Muskegon Lake
Muskegon County
Muskegon River Watershed

Mark A. Tonello, Fisheries Management Biologist

Environment

Muskegon Lake (Figures 1-3) is located in Muskegon County, Michigan, in the central-western Lower Peninsula. Currently, it is approximately 4,232 acres in size (Hanchin et al. 2007) and is classified as a drowned river mouth lake due to its proximity to Lake Michigan and its location at the downstream end of the Muskegon River. Muskegon Lake drains into Lake Michigan via a channel and outer harbor, with the outlet from the outer harbor being 1.2 miles from Muskegon Lake. Muskegon Lake is approximately 4 ½ miles long, averages 1.25 miles wide, has an average depth of 24 feet, and a maximum depth of approximately 70 feet (Hanchin et al. 2007). Due to its direct connection to Lake Michigan, the lake levels of Muskegon Lake vary according to lake level fluctuations in Lake Michigan. Substrates of Muskegon Lake are primarily sand and gravel, although the upper portion of the lake also has significant organic (muck) substrate. Aquatic plant growth is also dense in places on Muskegon Lake, in particular the upper portion of the lake where the Muskegon River flows in. Between Whitehall Road and Maple Island Road, the Muskegon River forms a large coastal wetland that is approximately 10.5 miles long and up to 2.5 miles wide. Muskegon Lake also receives the flow from Bear Lake, a 415-acre lake that lies just to the north of Muskegon Lake. While the surface area of Muskegon Lake is currently about 4,232 acres, it used to be much larger. Approximately 1,200 acres of Muskegon Lake and associated coastal wetlands have been filled in by human activity over time, shrinking the lake to its current size (MDNR files, Cadillac).

The city of Muskegon borders the entire southern shore of Muskegon Lake, while the city of North Muskegon lies on the northeastern shore. Most of the shoreline of Muskegon Lake is privately owned. The southwestern, southern, and eastern shorelines within the City of Muskegon are very heavily developed with private marinas, dense condominium developments (with accompanying hardened shoreline, boat docks, and other habitat alteration), and docking facilities for ships. Very little natural shoreline remains intact within the City of Muskegon. The northern shoreline of Muskegon Lake is mostly privately owned by residential landowners but is much less intensively developed than the City of Muskegon shoreline. Muskegon State Park lies on the northwestern shores of Muskegon Lake, and provides approximately 2 miles of public shoreline, most of which is undeveloped and in a natural state.

Public access to the southern shoreline of Muskegon Lake is very limited, particularly within the City of Muskegon and particularly for shorebound anglers. Some modest shore fishing access with limited accommodations can be found on the southern shore of Muskegon Lake at the Cottage Grove Access Site (shown on some maps as the Jaycee Launch), Grand Trunk, Hartshorn, Heritage Landing, the SPX Breakwater, and Fisherman's Landing. Public boat launches are found at Cottage Grove, Grand Trunk, Hartshorn, and Fisherman's Landing. Cottage Grove, Hartshorn, and Fisherman's Landing are all owned and administered by the City of Muskegon. Grand Trunk is owned by the State of Michigan but leased and operated by the City of Muskegon. Heritage Landing is owned by Muskegon County. On the northern shore of Muskegon Lake, access can be found at several small parks owned by the City of North Muskegon, and the Muskegon Lake Nature Preserve, which is owned by a non-profit group that allows

public access. Muskegon State Park offers boat launching facilities, a fish cleaning station, and shore fishing access. Shore anglers also commonly fish from both sides of the channel that connects Muskegon Lake to Lake Michigan.

The Muskegon River is the primary tributary of Muskegon Lake, providing the majority of the water flowing into Muskegon Lake (Figures 1 and 2). The Muskegon River is one of the largest watersheds and longest rivers in Michigan, at approximately 212 miles in length, with a watershed area of approximately 2,350 square miles (O'Neal 1997). The landscape that forms the Muskegon River watershed consists of forested and agricultural areas that also includes some wetlands and urban areas.

The first dam constructed on the Muskegon River was the Newaygo Dam, which was built in 1854 to provide waterpower to run a large sawmill. For over 100 years, the Newaygo Dam was the lowermost fish passage barrier on the Muskegon River. However, in 1969, Newaygo Dam was completely removed, leaving Croton Dam as the first upstream fish passage barrier. There are currently four large dams on the Muskegon River mainstem, including Reedsburg Dam, Rogers Dam, Hardy Dam, and Croton Dam. Rogers, Hardy, and Croton Dams are hydropower Dams that are owned and operated by Consumers Energy. The Muskegon River hosts annual migrations of migratory fish from Muskegon Lake and Lake Michigan, including Rainbow Trout (Steelhead), Chinook Salmon, Coho Salmon, Walleye, White Suckers, and several Redhorse species. Croton Dam is the first upstream fish passage barrier on the Muskegon River, and migratory fish from Lake Michigan and Muskegon Lake cannot move upstream beyond the dam.

In addition to the Muskegon River and the Bear Lake outlet, there are three other named tributaries that flow into Muskegon Lake. They include Ryerson and Ruddiman Creeks that flow into the southern portion of Muskegon Lake, and Green Creek, which flows in from the north. All three of these streams are relatively small. Ruddiman Creek forms a lagoon just upstream of where it enters Muskegon Lake.

The Muskegon Lake Watershed Partnership (MLWP) is a non-profit, community-based, volunteer advocacy group focused on Muskegon Lake. MLWP was started in 1993. According to their website (muskegonlake.org): "The MLWP is organized exclusively for charitable, educational, and scientific purposes and shall be a coalition of community interests dedicated to working cooperatively for the improvement of the Muskegon Lake ecosystem, and for the delisting of Muskegon Lake as an Area of Concern. The MLWP shall obtain and disseminate information concerning Muskegon Lake watershed issues, provide a forum for discussion of those issues, and initiate, facilitate, and/or coordinate plans and actions to improve the Muskegon Lake ecosystem."

History

Lake Management Issues

Since the 1870s, Muskegon Lake and its shoreline have been heavily impacted by dredging, filling, hardening, dumping, industrialization, and overall degradation. Multiple sawmills were constructed on the lake in the 1870s, and those were eventually supplanted by heavy industry. Muskegon Lake has also long been used as a port for freight shipping, passenger boats, and commercial fishing. According to Peterson (1951), "The lake is the depository for much industrial and domestic waste". Despite this, Peterson reported that the lake was still heavily fished by anglers.

While there have been (and continue to be) many industrial sites on or near the shores of Muskegon Lake, two that had particular impact on Muskegon Lake included the BC Cobb Plant and the Sappi Paper Mill. The BC Cobb Plant was a coal-fired power plant that operated on the shore of Muskegon Lake for nearly 70 years. It ceased operation in 2016 and was demolished in 2020. The BC Cobb Plant was known to entrain and kill juvenile Lake Sturgeon (and probably other fish as well), and it had a hot water discharge that long affected fish populations of Muskegon Lake. Fish kills in the hot water discharge were also reported frequently. The Sappi Paper mill operated from approximately 1900 through 2009 (although other industries used the property prior to construction of the paper mill). Although the paper mill has been removed, according to the Michigan Department of Environment, Great Lakes, and Energy (EGLE; https://www.michigan.gov/pfasresponse/investigations/sites-aoi/muskegon-county/former-sd-warren-sappi), the site remains heavily contaminated with multiple substances, including various metals, dioxin, ammonia, and PFAS.

Much of the Muskegon Lake fisheries file correspondence in the 1900s (MDNR files, Cadillac) revolve around the environmental issues facing Muskegon Lake. Fish kills, oil spills and other pollution, and reports of Muskegon Lake fish tasting and smelling of oil or kerosene are repeatedly discussed. Dredging and filling of Muskegon Lake bottomland is also discussed frequently, with multiple instances of Michigan Department of Conservation (MDOC; the precursor to the MDNR of today) Fisheries Biologists recommending against the filling of Muskegon Lake bottomlands, often to no avail. The first chemical treatment for nuisance aquatic plants was conducted in 1956, with chemical treatments for algae blooms first conducted in the 1960s.

Muskegon Lake was declared an Area of Concern (AOC) in 1987 by the International Joint Commission. At that time, Muskegon Lake was considered one of the 14 most polluted lakes in Michigan. According to the Environmental Protection Agency (EPA) website for the Muskegon Lake Area of Concern (https://www.epa.gov/great-lakes-aocs/muskegon-lake-aoc), reasons for the designation included historical industrial discharges of pollutants, shoreline development and hardening, historic sawmill debris, foundry sand and slag, filling open water and coastal wetlands, and localized groundwater contamination moving toward the lake and its tributaries. Because of these practices, Muskegon Lake had sediment contaminated with petroleum hydrocarbons, mercury, lead and other heavy metals, oils, PAHs and PCBs. Muskegon Lake also had degradation of water quality due to high levels of nutrients, solids, and toxins entering the lake, and due to excessive fill and loss of natural shoreline, and large-scale impacts to critical wetlands.

Over the years since the designation, approximately $73 million has been spent in attempts to alleviate the contamination issues on Muskegon Lake. Projects have included the removal of over 200,000 cubic yards of contaminated sediments, the removal of tens of thousands of tons of old sawmill debris, wetland restoration projects, and shoreline restoration projects. Funding sources have included the EPA, the Great Lakes Restoration Initiative, the Clean Michigan Initiative, the Michigan Department of Environment, Great Lakes, and Energy, and others. The AOC designation for Muskegon Lake is slated to be removed in 2025. Despite this, many environmental and habitat challenges remain on Muskegon Lake.

Fish Stocking

The first records of fish stocking in Muskegon Lake date back to 1883 when American Eels were stocked by the Michigan Fishery Commission (Table 1). Walleye fry were first stocked into Muskegon Lake during an eight-year period from 1933 to 1940. Walleye stocking was resumed in 1974, and Walleye

have been regularly stocked into Muskegon Lake since then. In addition to being stocked into Muskegon Lake, Walleye have occasionally been stocked into the Muskegon River upstream of Muskegon Lake near the Muskegon Walleye Pond (Table 2) and those stocking efforts also likely contribute to the Muskegon Lake Walleye population. Tiger Muskellunge were also stocked once there, in 1976 (Table 1). Northern Pike were stocked once into the Muskegon River at the Mill Iron Road access point in 1991 (Table 1). More recently, Great Lakes strain Muskellunge were first stocked in 2013, and they have been stocked six times since then, most recently in 2024 (Table 1).

Historical Fisheries Issues

Starting in 1923, fisheries personnel from MDOC captured Walleye (and other fish species) by dipnets at Newaygo Dam and transferred them to upstream impoundments and other lakes in the watershed (Eschmeyer 1949). This project was known as the "Newaygo Transfer". The Newaygo Transfer continued until 1966. Over the years, tagging studies confirmed that downstream movement of Walleye through the dams was occurring (Crowe 1957, Eschmeyer 1949). Anglers who primarily fished Muskegon Lake or the Muskegon River below Newaygo Dam were strongly against the practice, while those who fished the upstream impoundments that received the transferred fish were usually in favor. There was strong evidence that many of the transferred Walleye successfully migrated back downstream through the dams (Crowe 1957).

While it was in operation, the hot water discharge from the BC Cobb plant attracted undesirable fishes in large concentrations. There is considerable correspondence (MDNR files, Cadillac) in the 1950s discussing the manual removal of common carp through netting at the BC Cobb plant by volunteers. In the spring of 1955, file records indicate that more than 8 tons of Common Carp were removed in less than two weeks' time. Whether or not this practice had any appreciable impact on the overall Common Carp population of Muskegon Lake is unknown.

Correspondence from MDNR Fisheries Biologist John Trimberger in 1980 discussed the Walleye fishery in Muskegon Lake, and particularly many positive angler reports. In addition to legal sized fish, anglers were also reporting large numbers of sublegal Walleye. He attributed the numerous reports of sublegal Walleye to plants made by MDNR in 1978 and 1979 from the Muskegon Walleye Pond.

A Muskegon Chronicle article from January 1994 documents the catch of a "Wiper" (hybrid cross between a striped bass and a White Bass) from the hot water discharge at the B. C. Cobb plant. The fish was 23 inches in length and weighed over 6 lbs. The article mentions that another Wiper had been caught from Muskegon Lake the previous summer. Apparently three Wipers were caught from Lake Macatawa, another drowned rivermouth lake located approximately 32 miles south of Muskegon Lake in 1998 (MDNR files, Cadillac). How these fish got into Lake Michigan is unknown, as there are no recorded stocking events.

Another article from the Muskegon Chronicle documented the first ever catch of a Grass Carp from Muskegon Lake in 1998. Grass Carp are an invasive species that can destroy native aquatic plant beds, damage wetland ecosystems and waterfowl habitat, and ultimately foster algae blooms. Another Grass Carp was harvested by a bowfisher in the summer of 2021. Ploidy testing determined that the 2021 Grass Carp was diploid, meaning that it was fertile and capable of reproducing. While diploid Grass Carp have been encountered in Lake Michigan tributaries further south (the Kalamazoo and St. Joseph River), this

was the northernmost observation of a diploid Grass Carp in Michigan waters of the Lake Michigan watershed.

White Perch were first recorded from Muskegon Lake in the late 1990s (MDNR files, Cadillac). They were first recorded in Master Angler records for Muskegon Lake in 2001, and they were also recorded in the 2002/2003 MDNR creel survey (Table 3; Hanchin et al. 2007). In 2014 a State Record White Perch was caught from Muskegon Lake. The fish was 13.25 inches in length and weighed 1.93 lbs. In 2015, that fish was unseated by a 13.6-inch, 2.0 lb. White Perch that was caught from Bear Lake, which is connected to Muskegon Lake via a short channel.

Round Goby were first introduced into the Great Lakes in the early 1990s (Jude et al. 1992). The first records were in the St. Clair River and southern Lake Huron. They were likely present in Muskegon Lake by the late 1990s and were first captured in an MDNR survey in 2008 (Table 3). Since their entrance into Muskegon Lake, they have become abundant and likely play a role in the Muskegon Lake piscine food web. Species like Smallmouth Bass and Walleye are known to prey heavily on Round Gobies. While they have been documented preying on Smallmouth Bass nests in the Great Lakes, their impact on Smallmouth Bass and other native species is unknown.

O'Neal (1997) states that Arctic Grayling, Sauger, Muskellunge, White Bass, and Cisco have been extirpated from the watershed. Since the 1997 report was written however, Muskellunge, White Bass, and Cisco have been recorded in Muskegon Lake, at least in small numbers. There is a White Bass Master Angler record from Muskegon Lake in 2014 and a Cisco Master Angler record from 2022 (Table 4). Lake Macatawa has long had a viable population of White Bass, and it is possible that individuals from that population have made their way into Muskegon Lake. In the early 2000s, MDNR Fisheries Biologist Rich O'Neal attempted to start a White Bass restoration project for Muskegon and White Lakes. White Bass restoration for Muskegon Lake was listed as a Management Option in O'Neal's Muskegon River Assessment (1997). Unfortunately, a White Bass restoration project for Muskegon Lake was never implemented. Cisco numbers have rebounded in Lake Michigan in recent years, and the recent catch from Muskegon Lake likely resulted from Cisco migration into Muskegon Lake from Lake Michigan. Muskellunge were recorded in the 2002/2003 creel survey (Table 3) and are currently present in Muskegon Lake due to the MDNR stocking program, which began in 2013 (Table 1). Frequent angler catches of Muskellunge from Muskegon Lake have been recorded in recent years (MDNR files, Cadillac). Of the five species noted as extirpated from the Muskegon River watershed by O'Neal (1997), only Sauger and Arctic Grayling remain extirpated. Sauger is listed as a "state threatened" species in Michigan, and there are likely no viable populations remaining in the state (Schneider et al. 2007).

Muskegon Lake and the lower Muskegon River support one of only eleven remaining Lake Sturgeon populations in Michigan waters of the Lake Michigan watershed (Harris 2020). No Lake Sturgeon have ever been stocked into Muskegon Lake or the Muskegon River, so the population is entirely supported by natural reproduction. According to Hayes and Caroffino (2012) the estimated population size of the Muskegon River Lake Sturgeon population was 166 individuals. In the 2012 report, the Muskegon River Lake Sturgeon population was classified as "small increasing". Harris et al. (2017) studied the Muskegon system Lake Sturgeon population and captured a total of 268 individuals and estimated a Muskegon River spawning run of less than 50 individuals in any given year. Altenritter et al. (2013) found that juvenile Lake Sturgeon were utilizing Muskegon Lake throughout the year and concluded that Muskegon Lake serves as important nursery habitat for juvenile Lake Sturgeon for at least several years after they

hatched in the Muskegon River. Harris (2020) found that adult Lake Sturgeon also spent significant time in Muskegon Lake.

In file discussion from 2011, MDNR Fisheries Biologist Rich O'Neal attributes increased abundance of Lake Sturgeon in recent years to run of river flows from Croton Dam since 1990 (as opposed to previous daily peaking and dewatering operations that occurred prior to 1990) and an operational change at the BC Cobb plant, which was always suspected of entraining and killing juvenile Lake Sturgeon. The BC Cobb plant eventually ceased operating in 2016 and was removed in 2020. Frequent angler catches of Lake Sturgeon from Muskegon Lake have been reported to MDNR staff and observed in recent years on social media.

Access for anglers to Muskegon Lake has been a frequent discussion topic for many years (MDNR files, Cadillac). The discussion has become even more acute in recent years, as polluted sites have been remediated with public grant funding but then given to developers for private development without public access. Currently, access to Muskegon Lake for anglers is sparse, particularly on the southern and eastern shores of Muskegon Lake where the heaviest population densities lie. The Fisherman's Landing access site and campground has been a frequent target for disposal by the City of Muskegon. There are multiple file entries regarding Fisherman's Landing, including many in the late 1990s and early 2000s. This topic has come up again recently, as the City of Muskegon has again proposed trading portions of the property to a local shipping company for other nearby land parcels that may or may not be as desirable to Muskegon Lake anglers, as well as the public and the citizens of the City of Muskegon.

Also, recently, the City of Muskegon is now allowing a private business to utilize the Hartshorn Public Access Site, hampering the ability of the public to use the site for activities such as fishing and lake viewing. This was one of the few public access sites where shorebound anglers and people with disabilities and limited mobility could access the lake to fish. Also, this access site is within proximity to a large proportion of the population of Muskegon, making it all the more valuable for public access to Muskegon Lake, particularly for people without transportation.

Muskegon Lake is one of the most popular lakes in Michigan for bass tournaments. Between 2016 and 2024, there were 470 tournaments conducted on Muskegon Lake. This ranked Muskegon Lake as the third most popular lake in Michigan for bass tournaments, surpassed only by Lake St. Clair and Gull Lake (Barry County). In the 470 tournaments on Muskegon Lake, a total of 39,593 bass were reported as caught. Of those, approximately 86% were Largemouth Bass, and 14% were Smallmouth Bass. The average heaviest bass in those tournaments was 4.41 lbs., while the statewide average is 3.9 lbs. Approximately 3% of the bass entered in the tournaments were over 4 lbs. (Tom Goniea, MDNR Fisheries Division, unpublished data). The larger tournaments are typically held at the Fisherman's Landing Access Site, which is the only site with parking that can accommodate large numbers of vehicles and trailers, plus space for conducting tournament weigh-in festivities.

Since 1994, a total of 927 exceptional fish caught from Muskegon Lake have been entered in the MDNR Fisheries Division Master Angler program. A total of 30 different species have been entered for Muskegon Lake (Table 4). Freshwater Drum was the most frequently entered species, with 156 entries, followed by Walleye with 146 entries, Longnose Gar with 117 entries, and Bowfin with 92 entries. The current State Record Freshwater Drum was caught from Muskegon Lake in 2015. The fish was 34 inches in length and weighed 28.6 lbs.

Historical Fisheries Surveys

A creel survey was conducted by the Michigan Department of Conservation (the precursor to the Michigan Department of Natural Resources or MDNR of today) in the spring and summer (May 2 through September 27) of 1948 (Fukano 1950). A total of 15 different species were caught by anglers surveyed in the study (Table 3). Yellow Perch, Bluegill, and Rock Bass were the most commonly caught species. The angling effort generated during the time of the study was approximately 138,000 angler/hours (Fukano 1950).

The first known comprehensive fisheries survey of Muskegon Lake was conducted in 1950 by MDOC (Peterson 1951). The survey methods included the use of gill nets, trap nets, seining, and hook and line. A total of 32 different species were documented in the survey (Table 3). The most abundant species in the survey included Bluegill, Yellow Perch, and Pumpkinseed Sunfish. Peterson's conclusions were that the lake produces abundant fish populations and is heavily fished, with Yellow Perch, Bluegill, and Rock Bass making up the bulk of the catch. He also concluded that pollution was affecting fish life along the southern shore of the lake. Also of note was the presence of Sauger and White Bass in the survey. Peterson also mentions and provides some data from another fisheries survey that had apparently been conducted in 1936. Although most details are not provided, the survey seems to have caught nine different game/panfish species (Table 3). It appears that non-game species from the 1936 survey were either not recorded or were not included in Peterson's report.

In 1953 and 1954, a Walleye tagging study was conducted on Muskegon Lake and the lower Muskegon River below Newaygo Dam by MDOC (Crowe 1955). The goal of the study was to establish a population estimate for the Walleye spawning run in the Muskegon River. The estimate from 1953 was 114,000, and the 1954 estimate was 139,000 Walleye. The study also estimated Walleye angler harvest as approximately 9,000 in 1953 and 11,000 in 1954. Muskegon River anglers caught very few Walleye after June 1, leading to the conclusion that most of the spawning Walleye population had migrated downstream to Muskegon Lake or Lake Michigan by then.

A comprehensive fisheries survey of Muskegon Lake was conducted by MDNR in 1967 (MDNR files, Cadillac). Gear used in the survey included fyke nets, experimental gill nets, trap nets, and electrofishing. A total of 25 different fish species were recorded in the survey (Table 3). MDNR Fisheries Biologist Bill Bryant noted that numerical catches and species diversity in the catch varied dramatically based on location, and that the least polluted areas of the lake provided the most fish and the most species. The more polluted parts of the lake only harbored species that are extremely tolerant of degraded water quality. Pollution noted in the survey included wood slabs and bark on the bottom (likely waste from sawmills), kraft waste effluent, and oil on the lake bottom and surface. Bryant also reported that fish in the survey had a kerosene odor to them, which led to Water Resources Division conducting taste testing of the fish. The fish that were taste-tested were graded as "not acceptable" or "barely acceptable". Bryant also noted that very few fish were caught from the deeper areas of the lake, and that limnological study showed low dissolved oxygen levels.

According to Schneider and Leach (1979), in 1975, the spring Walleye spawning run on the Muskegon River had dwindled to only about 2,000 fish. They attributed this decline to poor natural recruitment, although Sea Lamprey predation may have also played a role. They believed that the poor recruitment

in that timeframe was primarily due to competition with and/or predation by Alewife. Alewife numbers had dramatically increased in the 1960s and they were very abundant in the early and mid-1970s.

A short gill net survey was conducted by MDNR in August 1981 (MDNR files, Cadillac). The survey was conducted in an attempt to assess the value of the marsh area in the northeast corner of Muskegon Lake. A total of 10 species were caught in the survey (Table 3). No written report from the survey can be found.

In response to the low numbers of Walleye, MDNR started a Walleye stocking program for Muskegon Lake in the late 1970s (Tables 1 and 2). Another Walleye tagging study was conducted in the Muskegon system 1986 by Day (1991). Day estimated the Walleye run at 43,222 in 1986. While earlier studies had showed that Walleye that spawned in the Muskegon River moved to Lake Michigan after spawning and dispersed over a large area, Day reached the opposite conclusion. Only 3.3 percent of the tag returns from Day's study came from outside the Muskegon River/Lake system. While Day found a spawning population that was much higher than that documented in 1975 (Schneider and Leach 1979), he also concluded that the population was primarily supported by an intensive stocking program and that high mortality of Age-0 Walleye was resulting in a lack wild recruitment.

Fisheries surveys were conducted by MDNR on Muskegon Lake in the spring of 1992 as part of a pilot program to evaluate the effects of shoreline development on fish habitat and populations (MDNR files, Cadillac). Gear used in the 1992 survey included electrofishing and trap nets. A total of 34 species were recorded in the survey. Several species were reported in the 1992 survey that have not been documented in Muskegon Lake before or since. Those species included Black Redhorse, Central Mudminnow, Longnose Sucker, and Spotted Sucker.

Another population estimate of the Muskegon River Walleye spawning run was conducted in 1998 by MDNR (O'Neal 1999). In that study the estimated size of the spawning run was 46,479. O'Neal also concluded that intensive stocking was supporting the population, and that less than 5% of the population was naturally reproduced. The most recent Walleye population estimate of the Muskegon Lake/River spawning run was conducted in 2002 (Hanchin et al. 2007). That study resulted in an estimate of 37,851 Walleye in the spawning run.

The 2002 study of Muskegon Lake (Hanchin et al. 2007) also included a creel survey component. A total of 20 different species were recorded as caught by anglers. The creel survey found that Yellow Perch were the most frequently harvested fish from Muskegon Lake, in both winter and summer. In total, panfish species comprised 97% of the harvested fish, with Largemouth and Smallmouth Bass, Northern Pike, and Walleye also seeing considerable harvest. The creel study showed that Muskegon Lake generated over 180,000 angler hours between April 27, 2002, and March 31, 2003.

Another comprehensive fisheries survey was conducted on Muskegon Lake by MDNR in the spring of 2008. MDNR Status and Trends survey protocols (Wehrly et al. 2009) were used for the survey. Netting with trap nets and inland gill nets was conducted from May 19 to 22, while seining and electrofishing was conducted on June 11. In the 2008 survey, a total of 1,461 fish were caught, representing 37 species (Tables 5 and 6). Age and growth analysis was conducted on all gamefish collected in the 2008 survey (Table 7), as was shoreline habitat data (Table 8). No report for the 2008 MDNR survey of Muskegon Lake was ever produced.

Between 2003 and 2009, researchers from Grand Valley State University (GVSU) conducted fisheries surveys on Muskegon Lake (Bhagat and Ruetz III 2011). In those surveys, a total of 45 different fish species were captured. Of note were Blackside Darter, Bloater, Johnny Darter, and Mimic Shiner, which have not been caught in any MDNR/MDOC fisheries surveys of Muskegon Lake (Table 3). Also, a small number of White Bass were caught in the surveys as well, providing further evidence that White Bass may not be completely extirpated from Muskegon Lake.

In October of 1994, the first of many fall electrofishing surveys targeting juvenile Walleye was conducted on Muskegon Lake according to protocols outlined by Serns (1982 and 1983) and subsequently updated by Ziegler and Schneider (2000). Surveys have been conducted each year except for 2003, 2022, and 2023 (O'Neal 2017; Tonello and O'Neal 2020; Table 9). The goal of these surveys is to assess Walleye year class strength (both stocked and wild) by targeting juvenile Walleye in the shallows. In most of the surveys, very few Walleye were caught, regardless of whether Walleye had been stocked or not. Exceptions were 1995, 1999, and 2004. In those years, over 40 age-0 Walleye per mile were caught with the highest catch coming in 1995 at 72.8 age-0 Walleye per mile.

In some years, the Walleye stocked by MDNR into Muskegon Lake were marked with Oxytetracycline (OTC). OTC leaves a mark on the vertebrae of the fish, making it possible for Biologists to determine that the fish were indeed produced in a hatchery, and not born of natural reproduction. The majority of the juvenile Walleye caught in surveys in years where the Walleye were identified as hatchery fish, leading to the conclusion that the Muskegon Lake Walleye population was heavily dependent on stocking. The one exception was in 2007, when Walleye were not stocked, yet the fall electrofishing survey showed a catch rate of 30.7/mile for age-0 Walleye (O'Neal 2017).

Yellow Perch have long been a popular fish for anglers on Muskegon Lake. They were the most frequently harvested fish in both the summer 2002 and winter 2003 creel surveys of Muskegon Lake, with harvest estimates exceeding 90,000 (Hanchin 2007). In addition to hosting a resident population, Yellow Perch from Lake Michigan occasionally move into Muskegon Lake. Angler effort targeting Yellow Perch can be quite high during these incursions. Several recent studies have shown that the resident Yellow Perch of Muskegon Lake are genetically distinct from the Lake Michigan migrants, and that the two groups do not appear to interbreed (Yin et al. 2025; Chorak et al. 2019). This phenomenon has also been documented in other drowned rivermouth lakes along the Lake Michigan coast (Chorak et al. 2019).

Current Status

The most recent fisheries survey of Muskegon Lake was conducted in the spring, summer, and fall of 2024. MDNR Status and Trends survey protocols (Wehrly et al. 2009) were used for the spring/summer portions of the survey. The purpose of the spring and summer 2024 fisheries surveys was to assess the overall fish community of Muskegon Lake, while the fall electrofishing effort was aimed at evaluating Walleye year class strength for age-0 and age-1. The netting portion of the survey took place from May 20 through May 23, 2024. Gear used included two trap nets (6 net-nights), three large-mesh fyke nets (5 net-nights), three experimental graded-mesh inland gill nets (8 net-nights), four large-mesh fyke nets (11 net-nights), and two small-mesh fyke nets (5 net-nights). Seining and electrofishing were conducted on June 24. A total of six seine hauls were completed, along with three ten-minute electrofishing transects.

Total length to inch class (e.g., 7-inch class = 7.0-7.9 inches) was recorded for all fish captured. Weights for all fish species were calculated using the length-weight regression equations compiled by Schneider et al. (2000b).

A total of 3,346 fish were caught, representing 33 different species (Tables 3, 10, and 11). Yellow Perch (n = 698), Pumpkinseed (n = 588), and Bluegill (n = 376) were the most abundant species in the catch (Tables 9 and 10). Predators (Bowfin, Channel Catfish, Flathead Catfish, Largemouth Bass, Longnose Gar, Northern Pike, Smallmouth Bass, and Walleye) made up 48.6% of the fish biomass. Previously recorded fish species that were not present in the 2024 survey included Black Bullhead, Black Redhorse, Blacknose Shiner, Brown Trout, Central Mudminnow, Chinook Salmon, Coho Salmon, Emerald Shiner, Fathead Minnow, Golden Redhorse, Goldfish, Hybrid Sunfish, Iowa Darter, Logperch, Longnose Sucker, Muskellunge, Rainbow Trout, River Redhorse, Sand Shiner, Sauger, Spotted Sucker, Tadpole Madtom, Trout-Perch, Warmouth, and White Bass (Table 3). Species caught in the 2024 survey that were not present in previous surveys included Grass Pickerel and Spotfin Shiner (Table 3).

To age gamefish species, scale or spine samples were collected from up to ten fish per inch group. Age and growth analysis was conducted by counting growth rings present in cross sections of spines or scales. Weighted age compositions of gamefish populations were calculated as described by Schneider (2000b). Mean length at age was used to obtain a growth index by calculating the difference from the state average length (Schneider et al. 2000a). The mean growth indices for a given gamefish species was generated by averaging the growth indices for each age class that was represented by at least five fish. Growth rates exceeding the state average were observed for the six species that had enough samples to make statistical inferences (Table 12).

Shoreline data were collected on Muskegon Lake by MDNR Fisheries personnel in September 2024, according to protocols outlined in Wehrly et al. (2009). Data collected included the number of docks, submerged trees, and houses observed per kilometer of shoreline, as well as how much of the shoreline is armored or hardened with seawalls or riprap to prevent erosion. Muskegon Lake averaged 4.2 docks, 36.7 submerged trees and 8.0 houses per kilometer of shoreline. Armoring structures and materials were present along 62.6% of the lake shoreline (Table 8). A temperature/dissolved oxygen profile was also collected on September 26, 2024. The profile was taken in the deepest part of the lake. Oxygen levels suitable for fish were found to a depth of 29 feet (Table 13).

The fall electrofishing effort on Muskegon Lake showed the third highest abundance of age-0 (2024-year class) Walleye since 1994 (Table 9), and the highest age-0 abundance in any non-stocked year. The effort also showed the third highest abundance of age-1 (2023-year class) Walleye over the 25-year span that the surveys have been conducted. While Muskegon Lake received a full complement of Walleye stocking in 2023, only a very small number were stocked in at the Muskegon Walleye Pond outlet in 2024, essentially making 2024 a non-stocking year (Tables 1 and 2).

Analysis and Discussion

The 2024 MDNR fisheries surveys of Muskegon Lake were extremely successful in that they provided current information on the fish populations of Muskegon Lake, and particularly those species that anglers like to pursue. While the 2008 and 2024 surveys were similar in nature and timeframe, the ability to draw a direct comparison between the two is limited due to differences in gear utilized. However, some

differences between the two surveys can be noted. For example, growth rates for most species were improved in 2024 when compared to 2008 (Tables 7 and 12).

The panfish populations, in particular Bluegill and Pumpkinseed, have improved dramatically since the 2008 survey. In 2008, the Bluegill growth rate was -0.4 inches below the state average, and the Pumpkinseed growth rate was -1.0 inches below the state average (Table 7). However, in 2024, the Bluegill growth rate was +0.3 inches greater than the state average, while the Pumpkinseed growth rate was +0.3 inches greater than the state average (Table 12). In the 2008 survey, only one Bluegill and no Pumpkinseed were in the 8-inch class, and only a few were in the 7-inch class. However, in 2024, more Bluegill and many more Pumpkinseed were in the 7-inch class, with some also reaching the 8-inch class. According to the Schneider Index, a tool which examines Bluegill size structure and growth rates to provide a score for the Bluegill population of a lake (Schneider 1990), the 2024 Bluegill catch for Muskegon Lake rated as "Satisfactory", while the 2008 catch only rated as "Acceptable" (Table 14). The reason(s) for the improvement in the Bluegill and Pumpkinseed populations shown in the 2024 survey are unclear. Anglers have certainly taken note, as we observed numerous anglers out targeting and catching panfish while we conducted the survey.

While Largemouth Bass were not overly numerous in either the 2008 or 2024 surveys, they are clearly an important component of the Muskegon Lake fish community. One indication of the health of the Largemouth Bass population of Muskegon Lake is the popularity of the lake for bass tournament anglers, with over 34,000 Largemouth Bass recorded in 470 bass tournaments from 2016-2024. One curiosity of both the 2008 and 2024 surveys was the lack of Smallmouth Bass in the catch. While Largemouth Bass clearly outnumber Smallmouth Bass in Muskegon Lake, Smallmouth Bass are an important component of the Muskegon Lake fish community. The lack of Smallmouth Bass in these surveys may be a geographical issue. Smallmouth Bass are known to inhabit the channel and pierhead areas, where it is not possible to set nets. Also, the Muskegon River is known to host a summer fishery for Smallmouth Bass. While it is possible or even likely that most of these fish are migrants from Muskegon Lake, this run/population has never been studied.

Rock Bass and Yellow Perch were also abundant in the 2024 survey catch. The Rock Bass are not often directly pursued by anglers, but they do add variety to the catch for panfish anglers. Muskegon Lake has long had a reputation as an excellent fishing lake for Yellow Perch. There are likely two different metapopulations of Yellow Perch in Muskegon Lake- those that are year-round residents, and those that are migrants from Lake Michigan (Schneider et al. 2007; Chorak et al. 2019). The migratory Yellow Perch enter Muskegon Lake (and other drowned river mouth lakes along the eastern shore of Lake Michigan) for spawning and foraging purposes. The Lake Michigan migrant Yellow Perch tend to be larger and paler in coloration, and anglers take note when they show up in Muskegon Lake. During the 2024 survey, we observed anglers targeting and catching what were likely Lake Michigan migrant Yellow Perch just inside the channel to Lake Michigan. Our survey gear also caught Yellow Perch in that area, including some larger, paler individuals that were likely migrants from Lake Michigan.

Walleye were fairly abundant in the 2024 survey, with 66 caught, ranging from 7 to 27 inches in length (Tables 10 and 11). Eight different year classes were represented (Table 12). Six of those year classes were stocked, either into Muskegon Lake or by release from the Muskegon Walleye Pond into the Muskegon River (Tables 1 and 2). The Walleye catch in the 2024 survey represented a marked increase from the 2008 catch, in which only 29 Walleye representing seven-year classes were caught (Tables 5

and 7). Most of the Walleye caught in the 2008 survey were from stocked year classes, although 10 Walleye from unstocked year classes (2007 and 2005) were present.

In the 2024 spring and summer surveys, the most well-represented Walleye year class was the 2022-year class, which was unstocked. The fall electrofishing effort documented the strong presence of the 2024-year class, which was also unstocked. The presence of several strong, unstocked Walleye year classes in Muskegon Lake is encouraging, and represents a potential change in Walleye population dynamics on Muskegon Lake. Previously, it was thought that stocking was the primary provider of Walleye to Muskegon Lake and that natural reproduction only played a minor role (O'Neal 2017, Tonello and O'Neal 2019). Whether this trend will continue or not remains to be seen.

Walleye growth in both the 2008 and 2024 MDNR Muskegon Lake fisheries surveys was excellent, at over 2 inches greater than the State of Michigan mean length at age in both surveys. This has been a common theme for Muskegon Lake in recent years (Diana 2006; Hanchin et al. 2007). However, in the mid-1900s when the Walleye population of Muskegon Lake was much larger, growth rates were slower (Schneider et al. 2007). This was likely due to density-dependent growth. In addition, at least some of the Walleye in the Muskegon Lake/River system migrate out to Lake Michigan, presumably to take advantage of prey opportunities there (Crowe 1957; Hanchin et al. 2007; Hanson 2006).

Other gamefish species like Channel Catfish, Flathead Catfish, and Northern Pike were present in the 2024 survey. While the catch was not overly numerous for these species, multiple size classes were present, and populations appear to be healthy (Tables 10 and 11). Consistent year classes were present for Northern Pike (Table 12), indicating that natural reproduction for this species is occurring in most or even all years. Growth rates for Northern Pike were excellent as well. Muskegon Lake is known as an excellent fishing lake for Northern Pike, particularly through the ice in the winter. Channel Catfish are a popular fishery on Muskegon Lake, particularly for shorebound anglers. While Flathead Catfish are usually not actively pursued by Muskegon Lake anglers, they represent a trophy catch when anglers do catch one.

One disappointment of the 2024 Muskegon Lake survey was the lack of any Muskellunge in the catch. However, the survey was not specifically designed to target Muskellunge, so this is not surprising. Reports and pictures from anglers confirm that the stocked Muskellunge are surviving and creating a fishery. While those that intentionally pursue them have reported good catch rates, incidental catches by anglers targeting other fish species have been reported as well. There is plenty of soft-rayed forage available for the Muskellunge in Muskegon Lake, and growth rates of other predator species were very good in the 2024 survey (Table 11). Northern Pike, which prefer similar prey, were growing extremely well, at +5.1 inches greater than the state average.

Compared to other large, deep lakes in Michigan, Muskegon Lake has average numbers of docks and dwelling density (Table 8; Wehrly et al. 2015). Muskegon Lake did have more submerged woody habitat than other large, deep lakes in Michigan. However, Muskegon Lake had nearly double the amount of shoreline armoring than other large, deep Michigan lakes. The Muskegon Lake shoreline is clearly heavily developed and natural, undeveloped shoreline is severely lacking. In addition, Muskegon Lake water levels (and subsequent shoreline impacts) will always be heavily dependent on Lake Michigan water levels.

Management Direction

Based on the 2024 fisheries survey catch (both spring/summer and fall), and reports from anglers, the Walleye population of Muskegon Lake appears to be similar to what it has been in the past. Walleye are a very important species for anglers on Muskegon Lake. The recent stocking regime of 211,600 spring fingerlings (approximately 50/acre) on a biannual basis seems to be creating the desired fishery, with assistance from natural reproduction, at least in some years. Muskegon Lake continues to be a premier destination for Walleye anglers, and especially for those targeting trophy Walleye. A total of 146 Walleye from Muskegon Lake have been entered in the Master Angler program since 1994 (Table 4). Some of these entries have been quite large. One Walleye caught by an angler in January 2023 weighed 15lbs 10oz (MDNR files, Cadillac). Since the most recent Walleye stocking occurred in 2023, Walleye should be stocked into Muskegon Lake in 2025. The 2025 Walleye stocking effort should be followed up with a fall electrofishing effort targeting juvenile Walleye that follows protocols outlined by Ziegler and Schneider (2000). Since a population estimate for Muskegon Lake Walleye has not been conducted since 2002, a population estimate survey targeting Walleye should be conducted as soon as possible. The importance of the Muskegon Lake Walleye population cannot be overstated. In addition to providing a fantastic fishery with trophy potential, migratory walleye from Muskegon Lake serve as a broodstock source for the MDNR Walleye stocking program that provides fingerlings for stocking all over the Lower Peninsula.

Although no Muskellunge were caught in the 2024 survey, we have received numerous Muskellunge catch reports from anglers. Clearly, some of the stocked Muskellunge are surviving and being caught by anglers. Muskegon Lake provides excellent habitat and forage for Muskellunge. Therefore, Muskellunge (Great Lakes strain) stocking should continue in Muskegon Lake. The stocking rate should be 1.5/acre fall fingerlings (3,857 fish) stocked on a biannual basis. Muskellunge were stocked into Muskegon Lake in the fall of 2024 (Table 1), so they should next be stocked in the fall of 2026. In the summer of 2024, a juvenile Muskellunge was caught in a fisheries survey being conducted by GVSU (Dr. Carl Ruetz, personal communication). This particular Muskellunge was too small to have been a product of any recent stocking and must have been a naturally reproduced fish. One goal of the stocking program is to restore a self-sustaining population, so the presence of at least one naturally reproduced juvenile Muskellunge is an encouraging sign.

Lake Sturgeon are designated as a State-threatened species in Michigan. Although no Lake Sturgeon were caught in the 2024 survey, they are an important resident of Muskegon Lake. It is possible or even likely that the population is higher now than it was in the early to mid-2010s when several Lake Sturgeon studies were conducted on Muskegon Lake (Altenritter 2013; Hayes and Caroffino 2012; Harris 2017). This is likely due to the removal of the BC Cobb plant, and due to the efforts of the Little River Band of Ottawa Indians, the US Fish and Wildlife Service, and other partners to protect juvenile Lake Sturgeon during chemical treatments on the Muskegon River targeting Sea Lamprey. Such efforts should continue. Since the Muskegon Lake/River Lake Sturgeon population is entirely dependent on natural reproduction, Conservation Officers should place a high priority on protecting the Lake Sturgeon that spawn in the Muskegon River from illegal harvest or harassment. Also, since both juvenile and adult Lake Sturgeon spend significant portions of their lives in Muskegon Lake, dredging and filling of bottomlands should be minimized to the greatest extent or avoided altogether. Lake Sturgeon are benthivores and require healthy populations of benthic invertebrates as forage.

Muskegon Lake offers tremendous opportunities for bowfishing. Species including Common Carp, White Sucker, and several species of Redhorse are abundant in Muskegon Lake. Bowfishing may also help to stop the spread of invasive species. Grass Carp are a major concern for Muskegon Lake (and the Lake Michigan watershed in general). The documented presence of a diploid Grass Carp in Muskegon Lake in 2021 was particularly alarming. Luckily, that fish was harvested by a bowfisher. Any bowfishers that observe Grass Carp are strongly encouraged to target and harvest them.

Public access to Muskegon Lake, particularly along the southern and eastern shores of Muskegon Lake is woefully inadequate. Especially within the City of Muskegon, there are few places where the public can access, view, and fish Muskegon Lake unless they can afford to rent a boat slip in a marina or own a lakefront condominium. People with limited mobility or transportation have even fewer opportunities. This disproportionately affects folks with lower incomes and may present an environmental justice issue. The City of Muskegon should be actively pursuing new opportunities for direct public access to Muskegon Lake for its citizens, while vigorously defending what little public access remains.

Unfortunately, significant habitat degradation remains an issue in and near Muskegon Lake. Multiple large-scale development projects are under construction within Muskegon city limits that already have or will further degrade and harden the Muskegon Lake shoreline, dredge or fill lake bottom areas, destroy coastal wetlands, and eliminate public access. Even areas where Muskegon Lake restoration projects have been previously completed (usually funded with public grants) are not immune as several of those projects have already been intensely redeveloped, with negative impacts to the restored areas.

Improved shoreline management would greatly benefit the fish populations and the overall ecosystem of Muskegon Lake. Seawalls, dredging, hardened and heavily developed shorelines, along with manicured lawns do not provide the appropriate habitat for the Muskegon Lake ecosystem. Instead, consideration for the Muskegon Lake ecosystem should be factored into development plans. Concepts like setbacks and buffer strips, natural shorelines with native vegetation, and features designed to improve habitat for Muskegon Lake fish and wildlife should be strongly considered when development planning is conducted.

The Michigan Natural Shoreline Partnership, an organization dedicated to promoting natural shoreline landscaping to protect Michigan's inland lakes (http://www.mishorelinepartnership.org/), can provide guidance and training on how best to manage the land/water interface for the benefit of Muskegon Lake. Placing downed trees in the shallows of the lake provide excellent habitat for numerous popular species, including Largemouth Bass, Smallmouth Bass, and panfish. Any trees that fall into the lake should be left alone as fisheries habitat. In addition, trees could be intentionally placed in appropriate shallow water areas of Muskegon Lake to provide cover and habitat for desirable fish species. Emergent woody structure also provides basking habitat for turtles. Any development or restoration projects on or near Muskegon Lake should consider the fluctuations in Lake Michigan water levels over time and the impacts of higher or lower water levels.

A healthy aquatic plant community is critical for the fish community of Muskegon Lake, particularly for important species like Bluegill, Pumpkinseed, Largemouth Bass, and many others. In recent years on Muskegon Lake, chemical aquatic nuisance plant treatments have been only conducted on relatively small areas, mostly near marinas and other developed areas. These treatments have typically been spot-treatments in places where Eurasian milfoil, curly-leaf pondweed, and a few other species have reached

unacceptable densities. We recommend that this strategy continue. Aquatic plants, both native and non-native, should only be chemically treated only when they become a nuisance to recreation or navigation. This will result in lower expenses for Muskegon Lake riparian landowners, and a healthier Muskegon Lake ecosystem. Copper sulfate-based products should not be used under any circumstances, as it is known to be extremely harmful to aquatic insect populations, especially mayflies, and will accumulate in sediment leading to long-term exposure and toxicity.

References

Altenritter, M. E., A. C. Wieten, C. R. Ruetz III, and K. M. Smith. 2013. Seasonal spatial distribution of juvenile Lake Sturgeon in Muskegon Lake, Michigan. Ecology of Freshwater Fish 22:467-478.

Bhagat, Y.& Ruetz, C.R. III. 2011. Temporal and fine-scale spatial variation in fish assemblage structure in a drowned river mouth system of Lake Michigan. Transactions of the American Fisheries Society 140: 1429-1440.

Chorak, G. M., Ruetz III, C. R., Thum, R. A., Partridge, C. G., Janetski, D. J., Hook, T. O., and D. C. Clapp. 2019. Yellow perch genetic structure and habitat use among connected habitats in eastern Lake Michigan. Ecology and Evolution.

Crowe, W. R. 1955. Numerical Abundance and Use of a Spawning Run of Walleyes in the Muskegon River, Michigan. Transactions of the American Fisheries Society, Volume 84, Issue 1.

Crowe, W. R. 1957. Movement and harvest of native Walleyes from impoundments on the Muskegon River. Institute for Fisheries Research Report 1518. Michigan Department of Conservation, Ann Arbor.

Day, R. M. 1991. Population dynamics and early life history of Muskegon River Walleyes. Master's thesis, Michigan State University, Lansing.

Eschmeyer, P. H. 1949. A review of Pike-Perch tagging experiments in Michigan, with particular reference to studies on the Muskegon River. Institute for Fisheries Research Report 1222. Michigan Department of Conservation, Ann Arbor.

Fukano, K. G. 1950. Muskegon Lake creel census for the spring and summer of 1948. Fisheries Research Report No. 1246. Michigan Department of Conservation, Ann Arbor.

Hanchin, P. A., R. P. O'Neal, R. D. Clark, and R. N. Lockwood. 2007. The Walleye population and fishery of the Muskegon Lake system, Muskegon and Newaygo Counties, Michigan in 2002. Michigan Department of Natural Resources Special Report 40, Ann Arbor.

Hanson, J. R. 2006. Seasonal movement patterns of Walleye (Sander vitreus) in the Muskegon River and Muskegon Lake, Michigan. M. S. Thesis, University of Michigan, Ann Arbor.

Harris, B. S., Ruetz, C. R. III, Wieten, A. C., Altenritter, M. E., & Smith, K. M. 2017. Characteristics of lake sturgeon Acipenser fulvescens Rafinesque, 1817 in a tributary of Lake Michigan, USA: Status of the Muskegon River population. Journal of Applied Ichthyology, 33(3), 338-346.

Harris, B.S., C.R. Ruetz III, T.J. Ellens, A.D. Weinke, and Biddanda, B.A. 2020. Adult Lake Sturgeon (Acipenser fulvescens Rafinesque, 1817) occurrence in the Muskegon River system, a Lake Michigan drowned river mouth, USA. Journal of Applied Ichthyology. 36: 547-558.

Hayes, D. B. and D. C. Caroffino, editors. 2012. Michigan's Lake Sturgeon rehabilitation strategy. Fisheries Special Report 62. Michigan Department of Natural Resources, Lansing.

Jude, D.J., R.H. Reider, and G.R. Smith. 1992. Establishment of Gobiidae in the Great Lakes basin. Canadian Journal of Fisheries and Aquatic Sciences 49:416-421.

O'Neal, R. P. 1997. Muskegon River Watershed Assessment. Michigan Department of Natural Resources, Fisheries Special Report 19, Lansing.

O'Neal, R. P. 1999. Muskegon River Walleye Population Estimate, 1998. Michigan Department of Natural Resources, Cadillac.

O'Neal, R. P. 2017. Muskegon Lake 2015-2016 survey report. Michigan Department of Natural Resources, Fisheries Division, Fish Collection System, Ann Arbor.

Peterson, K. L. 1951. A biological survey of Muskegon Lake. Fisheries Research Report No. 1276. Michigan Department of Conservation, Ann Arbor.

Schneider, J. C., and J. H. Leach. 1979. Walleye stocks in the Great Lakes, 1800-1975: Fluctuations and possible causes. Great Lakes Fishery Commission, Technical Report 31, Ann Arbor, Michigan.

Schneider, J. C. 2000a. Interpreting fish population and community indices. Chapter 21 in Schneider, J. C., editor. 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Schneider, J. C. 2000b. Weighted average length and weighted age composition. Chapter 15 in Schneider, J. C., editor. 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Schneider, J. C., R. P. O'Neal, and R. D. Clark Jr. 2007. Ecology, management, and status of walleye, sauger, and yellow perch in Michigan. Michigan Department of Natural Resources, Fisheries Special Report 41, Ann Arbor.

Serns, S. L. 1982. Relationship of Walleye fingerling density and electrofishing catch per effort in northern Wisconsin lakes. North American Journal of Fisheries Management 2:38-44.

Serns, S. L. 1983. Relationship between electrofishing catch per effort and density of Walleye yearlings. North American Journal of Fisheries Management 3:45 1-452.

Tonello, M. A., and O'Neal, R. P. 2020. 2017-2019 Fisheries Survey Report: Muskegon Lake, Muskegon County. Michigan Department of Natural Resources, Cadillac.

Wehrly, K.E., G.S. Carter, and J.E. Breck. 2009 Draft. Standardized sampling methods for the inland lakes status and trends program. Chapter 27 in Manual of Fisheries Survey Methods. Michigan Department of Natural Resources, Fisheries Division internal document, Ann Arbor.

Wehrly, K. E., D. B. Hayes, and T. C. Wills. 2015. Status and trends of Michigan inland lake resources 2002-2007. Michigan Department of Natural Resources Fisheries Report 08. Institute for Fisheries Research, Ann Arbor.

Yin X., Schraidt C. E., Sparks M. M., Euclide P. T., Hoyt T. J., Ruetz III C. R., Höök T. O., Christie M. R. 2025. Parallel genetic adaptation amid a background of changing effective population sizes in divergent yellow perch (Perca flavescens) populations. Proceedings of the Royal Society B 292: 20242339.

Ziegler, W., and J. C. Schneider. 2000. Guidelines for evaluating Walleye and muskie recruitment. Chapter 23 in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Table 1. Fish stocked in Muskegon Lake, Muskegon County, 1883-2024.

Year	Species	Number	Size	Strain
1883	American Eel	4,500	spring fingerlings	Hudson River
1933	Walleye	1,200,00	fry	
1934	Walleye	1,000	fry	
1935	Walleye	850,000	fry	
1936	Walleye	750,000	fry	
1937	Walleye	825,000	fry	
1938	Walleye	1,000,000	fry	
1939	Walleye	880,000	fry	
1940	Walleye	2,000,000	fry	
1974	Walleye	3,559	fingerlings	
1975	Walleye	3,477	spring fingerlings	
1976	Tiger Muskellunge	2,932	spring fingerlings	
1978	Walleye	12,428	fall fingerlings	
1979	Walleye	71,060	spring fingerlings	
1980	Walleye	125,664	spring fingerlings	
1981	Walleye	2,000	spring fingerlings	
1983	Walleye	50,000	fry	
	Walleye	41,000	spring fingerlings	
1985	Walleye	162,965	spring fingerlings	Muskegon
1986	Walleye	191,598	spring fingerlings	Muskegon
1987	Walleye	17,872	spring fingerlings	Muskegon
1990	Walleye	99,000	fry	Muskegon
	Walleye	18,357	spring fingerlings	Muskegon
1991	Northern Pike*	200,267	spring fingerlings	Muskegon
	Walleye	251,155	spring fingerlings	Muskegon
	Walleye	3,500	spring fingerlings	Ohio
1992	Walleye	271,887	spring fingerlings	Muskegon
1993	Walleye	442,262	spring fingerlings	Muskegon
	Walleye*	108,317	spring fingerlings	Muskegon
1994	Walleye	2,300,000	fry	Muskegon
	Walleye	547,555	spring fingerlings	Muskegon
1995	Walleye	500,000	fry	Muskegon
	Walleye	548,971	spring fingerlings	Muskegon
1996	Walleye	269,231	spring fingerlings	Muskegon
1997	Walleye	568,785	spring fingerlings	Muskegon
1998	Walleye	406,714	spring fingerlings	Muskegon
1999	Walleye	594,588	spring fingerlings	Muskegon
2000	Walleye	549,753	spring fingerlings	Muskegon

Table 1 continued. Fish stocked in Muskegon Lake, Muskegon County, 1883-2024.

2002	Walleye	351,885	spring fingerlings	Muskegon
2004	Walleye	98,141	spring fingerlings	Muskegon
2006	Walleye	191,356	spring fingerlings	Muskegon
2008	Walleye	204,780	spring fingerlings	Muskegon
2010	Walleye	200,689	spring fingerlings	Muskegon
2012	Walleye	211,996	spring fingerlings	Muskegon
2013	Muskellunge	6,846	fall fingerlings	Great Lakes
2014	Muskellunge	6,173	fall fingerlings	Great Lakes
	Walleye	174,765	spring fingerlings	Muskegon
2015	Muskellunge*	6,205	fall fingerlings	Great Lakes
2016	Walleye	212,619	spring fingerlings	Muskegon
2018	Muskellunge	4,179	fall fingerlings	Great Lakes
	Walleye	212,124	spring fingerlings	Muskegon
2021	Muskellunge	6,216	fall fingerlings	Great Lakes
	Walleye	132,076	spring fingerlings	Muskegon
2022	Muskellunge	2,535	fall fingerlings	Great Lakes
2023	Walleye	210,000	spring fingerlings	Muskegon
2024	Muskellunge	6,217	fall fingerlings	Great Lakes

*Indicates that the fish were stocked in the lower Muskegon River at either the Creston Road or Mill Iron Road access points.

Table 2. Walleye released directly into the lower Muskegon River from the Muskegon Walleye Rearing Pond, Muskegon County, 1980-2024.

Year	Species	Number	Size	Strain
1980	Walleye	30,000	spring fingerlings	Muskegon
1984	Walleye	82,026	spring fingerlings	Muskegon
1985	Walleye	28,591	spring fingerlings	Muskegon
1989	Walleye	799	fall fingerlings	Muskegon
1990	Walleye	28,409	spring fingerlings	Muskegon
1991	Walleye	265,402	spring fingerlings	Muskegon
1994	Walleye	38,285	spring fingerlings	Muskegon
1995	Walleye	40,000	spring fingerlings	Muskegon
1996	Walleye	118,893	spring fingerlings	Muskegon
2003	Walleye	50,210	spring fingerlings	Muskegon
2014	Walleye	21,395	spring fingerlings	Muskegon
2015	Walleye	109,740	spring fingerlings	Muskegon
2016	Walleye	107,663	spring fingerlings	Muskegon
2017	Walleye	184,812	spring fingerlings	Muskegon
2019	Walleye	75,831	spring fingerlings	Muskegon
2024	Walleye	4,100	spring fingerlings	Muskegon

Table 3. Presence/absence of fish species in historical fisheries surveys of Muskegon Lake, Muskegon County.

Species	1936	1948	1950	1967	1981	1992	2002	2008	2024
Alewife				x				x	x
Banded Killifish			x					x	x
Black Bullhead			x	x		x			
Black Redhorse						x			
Black Crappie	x	x	x		x	x	x	x	x
Blacknose Shiner			x						
Bluegill	x	x	x	x	x	x	x	x	x
Bluntnose Minnow			x	x		x		x	x
Bowfin		x	x	x	x	x	x	x	x
Brook Silverside			x			x		x	x
Brown Bullhead			x	x		x		x	x
Brown Trout						x	x		
Bullhead spp.		x			x				
Channel Catfish		x	x				x	x	x
Central Mudminnow						x			
Chinook Salmon							x		
Coho Salmon							x		
Common Carp			x	x		x		x	x
Common Shiner				x		x		x	x
Emerald Shiner				x		x			
Fathead Minnow								x	
Flathead Catfish								x	x
Freshwater Drum			x	x			x	x	x
Golden Redhorse							x	x	
Golden Shiner			x	x		x		x	x
Goldfish				x					
Grass Pickerel									x
Gizzard Shad				x		x	x	x	x
Hybrid Sunfish			x			x		x	
Iowa Darter			x						
Largemouth Bass		x	x	x		x	x	x	x
Logperch			x						
Longnose Gar			x	x				x	x
Longnose Sucker						x			
Muskellunge							x		
Northern Pike	x	x	x	x	x	x	x	x	x
Pumpkinseed	x	x	x	x	x	x	x	x	x
Quillback				x		x	x	x	x
Rainbow Trout						x	x	x	
Redhorse spp.			x	x		x		x	
River Redhorse						x			
Rock Bass	x		x	x	x	x	x	x	x
Round Goby								x	x
Sand Shiner								x	
Sauger	x	x	x						
Shorthead Redhorse						x		x	x
Silver Redhorse								x	x
Smallmouth Bass	x	x	x	x		x	x	x	x

Table 3 continued. Presence/absence of fish species in historical fisheries surveys of Muskegon Lake, Muskegon County.

Species	1936	1948	1950	1967	1981	1992	2002	2008	2024
Smallmouth Bass	x	x	x	x		x	x	x	x
Spotfin Shiner									x
Spottail Shiner								x	x
Spotted Sucker						x			
Tadpole Madtom			x						
Trout-perch						x			
Walleye	x	x	x	x		x	x	x	x
Warmouth			x		x	x			
White Bass		x	x				x		
White Perch							x	x	x
White Sucker		x	x	x	x	x	x	x	x
Yellow Bullhead			x	x		x		x	x
Yellow Perch	x	x	x	x	x	x	x	x	x

Table 4. Michigan DNR Master Angler awards issued for fish caught from Muskegon Lake, Muskegon County, Michigan, 1994-2024.

Species	Number issued
Freshwater Drum	156
Walleye	146
Longnose Gar	117
Bowfin	92
White Perch	78
Common Carp	72
Channel Catfish	42
Flathead Catfish	40
Gizzard Shad	28
Yellow Perch	21
Quillback	20
Bluegill	16
Northern Pike	14
Lake Whitefish	12
Black Crappie	11
Redhorse Spp.	11
Chinook Salmon	11
White Sucker	10
Largemouth Bass	8
Smallmouth Bass	7
Pumpkinseed	3
Brown Trout	2
Black Buffalo	2
Green Sunfish	2
Longnose Gar	1
Cisco	1
Bullhead Spp.	1
Menominee Whitefish	1
Rainbow Trout	1
White Bass	1
Total:	927

Table 5. Number, weight, and length of fish collected from Muskegon Lake, Muskegon County, with trap nets, inland gillnets, seining, and electrofishing, June 2008.

Species	Number	% by number	Weight (lbs)	% by weight	Length range (inches)[1]	Ave. length	Percent legal or acceptable size
Alewife	55	3.8	2.9	0.3	4-6	6.0	
Banded Killifish	107	7.3	1.5	0.1	1-4	3.2	
Black Crappie	20	1.4	9.9	0.9	5-12	9.3	95 (7")
Bluegill	234	16.0	33.8	3.0	3-8	5.7	44 (6")
Bluntnose Minnow	109	7.5	0.6	0.1	1-3	2.5	
Bowfin	14	1.0	70.7	6.2	20-27	25.1	
Brook Silverside	12	0.8	0.0	0.0	2-3	3.4	
Brown Bullhead	6	0.4	4.5	0.4	10-12	11.7	100 (7")
Channel Catfish	40	2.7	176.7	15.6	5-31	22.7	98 (12")
Common Carp	5	0.3	47.4	4.2	25-29	27.5	
Common Shiner	1	0.1	0.0	0.0	2-2	2.5	
Freshwater Drum	17	1.2	32.9	2.9	6-22	15.7	
Fathead Minnow	1	0.1	0.0	0.0	2-2	2.5	
Flathead Catfish	7	0.5	182.3	16.0	31-41	37.6	100 (12")
Golden Redhorse	1	0.1	1.6	0.1	16-16	16.5	
Golden Shiner	1	0.1	0.1	0.0	7-7	7.5	
Gizzard Shad	13	0.9	21.9	1.9	12-18	16.2	
Hybrid Sunfish	3	0.2	0.2	0.0	3-4	4.2	0 (6")
Largemouth Bass	30	2.1	35.7	3.1	4-17	11.9	37 (14")
Longnose Gar	37	2.5	156.7	13.8	28-44	36.6	
Northern Pike	27	1.8	102.1	9.0	14-36	24.4	44 (24")
Pumpkinseed	62	4.2	8.3	0.7	2-7	5.4	29 (6")
Quillback	14	1.0	43.7	3.8	12-22	18.2	
Rainbow Trout	1	0.1	5.3	0.5	24-24	24.5	100 (10")
Redhorse spp.	13	0.9	22.9	2.0	10-21	17.2	
Rock Bass	71	4.9	14.3	1.3	1-8	5.3	59 (6")
Round Goby	19	1.3	0.0	0.0	1-3	2.2	
Sand Shiner	11	0.8	0.0	0.0	1-2	2.4	
Shorthead Redhorse	7	0.5	18.3	1.6	15-20	18.5	
Silver Redhorse	7	0.5	15.6	1.4	13-23	19.0	
Smallmouth Bass	1	0.1	1.0	0.1	12-12	12.5	0 (14")
Spottail Shiner	1	0.1	0.0	0.0	3-3	3.5	
Walleye	29	2.0	59.5	5.2	9-27	18.6	79 (15")
White Perch	50	3.4	15.8	1.4	5-12	8.7	88 (7")
White Sucker	17	1.2	33.5	2.9	10-23	16.8	
Yellow Bullhead	4	0.3	2.9	0.3	10-12	11.2	100 (7")
Yellow Perch	414	28.3	13.4	1.2	2-9	5.4	4 (7")
Total	1,461	100	1136.0	100			

[1]Note some fish were measured to 0.1 inch, others to inch group: e.g., "5"=5.0 to 5.9 inch, "12"=12.0 to 12.9 inches; etc.

Table 6. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County, with trap nets, inland gillnets, seining, and electrofishing, May and June 2008.

Inch Class	Alewife	Banded Killifish	Black Crappie	Bluegill	Bluntnose Minnow	Bowfin	Brook Silver-Side	Brown Bullhead	Common Carp	Common Shiner
1		2			11					
2		35			95		1			1
3		68		9	3		11			
4	1	2		40						
5	32		1	82						
6	22			80						
7			2	22						
8			4	1						
9			9							
10			1					1		
11			1					3		
12			2					2		
13										
14										
15										
16										
17										
18										
19										
20						3				
21						2				
22						1				
23						1				
24						1				
25									1	
26						4			1	
27						2			1	
28									1	
29									1	
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
44										
Total	55	107	20	234	109	14	12	6	5	1

Table 6, continued. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County, with trap nets, inland gillnets, seining, and electrofishing, May and June 2008.

Inch Class	Channel Catfish	Fathead Minnow	Fresh-water Drum	Flathead Catfish	Golden Redhorse	Golden Shiner	Gizzard Shad	Hybrid Sunfish	Large-mouth Bass
1									
2		1							
3								1	
4								2	1
5	1								
6			1						
7			1			1			2
8									1
9									1
10									2
11			1						7
12			3				2		2
13	1		4				1		3
14									4
15	3		1				3		3
16	2				1				3
17	4						4		1
18	2		1				3		
19	1		1						
20	4		2						
21			1						
22	3		1						
23									
24	1								
25	3								
26	6								
27	2								
28	3								
29	2								
30	1								
31	1			1					
32									
33									
34									
35									
36									
37				2					
38				1					
39				1					
40									
41				2					
44									
Total	40	1	17	7	1	1	13	3	30

Table 6, continued. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County, with trap nets, inland gillnets, seining, and electrofishing, May and June 2008.

Inch Class	Long-nose Gar	Northern Pike	Pumpkin-seed	Quill-back	Rain-bow Trout	Red-horse spp.	Rock Bass	Round Goby	Sand Shiner
1							2	8	2
2			6				4	7	9
3			5				4	4	
4			14				7		
5			19				12		
6			14				18		
7			4				17		
8							7		
9									
10						1			
11									
12				1					
13						2			
14		1				2			
15		2		1		3			
16		1		1					
17				2					
18		1				1			
19		2		5		1			
20		3		2		1			
21		3		1		2			
22		1		1					
23		1							
24		2			1				
25		1							
26									
27		1							
28	1	2							
29	2								
30	2	1							
31	2	1							
32	4	1							
33	6	1							
34	3								
35	4	1							
36	4	1							
37	3								
38	2								
39	2								
40	1								
41									
44	1								
Total	37	27	62	14	1	13	71	19	11

Table 6, continued. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County, with trap nets, inland gillnets, seining, and electrofishing, May and June 2008.

Inch Class	Short-Head Redhorse	Silver Redhorse	Small-mouth Bass	Spottail Shiner	Walleye	White Perch	White Sucker	Yellow Perch	Yellow Bullhead
1									
2								134	
3				1				202	
4								3	
5						2		17	
6						4		43	
7						13		6	
8						22		8	
9					3	2		1	
10					1	3	1		1
11						3	4		2
12			1			1			1
13		1			1		2		
14					1		1		
15	1	1			3		1		
16					1				
17	1	1			5		1		
18	1	1			2		1		
19	3	1			1		1		
20	1				4		4		
21		1			2				
22					1				
23		1			2		1		
24									
25									
26					1				
27					1				
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
44									
Total	7	7	1	1	29	50	17	414	4

Table 7. Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from Muskegon Lake, Muskegon County, with trap nets, inland gill nets, seining, and electrofishing, May and June 2008. Number of fish aged is given in parenthesis. A minimum of five fish per age group is statistically necessary for calculating a Mean Growth Index, which is a comparison to the State of Michigan average.

Species	Age I	Age II	Age III	Age IV	Age V	Age VI	Age VII	Age VIII	Mean Growth Index
Black Crappie		5.7	8.6	9.3	11.8	12.4	12.3		+0.6
		(1)	(8)	(8)	(1)	(1)	(1)		
Bluegill		3.2	5.0	5.6	6.4	7.1	8.2		-0.4
		(2)	(20)	(4)	(10)	(14)	(1)		
Largemouth Bass		8.2	11.2	12.0	13.9	15.5	16.2		+0.4
		(4)	(6)	(6)	(5)	(7)	(1)		
Northern Pike	15.5	20.4	22.5	27.6	32.4	33.2	34.0		+1.0
	(4)	(7)	(6)	(4)	(3)	(1)	(2)		
Pumpkinseed	2.8	3.8	4.9	6.0	6.0	7.4			-1.0
	(1)	(3)	(13)	(21)	(9)	(2)			
Rock Bass		3.9	5.0	6.2	6.7	7.3	8.1		-0.5
		(2)	(14)	(10)	(16)	(12)	(4)		
Smallmouth Bass				12.5					--
				(1)					
Walleye	9.8	12.6	16.8	17.8	20.8	22.3		26.4	+2.2
	(3)	(3)	(7)	(5)	(4)	(5)		(2)	
White Perch*	5.0	6.5	8.1	9.9	10.6		11.1		--
	(1)	(4)	(31)	(1)	(2)		(1)		
Yellow Perch	3.1	5.8	6.6	7.6	8.5				-0.3
	(21)	(15)	(14)	(9)	(3)				

*No State of Michigan average growth rates have been developed for White Perch.

Table 8. Shoreline data for Muskegon Lake, Muskegon County, compared with that for other large, deep depth lakes in Michigan (from Wehrly et al. 2015). Sampling was conducted by MDNR Fisheries personnel on August 11, 2008, and September 26, 2024.

	Total docks per km	Dwellings per km	Percent shoreline armoring	Submerged trees per km
Muskegon Lake 2008	3.7	8.4	56.9	13.9
Muskegon Lake 2024	4.2	8.0	62.6	36.7
Michigan statewide average for large, deep depth inland lakes	4.3	9.2	24.2	8.4

Table 9. Results of fall electrofishing surveys conducted on Muskegon Lake targeting juvenile Walleye. The surveys were conducted according to protocols described by Serns (1982 and 1983) and updated by Ziegler and Schneider (2000). Asterisk indicates a stocked year-class.

Year survey was conducted	Age 0 Walleye #/mile of electrofishing	Age 1 Walleye #/mile of electrofishing
1994*	10.9	4.3
1995*	72.8	1.2
1996*	2.6	36.4
1997*	12.5	4.5
1998*	11.2	12.1
1999*	41.5	1.7
2000*	12.5	13.3
2001*	4.8	2.9
2002*	15.9	0.3
2004*	43.5	0.3
2005	7.3	3.5
2006*	0.9	0
2007	30.8	0
2008*	18.7	8.3
2009	1.3	0.4
2010*	8.5	1.7
2011	4.7	0
2012*	26.0	0
2013*	9.4	3.5
2014*	28.9	0.4
2015*	9.4	17.6
2016*	17.9	0.9
2017*	30.6	0
2018*	2.1	0.4
2019*	27.1	4.7
2020	1.3	0
2021*	5.1	0
2024	41.4	10.3
Average:	17.8	4.6

Table 10. Number, weight, and length of fish collected from Muskegon Lake, Muskegon County, with trap nets, large mesh fyke nets, small mesh fyke nets, inland gill nets, seining, and electrofishing, May 20- June 24, 2024.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Alewife	210	6.3	17.1	1.2	5-8	6.8	
Banded Killifish	370	11.1	4.0	0.3	2-4	2.7	
Black Crappie	5	0.1	2.0	0.1	5-11	8.8	60 (7")
Bluegill	376	11.2	71.0	5.1	2-8	6.2	66 (6")
Bluntnose Minnow	295	8.8	2.5	0.2	1-4	2.4	
Bowfin	20	0.6	111.1	8.0	17-28	25.1	
Brook Silverside	1	0.0	0.0	0.0	3-3	3.5	
Brown Bullhead	3	0.1	2.0	0.1	10-11	11.2	100 (7")
Channel Catfish	19	0.6	94.8	6.8	13-29	23.7	100 (12")
Common Carp	3	0.1	41.9	3.0	27-36	31.2	
Common Shiner	1	0.0	0.0	0.0	3-3	3.5	
Flathead Catfish	8	0.2	140.3	10.1	19-39	28.8	100 (12")
Freshwater Drum	27	0.8	62.8	4.5	6-28	15.5	
Gizzard Shad	4	0.1	7.8	0.6	14-19	17.8	
Golden Shiner	1	0.0	0.1	0.0	7-7	7.5	
Grass Pickerel	1	0.0	0.5	0.0	13-13	13.5	
Largemouth Bass	33	1.0	44.6	3.2	3-18	12.1	42 (14")
Longnose Gar	21	0.6	67.2	4.8	26-38	33.3	
Northern Pike	29	0.9	100.9	7.2	12-34	24.0	55 (24")
Pumpkinseed	588	17.6	130.6	9.4	2-8	5.8	70 (6")
Quillback	2	0.1	9.4	0.7	19-23	21.5	
Rock Bass	322	9.6	64.7	4.6	2-8	5.9	55 (6")
Round Goby	68	2.0	0.0	0.0	1-3	2.5	
Shorthead Redhorse	12	0.4	30.5	2.2	11-21	18.2	
Silver Redhorse	23	0.7	78.5	5.6	10-25	20.8	
Smallmouth Bass	10	0.3	12.9	0.9	3-18	12.7	50 (14")
Spotfin Shiner	1	0.0	0.0	0.0	3-3	3.5	
Spottail Shiner	8	0.2	0.2	0.0	3-4	4.3	
Walleye	66	2.0	106.5	7.6	7-27	16.1	42 (15")
White Perch	98	2.0	33.2	2.4	4-13	7.7	73 (7")
White Sucker	11	0.3	15.8	1.1	9-21	14.1	
Yellow Bullhead	12	0.4	6.5	0.5	5-13	9.4	83 (7")
Yellow Perch	698	20.9	133.7	9.6	4-13	7.1	44 (7")
Total	3,346	100	1393.1	100			

[1]Note some fish were measured to 0.1 inch, others to inch group: e.g., "5"=5.0 to 5.9 inch, "12"=12.0 to 12.9 inches, etc.

[2]Percent legal size or acceptable size for angling. Legal size or acceptable size for angling is given in parentheses.

Table 11. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County with trap nets, large mesh fyke nets, small mesh fyke nets, inland gillnets, seining, and electrofishing, May and June 2024.

Inch Class	Alewife	Banded Killifish	Black Crappie	Bluegill	Bluntnose Minnow	Bowfin	Brook Silverside	Brown Bullhead
1					10			
2		227		1	216			
3		141		3	67		1	
4		2		18	2			
5	13		1	105				
6	133		1	152				
7	61		1	93				
8	3			4				
9								
10			1					1
11			1					2
12								
13								
14								
15								
16								
17						1		
18								
19								
20								
21						2		
22						1		
23						2		
24						2		
25						3		
26						7		
27						1		
28						1		
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
Total	210	370	5	376	295	20	1	3

Table 11, continued. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County with trap nets, large mesh fyke nets, small mesh fyke nets, inland gillnets, seining, and electrofishing, May and June 2024.

Inch Class	Channel Catfish	Common Carp	Common Shiner	Flathead Catfish	Fresh-water Drum	Golden Shiner	Gizzard Shad	Grass Pickerel
1								
2								
3			1					
4								
5								
6					1			
7					2	1		
8								
9					2			
10					5			
11					1			
12					2			
13	1				3			1
14	1				1		1	
15	1				2		1	
16	2				1			
17	1							
18							1	
19				1			1	
20								
21					3			
22	1							
23								
24	2			1	1			
25					2			
26	2							
27	5	1						
28					1			
29	3	1						
30								
31				1				
32								
33				1				
34								
35								
36		1		1				
37				1				
38				1				
39				1				
40								
Total	19	3	1	8	27	1	4	1

Table 11, continued. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County with trap nets, large mesh fyke nets, small mesh fyke nets, inland gillnets, seining, and electrofishing, May and June 2024.

Inch Class	Large-mouth Bass	Longnose Gar	Northern Pike	Pumpkin-seed	Quill-back	Rock Bass	Round Goby	Shorthead Redhorse
1							8	
2				3		9	52	
3	3			17		8	8	
4	1			32		52		
5				127		76		
6				277		77		
7				123		67		
8	2			9		33		
9	1							
10								
11	3							1
12	3		1					
13	6							
14	4		1					1
15	5		2					
16	2		3					
17	1		3					1
18	2							4
19			1		1			3
20								
21								2
22			2					
23					1			
24			3					
25								
26		1	1					
27			4					
28		2	1					
29		1	4					
30		3	1					
31		5						
32		2						
33		3	1					
34			1					
35		1						
36		1						
37		1						
38		1						
39								
40								
Total	33	21	29	588	2	322	68	12

Table 11, continued. Length frequency distribution for fish species caught from Muskegon Lake, Muskegon County with trap nets, large mesh fyke nets, small mesh fyke nets, inland gillnets, seining, and electrofishing, May and June 2024.

Inch Class	Smallmouth Bass	Spotfin Shiner	Spottail Shiner	Walleye	White Perch	White Sucker	Yellow Bullhead	Yellow Perch
1								
2								
3	1	1	2					
4			6		1			3
5					3		1	58
6					22		1	331
7				1	22		1	128
8				6	25			68
9	1			1	9	3	2	55
10	1			1	4		2	34
11				2	3	1	3	18
12	1			6	7	1	1	1
13	1			13	2	1	1	2
14	4			8				
15				2		1		
16				1				
17				3		1		
18	1			6		2		
19				4				
20				2				
21				2		1		
22				3				
23				2				
24				1				
25								
26								
27				2				
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
Total	10	1	8	66	98	11	12	698

Table 12. Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from Muskegon Lake with trap nets, large mesh fyke nets, small mesh fyke nets, inland gill nets, electrofishing, and seining, May 20-June 24, 2024. Number of fish aged is given in parenthesis. A minimum of five fish per age group is statistically necessary for calculating a Mean Growth Index, which is a comparison to the State of Michigan average.

Species	Age I	Age II	Age III	Age IV	Age V	Age VI	Age VII	Age VIII	Age IX	Mean Growth Index
Black Crappie		6.0	7.6	10.5	11.8					--
		(2)	(1)	(1)	(1)					
Bluegill		4.6	5.0	6.2	6.7	7.6				+0.3
		(2)	(9)	(19)	(10)	(4)				
Largemouth Bass	4.3	10.4	11.1	12.8	14.1	16.2	16.1	17.4	17.2	+1.3
	(1)	(3)	(5)	(4)	(8)	(2)	(3)	(3)	(1)	
Northern Pike	15.6	23.2	26.8	28.9	29.8					+5.1
	(10)	(5)	(4)	(9)	(2)					
Pumpkinseed		4.0	5.1	5.9	6.7	6.6	7.4	8.7		+0.3
		(9)	(7)	(9)	(18)	(8)	(2)	(1)		
Smallmouth Bass			11.7	14.1	14.3	18.0				--
			(4)	(3)	(1)	(1)				
Walleye	8.3	13.2	15.5	18.4	20.5	22.3	25.1	25.1		+2.1
	(8)	(22)	(15)	(4)	(8)	(4)	(2)	(2)		
Yellow Perch		5.9	6.6	7.8	8.5	9.9	10.1	12.1		+0.4
		(4)	(18)	(8)	(17)	(19)	(4)	(1)		

Table 13. Temperature and dissolved oxygen profile for Muskegon Lake, Muskegon County, on 9/26/2024.

Depth (feet)	Temperature (F)	O2 (ppm)
0	69.2	9.82
3	68.8	9.77
6	68.5	9.19
9	68.4	9.03
12	68.3	8.92
15	68.1	8.53
18	68.0	8.17
21	67.5	7.02
24	65.8	5.67
25	65.2	5.31
26	64.6	4.75
27	63.9	4.48
28	63.3	4.07
29	62.6	3.44
30	62.3	2.87
31	61.8	2.60
32	61.5	2.41
33	61.3	2.37
34	61.0	2.04
35	60.9	1.97
36	60.6	1.80
37	60.1	1.71
38	60.4	1.73
39	59.5	1.49
42	58.7	1.41
45	57.5	1.50
48	57.3	1.57
51	57.0	1.58
54	56.3	1.61
57	56.1	1.59
60	56.0	1.57
63	56.0	1.54
66	55.9	1.56
69	55.9	1.57
72	55.9	1.55
75	55.9	1.52

Table 14. Muskegon Lake Bluegill size structure rating using the Schneider Index (Schneider 1990). Schneider Index rankings are as follows: 1 = very poor, 2 = poor, 3 = acceptable, 4 = satisfactory, 5 = good, 6 = excellent, 7 = superior.

	Trap net/large mesh fyke net catch average length (in.)	%>6 in.	%>7 in.	%>8 in.	Growth Index	Schneider Index
2008 Metrics	6.0	49.2	10.7	0.0	-0.4	
2008 Rankings	4	3	4	1	3	3.0 (Acceptable)
2024 Metrics	6.5	68.2	27.3	1.1	+0.3	4.4 (Satisfactory)
2024 Rankings	5	4	4	5	4	

Figure 1. Muskegon Lake, Muskegon County, Michigan.

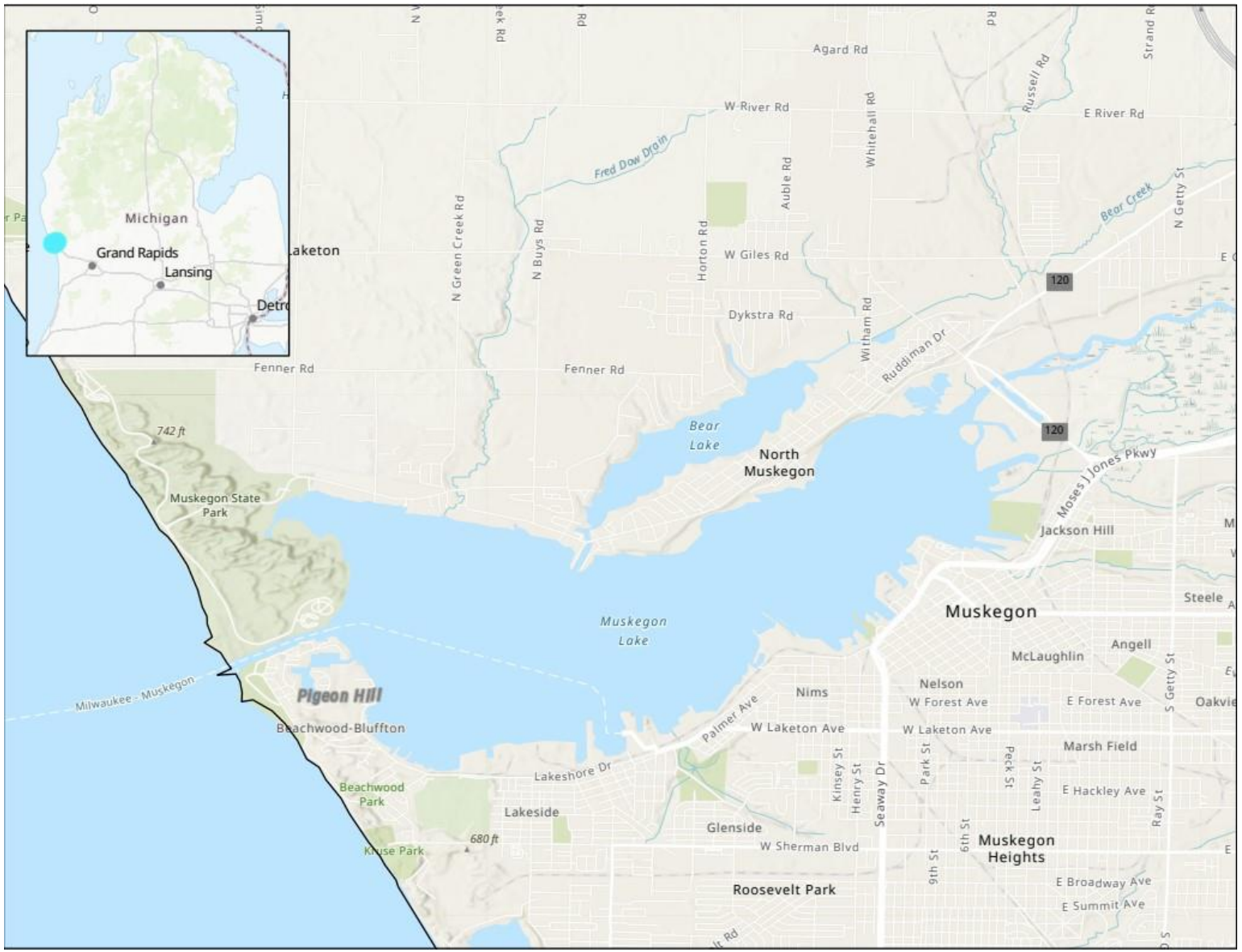


Figure 2. Lakeshed map for Muskegon Lake, Muskegon County, MI.

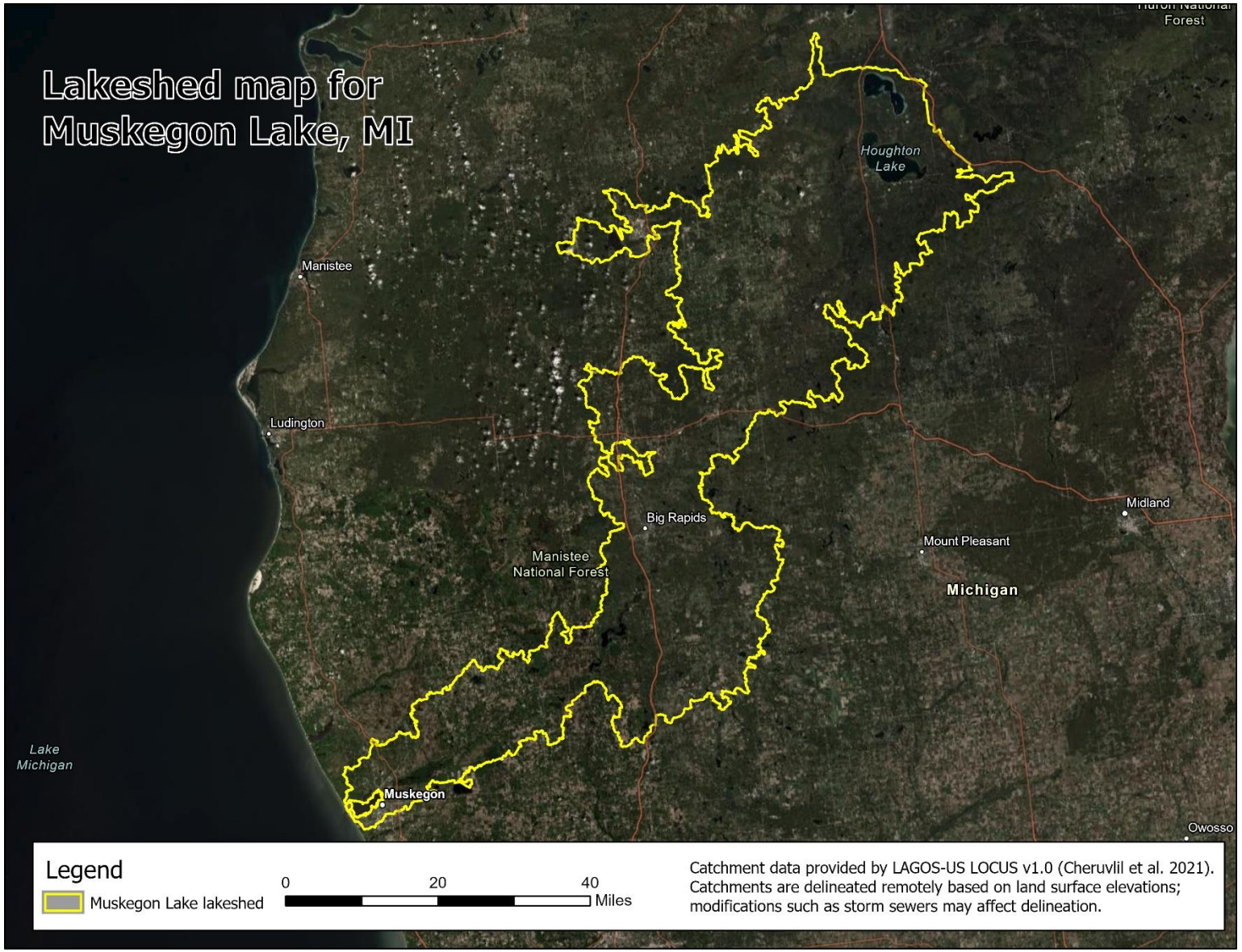
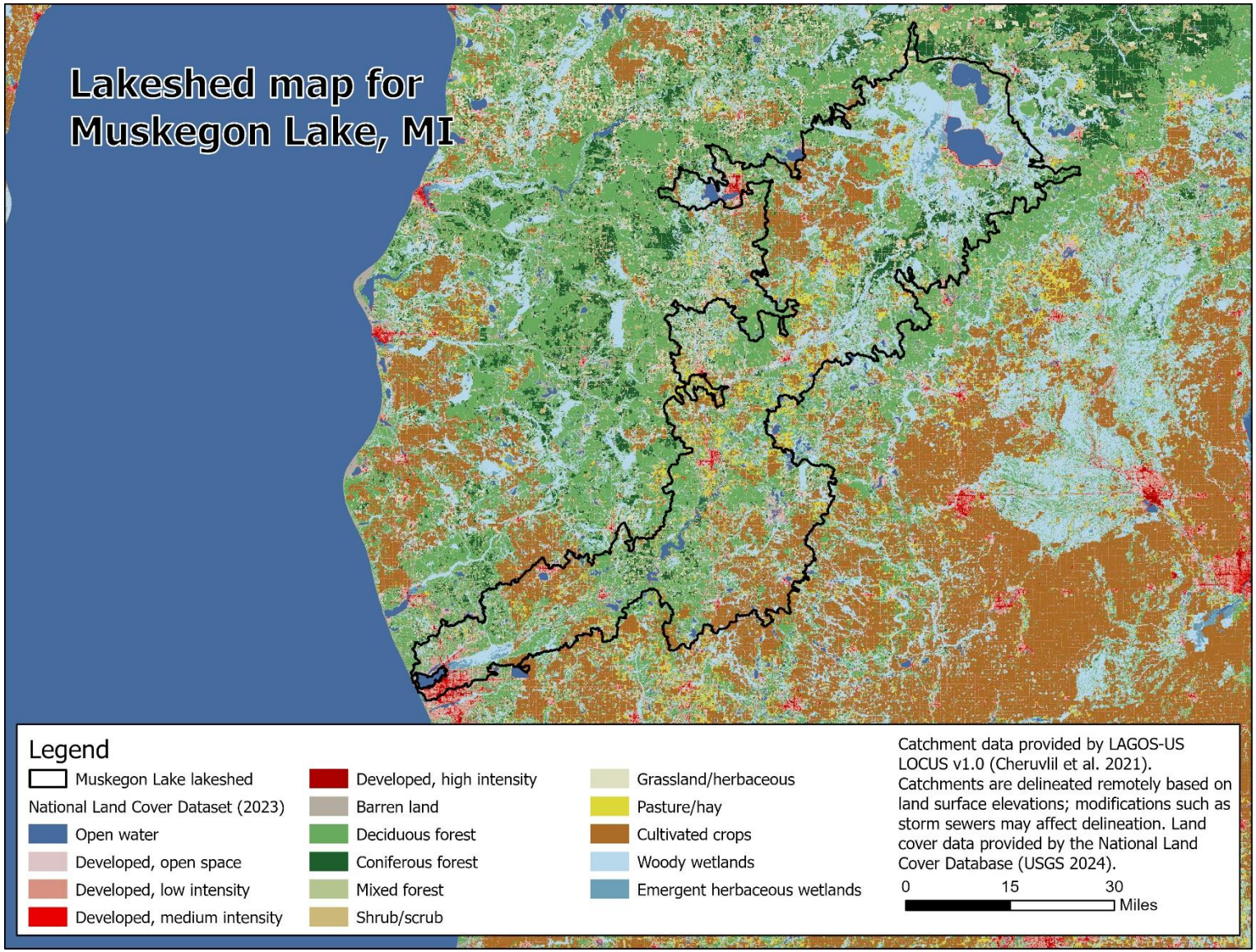


Figure 3. Lakeshed landcover map for Muskegon Lake, Muskegon County, MI.



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