species in the state-licensed commercial fishery in Saginaw Bay is Lake Whitefish. Commercial Lake Whitefish harvest is managed with a combination of limits to the number of trap nets that can be fished on each license, minimum length limits (432-mm [17.0-in] for Lake Whitefish), and a seasonal closure for Lake Whitefish in November. There are no harvest quotas for the state-licensed commercial fishery and the scope of its management is largely set by existing statutes rather than the DNR. Commercial harvest is reported twice a month by the industry to the DNR.

PUBLIC ENGAGEMENT AND SOCIAL CONSIDERATIONS

Public engagement and participation in fisheries management is paramount to building trust, consensus, and shared values and goals (Fulton and Adelman 2003; Hall-Arber et al. 2009). This planning effort incorporated public engagement and social science into the management planning to facilitate collaborative and transparent management approaches to the Saginaw Bay fishery. An extensive amount of community engagement occurs annually throughout the state, as detailed below. The following subsections highlight engagement activities focusing on fisheries management in Saginaw Bay.

Lake Huron Citizens Fishery Advisory Committee

The Lake Huron Citizens Fishery Advisory Committee is a group composed of non-DNR constituents who have a vested interest in the recreational and commercial fishery of Lake Huron. This includes recreational anglers, fishing charter captains, fishing guides, and commercial fishers. The committee currently has 27 voting members, and the DNR Lake Huron Basin Coordinator is a facilitating member. The committee reviews and provides recommendations and direction related to Lake Huron fishery goals, objectives, and management plans. The committee meets four times per year and all meetings are open to

the public. Staff from the DNR regularly attend the meetings as an information resource. The status of the Saginaw Bay fishery is typically discussed extensively at the August meeting.

Saginaw Bay Walleye and Yellow Perch Workgroup

The Saginaw Bay Walleye and Yellow Perch Workgroup was formed in August 2020 to develop an angler-driven vision for the present and future Saginaw Basin (bay and rivers) Walleye and Yellow Perch recreational fishery to incorporate into DNR management processes and decisions. A virtual format facilitated by Michigan Sea Grant and Michigan State University Extension was used to conduct the workgroup activities (Appendix 3) due to the health and safety precautions of the COVID-19 pandemic. The workgroup was made up of 11 members of the invited public who represented a variety of diverse interests beyond general interest in the recreational fishery of Saginaw Bay, along with four DNR staff and three Michigan Sea Grant facilitators. In addition to appointees from the LHCFAC, representatives of tribal governments, recreational anglers, the charter industry, tournament and club anglers, business/retail, education, youth, and general community development were involved. Effort was also given to represent the diversity of fishery interests and uses with members from throughout the greater bay region.

A vision statement of the workgroup was created: "Develop an angler-driven vision for the present and future Saginaw Basin (bay and rivers) Walleye and Yellow Perch recreational fishery to incorporate into DNR management processes and decisions."

The workgroup vision included:

- A resilient fishery that can consistently offer harvest opportunities amongst natural population fluctuations.
- A high-quality Saginaw Bay fishery (e.g., catch rates, abundance).
- A diverse fish community in terms of recreational species and angling tactics available as well as diverse fishing opportunities in terms of seasonality, accessibility, and approaches (e.g., bay fishing, river fishing, shore fishing, ice fishing).
- Native species recovery and restoration.
- Improvement and restoration of habitat and water quality.
- Efforts to improve the Yellow Perch fishery.
- Community development opportunities that enhance the value of the fishery.

Workgroup members expressed a moderately-conservative tolerance for risk. They indicated that caution should be used when taking risks related to the fishery and they preferred calculated decision making.

A recreational angler survey to gauge angler values, perceptions, and risk was developed and reviewed by the workgroup. The final version of the survey was administered to a random sample of 219,931 anglers, which is 10% of the DNR's licensed angler database. A total of 2,168 responses of (1% response rate) were received during the 39 days the survey was open. Overall, most of the anglers surveyed (71%) indicated they were at least somewhat satisfied with the current state of the Saginaw Bay fishery. Over half of the respondents were harvest-oriented (55%) and more motivated by the ability to catch limits than catching trophy-sized fish. When only one answer could be given, the two most targeted species in Saginaw Bay were Walleye (73%) and Yellow Perch (2%). Although Yellow Perch were the primary target for few anglers, 46% of respondents would support increasing Walleye harvest to reduce predation if it might help recover the Yellow Perch population. Conversely, increasing Walleye harvest might include risks like overharvest and 67% of anglers preferred management options ensuring no overharvest would occur. Furthermore, anglers were divided on several regulation questions that are described in further detail in Appendix 3.

Other Outreach

Other outreach occurs continuously, both formally and informally, throughout the year. The Michigan Sea Grant hosts annual spring fisheries workshops for the public that include information about fisheries topics including population dynamics, angler catch data, forage fish surveys, fisheries management updates, citizen science opportunities, and other region-specific topics. An entire workshop is dedicated to the nearshore fishery of Lake Huron with a heavy emphasis on Saginaw Bay.

The DNR hosts annual public "Conversations and Coffee" meetings focusing on fishery management topics around the state. Local and statewide regulations are a primary topic of the meetings. The fishery of Saginaw Bay is often a primary topic of the Southern Lake Huron meeting.

Michigan DNR creel clerks are one of the most important conduits of information to and from the public. The day-to-day interactions and angler interviews provide important perspectives on the status of the fishery. Anglers interviewed by DNR creel clerks in 2022 about the opening of the lower Saginaw River to year-round harvest expressed mixed feelings about this proposed regulation change.

Michigan DNR staff often attend and present information to various fishing and conservation groups throughout the region. Organizations are typically fishing clubs, conservation clubs, and marina dock-owners. Finally, citizen engagement happens on a continuous basis through informal conversations with the public through the day-to-day activities of the DNR.

Natural Resources Commission

Michigan's NRC is a seven-member public body whose members are appointed by the Governor. The Commission has exclusive authority to regulate the taking of game and sportfish (i.e., recreational) and is authorized to designate game species and authorize the establishment of the first open season for animals through the issuance of orders. Proposed Fisheries Orders (i.e., regulation recommendations) are reviewed by the NRC and ultimately approved, denied, or amended. The NRC helps ensure natural resource management is responsive to the needs and opinions of stakeholders as well as scientifically sound.

FISHERY GOALS, OBJECTIVES, AND MANAGEMENT APPROACH

Walleye Population Vision

A Walleye population that: 1) provides abundant and diverse angling and harvest opportunities; 2) is self-sustaining: and 3) remains in balance with the carrying capacity of the bay.

The Walleye population will be managed to maximize the ability to access, participate, and harvest fish while maintaining sustainability. To accomplish this, several metrics (Appendix 1) that measure the following subjects will be annually reviewed:

- Sustainability reflects the ability of a population to be harvested at a level where the population does not decline over time (past defined reference points) by maintaining population and ecosystem resiliency.
- Recruitment is the ability of a year-class to survive to a size where it becomes harvestable.
- Fishery quality is a function of fish length and weight and catch and harvest rates.

While not a stated goal, it is important to recognize that an added benefit to managing for an abundant predator population (Walleye) is maintaining a predation barrier to the establishment of new invasive

species and the resurgence of existing invasive species such as Alewives. It was only through the decline of Alewives in Lake Huron that Walleye could begin regularly reproducing naturally and achieve recovery targets. The biggest threat to sustaining that recovery would be the return of Alewives. Heavy predation in the bay (the spawning and nursery grounds of Alewives when abundant) is one of the best means to suppress this invasive species. It has also been predicted that productive locations such as Saginaw Bay are where invasive carp species (Bighead Carp *Hypophthalmichthys nobilis*, Silver Carp *H. molitrix*, and Black Carp *Mylopharyngodon piceus*) could become hyperabundant, similar to what occurred in the Illinois River system. The most important line of defense is to ensure these nonnative species never gain access to the Great Lakes but if they ever did, a robust predator population remains our next best defense against their establishment.

Metrics in support of these goals were prioritized and given a weight based on our subjective determination of importance to the objectives as well as stakeholder input. The score of the metrics is summed to give an index for that year. The Saginaw Bay Walleye index will be calculated annually, evaluated by DNR Southern Lake Huron Fisheries Management Unit staff and the DNR Lake Huron Basin Team, and presented at the August LHCFAC meeting. In general, trends (increasing/decreasing in 3 of 5 years) of individual metrics will be the basis for discussing management actions given the natural variability of the Saginaw Bay Walleye population. As of 2022, the Walleye population has an Integrated Index score of 55.5 and met the above criteria.

Goal 1. Maintain a Walleye population that maximizes sustainable recreational angling and harvest opportunity and is carrying capacity of the habitat and prey-base.

Objectives

- *Integrated index score:* A score of 40 or greater which contains important metrics of sustainability, recruitment, and fishery quality. Metrics are described in Appendix 1.
- *Recruitment*: Mean catch-per-unit-effort of age-0 Walleye greater than 20 fish/10 min bottom trawl tow in at least 3 of 5 consecutive years.
- *Growth*: Mean length of age-3 Walleye is no greater than 424 mm (16.7 in), which is 110% of the statewide average length at age 3.
- *Reproductive potential*: Spawning stock biomass (i.e., total weight of fish in population that are of spawning age) is greater than 20% of the unfished level.
- *Angler-targeted catch rate*: Open water targeted catch rate of Walleye greater than or equal to 0.4 fish/h.

Goal 2. Protect or restore connectivity to spawning and nursery habitats, like estuaries and nearshore areas, in the bay and tributary rivers essential to supporting a self-sustaining population.

Objectives

- Conserve existing spawning habitat and reduce sedimentation in Saginaw Bay tributaries.
- Restore connectivity to spawning habitat with dam removals and fish passage improvements, particularly at Dow Dam on the Tittabawassee River.
- Restore offshore spawning habitat in Saginaw Bay by constructing rock reefs.

Goal 3. Maintain and expand fishing opportunities where feasible to maximize fishery participation.

O*bjectiv*es

- Preserve, maintain, and renovate existing state-owned access sites and other public areas to keep them accessible and functional.
- Increase the number of fishery access points.
- Disseminate an index of fishery access points to public.

Goal 4. Pursue and advocate for current and new research that addresses information gaps and is needed to inform fishery management and policy.

Objectives

- Evaluate fish passage improvements in the Saginaw Bay watershed and their effects on the Walleye population.
- Identify and quantify Walleye spawning locations at tributaries and reefs.
- Determine if the Saginaw River is a significant rearing location for juvenile Walleye.
- Estimate Walleye predation thresholds on the Yellow Perch population that would result in realized Yellow Perch fishery benefits.

Walleye Regulations Toolbox

The Walleye regulations toolbox provides examples of specific regulation options that are available to fishery managers. When sustainability, recruitment, and fishery quality metrics decline below fishery objectives, fishery managers will discuss with the internal Lake Huron Basin Team, consult citizen representatives like the LHCFAC, and use the best science (i.e., monitoring data outlined above) to determine if management adjustments or regulation proposals are warranted and should be pursued. The possible adjustments in harvest regulations are intended to reflect possible changes in the size of the bay's Walleye population. Recommendations are submitted to the NRC who has the authority to set harvest regulations. The following examples are not all-inclusive, and any management and regulatory change will be context-dependent and designed to remedy any failure to meet the explicitly outlined management objectives.

Examples of Regulation Options

Minimum size limit (MSL) and daily possession limit (DPL)

- 13-in MSL; 8 fish DPL
  Goal: Reduce the risk of an imbalance with the prey base and provide anglers with increased harvest opportunities.
- 13-in MSL; 5 fish DPL
  Goal: Harvest of adult Walleye yet provide for early harvest at ages and sizes that moderate lifetime impacts to the prey base.
- 15-in MSL; 5 fish DPL
  Goal: Protect the majority of juvenile Walleye from harvest prior to maturity and allow for harvest opportunities of adults that align with sustainable mortality rates. This option is consistent with default statewide Walleye management regulations.

Fishing and Possession Season

- Year-round season to maximize fishing and harvest opportunity in the bay and Saginaw River. This type of regulation would be appropriate for a population not showing signs of overharvest.
- Saginaw River seasonal closure from March 16th through the Friday before the last Saturday in April which prevents harvest of Walleye while they migrate through a major spawning corridor. This type of regulation would be appropriate for a population showing early signs of over harvest or low recruitment, whereby added protection for the spawner stock is necessary to ensure adequate spawners remain available. Other fishery closures are in place to prohibit targeting and harvesting Walleye when they are concentrated on spawning grounds and vulnerable to anglers.

Gear Restrictions

- Variety of tackle restrictions to reduce non-target fish incidental catch and increase release survival.

Other Walleye Management

Prior to the Alewife collapse,Walleye fingerling stocking was necessary to bypass Alewife predation and support Walleye recruitment. The current level of recruitment could not be replicated by stocking, but from 1983 to 2006 stocking was successful in generating a limited recreational fishery in the presence of otherwise poor natural reproduction. If the Lake Huron Alewife population ever rebounds and associated predation on newly hatched Walleye fry is again a limiting factor, Walleye fingerling stocking may need to be resumed to maintain the population. Population simulation computer modeling forecasts a severe decline and loss of Walleye recovery if Alewives were ever to become abundant in Lake Huron again. While stocking could not compensate for that loss, it nevertheless is identified here as one management tool held in reserve.

Yellow Perch Population Vision

A Yellow Perch population that: 1) supports diverse angling and harvest opportunities; 2) is self-sustaining; and 3) that contributes to a balanced prey base while not being the dominant prey item.

The Yellow Perch population will be managed to maximize harvest opportunity (i.e., the ability to access, participate, and harvest fish), shared between the recreational and commercial fisheries, while maintaining sustainability. To accomplish this, several sustainability, recruitment, and quality metrics will be annually reviewed (Appendix 2). Sustainability measures the ability of a population to be harvested where the population does not decline over time by maintaining population and ecosystem resiliency. Recruitment is the ability of a year class to survive to a size where it becomes harvestable. Quality is a function of fish condition (e.g., length and weight) and the angling experience (e.g., catch rate and harvest rate). Metrics were prioritized and given a weight based on our subjective determination of importance. The score of the metrics is summed to give an index for that year (see Appendix 1 for a further explanation of scoring methods). The Saginaw Bay Yellow Perch index will be calculated annually, evaluated by Unit staff and the internal DNR Lake Huron Basin Team, and presented at the August LHCFAC meeting. In general, trends (increasing/decreasing in 3 of 5 years) of individual metrics will be the basis for discussing management actions given the natural variability of the Saginaw Bay Yellow Perch population. As of 2022 the Yellow Perch population has an Integrated Index score of zero and does not meet the above criteria.

Goal 1. Promote a resilient Yellow Perch population that has recreational and commercial harvest opportunity, consistent recruitment to age-1, and acceptable size-structure.

Objectives

- *Integrated index score:* A score of 20 or greater which contains important metrics of sustainability, recruitment, and fishery quality. Metrics are detailed in Appendix 2.
- *Recruitment*: Mean CPUE of age-1 and older Yellow Perch above 200 fish/10 min bottom trawl tow in at least 3 of 5 consecutive years.
- *Growth*: Mean length of age-3 Yellow Perch is no greater than 201 mm (7.9 in), which is 110% of the statewide average length at age-3, at least 3 of 5 consecutive years.
- *Angler catch-rate*: Mean angler-nontargeted catch rate greater than 1 fish/h in the open water and ice fishery combined.

Goal 2. Protect or restore connectivity to essential spawning and nursery habitats.

Objective

- Restore coastal wetlands to improve foraging habitat and predator refugia for juvenile Yellow Perch in Saginaw Bay and tributaries.

Goal 3. Pursue and advocate for current and new research that addresses information gaps needed to inform management and policy.

Objectives

- Determine magnitude of fish and bird predation on Yellow Perch.
- Determine population-level implications of early Yellow Perch maturation.
- Determine effects of food web changes on larval and adult Yellow Perch population dynamics.
- Develop Yellow Perch statistical catch-at-age model.
- Incorporate Yellow Perch into the Walleye stochastic simulation model.
- Determine spatial distribution of Yellow Perch in Saginaw Bay.

Yellow Perch Regulations Toolbox

The Yellow Perch regulations toolbox provides examples of specific regulation options that are available to fishery managers. When sustainability, recruitment, and fishery quality metrics decline below fishery objectives, fishery managers will discuss with the Lake Huron Basin Team, consult citizen representatives like the LHCFAC, and use the best science to determine if management adjustments or regulation changes are warranted and should be pursued. Recommendations are submitted to the NRC who has the authority to set harvest regulations. The following examples are not all-inclusive, and any management and regulatory change will be context-dependent and designed to remedy any failure to meet the explicitly outlined management objectives.

Examples of Regulation Options

Minimum size limit (MSL) and daily possession limit (DPL)

- No recreational MSL; 50 fish DPL
  Goal: Provide increased harvest while maintaining sustainable mortality rates.

- No recreational MSL; 25 fish DPL
  Goal: Reduce mortality rate while still providing some harvest opportunity with a socially acceptable possession limit. This is the same as the default statewide Yellow Perch harvest regulations.

Fishing and Possession Season

- Year-round to maximize fishing and harvest opportunity.

Gear restrictions

- Variety of tackle restrictions to reduce non-target fish incidental catch and increase release survival.

It is recognized that these regulation options will not, by themselves, likely result in increases in the Yellow Perch population or fisheries given the present limitations. The current limiting factor of low survival between age-0 and age-1 Yellow Perch due to predation will not respond to regulations. Instead, these regulations are intended to provide for fisheries to the extent the current depressed population can sustain and to position the population to expand when ecological conditions improve.

SAGINAW BAY ACTION ITEMS

This section provides a suite of priority actions for the DNR Southern Lake Huron Management Unit and partners. Addressing these and other unlisted, yet relevant, items will improve the ability to manage Saginaw Bay and its watershed.

Habitat

- Promote actions to create inshore and offshore spawning reefs.
- Pursue improvements in tributary fish passage including dam removal with a focus on terminal barriers.
- Pursue acquisition and integration of new technologies such as remote sensing and sonar to delineate and monitor important fish habitat.
- Pursue and promote project proposals to improve land use practices in watersheds of Saginaw Bay tributaries.
- Identify sites for wetland restoration in Saginaw Bay and its watershed.
- Investigate habitat impairments such as the presence of invasive aquatic vegetation.

Access

- Create a GIS database of fishery access points for Saginaw Bay, Saginaw River, Tittabawassee River, Shiawassee River, Flint River, and Cass River and disseminate it to the public.
- Partner to renovate state-owned access sites to maximize functionality (i.e., parking expansion, well-lighted launches, universally accessible docks, and invasive Phragmites treatment).
- Advocate for the preservation and renovation of non-state-owned access sites to keep them accessible and functional.
- Identify parcels with access to Saginaw Bay or the Saginaw River for purchase to increase the number of fishery access points.
- Install a fish cleaning station along the Saginaw River.

ACKNOWLEDGEMENTS

The content of this management plan reflects significant input from several individuals and groups. The Saginaw Bay Walleye and Yellow Perch Workgroup were generous with their time, patience, and contributions to this effort. These individuals represented citizen and nongovernmental organization input to help craft management visions and goals. They persevered and were great and gracious partners as we worked through a virtual process that was imposed by the COVID-19 pandemic. The Lake Huron Citizens Fishery Advisors provided a respectful and valuable platform for discussing the various relevant topics.

The efforts of the Michigan Sea Grant and Michigan State University Extension including Meaghan Gass, Brandon Schroeder, Jennifer Hunnell, and the supporting staff were crucial to facilitating the workgroup activities, Lake Huron Citizens Fishery Advisory Committee meetings, spring Sea Grant Fisheries Workshops, and DNR Coffee and Conversations workshops.

Contributions by DNR staff were rich and paramount. Many DNR staff (retired and present) from Fisheries and Law Enforcement Divisions gave valuable input. Earlier versions of this plan were improved by the reviews of Doug Schultz, Patrick Hanchin, Jennifer Johnson, Darren Kramer, Sara Thomas, and Troy Zorn.

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APPENDIX 1

Walleye Reerence Points Dashboard

A set of criteria were established across three categories (sustainability, recruitment, and quality) to indicate when management action may be warranted for Walleye and Yellow Perch. The criteria are intended to be reflective of population and fishery status. Within each of these categories are one or more metrics measured regularly by the DNR's Fisheries Division. Metrics are weighted on a scale of 0 to 10 based on their relative importance as a population status indicator, with 10 being the most important. Metrics are assigned numerical reference points reflective of stable, increasing, or decreasing stock status and an associated risk indicative of future population status if the reference point is sustained. Each risk level is assigned a multiplier (0 for 'high risk', 0.5 for the 'moderate risk' and 1.0 for 'no risk'). For example, growth rates between 100-110% of the Statewide Average Growth Rate (SAGR) infers a relatively stable population balanced with available resources and has a risk multiplier of 1.0. Growth rates above 110% of the SAGR suggest the population has declined such that the density-dependent growth has increased beyond the target, and this would be deemed a high-risk assignment and a risk multiplier of 0. Metrics will be scored and totaled annually after each survey is completed to reflect the 'integrated score' for that species (Walleye or Yellow Perch). The higher the total integrated score, the healthier and safer the population and fishery is deemed. The following management prescriptions are based partly on the annual assessment integrated total score for helping to indicate when corrective action is warranted.

Type	Metric	Weight	Signal	Reference Point	Indication
Sustainability	Growth Rate	10	Meets target	Between 100% and 110% SAGR for age 3 in early Sept.	Population congruent with carrying capacity
			Some risk	Below SAGR of 386 mm for age 3 in early Sept	Population exceeding carrying capacity
			High risk	Above 110% SAGR (425 mm) for age 3 in early Sept.	Population below carring capacity
Sustainability	Spawning Stock Biomass (SSB)	10	Meets target	Above 30%	No recruitment overfishing
			Some risk	Between 20% and 30%	
			High risk	Below 20% of the unfished level	Recruitment overfishing
Recruitment	Alewife density in Lake Huron	10	Meets target	<0.25 per hectare	Determined by annual GLFC bottom trawling
			Some risk	0.25-0.35 per hectare	
			High risk	>0.35 per hectare	
Recruitment Sustainability	Stock Recruitment function position	5	Meets target	Within 20% of the Stock size to the right of the curve apex	Maximum recruitment
			Some risk	beyond 20% to the right of the curve's apex	Compensation
			High risk	Anywhere to the left of the apex	Recruitment overfishing
Recruitment	Age 0 mean trawl CPUE (per 10 min tow)	10	Meets target	>24.4	
			Some risk	6-24	
			High risk	<6.0 for more than one year out of four	
Sustainability	Total annual mortality rate age 4+	5	Meets target	0.3 - 0.4	
			Some risk	<0.3	Under utilization of fishery
			High risk	>0.4	Potential overharvest if consistently >0.4
Sustainability	Forage base	5	Meets target	> 5.0	
			Some risk	3.0 - 5.0	Trawling index kg/10 min tow
			High risk	<3.0	
Quality	Angler targeted catch rate	5	Meets target	>=0.40	
			Some risk	0.30-0.40	
			High risk	<0.30	
Sustainability Quality	Population (age 2+) size	2	Meets target	>5 million	
			Some risk	3-5 million	
			High risk	< 3 million	
Objective function	Recreational harvest	1	Meets target	>175,000	
			Some risk	125,000-175,000	
			High risk	< 125,000	
	Total max score possible:	**63**			

APPENDIX 2

Yellow Perch Reerence Points Dashboard

Type	Metric	Weight	Signal	Reference Point	Indication
Sustainability	Growth Rate	10	Yellow	Below SAGR of 185 mm for age 3 in early Sept	Yellow Perch pop exceeding carrying capacity
			Green	Between 100% and 110% SAGR for age 3 in early Sept.	Yellow Perch pop in line with Carrying Capacity
			Red	Above 110% SAGR (203 mm) for age 3 in early Sept.	Yellow Perch pop below carring capacity
Sustainability	Total annual mortality rate age 1+	10	Yellow	<0.5	
			Green	0.5-0.6	
			Red	>0.6	
Recruitment	CPUE of age 1+ Perch in the trawl (no/10 min tow)	5	Yellow	100-200	
			Green	>200	
			Red	<100	
Recruitment	Age-0 to Age-1 mortality rate	10	Yellow	0.6-0.75	
			Green	<0.6	
			Red	>0.75	
Quality	Angler catch rate	3	Yellow	0.25-0.80	
			Green	>0.80	
			Red	<0.25	
Objective function	Commercial Yield	2	Yellow	18000-27000	
			Green	>27000	
			Red	<18000	
Objective function	Recreational harvest	2	Yellow	700000-1000000	
			Green	>1000000	
			Red	<700000	
	Total max score possible:	**42**			

APPENDIX 3

Saginaw Bay Walleye and Yellow Perch Workgroup

Background

Public engagement in freshwater fishery management is of paramount importance as it serves as a crucial mechanism for fostering sustainable practices and achieving successful conservation outcomes. By involving stakeholders, such as local community members, recreational anglers, environmentalists, and policymakers, in the decision-making process, a more comprehensive understanding of the diverse needs and concerns surrounding freshwater ecosystems is gained. This inclusive approach helps to ensure that management strategies are not only based on scientific expertise but also reflect the values and priorities of those directly impacted by the management decisions. Moreover, public engagement enhances public awareness and appreciation for the ecological significance of freshwater fisheries, thereby fostering a sense of responsibility and stewardship among citizens. Ultimately, collaborative efforts between researchers, managers, and the public lead to more effective, adaptive, and equitable management strategies that can safeguard the delicate balance of freshwater ecosystems and promote the sustainable use of fishery resources for present and future generations.

The Saginaw Bay Walleye and Yellow Perch Workgroup was formed in August 2020. The stated planning purpose was to: Develop an angler-driven vision for the present and future Saginaw Basin (bay and rivers) Walleye and Yellow Perch recreational fishery to incorporate into Michigan DNR management processes and decisions. Four members of the DNR participated as workgroup conveners, and Michigan Sea Grant and Michigan State University Extension facilitated the workgroup discussions. The Workgroup was made up of 11 members of the public who represented a variety of diverse interests in the recreational fishery of Saginaw Bay. In addition to appointees from the Lake Huron Citizens Fishery Advisory Committee, representatives of tribal, recreational anglers, charter industry, tournament and club anglers, business/retail interests, education, youth, and general community interests were involved. Effort was also given to represent the diversity of fishery interests and utilization with members from throughout the greater bay region.

At the start of the workgroup, conveners and facilitators took efforts to ensure that workgroup members understood the overall process by:

- Identifying workgroup roles and responsibilities:
    - Convener (MI DNR): Convenes agency and workgroup contributors; establishes workgroup roles; listens and participates following workgroup norms; provides technical assistance.
    - Facilitator (MI Sea Grant): Serves a neutral, honest broker role; records ideas and information with effective note taking; coordinates technology.
    - Participant: Follows workgroup norms and actively engages in workgroup process.
- Identifying workgroup virtual platforms (e.g., video teleconference, technological tools), share why they will be used, and provide technology training if needed.
- Constructing workgroup schedule with clear timeline and objectives.
- Establishing workgroup expectations (i.e., time commitment), norms, and opportunities for continued dialogue, which will be reviewed and agreed upon by workgroup members.
- Celebrating workgroup and completion of process.

Four virtual meetings were held in 2020, beginning on 22 September 2020 due to the health and safety precautions of the COVID-19 pandemic. The meetings utilized the Zoom videoconferencing platform (Zoom Video Communications, Inc., 2016; Archibald et al. 2019) and ranged in duration

from one to two hours. Meeting activities included: developing and agreeing to workgroup ground rules; establishing relationships and trust; developing a workgroup vision statement; completing fishery appreciate inquiry, fishery visioning, fishery tradeoff activities; and developing and piloting of an angler survey. The Miro software platform (Miro online whiteboard, RealTime Board, Inc.) was used within the virtual format to provide visual whiteboard tools to focus the fishery discussions. Qualitative, semi-structured interviews were held with workgroup members as well as two additional outside stakeholders representing interests of the communities of Bay City and Saginaw.

Saginaw Bay Walleye and Yellow Perch Workgroup Vision Statement:

"Develop an angler-driven vision for the present and future Saginaw Basin (bay and rivers) Walleye and Yellow Perch recreational fishery to incorporate into DNR management processes and decisions."

Workgroup Activities

Values

Relationship Building

Workgroup values were explored during introductory relationship-building conversations. During the first two sessions each group member was asked to contribute to Google Slides by describing and sharing images in response to these the question prompts:

1. How do you participate in the fishery?
2. What are your best and worst fishing trips?

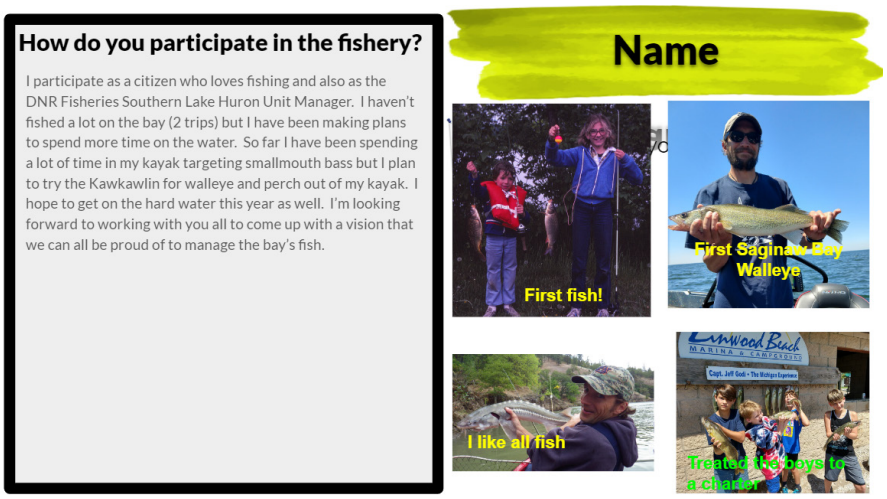


Figure A. 3. 1. Example of Google Slide for workgroup members to share fishery values.

Through more focused group conversation these personal values toward the recreational Saginaw Bay Walleye and Yellow Perch fisheries were explored collectively, as well as sharing and discussing added layers of their family values, community values, ecosystem (ecological) values, future (legacy) values, and conflicting values that may be held by others.

These collected value statements resulting from the work group meetings were recorded using Miro virtual whiteboard, summarized and organized broadly among the commonly described 'Four Fs of Fish' public values of fish and fisheries: Food, Fun, Finances, and [Ecological] Function (Lynch and Taylor 2013). The categorized results of the workgroup identified the following

items and examples within each category.

Food.

- Sustainable source of local food/protein
- Subsistence values in recreational fisheries
- Commercial fisheries

Fun.

- High quality fishery, catchability (catch rates)
- Diverse fishing opportunities – species, seasons, and methods of fishing
- Appreciating, participating in outdoor experiences
- Fishing with family and friends
- Experiences and memories
- Engaging youth, young anglers

Finances.

- Community sense of place, pride in fishery
- Community development opportunity
- Economic values and contributions
- Tourism – an angling destination
- Offering a premier fishery in the country

Ecological Function.

- Sustainable fisheries
- Biodiversity (variety of fish species)
- Native fish species
- Environmental quality
- Protecting/Restoring Fish Habitat
- Understanding Human Interactions
- Research and Management

Cross-cutting themes.

- Access, opportunity to participate in fish and fisheries
- Diversity of community, user values toward shared fishery
- Sense of community, family, and friendships through fisheries
- Ethics – respect for diverse fisheries, user values, rules regulating
- History, heritage, and traditions connected with all fisheries
- Tribal nations – connections, values, traditions relating to fisheries
- Future generations – youth engagement, legacy of a great fishery for future

Appreciative Inquiry

The workgroup used an adapted Appreciative Inquiry process (Cooperrider and Whitney 2005; Hammond 1998) to accomplish some broad vision statements from the work group based on discussions about:

1. NOW? What do you most appreciate about the Saginaw Bay Fishery?
2. WOW? How would you describe an even better Saginaw Bay Fishery?
3. HOW? How do we get to this better fishery (types of actions)?

Discussion and comments responding to these three appreciative inquiry prompts were recorded and summarized. The 'WOW' and 'HOW' themes emerging served as the foundation for the core vision concepts described and later prioritized. These were summarized:

NOW? What do you most appreciate about the Saginaw Bay Fishery?

- All Season Fishery
- Diverse Species
- All-Star Walleye Fishery
- Diverse Access (boat, shoreline, ice, etc.)
- Community Development (Sense of Place, Quality of Life)
- Economic Development (Tourism Development, Bringing $$ into Community
- Family & Friendships
- Environmental, Habitat Restoration
- Perch Recovery - Interest & Efforts
- Stewardship, Community Service
- Multiple, sometimes conflicting, fishery values (recreational, commercial, etc.)

WOW? How would you describe an even better Saginaw Bay Fishery?

- Youth in angler and stewardship education
- Community Development (Valuing Fishery)
- Enhancing Fishing Opportunity / Further diversifying fishery
- Enhancing Access (infrastructure, wayfinding, etc.)
- Economic Development/Tourism Development Opportunity
- Coordinating Commercial Fisheries w/ DNR monitoring / management efforts
- Improved Agency Communication (e.g., fish stocking effort)
- Research Investments
- Sustaining Walleye fishery (numbers, catch rates, etc.)
- Food web Monitoring/Mgt
- Native Species Recovery
- Perch Recovery
- Habitat Improvements

HOW? How do we get to this better fishery (types of actions)?

- Science-driven, Adaptive Mgt
- Improve Access
- Culture, Traditions, Education
- Partnerships & Collaboration
- Habitat, Water Quality Investments
- Law Enforcement
- AIS prevent/ manage
- Prey Fish monitor/manage
- Cormorant Management
- Protect large WAE (e.g., river spawners)
- Maintain opportunity for increased WAE numbers and harvest of fish
- Habitat and Water Quality Investments

Fishery Visioning and Tradeoffs

An adapted paired comparison or pairwise comparison method (Ramik 2020) was used to analyze and prioritize these broader visioning goals resulting from the appreciative inquiry and

visioning process. This process was used to rate or rank the importance of each identified vision priority item relative to each other priority item. This method served to compare identified priority items that are otherwise non-comparable - each priority item being different in nature from each other or subjective (lacking objective, comparable data).

Both stakeholder work group and resource (research and management) agency team members participated in this exercise of prioritizing these items. A survey paired each item against each of the other items individually, and each person was asked to choose the higher-ranking choice for each combination of possible comparisons for each of these paired items. Items were then prioritized by aggregating the total number of 'wins' or 'ties' each item received when paired with each other item option. These priority rankings were summarized for the aggregated responses from both the work group and the resource agency team individually, and then compared collectively looking for areas of agreement among both groups (Table 1).

Table A. 3. 1: Paired comparison ranking by work group and agency team for visioning priorities

Priority Item - WORKGROUP	WINS + TIES	Priority Item - DNR AGENCY	WINS
N. Resilient Saginaw Bay fishery that can quickly bounce back and withstand change	14	H. Research and monitoring efforts within Saginaw Bay and Lake Huron	13
E. Diverse fishery to supporting variety in fish species and seasonal fisheries	13	J. High quality Saginaw Bay Walleye Fishery (current numbers, catch rates, etc.)	12
J. High quality Saginaw Bay Walleye Fishery (current numbers, catch rates, etc.)	13	N. Resilient Saginaw Bay fishery that can quickly bounce back and withstand change	12
L. Yellow Perch recovery efforts in Saginaw Bay	12	K. Native species recovery and restoration in Saginaw Bay (e.g. Cisco, Whitefish, Lake Sturgeon)	11
P. Habitat restoration and water quality improvement investments	11	P. Habitat restoration and water quality improvement investments	9
D. Fishing opportunities for different angler seasons, locations, and methods	11	D. Fishing opportunities for different angler seasons, locations, and methods	8
K. Native species recovery and restoration in Saginaw Bay (e.g. Cisco, Whitefish, Lake Sturgeon)	11	F. Access to the fishery with improved infrastructure and better wayfinding	8
B. Community development opportunities that enhance the value of the fishery	10	E. Diverse fishery to supporting variety in fish species and seasonal fisheries	7
O. Invasive species monitoring and management within Saginaw Bay.	8	A. Youth in angler and stewardship education	6
F. Access to the fishery with improved infrastructure and better wayfinding	8	L. Yellow Perch recovery efforts in Saginaw Bay	6
A. Youth in angler and stewardship education	8	I. MDNR science communication and engagement with anglers and community members	5
H. Research and monitoring efforts within Saginaw Bay and Lake Huron	7	G. Commercial fisheries as part of DNR fisheries management efforts	3
C. Tourism and economic development opportunities that connect to the Saginaw Bay fishery	7	O. Invasive species monitoring and management within Saginaw Bay.	3
G. Commercial fisheries as part of DNR fisheries management efforts	5	B. Community development opportunities that enhance the value of the fishery	2
I. MDNR science communication and engagement with anglers and community members	4	M. Enforcement of regulations (e.g. increased presence of conservation officers)	2
M. Enforcement of regulations (e.g. increased presence of conservation officers)	0	C. Tourism and economic development opportunities that connect to the Saginaw Bay fishery	1

	top 25% both WORK GROUP & DNR FISHERIES
	top 50% both WORK GROUP & DNR FISHERIES
	top 50% WORK GROUP; but rated lower by DNR FISHERIES
	top 50% DNR FISHERIES; but rated lower by WORK GROUP

Two items rated highest in priority (ranking in the top 25%) and in agreement among both the work group and the agency team.

- High quality Saginaw Bay Walleye fishery (current numbers, catch rates, etc.)
- Resilient Saginaw Bay fishery that can quickly bounce back and withstand change

Four items ranked in the top 50% of prioritized list for both the work group and agency team.

- Diverse fishery supporting variety in fish species and seasonal fisheries
- Native species recovery and restoration in Saginaw Bay (e.g. Cisco, Whitefish, Lake Sturgeon)
- Habitat restoration and water quality improvement investments
- Fishing opportunities for different angler seasons, locations, and methods

Two items ranked in the top 50% of prioritized list for the work group but not for the agency team.

- Yellow Perch recovery efforts in Saginaw Bay
- Community development opportunities that enhance the value of the fishery

Two items ranked in the top 50% of prioritized list for the agency team but not for the work group.

- Research and monitoring efforts within Saginaw Bay and Lake Huron
- Access to the fishery with improved infrastructure and better wayfinding

Summary

The main values and priorities identified through the workgroup process were:

- A resilient fishery that can consistently offer harvest opportunities amongst natural population fluctuations.
- A high-quality Saginaw Bay fishery (e.g., catch rates, abundance).
- A diverse fish community in terms of species and tactics as well as diverse fishing opportunities in terms of seasonality, and approaches (e.g., bay fishing, river fishing, shore fishing, ice fishing).
- Native species recovery and restoration.
- Improvement and restoration of habitat and water quality.
- Efforts to improve the Yellow Perch fishery.
- Community development opportunities that enhance the value of the fishery.

Workgroup members communicated a moderately-conservative approach to risk. They indicated that caution should be used when taking risks related to the fishery and they preferred calculated decision making.

There was frustration in the poor-quality Yellow Perch fishery. There was acknowledgment that this was a complicated issue and that management actions might only have a limited ability to influence the Yellow Perch population. Nevertheless, the members highlighted the positive value to the region when there was an abundant Yellow Perch population. It brought valuable attention and commerce to the area and likely attracted some unique anglers to the fishery that have been lost in recent years.

Statewide Recreational Angler Survey

A recreational angler survey to gauge angler values, perceptions, and risk was developed and piloted through the workgroup where feedback was incorporated to revise the survey for clarity and intent. A revised version was developed and administered to a random sample of 10% of the DNR's Licensed Angler Database resulting in 2,168 responses out 219,931 potential respondents (1% response rate). The survey duration was 39 days and respondents were largely from Michigan (Figure A. 3. 2) although there many respondents from other states and Canada (Figure A. 3. 3). Survey questions focused on recreational angling preferences, values, and attitudes toward fishery management of Saginaw Bay.

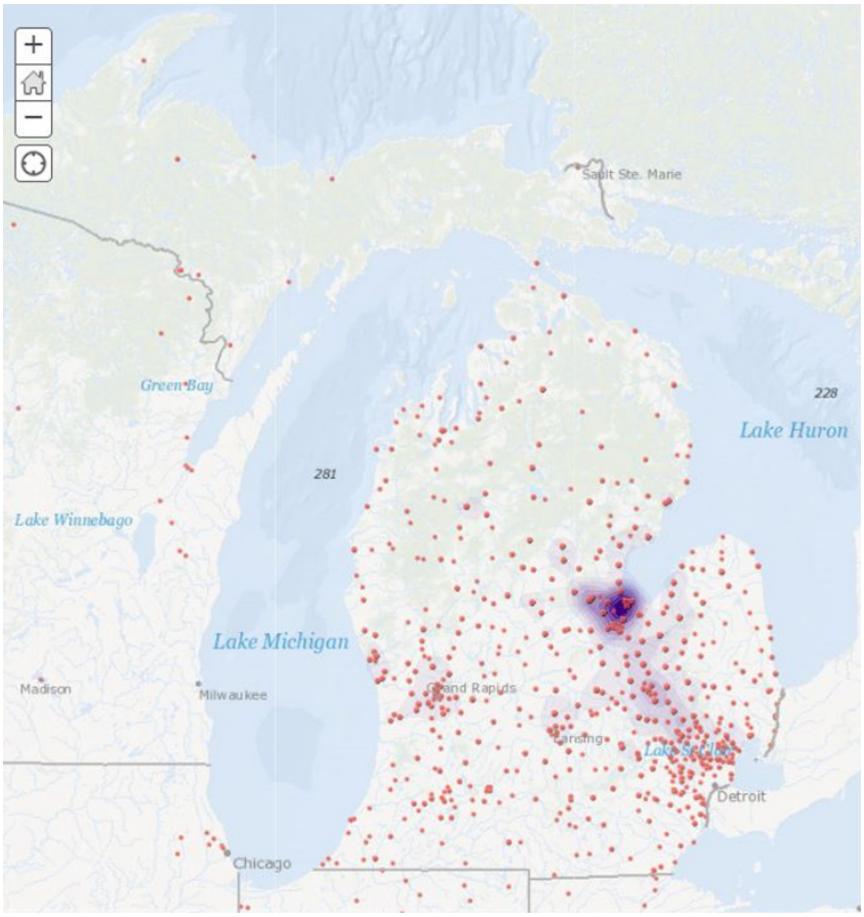


Figure A. 3. 2. Geographical distribution of survey respondents within Michigan as indicated by zip code.

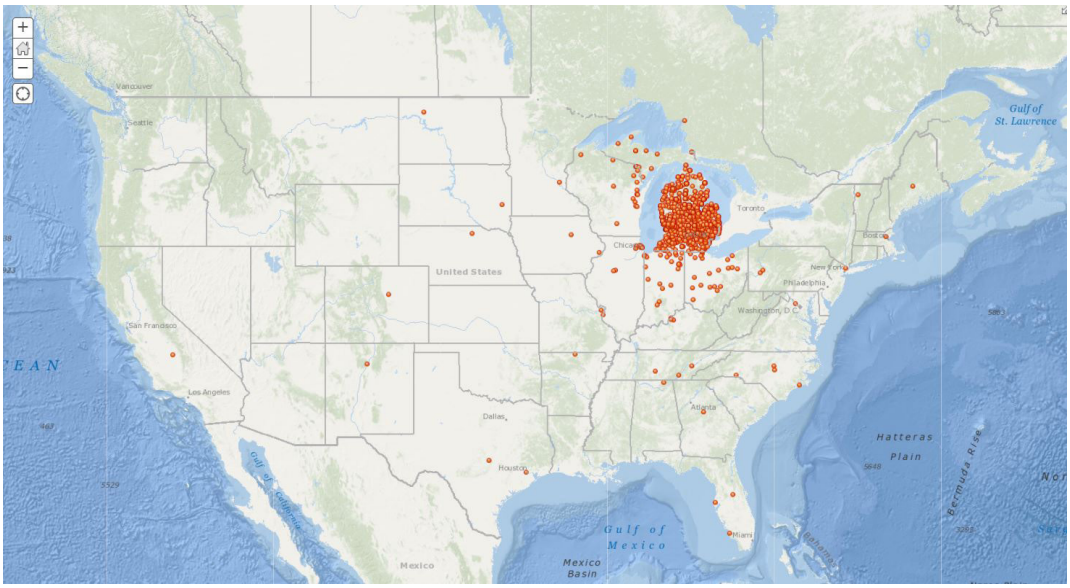
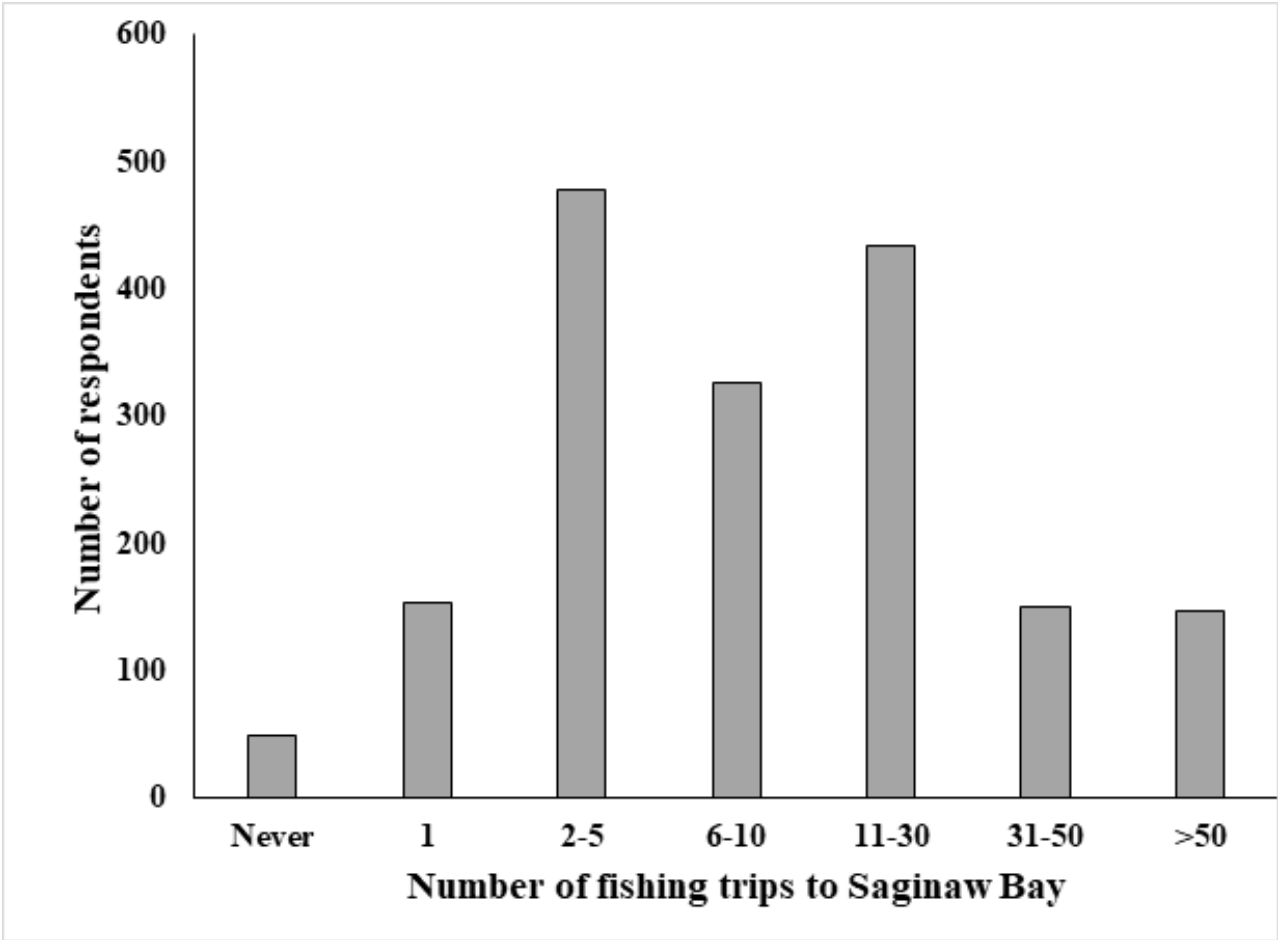


Figure A. 3. 3. Geographical distribution of survey respondents within the United States as indicated by zip code.

Survey Questions and Selected Responses

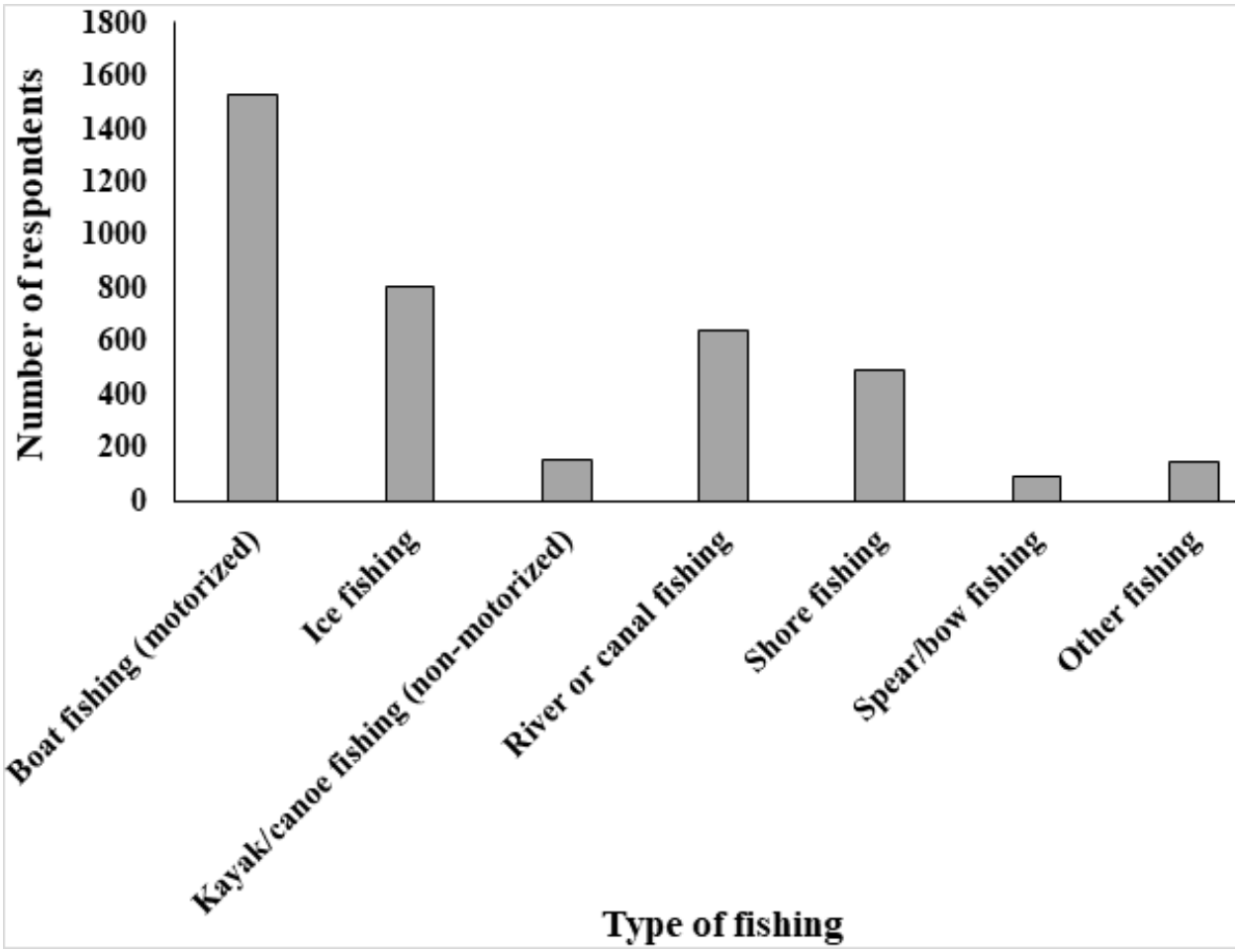
How frequently do you fish in the Saginaw Bay fishery (bay and connected rivers) on an average year?

□ Never □ 1 time □ 2-5 times □ 6-10 times □ 11-30 times □ 31-50 times □ +50 times



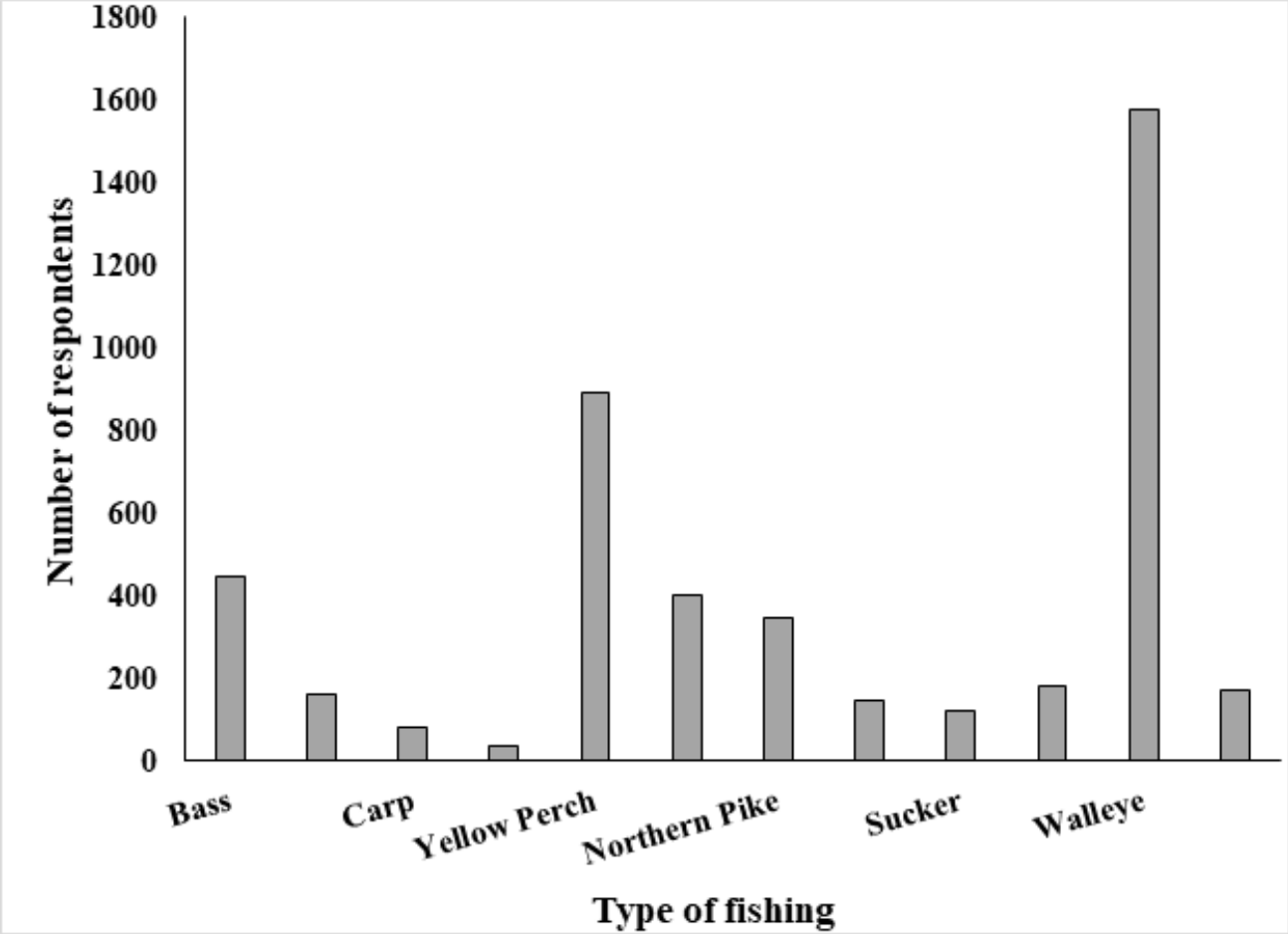
In the past 12 months, which of the following activities did you participate in? (Select all that apply)

□ Boat Fishing (motorized) □ Ice Fishing □ Kayak/Canoe Fishing (non-motorized) □ River (canal) Fishing □ Shore Fishing □ Spear/Bow Fishing □ Other



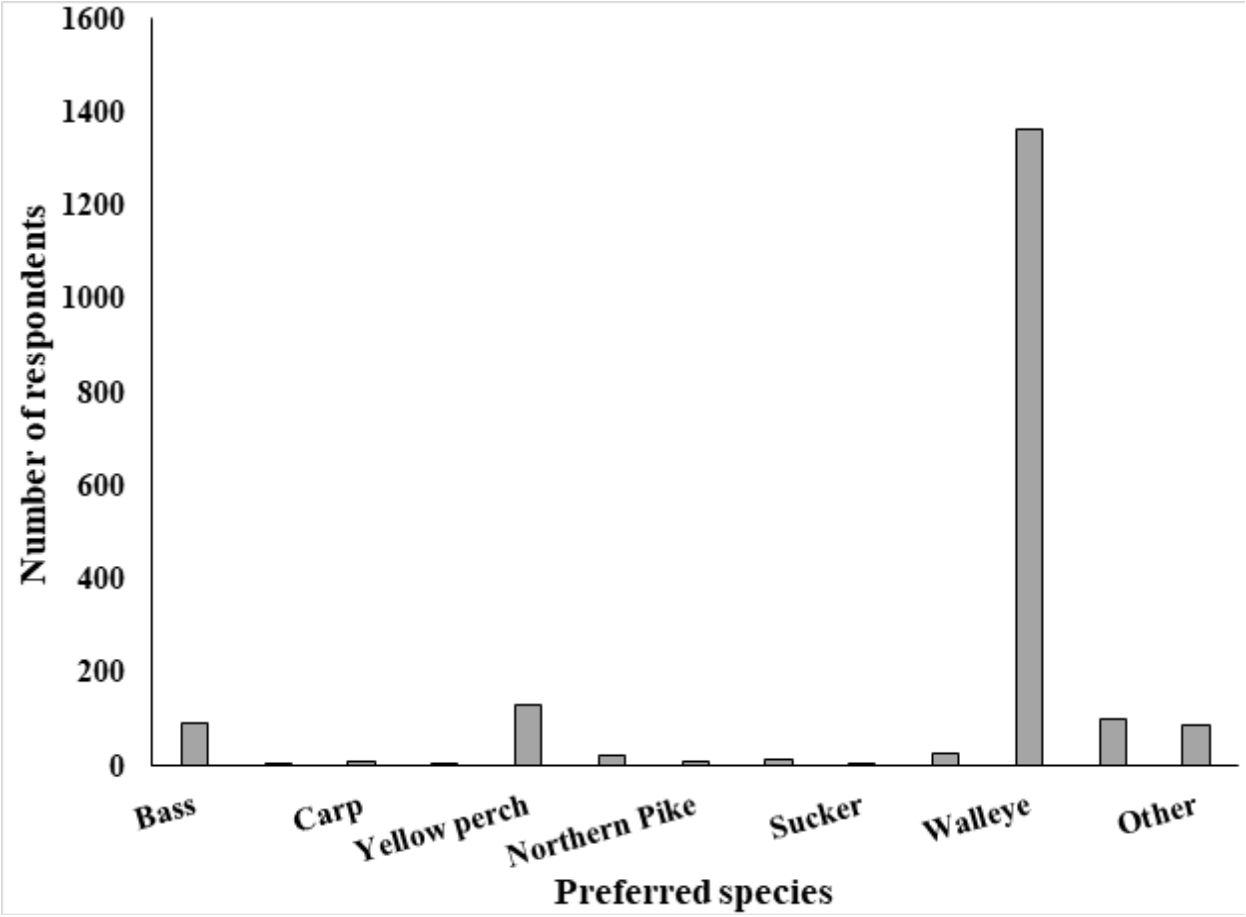
In the past 12 months, in which of the following activities did you participate? (Select all that apply)

□ Bass fishing □ Catfish fishing □ Carp fishing □ Muskie (Muskellunge) fishing □ Panfish fishing (yellow perch) □Panfish fishing (bluegill, sunfish, crappie etc.) □ Pike fishing □ Salmon fishing □ Sucker fishing □ Trout fishing □ Walleye fishing □ Other



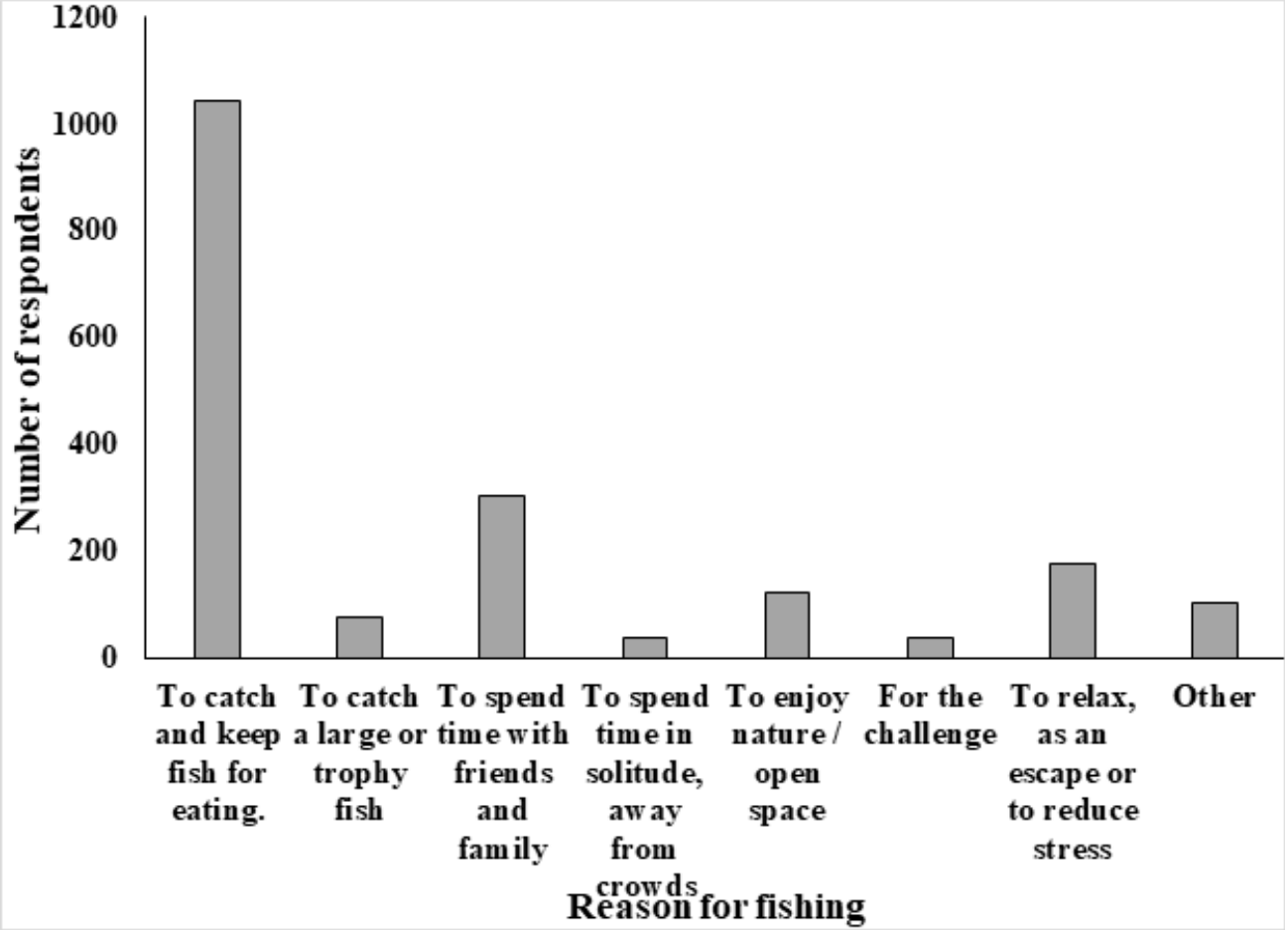
Which species do you target most often?

□ Bass □ Catfish □ Carp □ Muskie (muskellunge) □ Panfish (yellow perch) □ Panfish (bluegill, sunfish, crappie etc.) □ Pike □ Salmon □ Sucker □ Trout □ Walleye □ Any species that bites (e.g., angler does not target a specific species) □



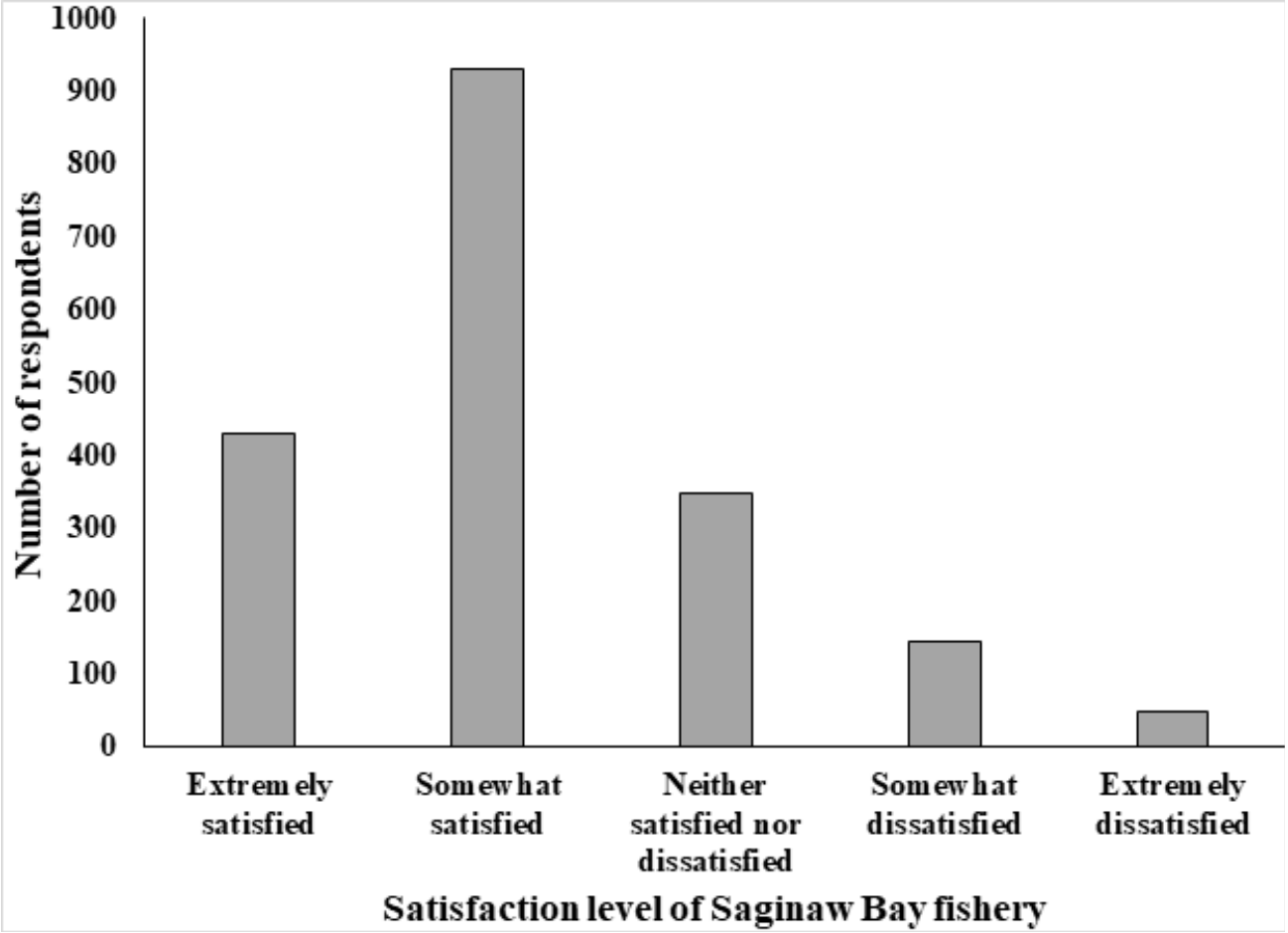
What is your most important reason for participating in Michigan's fisheries?

□ To catch and keep fish for eating □ To catch a large or trophy fish □ To spend time with friends and family □ To spend time in solitude, away from crowds □ To enjoy nature / open space □ For the challenge □ To relax, as an escape or to reduce stress □ Other



How satisfied are you with the Saginaw Bay fishery (bay and connected rivers)?

□ Extremely satisfied □ Somewhat satisfied □ Neither satisfied nor dissatisfied □ Somewhat dissatisfied □ Extremely dissatisfied

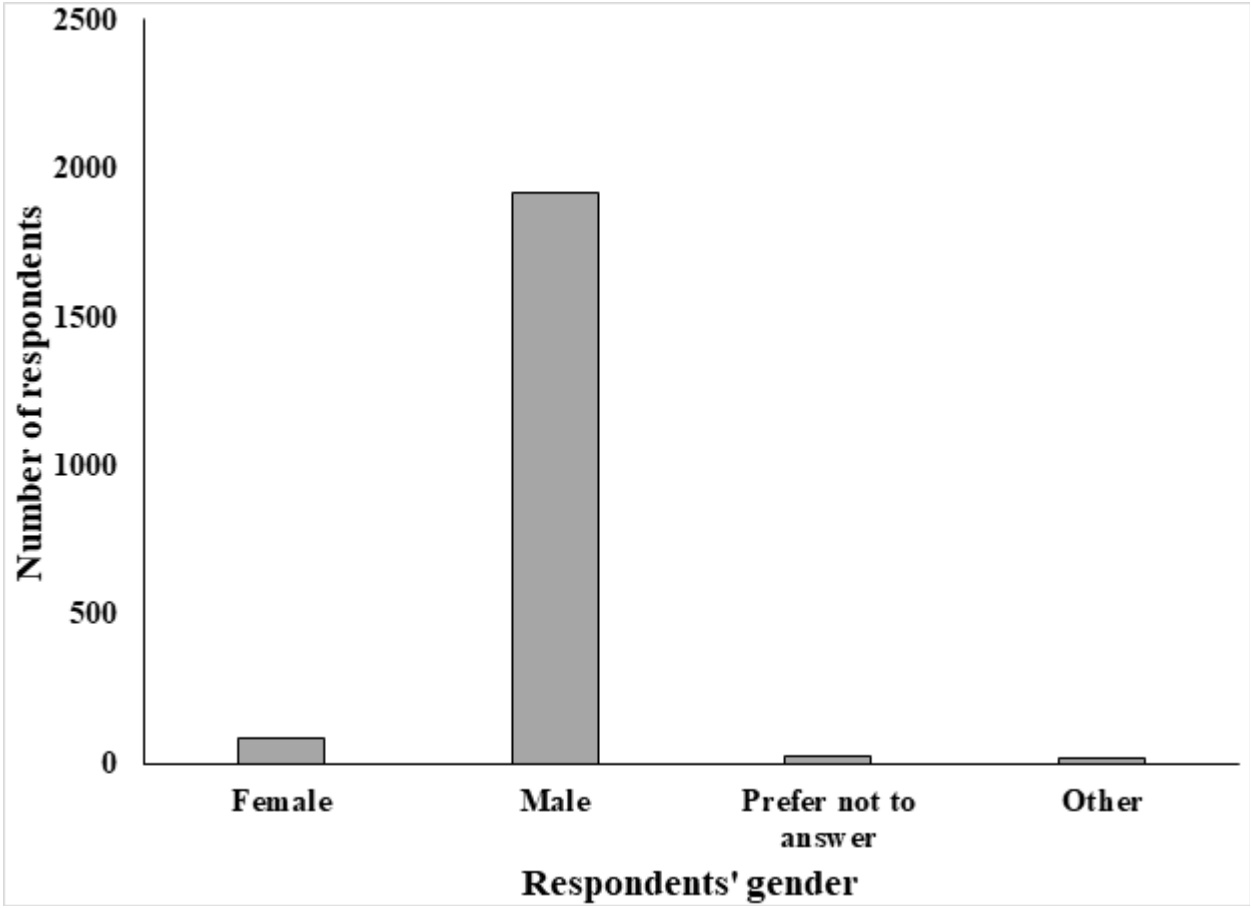


Enter the zip code of your primary residence.

Enter the year in which you were born.

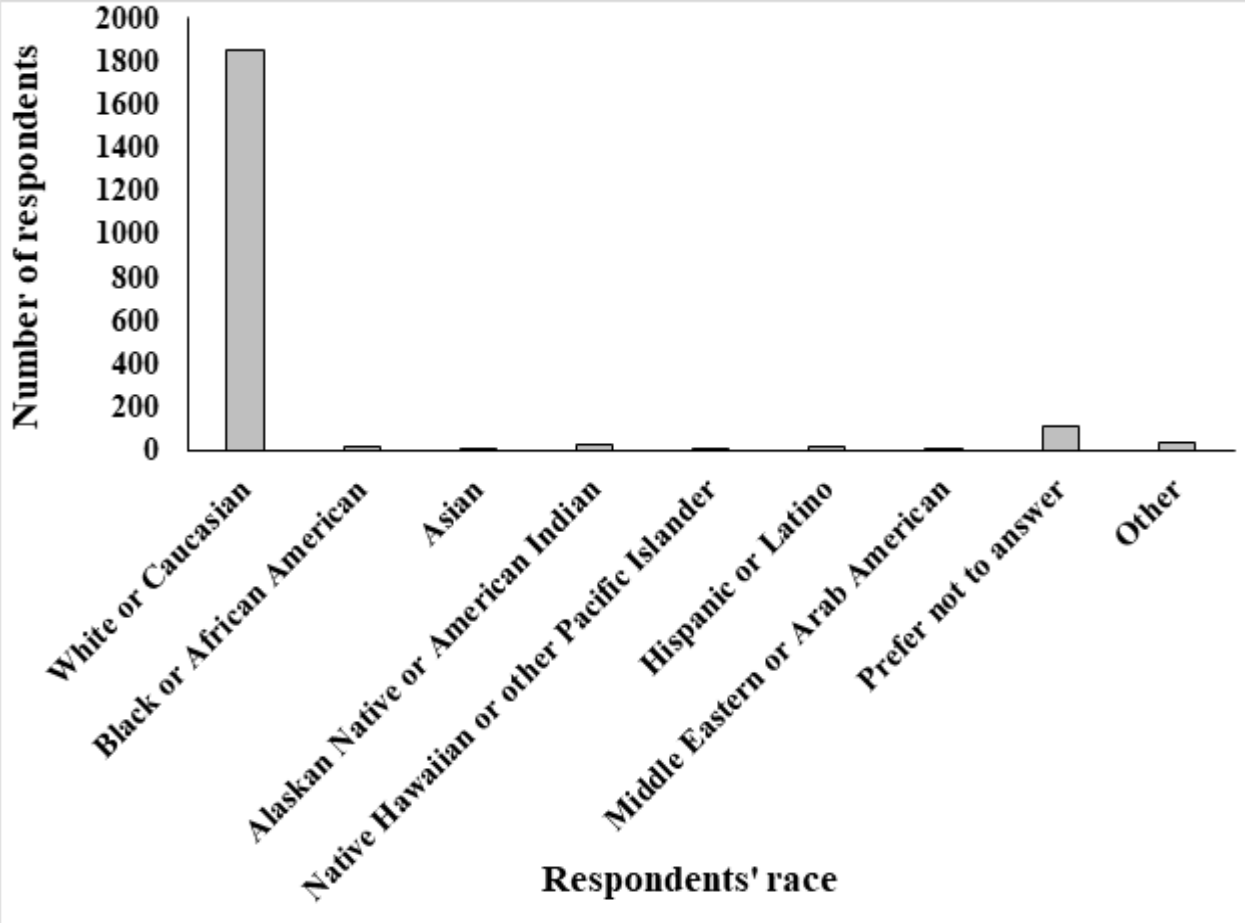
Which of the following best describes your gender?

□ Female □ Male □ Other



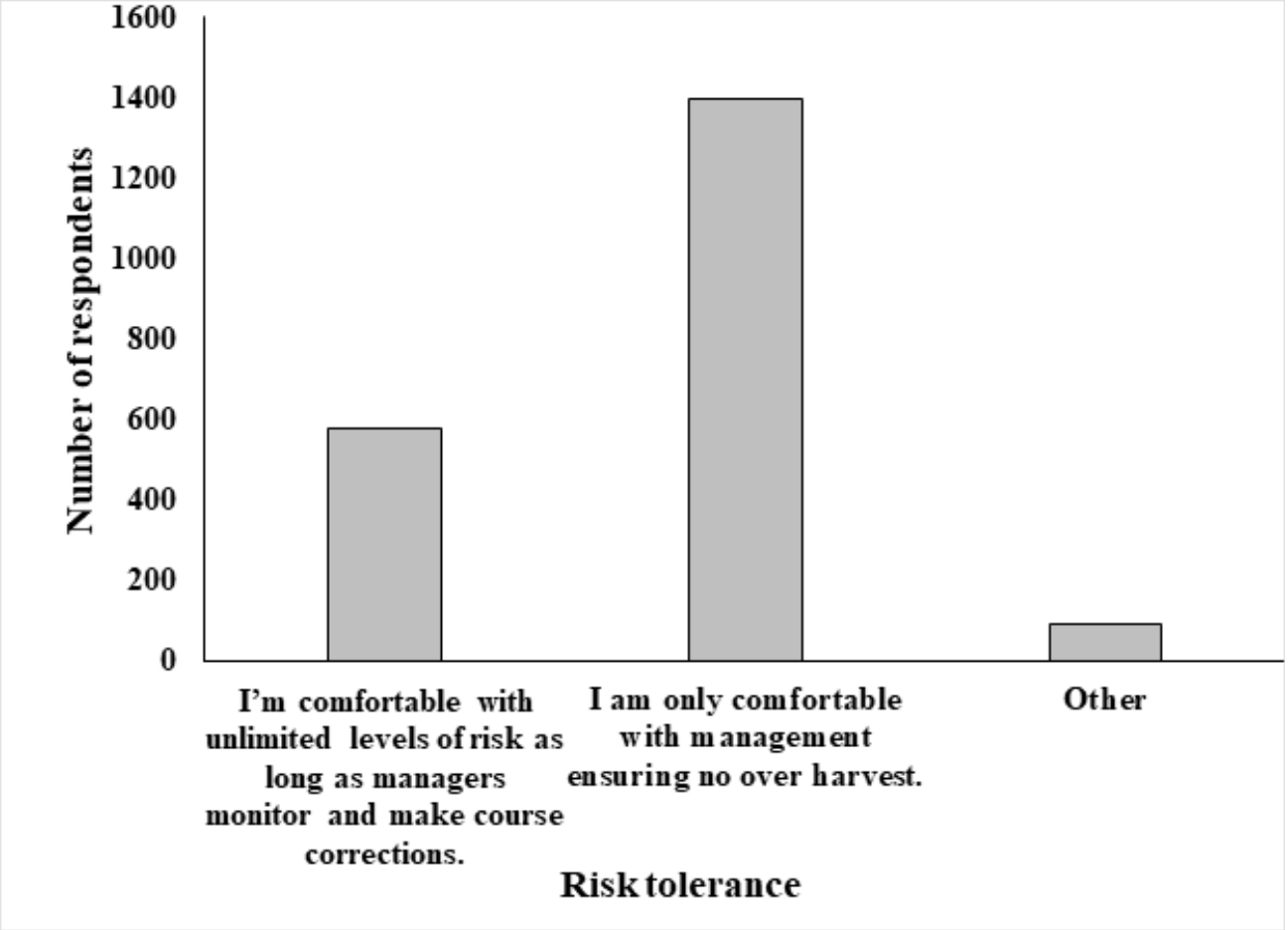
Please indicate your race/ethnicity. (Select all that apply)

□ White or Caucasian □ Black or African American □ Asian □ Alaskan Native or American Indian □ Native Hawaiian or other Pacific Islander □ Hispanic or Latino □ Middle Eastern or Arab American □ Prefer not to answer □ Other



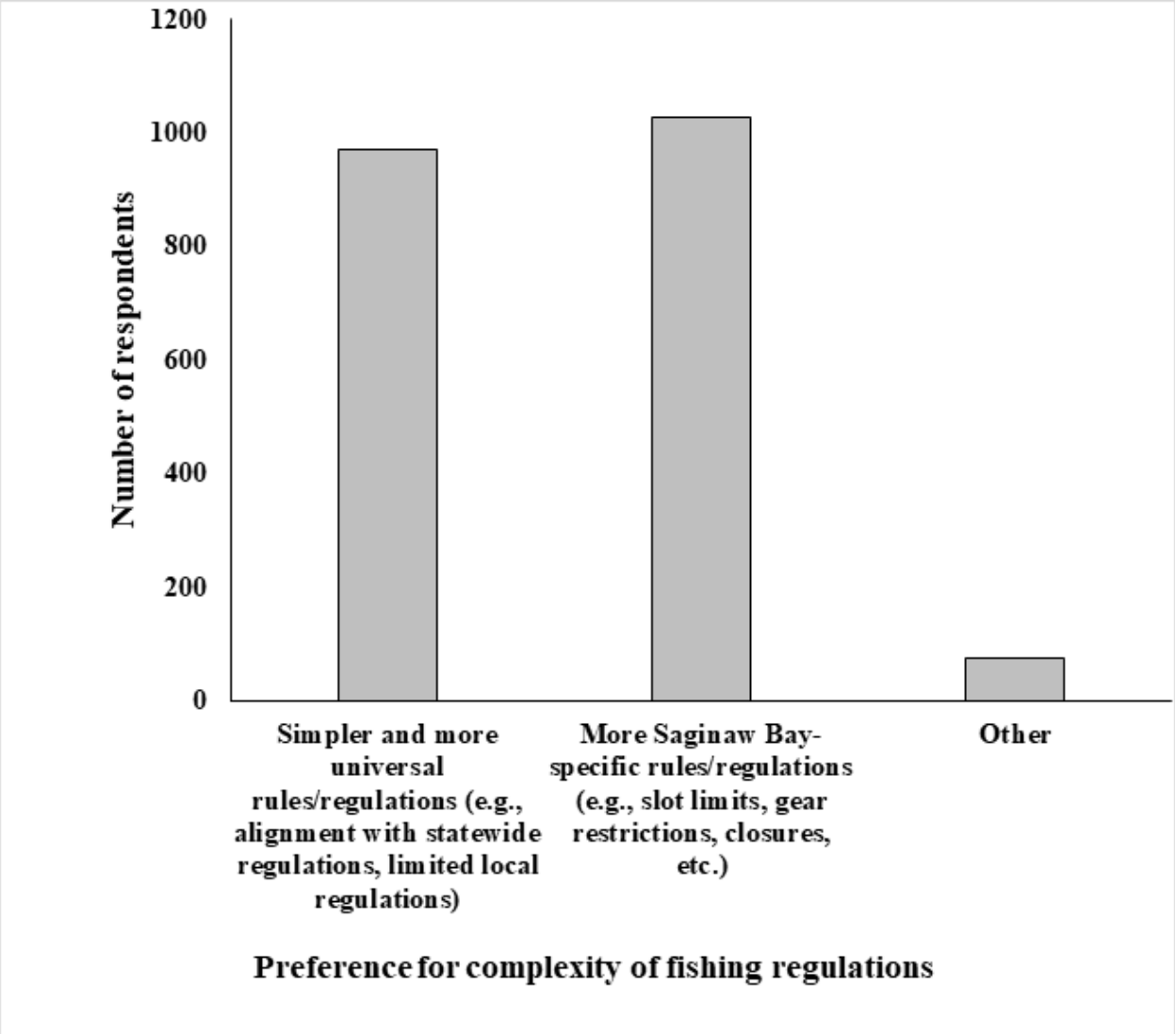
Managing for maximum harvest has benefits which might include more Walleye for anglers to take home in their daily bag limit, the ability to harvest walleye in the Saginaw River during the spring closure and decreasing predation on yellow perch. Managing for maximum harvest might include risks like overharvest which would decrease the spawning population of walleye. How willing are you to risk potential overharvest when managing to maximize walleye harvest?

□ *I'm comfortable with unlimited levels of risk so long as the managers will monitor and make course corrections* □ *I am only comfortable with management that ensures we never experience any over harvest.*



What level of complexity do you prefer for fishing regulations?

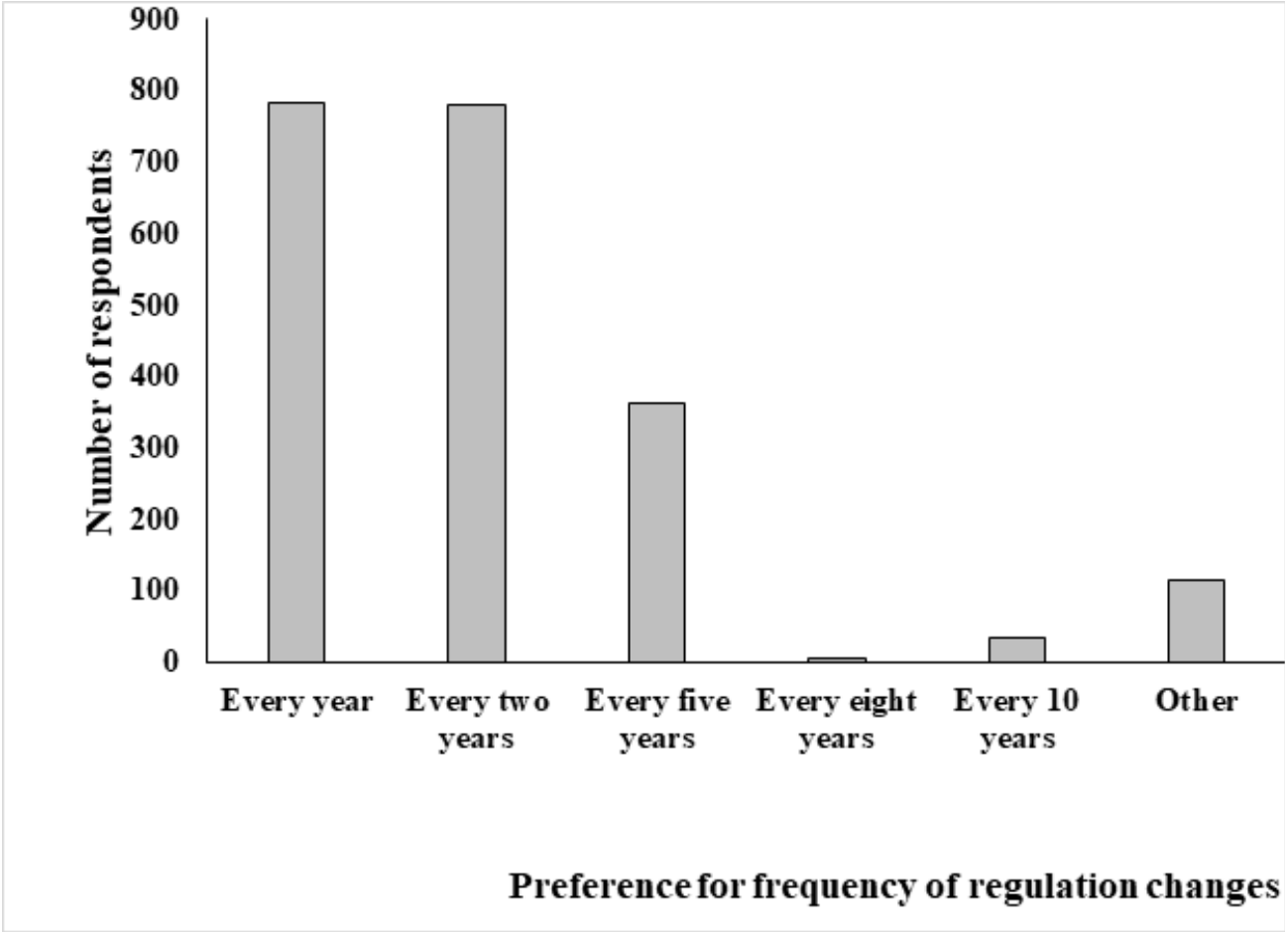
□ *Simpler and more universal rules/regulations (e.g., alignment with statewide regulations, limited local regulations)* □ *More Saginaw Bay-specific rules/regulations (e.g. slot limits, gear restrictions, closures, etc.)* □ *Other*



How often should MI Department of Natural Resources consider regulation changes as a fisheries management tool or strategy?

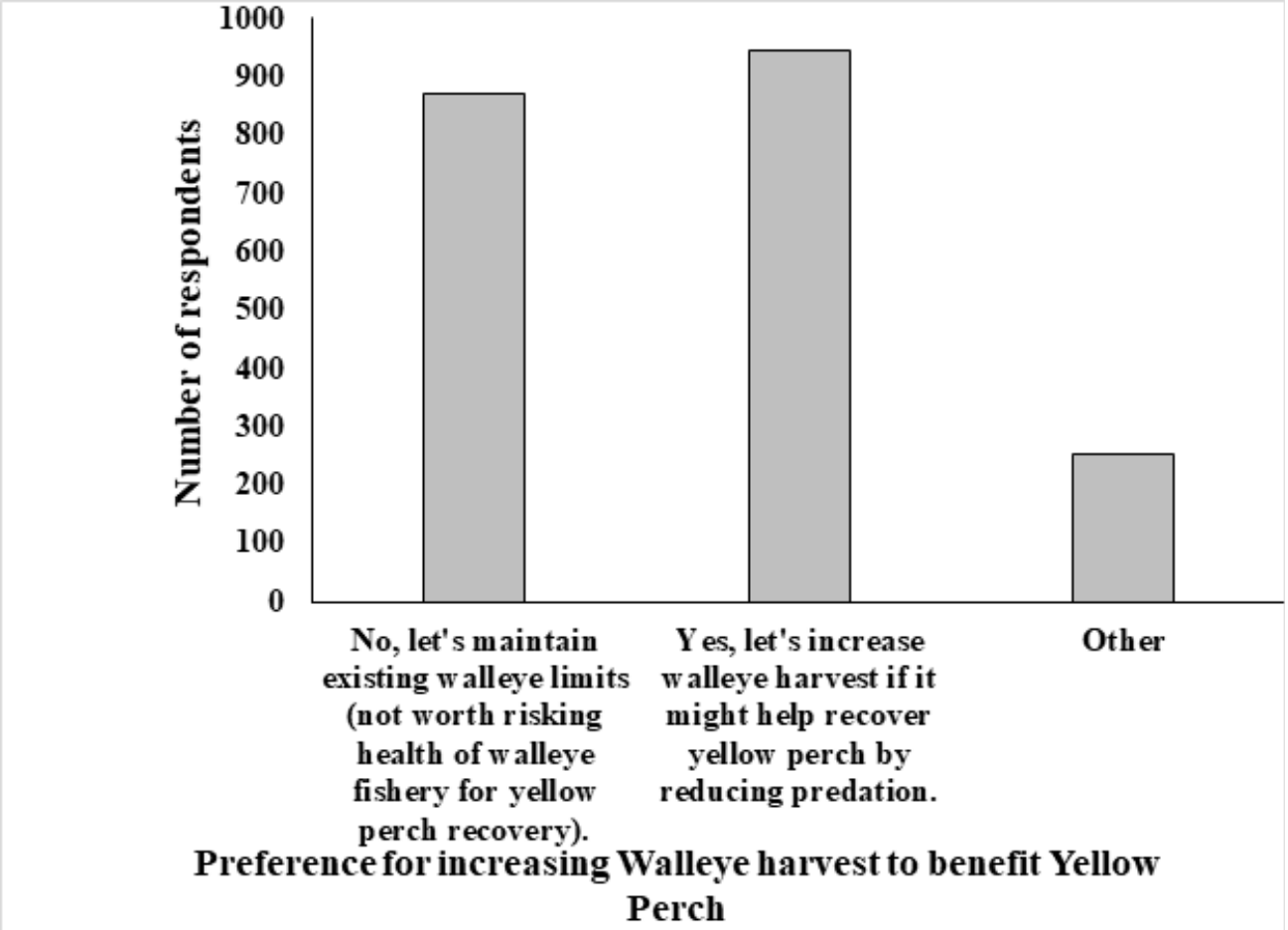
□ *Every year* □ *Every two years* □ *Every five years* □ *Every eight years* □ *Every ten years*

□ *Other*



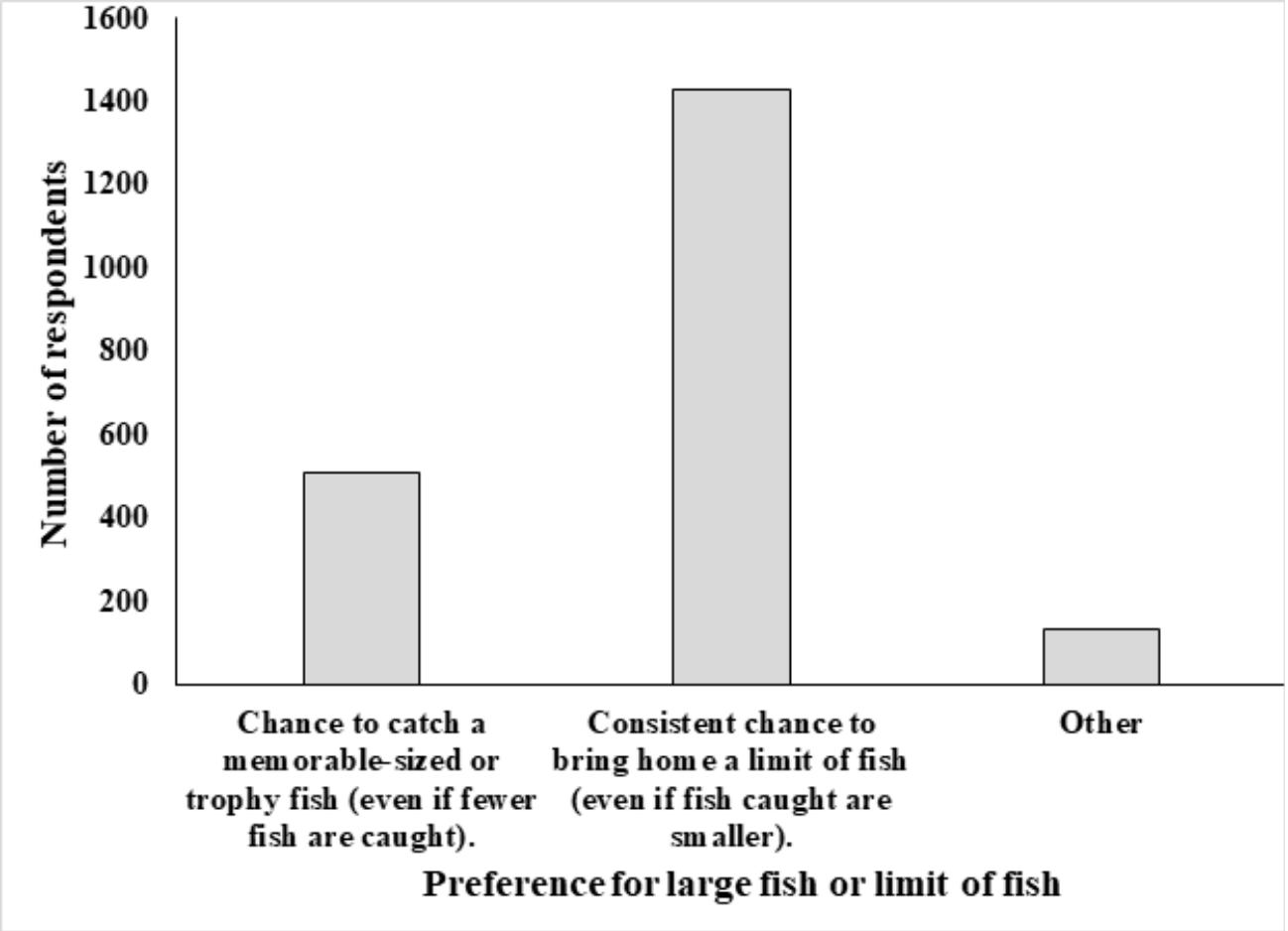
There is uncertainty on whether increasing harvest of walleye would improve the yellow perch fishery. Would you be willing to increase walleye harvest to help reduce potential predation on yellow perch?

□ No, let's maintain existing walleye limits (not worth risking health of walleye fishery for yellow perch recovery) □ Yes, let's increase walleye harvest if it might help recover yellow perch by reducing predation □ Other



Which walleye fishing opportunity would you prefer - more fish or bigger fish?

□ *Chance to catch a memorable-sized or trophy fish (even if less fish are caught)* □ *Consistent chance to bring home a limit of fish (even if fish caught are smaller)* □ *Other*

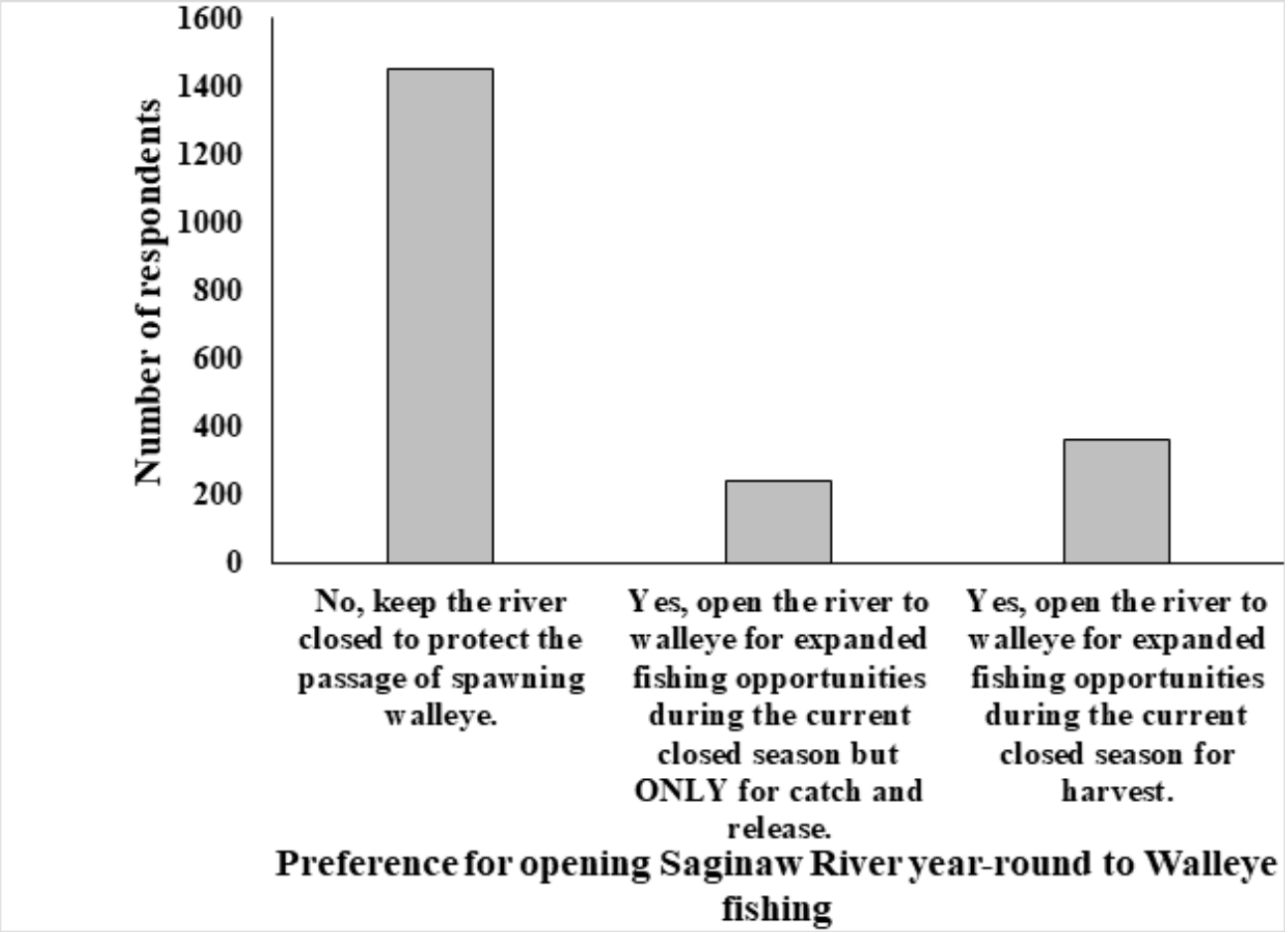


During the current statewide closure of the walleye fishery in March and April, should the Saginaw River to Saginaw Bay (just beyond the mouth of the river; MH-4 designation) be opened to walleye for expanded fishing opportunities?

□ *No, keep the river closed to protect the passage of spawning walleye*

□ *Yes, open the river to walleye for expanded fishing opportunities during the current closed season but ONLY for catch & release*

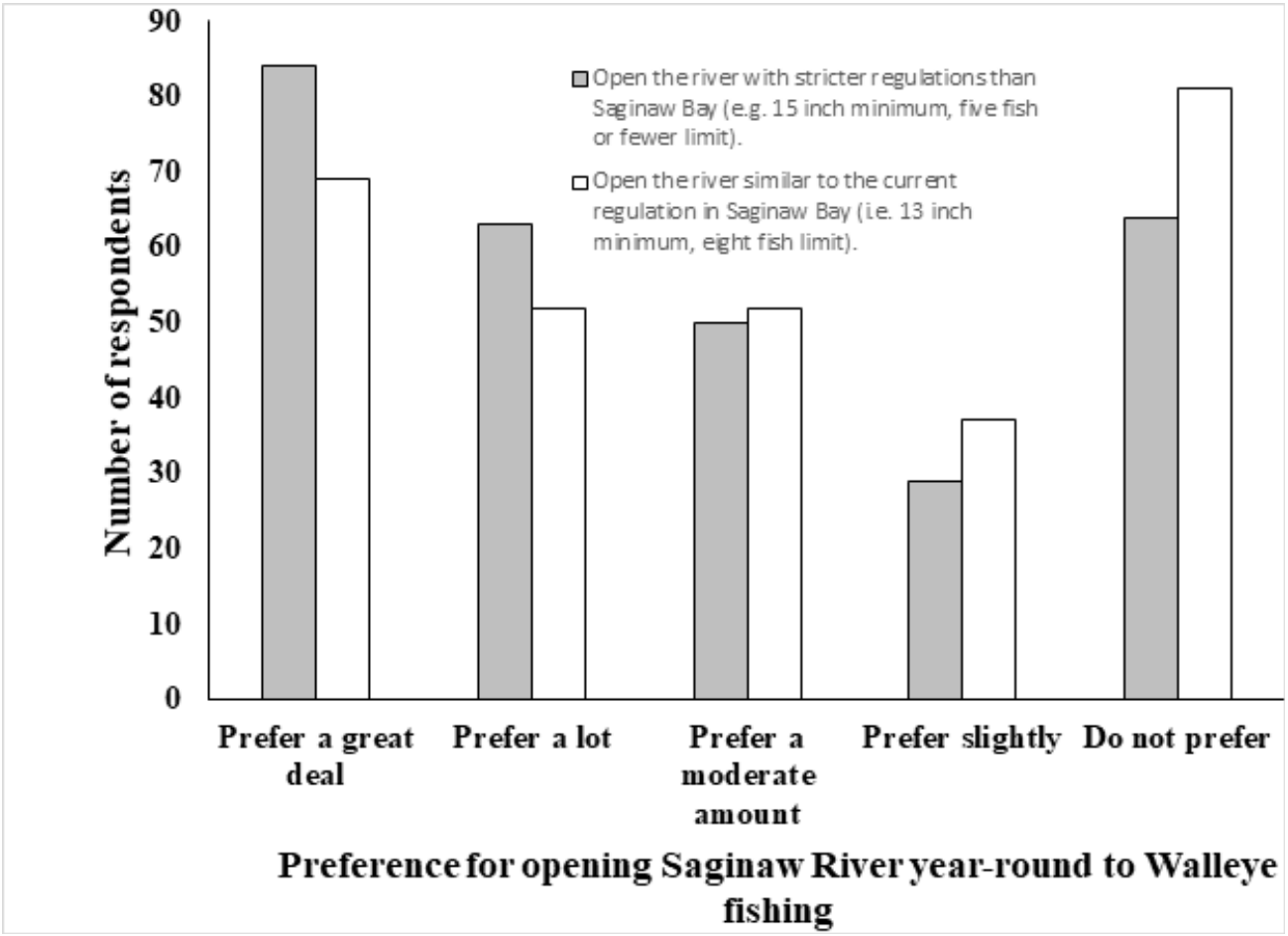
□ *Yes, open the river to walleye for expanded fishing opportunities during the current closed season for harvest*



If the river (Saginaw River to Saginaw Bay, just beyond the mouth of the river OR MH-4 designation) was opened for walleye fishing during the statewide closure, what is your preference for potential fishing opportunities?

Open the river with stricter regulations (e.g. 15 in. minimum, five fish or fewer limit) □ Prefer a great deal □ Prefer a lot □ Prefer a moderate amount □ Prefer slightly □ Do not prefer

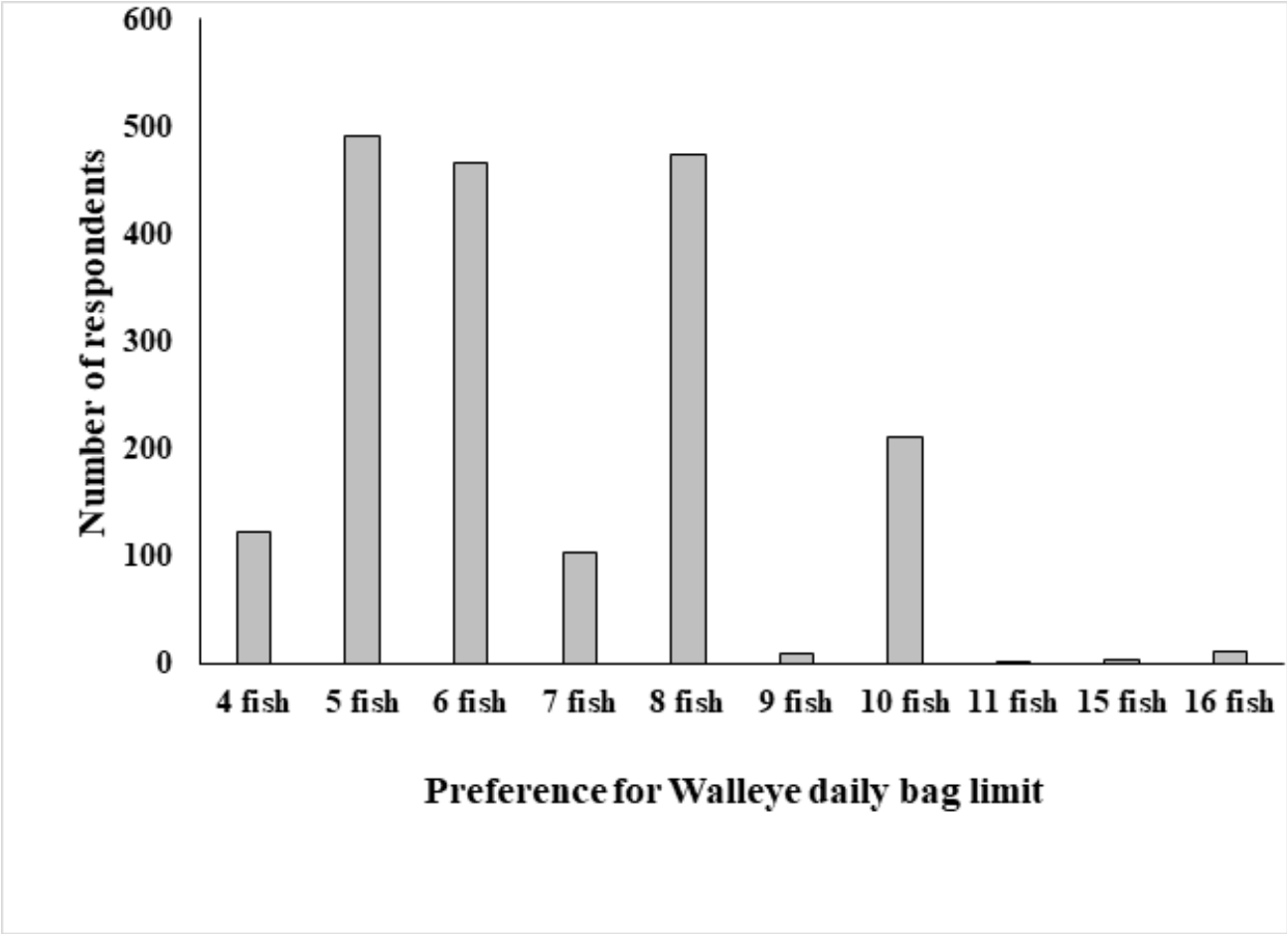
Open the river similar to the current regulation (e.g. 13 in. minimum, eight fish limit) □ Prefer a great deal □ Prefer a lot □ Prefer a moderate amount □ Prefer slightly □ Do not prefer



OPTIONAL: Please share any additional thoughts or input you have related to the river opening (from the Saginaw River to Saginaw Bay, just beyond the mouth of the river OR MH-4 designation).

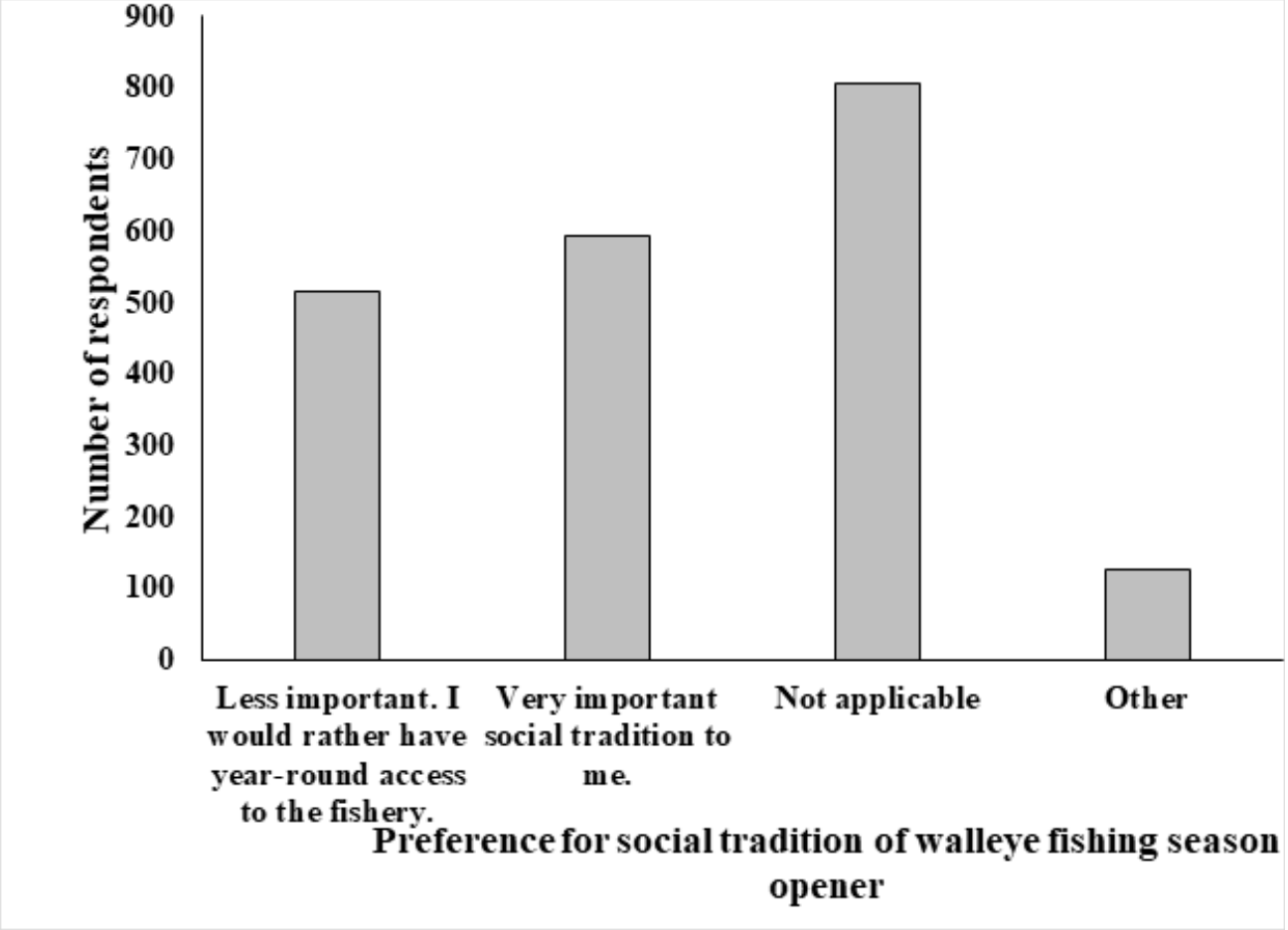
How high of bag limit would you support in Saginaw Bay - without the limit being considered wasteful or a way to devalue walleye?

□ 4 fish □ 5 fish □ 6 fish □ 7 fish □ 8 fish □ 9 fish □ 10 fish □ 11 fish □ 12 fish □ 13 fish □ 14 fish □15 fish □ 16 fish



How important is the social tradition of a walleye season river opener (last Saturday in April) as an angler in the Saginaw Bay Watershed?

□ *Less important. I would rather have year-round access to the fishery* □ *Very important social tradition to me* □ *Not applicable* □ *Other*



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APPENDIX 4

Frequency Asked Questions (FAQ) received during the open public comment period

From input received during the public comment period on the Saginaw Bay Recreational Fisheries Management Plan for Walleye & Yellow Perch, May – June 2024.

1. **Why is the Michigan Department of Natural Resources (DNR) not directing more effort at double-crested cormorant management in Saginaw Bay?**

Double-crested cormorants are protected under the Migratory Bird Treaty Act, and their management is regulated by the U.S. Fish and Wildlife Service (USFWS). Since the early 2000s, various USFWS approaches have been used to manage cormorants, with the current strategy involving a special permit issued annually to state and tribal natural resource agencies to address conflicts. This permit, which Michigan DNR has applied for and received annually since 2021, requires agencies to first attempt non-lethal methods before other actions. Michigan leads the nation in cormorant management due to its extensive Great Lakes shoreline.

While cormorants are most visible during spring and fall migrations when they typically occupy a location for less than a week, managing larger nesting colonies, particularly on the Great Lakes, can effectively reduce localized impacts on sportfish and co-nesting waterbirds. This has been Michigan's focus in areas where non-lethal methods are not feasible or have proven ineffective. Locations prescribed for management are based on the number of nesting birds present and the approximated consumption per surface area of water.

Michigan DNR has not received landowner permission to manage colonies on Saginaw Bay through culling and egg oiling. The resulting logistical challenges to implement management by other means are more costly and potentially less effective compared to other Great Lakes locations. Future management alternatives may be explored as additional funding becomes available. For more information, visit the USFWS FAQ page on cormorants.

2. **How can the DNR enhance Yellow Perch populations through specific management actions?**

Yellow Perch populations remain low primarily due to high juvenile mortality between their first fall as young-of-the-year and their second summer. This high mortality is largely caused by predation from Walleye, cormorants, Largemouth Bass, Smallmouth Bass, Northern Pike, and other predators. Despite good reproduction and strong year classes each summer, the number of Yellow Perch surviving to older, harvestable sizes is significantly reduced due to this early life stage mortality.

The low adult Yellow Perch abundance is not significantly affected by harvest from recreational or commercial fisheries. The Michigan DNR has already reduced recreational bag limits from 50 to 25 and commercial fishing activity in Saginaw Bay is lower than at any time in the last 100 years, but neither of these have increased adult abundance. Similarly, liberalized Walleye harvest regulations, intended to reduce predation, have also failed to improve Yellow Perch numbers.

The Michigan DNR is actively pursuing projects to diversify the food web, aiming to increase

alternative prey for predators and enhance high-quality prey for Yellow Perch. A key effort is the restoration of Cisco to Lake Huron and Saginaw Bay, in partnership with the U.S. Fish and Wildlife Service. If successful, abundant Cisco populations could serve as a predation buffer, improving young Yellow Perch survival. However, without further ecological changes in the bay and Lake Huron that provide alternative forage for predators or reduce predator numbers, Yellow Perch populations are likely to remain low.

3. Why aren't existing open-water prey species like Rainbow Smelt and Alewife being promoted or managed as alternative prey sources for predators in Lake Huron?

It's challenging to influence or "promote" prey fish populations in the Great Lakes because the key population drivers at the lower levels of the food web cannot be directly managed. Currently, the predator and prey populations in Lake Huron are largely balanced. Although the adult Yellow Perch population available for harvest is low, predators are not showing signs of overabundance. If predator density increases to the point where food becomes limited, we would expect slower growth rates, reduced condition, and delayed spawning at older ages and larger sizes. Several of these metrics are monitored through the Dashboard (Appendix 1 and 2) and currently do not indicate predator density has outpaced prey production.

Alewives, an invasive species, negatively affect the reproduction of native game species like Walleye and Lake Trout. The recent recovery of these native species in much of Lake Huron is largely due to the collapse of Alewife populations, a result of zebra and quagga mussel introductions. Since Alewives hinder native species restoration, there is no intent to restore them in Lake Huron or Saginaw Bay. However, efforts are underway to reintroduce Cisco, a native prey fish that is currently missing from most of Lake Huron. Cisco stocking aims to establish a reproducing population that could help buffer predation pressure on Yellow Perch.

4. Why is commercial harvest of Yellow Perch allowed in Saginaw Bay?

Commercial harvest of Yellow Perch in Saginaw Bay is authorized under Statute (MCL 324.47311 establishes seasons, MCL 324.47319 establishes size requirements). Commercial harvest of all species in Saginaw Bay has declined considerably since the invasion of zebra and quagga mussels, and commercial harvest of Yellow Perch has declined 75% on average since 2003 (comparing long term averages of 1972-2002 vs 2003-2023), mirroring declines in recreational harvest during the same period. Nine of 22 commercial harvest licenses have been active in Saginaw Bay since 2019 with most of the targeted catch and harvest consisting of Lake Whitefish. Since 2003, annual Yellow Perch harvest has averaged 84,096 pounds. in the recreational fishery and 32,225 pounds in the commercial fishery, and combined total annual harvest is just 18% of what was historically taken. Harvest by either fishery at current levels is not limiting the Yellow Perch population.

5. Why were other recreationally important species not included in this management plan?

Other Saginaw Bay sport species are included in statewide management plans maintained by the MDNR. Walleye and Yellow Perch are intensively managed and monitored by the MDNR, comprising 75% of the targeted recreational effort on Saginaw Bay; in turn, Saginaw Bay accounts for 88% of the annual recreational fishing effort on Lake Huron. Because of this, they were the

focus of the current Recreational Management Plan. Other species can be added to future versions of the Plan if they become more prominent in the fishery.

6. Why isn't the DNR stocking Walleye or implementing other management actions in Saginaw Bay?

The current Walleye population in Saginaw Bay is reproducing very well with consistent production of year classes, a wide range of sizes present, and providing a high-quality fishery in terms of size, catch frequency, and harvest opportunity. Walleye stocking was discontinued after 2005, and natural reproduction alone has supported expansion of the population to its current level. The current harvest levels within the lake are not negatively affecting the population. The Michigan DNR will consider management changes, such as stocking or regulations, when evidence suggests they may be warranted and could have a positive effect on population sustainability.

7. What is DNR stocking into Saginaw Bay and why?

The Michigan DNR is not currently stocking sportfish species in Saginaw Bay, though some sportfish stocking of tributaries still occurs to provide local stream fishing opportunities such as brown trout in the Rifle River. However, the DNR continues to collaborate with partners on continued efforts to reintroduce and restore Cisco and Lake Sturgeon. Both species are native, historically abundant, critically important to the food web, and are either missing or greatly reduced. These efforts, in cooperation with the USFWS and other partners, aim to restore these state-level threatened species.