Lake Michigamme

Baraga and Marquette Counties, T48N R30W Sections 25-36 and T47N R30W Sections 0
Michigamme Watershed, 2016 and 2017

Jennifer Johnson, Fisheries Management Biologist

Environment

Lake Michigamme is located approximately 30 miles west of Marquette and is located in both Marquette and Baraga Counties and is within the Michigamme River Watershed. It has a surface area of 4,360 acres, a maximum depth of 72 feet and is just south of US Highway 41 (Figure 1). Homes, resorts, and cottages are scattered around the perimeter of the lake. Van Riper State Park is located on the northeastern shore and has a sandy beach and public boat launch. Another public boat launch is located on the north shore off of Brown Road. Lake Michigamme has two main inlets; the Peshekee River and the Spur River. The outlet is the Michigamme River, which is located at the southern portion of the lake. There is a dam (originally built in 1878) that maintains the water level to some degree; however, there is no active control of gates or boards (Caroffino and Hanchin 2011). The surrounding area includes exposed bedrock and rocky and acidic soils that are nutrient poor, consequently creating an oligotrophic (low productivity) waterbody. Surrounding vegetation is dominated by northern hardwoods, aspen, pine and lowland conifers.

The morphology of the lake comprises of an irregular shoreline with a number of islands throughout the lake. The shoreline is approximately 36 miles in length, and the littoral area is comprised of bedrock, cobble, boulders, gravel, and some sand. (Caroffino and Hanchin 2011). For a more complete description of Lake Michigamme's environment, refer to Fisheries Division Special Report 59 by Caroffino and Hanchin 2011.

In general, Lake Michigamme can be described as a large lake that is low in productivity due to the nutrient-poor geology of the area. Limnological parameters measured on August 21, 2017 included temperature and oxygen. Temperature ranged from 69.8°F at the surface to 50°F at 68 feet. The thermocline was between 24-28 feet. Oxygen levels were 8 ppm at the surface, and declined to nearly 2.7 ppm at 68 feet. Alkalinity was also measured at 20 mg/L indicating Lake Michigamme has a low buffering capacity. Water transparency as measured by Secchi disk, was recorded at 5.0 feet. Additional samples were taken for Chlorophyll a (3.98 ppb) and total Phosphorus (11 ppb).

Spiny waterflea (Bythotrephes longimanus), an aquatic invasive species, has been documented in Lake Michigamme since at least the mid-1990s.

History

Stocking

Lake Michigamme has been intensively stocked and managed for a variety of fish species throughout its management history. Historical records indicate early fisheries management of Lake Michigamme began in 1876 when 24,000 Chinook salmon were stocked (Table 1). However, consistent management did not occur until 1933 with the stocking of Walleye. Between 1933 and 1943, Lake Michigamme was regularly stocked with a variety of fish species that included: Walleye, Yellow Perch, Lake Trout,

Bluegill, and Rainbow Smelt. Two additional stocking events occurred in 1963 (Lake Trout) and 1973 (Splake). Consistent stocking regimes were once again implemented between 1978 and 2005 (Table 1). Species stocked during this time included: Northern Pike, Tiger Muskellunge, Walleye, Yellow Perch, Smallmouth Bass, Brook Trout, Splake, Lake Trout, and Rainbow Trout (Table 1). Life-stages ranging from fry to adult were stocked for Walleye and Lake Trout throughout the stocking history.

Fisheries Management

In 1923, John Nicholas Lowe, a Biology Professor from Northern State Teachers College (now Northern Michigan University) surveyed Lake Michigamme. No survey methods were reported, however Northern Pike (N=2, 3.2 and 3.4"), Walleye (N=5, 1.2-1.9"), Smallmouth Bass (N=2, 1.2 and 1.3"), Largemouth Bass (N=3, 1.2-1.5"), and White Sucker (N=6, 1.2-1.6) were captured. Forage fishes included Common Shiner, Golden Shiner, Bluntnose Minnow, Iowa Darter, and Mottled Sculpin.

A 1938 survey conducted by the Institute of Fisheries Research, consisted of 22 gillnet sets totaling 4,500 feet and 9 seine hauls. Results indicated Yellow Perch to be the most abundant fish species followed by Black Crappie, Smallmouth Bass, and Northern Pike. Rare species included Bluegill, Largemouth Bass, and Walleye. A creel census was also conducted from 1935-1939 that documented 111 individual fish harvested, including 98 Northern Pike, 84 Yellow Perch, 67 Black Crappie, 55 Smallmouth Bass, 2 Bluegill, and 4 Walleye. The parasites black spot and tapeworms were observed in Northern Pike and Yellow Perch. Smallmouth Bass were recorded as having tapeworms. Aquatic vegetation analysis identified 33 different species of plants. Most were considered scattered and of very limited distribution. However, waterlilies, pondweeds, and cattails were recorded as the most numerous. There were also sedges and rushes located sporadically throughout the bays. Using an Ekman dredge, sediment samples were taken at 12 different locations. Sand, gravel and rock dominated nearshores and silt and muck were found in the deeper areas. No vegetation was pulled up from sediment samples. Organisms in the samples included roundworms, bivalves, crustaceans, mayflies, beetles, gnats, midges, worms, leeches, and caddisflies. The general fishing reputation was poor except for Northern Pike which was considered good. It was noted the little vegetation that was in the lake was not enough to provide a desired productivity of fish. A limited follow up survey in 1940 captured 11 Common Suckers, 2 Smallmouth Bass, 1 Yellow Perch and 1 Burbot using 2 gillnets (2 Net Nights (NN)). A 1940 report recommended to maintain the current status as a "pike lake." Stocking recommendations were to stock 9-12 inch Lake Trout but no further stocking of Bluegill, sunfish, or Largemouth Bass. Brush shelters (N=198) were constructed and scattered over sand shoal areas in 5-15 feet depths. It was also stated that the futility of stocking Walleye had been well established (Brown, 1940).

Another limited survey was conducted in 1950 using 6 gillnets (6 NN). Northern pike (N=1, 20.4"), Yellow Perch (N=3, 5.5-9"), Walleye (N=1, 13.2"), Lake Whitefish (N=2, 16.7 and 17.4", identification questioned), White Sucker (N=17, 14-21") and Longnose Sucker (N=3, 18-19.3"). A Muskellunge was reportedly (unverified) harvested in 1957 that was 30.5 inches long and weighed 8 pounds. Fisheries managers wrote it was likely from previous stockings in lakes that connected to the West Branch of the Peshekee River which flows into Lake Michigamme.

In 1958, the fishery of Yellow Perch, Smallmouth Bass, and Black Crappie was relatively stable. However, the Northern Pike population decreased and growth for Walleye was "uncommonly good." A

July 1972 survey reported biomass of fish to be low and quite similar to the 1958 results. Fish species captured were Walleye (N=32, 6-18"), Northern Pike (N=12, 16-22"), Smallmouth Bass (N=10, 6-16"), Yellow Perch (N=20, 4-14"), Rock Bass (N=15, 6-10"), Lake Whitefish (N=112, 6-16"), White Sucker (N=50, 8-22"+), Longnose Sucker (N=43, 8-13"), and Burbot (N=8, 10-18"). Fishing reports were fair for Walleye but poor for other species. The 1972 survey was the first time Rock Bass were recorded as present. Splake were stocked for the first time in 1973 (N=15,000, Table 1).

A more intensive survey was conducted from October 4-8, 1976. Fisheries managers used experimental and standard mesh gillnets for a total of 78NN. Trap and fyke nets were used near the outlets of the Peshekee and Spur Rivers that totaled 26NN. A total of 629 fish were captured during the 1976 effort. Fish species captured included Lake Whitefish (N=159, 7.2-24.4"), White Sucker (N=122, 2-21.5"), Yellow Perch (N=120, 2-14.4"), Walleye (N=66, 9.2-24.4"), Rock Bass (N=61, 2-11.1"), Northern Pike (N=43, 3-42"), Longnose Sucker (N=39, 11.4-22.9"), Smallmouth Bass (N=9, 3-16.4"), Burbot (N=7, 13.5-24.4"), Northern Muskellunge (N=2, 26" and 32.5"), and Bluegill (N=1, 7.6"). Despite multiple years of stocking, zero Lake Trout were captured during the 1976 survey or in the previous surveys (1940, 1950, 1958, and 1972). Also, there were no Splake captured at this time. Walleye numbers were low compared to the peak numbers from the 1940s-1950s. Managers believed Walleye numbers would remain low due to the lack of forage available rather than no spawning habitat. Overall, with productivity limited in Lake Michigamme and having over 4,000 acres in surface area, managers cautioned future attempts at population enhancement should be minimal. One opportunity managers did see is utilizing the forage source that was there but not being utilized by predator fish. Specifically, Lake Whitefish and White Suckers could provide food for the Muskellunge. A state record (40lbs 15oz, 51 inches in length) Northern Muskellunge was caught by an angler in Lake Michigamme the previous summer. Therefore managers recommended to stock Northern Muskellunge in order to provide a trophy fishery opportunity for anglers (Peterson, 1977). In 1979, Tiger Muskellunge, a hybrid cross between Northern Pike and Northern Muskellunge, was stocked into Lake Michigamme (N=4,350, 5.4" average).

A Fisheries Management Plan was updated in 1984 to reflect updated information on the fish population and to address continued angler dissatisfaction with the fishery (Bullen, 1984). Managers determined the Tiger Muskellunge stocking was not successful and was discontinued. Managers explained the failure was due to the natural increase in Northern Muskellunge and Northern Pike population abundance. Tiger Muskellunge seldom succeeded when pike abundance was high. Walleye and Yellow Perch numbers were down from the 1972 and 1976 surveys. However, Walleye did appear to be naturally reproducing sufficiently on their own with 55% below 15 inches captured in the nets. Conversely, Yellow Perch were described as being at an all-time low. Scarce spawning habitat, predation and competition with White Suckers were attributed to the low numbers. White Suckers and Lake Whitefish remained stable and continued to dominate the biomass with 42% and 17% of the catch, respectively. Managers recommended an experimental transfer of Yellow Perch and Smallmouth Bass into Lake Michigamme, stock Walleye fingerlings every other year, stock larger sized Lake Trout, and remove suckers by netting river mouths. The overall goal was to transfer productivity from the less desirable fish (Lake Whitefish and Suckers) to desirable gamefish (Walleye, Yellow Perch and Smallmouth Bass). This plan was to remain in effect until 1990 when evaluations could occur. Beginning in 1984, Smallmouth Bass (N=1,516, Table 1), and Yellow Perch (N=32,243, Table 1) were transferred from area lakes into Lake Michigamme. Walleye were stocked from a state hatchery (N=53,671, Table 1).

On September 13-24, 1993, another intensive fisheries survey was conducted. Gillnets (2.5" and 3.5" monofilament) and small fyke nets were set for a total of 108 net nights. Beach seining of 100 feet was conducted at 4 sites. A total of 496 fish were captured during the September survey effort. Species captured included Rock Bass (N=125, 1-10" range, 6.9" average length), Lake Whitefish (N=116, 9-16" range, 12.3" average length), Yellow Perch (N=69, 2-11" range, 7.4" average length), Smallmouth Bass (N=53, 2-18" range, 9.6" average length), Walleye (N=47, 11-18" range, 14.2 average length), White Sucker (N=45, 10-22" range, 16.9" average length), Northern Pike (N=37, 13-36" range, 19.8" average length), Black Crappie (N=4, 2-11" range, 7.8" average length), and Northern Muskellunge (N=1, 47"). The same management goals from the 1984 report were recommended in the 1994 report (Madison, 1994). Specifically, goals were to "decrease the competition from undesirable fish species (suckers and rock bass), and to increase year class strength of desirable fishes by either improving natural reproduction or by stocking." Walleye, Smallmouth Bass, and Yellow Perch were to be stocked when available. It was also noted that the Walleye population has been cyclical in its history of fish management; some years were good while other years were very poor. Anglers were cautioned to expect this natural Walleye fluctuation cycle to occur in Lake Michigamme, as is similar for all Walleye lakes. Another recommendation was to protect spawning habitat for Northern Muskellunge and Northern Pike. Both species provide control over the sucker populations, and to a lesser degree Rock Bass populations.

A Status and Trends survey was completed during July 18-19, 2002 (electrofishing) and June 10-13, 2002 (netting), and September 4, 2002 (limnology). During the survey effort, all fish captured were recorded. Three 10 minute electrofishing transects were completed, six (6) seine hauls were conducted, five (5) experimental gillnets were set for 11 NN, fifteen (15) large mesh fyke nets were set for 45 NN, and 2 small mesh fyke nets were set for 4 NN.

A total of 1,240 fish were captured during the 2002 efforts. Species captured included: Black Crappie, Bluegill, Brown Bullhead, Burbot, Common Shiner, Fathead Minnow, Golden Shiner, Lake Whitefish, Largemouth Bass, Longnose Sucker, Mottled Sculpin, Northern Pike, Northern Redbelly Dace, Pumpkinseed, Rock Bass, Smallmouth Bass, Walleye, White Sucker, and Yellow Perch. In terms of numbers captured, Rock Bass were the most abundant (comprising 48% of the catch), followed by Yellow Perch (20.5%), Smallmouth Bass (8%), and Northern Pike (7%). In terms of biomass captured during the survey, Northern Pike made up 44%, followed by Rock Bass (29.5%), White Sucker (11%), and Smallmouth Bass (9%). Age-growth data indicated Northern Pike (-0.4 mean growth index (MGI)), Rock Bass (+0.5 MGI), and Yellow Perch (-0.4 MGI) were growing around statewide average. Walleye (-5.6 MGI) and Smallmouth Bass (-2.1) were growing below statewide average. To elaborate, an MGI of 0.0 indicates that the sampled population is growing exactly the state average for the species in question. An index of +1.0 to -1.0 indicates that the sampled population is either growing 1.0 inch faster or 1.0 slower than average. A general rule is that satisfactory growth indices for panfish (e.g. Bluegill, Pumpkinseed sunfish) are in the range of +0.5 to -0.5 while the range for gamefish (e.g. Northern Pike and Walleye) is +1.0 to -1.0 (Schneider et. al 2000). There is a regional difference in growth rates, and for Walleye, in the Upper Peninsula in particular, it is typical to see them growing consistently 1 inch slower than statewide averages. Even with this consideration in mind, Walleye were growing much slower than even Upper Peninsula standards at 5.6 inches below state average. No report or fisheries management recommendations were written for the 2002 survey efforts. However, 2002 was the last year Walleye were stocked into Lake Michigamme. An approved stocking

prescription for spring fingerling Walleye (20/acre biennially) was effective until 2007, so it may be reasonable to infer that the abundance and very low growth rate of Walleye led to the stocking hiatus.

Walleye reproduction was assessed in September 2004 and 2005. In 2004, 68 Walleye were captured ranging from 3-14 inches in length and averaged 5.4 inches. Age analysis indicated ages 0-4 and 10 in the population. MGI was calculated at 2.9 inches below state average for Walleye. In 2005, 54 Walleye were captured ranging from 4-16 inches in length and averaged 6.8 inches. Age analysis indicated Ages 0-3, 5 and 8 were in the population. MGI was calculated at 2.4 inches below state average for Walleye. Since 2002 was the last stocking year for Walleye, any fish younger than 2 would be considered from natural reproduction. Any fish older than that in 2004 or 2005 could be either from stocking or natural reproduction. Since stocked Walleye were not specifically marked, it was impossible to distinguish between the two possible sources.

In 2006, a large lake survey was conducted on Lake Michigamme that specifically targeted Walleye and Northern Pike (Caroffino and Hanchin 2011). Total effort was 224 net nights and 23 electrofishing runs that captured 2,326 Walleye (16.4" average, 5.8-30.7" length range) and 653 Northern Pike (22.5" average, 9.8-43.7" length range). Walleye ages ranged from 2-18 years old and Northern Pike ages ranged from 1-11 years old. No specific management recommendations were made. Rather analyses from the data collected during 2006 efforts concluded that natural reproduction of both Walleye and Northern Pike was consistent enough to maintain both populations. Additionally, a Walleye population estimate was calculated to be 1.9 Walleye per acre. Although this density is near the average with other large lakes in Michigan, the anglers' harvest of Walleye in Lake Michigamme was above average (0.5 per acre at a rate of 0.09 per hour fished).

While methods of management may be varied somewhat over the years, a common observation was threaded in every report written. Lake Michigamme cannot support a large fish community (i.e. high numbers) because it lacks the necessary nutrient base (Brown 1940, Peterson 1977, Bullen 1984, Madison 1994, and Caroffino and Hanchin 2011).

Current Status

Two fisheries surveys and one limnological sampling event were completed by staff from the Northern Lake Michigan Management Unit (NLMMU) on Lake Michigamme during April 24-May 2, 2016 (Walleye population estimate, electrofishing) and June 5-8, 2017 (Status and Trends, netting and electrofishing), and August 21, 2017 (limnology). Surface water temperature ranged from 40-50°F on the 2016 survey effort and 62-64°F for the 2017 surveys efforts. Northern Pike and Walleye were targeted during the 2016 survey. The entire shoreline and the islands were electroshocked. An electroshocking survey on the Peshekee River was attempted; however, high waters made it unsafe for technicians to complete the river portion of the electrofishing effort. As a consequence, approximately 1500 feet was surveyed in the Peshekee River. Total time electroshocking for the 2016 effort was 50 hours. For the 2017 survey all fish captured were recorded. Three 10 minute electrofishing transects were completed, six (6) seine hauls were conducted, three (3) experimental gillnets were set for 9 net nights (NN), five (5) large mesh fyke nets were set for 14 NN, and three (3) small mesh fyke nets were set for 9 NN. In addition to the collection of biological data, staff also surveyed habitat features including the numbers of dwellings, docks, submerged logs, and distance of armored shoreline (i.e. riprap, seawall etc.).

A total of 1,453 fish were captured during the 2016 survey efforts. A variety of fish species were observed during the survey (e.g. Lake Whitefish and White Suckers); however, only Northern Pike and Walleye were counted and had biological data recorded.

Walleye (N=1,273) averaged 14.5 inches and ranged from 8-30 inches in length (Tables 2 and 3) with 34% of catch meeting or exceeding the legal size for harvest of 15 inches (Table 2). The population estimate (Schumacher Eschmeyer) for adult Walleye was 0.6 per acre. Age analysis indicated ages 1-16 and 18 present in the population and the mean growth index was 4.1 inches below state average (Table 4). There is a regional difference in growth rates, and Walleye in the Upper Peninsula tend to grow on average approximately 1 inch slower than the current average calculated for walleye in Michigan. Even with the 1 inch adjustment, Walleye in Lake Michigamme are growing considerably slower compared to other Upper Peninsula waterbodies.

Northern Pike (N=178) averaged 20.9 inches and ranged from 8-40 inches in length (Tables 2 and 3) with 25% of the catch meeting or exceeding the legal size for harvest of 24 inches (Table 2). Age analysis indicated ages 1-9 in the population and the mean growth index was 1.2 inches below state average which is still considered fair growth for Upper Peninsula waterbodies (Table 4).

A total of 648 fish were captured during the 2017 survey efforts. Species captured included: Black Crappie, Black Bullhead, Bluegill, Burbot, Lake Whitefish, White Sucker, Iowa Darter, Longnose Sucker, Logperch, Northern Pike, Pumpkinseed, Rock Bass, Sculpins, Smallmouth Bass, Walleye, and Yellow Perch. In terms of the number captured during the survey, Rock Bass were the most abundant (comprising 55% of the total catch), Yellow Perch were second at 17% and Lake Whitefish and Smallmouth Bass were tied for third at 5% (Table 5). In terms of biomass captured during the survey, Rock Bass comprised 40% of the survey catch, Northern Pike were second at 18% and White Sucker were third at 10.5% (Table 5).

Rock Bass (N=355) were the most abundant species captured during the survey. Rock Bass averaged 8.2 inches and ranged from 1-11 inches in length (Table 6) with 97% of the catch meeting or exceeding an acceptable size for harvest of 6 inches (Table 5). Age analysis indicated ages 2-12 present in the population and the mean growth analysis was considered average at 0.5 inches below statewide average (Table 7).

Yellow Perch (N=111) averaged 3.7 inches and ranged from 2-13 inches in length (Table 6) with 11% of the catch meeting or exceeding an acceptable size for harvest of 7 inches (Table 5). Age analysis indicated ages 1-6, 8 and 10 present in the population and the mean growth analysis was considered average at 0.3 inches below the statewide average (Table 7).

Lake Whitefish (N=38) averaged 13.5 inches in length and ranged from 10-16 inches in length (Table 6) with 100% of the catch meeting or exceeding an acceptable size for harvest of 8 inches (Table 5). Age analysis indicated ages 4-11 present in the population.

Smallmouth Bass (N=33) averaged 10.9 inches in length and ranged from 2-15 inches in length (Table 6) with 18% of the catch meeting or exceeding the legal size for harvest of 14 inches (Table 5). Age analysis indicated ages 1-8 present in the population and the mean growth analysis was considered poor at 3 inches below the statewide average (Table 7).

Black Crappie (N=28) averaged 10.7 inches in length and ranged from 9-13 inches in length (Table 6) with 100% of the catch meeting or exceeding an acceptable size for harvest of 7 inches (Table 5). Age analysis indicated ages 6-9, 11 and 12 present in the population and the mean growth analysis was considered average at 1 inch below the statewide average (Table 7).

Walleye (N=24) averaged 13.3 inches in length and ranged from 4-27 inches in length (Table 6) with 25% of the catch meeting or exceeding the legal size for harvest of 15 inches (Table 5). Age analysis indicated ages 1-7 and 16 present in the population and the mean growth was considered poor at 2.7 inches below the statewide average (Table 7).

Northern Pike (N=20) averaged 23.4 inches in length and ranged from 15-38 inches in length (Table 6) with 45% of the catch meeting or exceeding the legal size for harvest of 24 inches (Table 5). Age analysis indicated ages 2-6 and 8 present in the population and the mean growth was considered average at 0.2 inches below statewide average (Table 7).

Shoreline habitat surveys consisted of 10 sub-sampled sections and each sub-station was further divided into 3 individual 1000 foot sections. Total sampling was 5.7 miles around the lake. Lake Michigamme was found to have 16.3 dwellings/mile, 10.4 docks/mile, 3.5 submerged logs/mile, and 8.5% of the shoreline was armored.

Analysis and Discussion

The fish community of Lake Michigamme can be described as follows: 1) a panfish community clearly dominated by Rock Bass with average growth, good reproduction and recruitment, 2) a Walleye population that is successfully naturally reproducing and consistent enough to maintain the population, although numbers and growth rates will always be low, 3) a small Northern Pike population with good growth that appears to be consuming the forage that is available, 4) a forage population of Lake Whitefish and White Sucker that have size ranges more easily available for Northern Pike and Muskellunge and a low abundant Yellow Perch population likely utilized by Walleye.

Rock Bass were first captured in a fisheries survey in 1972 (N=15). Since that time, their numbers have only increased (2017 survey N=355). Rock Bass eat snails, crayfish, and small fish, including Yellow Perch. Rock Bass are likely competing with Smallmouth Bass and Walleye. This is supported by the growth rates of each species. Rock Bass are growing near state average while Smallmouth Bass and Walleye are much slower at nearly 3 inches below state average. Managers have previously tried to increase the Smallmouth Bass and Walleye populations by stocking both species. However, despite numerous stocking attempts, no substantial increase in either population or growth rates was ever documented. Rock Bass are often overlooked as a sportfish but their popularity has increased in recent years, as they can provide anglers with another fishing opportunity.

Efforts to establish a viable Walleye fishery began nearly 115 years ago in 1905 with 150,000 fry stocked into Lake Michigamme. Additional Walleye stocking occurred in various years from 1933-1942, 1983-1998 and last in 2002. Fishing reports have cycled from poor to very good throughout the years. For example, Walleye fishing was reported as poor in years 1938, 1950, 1982, 1992 and 1993. Conversely, Walleye fishing was good in years 1947-49, 1958, 1972, and 1988-90. Recent fishing reports in 2017 described a good Walleye fishery with anglers being able to catch their limits. Due to

the low productivity of Lake Michigamme, Walleye growth will likely continue to be slower than State average. Currently, it takes approximately 6-7 years for Walleye to reach the legal minimum size limit (≥15") in Lake Michigamme. On average statewide, it takes about 4 years for Walleye to reach the minimum size limit. Walleye were represented in 17 age classes for the 2016 survey and 8 age classes in the 2017 survey. Timing of the two surveys was different therefore the results were as expected. Walleye were targeted in the 2016 survey, therefore should have higher numbers and age classes than the 2017 survey which targeted all species, including bass and panfish. The Walleye population estimate changed from 1.9 per acre in 2006 to 0.6 per acre in 2016. Effort was higher in the 2006 than in 2016, especially in the rivers where Walleye were spawning. In 2016, technicians were unable to electroshock the majority of the Peshekee River due to high water levels. During April, most of the Walleye are concentrated in this river system, therefore it isn't surprising the estimated abundance was higher in 2006. Walleye have not been stocked in Lake Michigamme since 2002. Out of the 243 Walleye aged from the 2016 sampling effort, only 2% of the fish were from the 2002 or older year class, indicating natural reproduction continues to be successful, consistent and able to maintain the population.

In the early years of management, Lake Michigamme was first described a "pike lake." In a 1940 report, Northern Pike were recorded as "common," but numbers were not increasing (Brown 1940). The population experienced a decline in the 1940s and has remained relatively low. The high level of survey effort in the 2006 survey still resulted in a lower density of Northern Pike compared to other large Michigan lakes. Interestingly, the growth rates of Northern Pike in Lake Michigamme are higher than what is typically seen in the western Upper Peninsula. Growth rates were 1.2 and 0.2 inches below the state average for the 2016 and 2017 surveys, respectively. It is not atypical to see Northern Pike averages 2-3 inches below state average in the Western Upper Peninsula.

The main forage available, Lake Whitefish and White Suckers, are currently being underutilized by predator species. Walleye, one of the main predators in Lake Michigamme, will prey on Whitefish and suckers but prefer Yellow Perch. Northern Pike appear to be taking some advantage of the available food as evident of their growth rates. However, their population is not high enough to impact forage levels. Northern Muskellunge have been in Lake Michigamme since at least 1957 and have historically grown to large sized fish. In 1976, the Michigan State record (51 inches long and 40lbs, 15 oz) for Muskellunge was harvested out of Lake Michigamme. Since 1977, managers have recognized the potential for a Muskellunge fishery in Lake Michigamme. Northern Muskellunge would be able to efficiently utilize the available forage base and create a very nice fishery over time. Master Angler Awards have been given for a variety of fish species caught in Lake Michigamme. Qualifying Muskellunge (≥42 inches) were reported from 1994-2002 ranging between 42.5-47.5 inches in length and weighing between 20-25 pounds.

Salmonid stocking in Lake Michigamme first occurred in 1876 (Chinook Salmon) and continued through 1963 with Lake Trout. Managers were unable to create a naturally reproducing population, despite having suitable habitat for trout (cold deep oligotrophic lake). They attributed Lake Michigamme's vast size as one of the reasons a viable/fishable population could not be produced. Additional trout stockings occurred from 2000-2005 with Lake Trout, Brook Trout, Splake and Rainbow Trout. The intention was to provide a nearby location for hatchery staff (located in Marquette) to utilize for surplus fish due to unforeseen variations in stocking requests.

Lake Michigamme is more developed than most other lakes surveyed in the NLMMU using the Status and Trends protocol. Results from the habitat survey indicated the percent of armored shoreline was medium at 8.5%. The number of docks was high at 10.4 dock per mile. Woody habitat around the shoreline was medium at 3.5 trees per mile. And lastly, the dwelling density was high at 16.3 dwellings per mile. With an increase in development, typically the amount of submerged wood per mile decreases and that is what is seen on Lake Michigamme. This is most likely due to efforts by riparians to "clean-up" the littoral zone in front of their properties by removing woody material. Riparian owners should promote healthy environmental stewardship practices and encourage others to retain nearshore woody debris whenever they can. Submerged logs, or coarse woody habitat, is a vital component of healthy and diverse habitat in the near shore area.

Management Direction

1) One of the goals is to maintain the areas of undeveloped shoreline. Natural shorelines often contribute to large woody debris on the water's edge thus providing cover that helps protect fish during critical list stages (i.e. predation while young). Conversely woody debris can provide cover for ambush predators such as Northern Pike. Additionally, any aquatic vegetation should be preserved. Lake Michigamme does not have a high amount of vegetation therefore what little is there should be protected and preserved for fish to spawn and seek sanctuary. A potential obstacle in obtaining this goal would be lake property owners who wish to have manicured lawns to the water's edge. The riparian owner's education to the benefits of a natural shoreline is critical in reaching this goal.

2) Lake Michigamme has the potential to produce an attractive muskellunge fishery. Specifically, a modest population abundance of muskellunge that will likely live a long time and grow to large sizes. Before any management decisions are made, user groups, which include the Lake Michigamme Property Owners Association, should be consulted. Additional analysis of any impacts to the rest of the fish community needs to be conducted.

3) Anglers are encouraged to report sport catches of all species to the NLMMU. Reports are useful to track population trends and aid in further management of the fishery for current and future managers.

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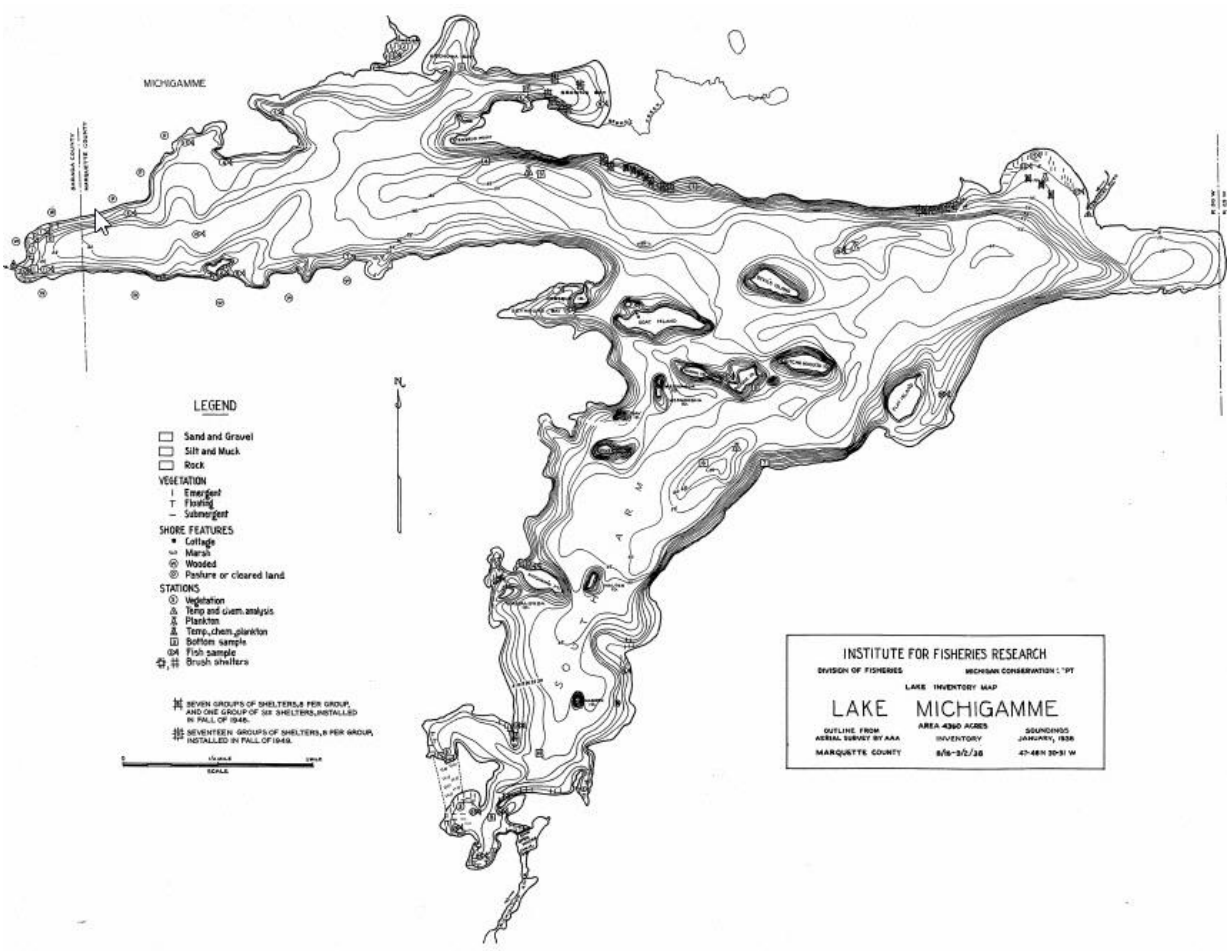

Figure 1: Map of Lake Michigamme showing depth contours and bottom substrates.

Table 1: Fish stocked into Lake Michigamme, Marquette County (1876-2005)

Year	Species	Number	Rate (#/acre)	Size (inches) or Age
1876	Chinook Salmon	24,000	6	Swim-up Fry
1889	Lake Trout	5,507	1	2
1905	Lake Trout	30,000	7	Fry
	Walleye	150,000	34	Fry
1909	Lake Trout	15,000	3	Fry
1910	Lake Trout	21,000	5	Fry
1933	Walleye	300,000	69	Swim-up Fry
1934	Walleye	480,000	110	Swim-up Fry
	Yellow Perch	5,600	1	<1
1935	Yellow Perch	300,000	69	Swim-up Fry
1936	Walleye	450,000	103	Swim-up Fry
	Yellow Perch	9,000	2	Adults
1937	Walleye	2,250,000	516	Swim-up Fry
1938	Lake Trout	2,500	1	<1

	Walleye	1,980,000	454	Swim-up Fry
1939	Bluegill	1,500	0	<1
	Walleye	1,050,000	241	Swim-up Fry
	Yellow Perch	6,000	1	<1
1940	Walleye	960,000	220	Swim-up Fry
1941	Lake Trout	4,550	1	Adults
1942	Lake Trout	3,500	1	Adults
	Rainbow Smelt	4,000	1	Adults
	Walleye	1,700	0	Adults
1943	Lake Trout	4.2	0	Adults
1963	Lake Trout	100,000	23	Fingerling
1973	Splake	15,000	3	Yearling
1978	Northern Pike	1,600	0	Fall Fingerling
1979	Tiger Muskellunge	4,350	1	5.35
1983	Walleye	18,423	4	0
	Yellow Perch	10,998	3	0
1984	Smallmouth Bass	1,516	0	3.62
	Walleye	53,671	12	1
	Yellow Perch	20,759	5	5.3
		11,484	3	4.3
1985	Smallmouth Bass	1,931	0	7.4
1986	Walleye	52,706	12	2.1
1988	Walleye	22,715	5	2.5
1989	Smallmouth Bass	52,146	12	1.7
1990	Walleye	28,373	7	2.1
		11,682	3	3.3
1992	Smallmouth Bass	10,487	2	2.2
	Walleye	28,128	6	
1994	Walleye	1,950,000	447	0.2
		140,796	32	2.1
		36,758	8	1.9
		26,686	6	2.6
1997	Smallmouth Bass	40,610	9	1.7
1998	Smallmouth Bass	33,530	8	1.7
	Walleye	2,000,000	459	0.43
2000	Brook Trout	1,000	0	5.2
		3,285	1	5.7
		13,899	3	2.2
		25,758	6	2.8
	Lake Trout	18,391	4	3.9
	Splake	13,662	3	3
2001	Brook Trout	150	0	19.4
	Lake Trout	47,100	11	6.9
2002	Lake Trout	97	0	33.1
		172	0	29.7

	Rainbow Trout	56490	13	4.4
	Splake	32,333	7	2.7
	Walleye	42,240	10	1.9
		43,605	10	2
2003	Brook Trout	200	0	14.1
	Lake Trout	38,662	9	5.7
		900	0	12.4
	Splake	13,250	3	7.5
		1,750	0	7.3
2004	Brook Trout	9,160	2	1.9
		8,683	2	2.4
	Lake Trout	96653	22	1.3
		30000	7	5.9
		40768	9	2.5
		29669	7	4.7
		48,120	11	2.7
2005	Brook Trout	5,407	1	5.8
		5,880	1	6.6
		3,339	1	6.7
		5,038	1	5.5
	Lake Trout	24,138	6	5.9
		4,086	1	6.6
		4,669	1	6.1
	Splake	26,313	6	7.2
		39288	9	3.5

Table 2: Number, length, and percentages of Northern Pike and Walleye collected from Lake Michigamme, Marquette County, in April and May 2016. Data from DNR, Fisheries Division records.

Common Name	Scientific Name	Number	Total weight (lbs.)	Average length (in.)	Percent of catch by number	Percent of catch by weight	Percent legal or acceptable size
Northern Pike	*Esox lucius*	178	440	20.9	12.3	24.8	25
Walleye	*Sander vitreus*	1273	1334	14.5	87.7	75.2	34

Table 3: Total catch by length range of Northern Pike and Walleye collected from Lake Michigamme, Marquette County, in April and May 2016. Data from DNR, Fisheries Division records.

Inch Group	Northern Pike	Walleye
0	-	-
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	1	2
9	-	9
10	2	15
11	7	28
12	7	131
13	2	312
14	3	340
15	7	240
16	11	119
17	12	48
18	13	10
19	18	5
20	16	2
21	12	3
22	13	1
23	9	2
24	10	-
25	7	2
26	3	1
27	5	-
28	8	2
29	3	-
30	1	1
31	-	-
32	2	-
33	2	-
34	-	-
35	2	-

Table 4: Weighted mean length (inches) at age and growth relative to the state average for Northern Pike and Walleye sampled from Lake Michigamme, Marquette County, in April and May 2016. Number of fish aged is in parentheses. Data from DNR, Fisheries Division records.

Year Class	Age Group	Northern Pike	Walleye
2015	1	11.7 (10)	8.4 (2)
2014	2	16.3 (14)	10.2 (11)
2013	3	19.8 (36)	11.7 (9)
2012	4	22.4 (27)	12.9 (31)
2011	5	24.0 (12)	14 (57)
2010	6	30.2 (3)	14.5 (16)
2009	7	28.1 (6)	15 (28)
2008	8	37.3 (2)	16.1 (41)
2007	9	35.3 (1)	16.3 (19)
2006	10	-	17.4 (9)
2005	11	-	17.1 (11)
2004	12	-	18.3 (1)
2003	13	-	21.1 (3)
2002	14	-	20.7 (2)
2001	15	-	28.4 (1)
2000	16	-	25.4 (1)
1999	17	-	-
1998	18	-	30.8 (1)
Mean Growth Index[1]		**-1.2**	**-4.1**

[1]Mean growth index is the average deviation from the state average length at age.

Table 5: Number, length, and percentages of fishes collected from Lake Michigamme, Marquette County, in June 2017. Data from DNR, Fisheries Division Records.

Common Name	Scientific Name	Number	Total weight (lbs.)	Average length (in.)	Percent of catch by number	Percent of catch by weight	Percent legal or acceptable size
Black Bullhead	*Ameiurus melas*	1	0.14	6.5	0.15	0.04	0 (≥7")
Black Crappie	*Pomoxis nigromaculatus*	28	20.04	10.7	4.32	5.13	100 (≥7)
Bluegill	*Lepomis machrochirus*	4	0.49	4.3	0.62	0.13	50 (≥6")
Burbot	*Lota lota*	6	4.94	14.2	0.93	1.26	-
Iowa Darter	*Etheostoma exile*	1	0	2.5	0.15	0	-
Lake Whitefish	*Coregonus clupeaformis*	38	31.63	13.5	5.86	8.09	100 (≥8")
Logperch	*Percina caprodes*	6	0.05	3	0.93	0.01	-
Longnose Sucker	*Catostomus catostomus*	2	6.86	19.5	0.31	1.76	-
Mottled Sculpin	*Cottus bairdi*	2	0.01	2	0.31	0	-
Northern Pike	*Esox lucius*	20	69.13	23.4	3.09	17.69	45 (≥24")
Pumpkinseed	*Lepomis gibbosus*	1	0.36	7.5	0.15	0.09	100 (≥6")
Rock Bass	*Ambloplites rupestris*	355	155.28	8.2	54.78	39.73	97.5 (≥6")

Smallmouth Bass	*Micropterus dolomieu*	33	27.7	10.9	18.18	7.09	18 (≥14")
Walleye	*Sander vitreus*	24	26.39	13.3	3.7	6.75	25 (≥15")
White Sucker	*Catostomus commersoni*	16	41.16	18.4	2.47	10.53	-
Yellow Perch	*Perca flavescens*	111	6.69	3.7	17.13	1.71	11 (≥7)

Table 6: Total catch by length range of select fishes collected from Lake Michigamme, Marquette County in June 2017. Data from DNR, Fisheries Division records.

Inch group	Black Crappie	Bluegill	Burbot	Lake Whitefish	Northern Pike	Rock Bass	Smallmouth Bass	Walleye	White Sucker	Yellow Perch
0	-	-	-	-	-	-	-	-	-	-
1	-	2	-	-	-	1	-	-	-	-
2	-	-	-	-	-	-	2	-	-	78
3	-	-	-	-	-	-	1	-	-	8
4	-	-	-	-	-	2	-	1	-	7
5	-	-	-	-	-	6	1	3	-	5
6	-	1	-	-	-	42	1	1	-	1
7	-	1	-	-	-	108	2	-	-	1
8	-	-	-	-	-	102	1	-	-	4
9	7	-	-	-	-	74	1	-	-	2
10	11	-	-	2	-	19	3	1	-	2
11	8	-	-	10	-	1	6	1	-	2
12	1	-	2	1	-	-	5	-	1	-
13	1	-	1	5	-	-	4	4	1	1
14	-	-	2	13	-	-	5	7	-	-
15	-	-	-	6	2	-	1	2	1	-
16	-	-	-	1	1	-	-	1	1	-
17	-	-	1	-	2	-	-	-	1	-
18	-	-	-	-	1	-	-	1	3	-
19	-	-	-	-	1	-	-	1	3	-
20	-	-	-	-	1	-	-	-	3	-
21	-	-	-	-	-	-	-	-	2	-
22	-	-	-	-	2	-	-	-	-	-
23	-	-	-	-	1	-	-	-	-	-
24	-	-	-	-	2	-	-	-	-	-
25	-	-	-	-	1	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	2	-	-	1	-	-
28	-	-	-	-	1	-	-	-	-	-
29	-	-	-	-	1	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	1	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-

35	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	1	-	-	-	-	-

Table 7: Weighted mean length (inches) at age and growth relative to the state average of for select species of fish sampled from Lake Michigamme, Marquette County, in June 2017. Number of fish aged in parentheses. Data from DNR, Fisheries Division records.

Year Class	Age Group	Black Crappie	Northern Pike	Rock Bass	Smallmouth Bass	Walleye	Yellow Perch
2016	1	-	-	-	3 (1)	5.7 (5)	3.3 (9)
2015	2	-	17 (7)	4.2 (1)	5.7 (3)	10.9 (1)	5 (11)
2014	3	-	22.9 (4)	6.4 (2)	7 (1)	13.1 (3)	7.9 (1)
2013	4	-	25.7 (5)	5.9 (6)	10 (6)	13.9 (6)	8.9 (3)
2012	5	-	28.1 (2)	7.4 (13)	11.9 (12)	14.8 (5)	9.3 (5)
2011	6	9.6 (4)	32.8 (1)	7.6 (6)	13.3 (3)	-	11.7 (1)
2010	7	10 (11)	-	7.9 (8)	14.6 (4)	16.2 (1)	-
2009	8	11 (4)	38.2 (1)	8.7 (6)	14.4 (2)	18.7 (1)	13.5 (1)
2008	9	10.9 (4)	-	9.5 (12)	-	-	-
2007	10	-	-	10 (5)	-	-	11.2 (1)
2006	11	11.1 (3)	-	10.1 (1)	-	-	-
2005	12	12.4 (3)	-	10.6 (4)	-	-	-
2004	13	-	-	-	-	-	-
2003	14	-	-	-	-	-	-
2002	15	-	-	-	-	-	-
2001	16	-	-	-	-	27 (1)	-
Mean Growth Index[1]		**-1**	**-0.2**	**-0.5**	**-3**	**-2.7**	**-0.3**

[1]Mean growth index is the average deviation from the state average length at age.