Annual Report

Lake Lansing
Special Assessment District
2023 Annual Report

Prepared for:

Charter Township of Meridian
and
Lake Lansing Special Assessment District Advisory Committee

Prepared by:

Progressive AE
1811 4 Mile Road, NE
Grand Rapids, MI 49525-2442
616/361-2664

November 2023

Project No: 53260102

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Executive Summary

The Lake Lansing Special Assessment District (SAD) was formed in 1998 to improve conditions in Lake Lansing. In 2017, public hearings were held and the Charter Township of Meridian approved continuing the project for a ten-year period. The project includes an update of the lake and watershed management plan, water quality sampling, nuisance aquatic plant control, watershed improvements, educational programs, and grant applications. The project is overseen by the Lake Lansing SAD Advisory Committee, whose members include representatives of residents within the SAD, Meridian Township, Ingham County Parks, and the Ingham County Drain Commissioner's Office. The following is a summary of project activities:

Water Quality Sampling: In 2023, samples were collected from Lake Lansing in March and September. During the 2023 sampling period, phosphorus levels were moderate to low, with the exception of the deepest samples in late summer which were high. Water clarity was moderate in spring and summer, and algae growth was low during both sampling events.

Nuisance Aquatic Plant Control: In 2023, 137 acres infested by non-native milfoil and curly-leaf pondweed required treatment in May and 36 acres of starry stonewort, brittle-leaf naiad, and nuisance native plants were harvested in mid-July.

Information and Education: Two newsletters were mailed to update all residents on project activities, one in April and the other in June. The annual aquatic invasive species "Landing Blitz" was held at the Lake Lansing public boat launch to raise awareness about preventing the spread of aquatic invasive species (AIS) through recreational boating and related activities. A Clean, Drain, Dry (CD^3) waterless boat cleaning station was installed at Lake Lansing Park North in 2023. Boaters should always clean, drain, and dry their watercraft before and after launching into Lake Lansing.

Natural Shoreline Demonstration Project: A natural shoreline demonstration project was constructed in June of 2023 at Lake Lansing Park South (Figure 1). The project utilized bioengineering to improve habitat and stabilize approximately 100 feet of shoreline. The goal of the project was to help lakefront residents visualize what a natural shoreline looks like and to encourage them to install their own, where appropriate.

Figure 1. Natural shoreline demonstration project progression. May 18, 2023 (left), June 7, 2023 (center), August 3, 2023 (right).

Introduction

Lake Lansing is located in Meridian Township, Ingham County, Michigan (Figure 2). The lake is 456 acres in surface area with a maximum depth of 35 feet and a mean (average) depth of 8.7 feet. In 1998, the Charter Township of Meridian established a special assessment district (SAD) under provisions of Public Act 188 of 1954 for the purposes of studying water quality, planning and implementing aquatic plant control, and developing a lake and watershed management plan for Lake Lansing. In March of 2002, a management plan was prepared for Lake Lansing and its watershed. Public hearings were held in the summers of 2002, 2007, and 2017 to continue the management program for the lake. Ongoing management is overseen by the Lake Lansing Special Assessment District Advisory Committee (hereinafter, the Advisory Committee) with assistance from the Advisory Committee's professional consultant, Progressive AE. The Advisory Committee includes representatives from each of the tiers in the special assessment district, Meridian Township Engineering Department, Ingham County Parks Department, and Ingham County Drain Commissioner's Office. This report includes information on 2023 Lake Lansing management activities.

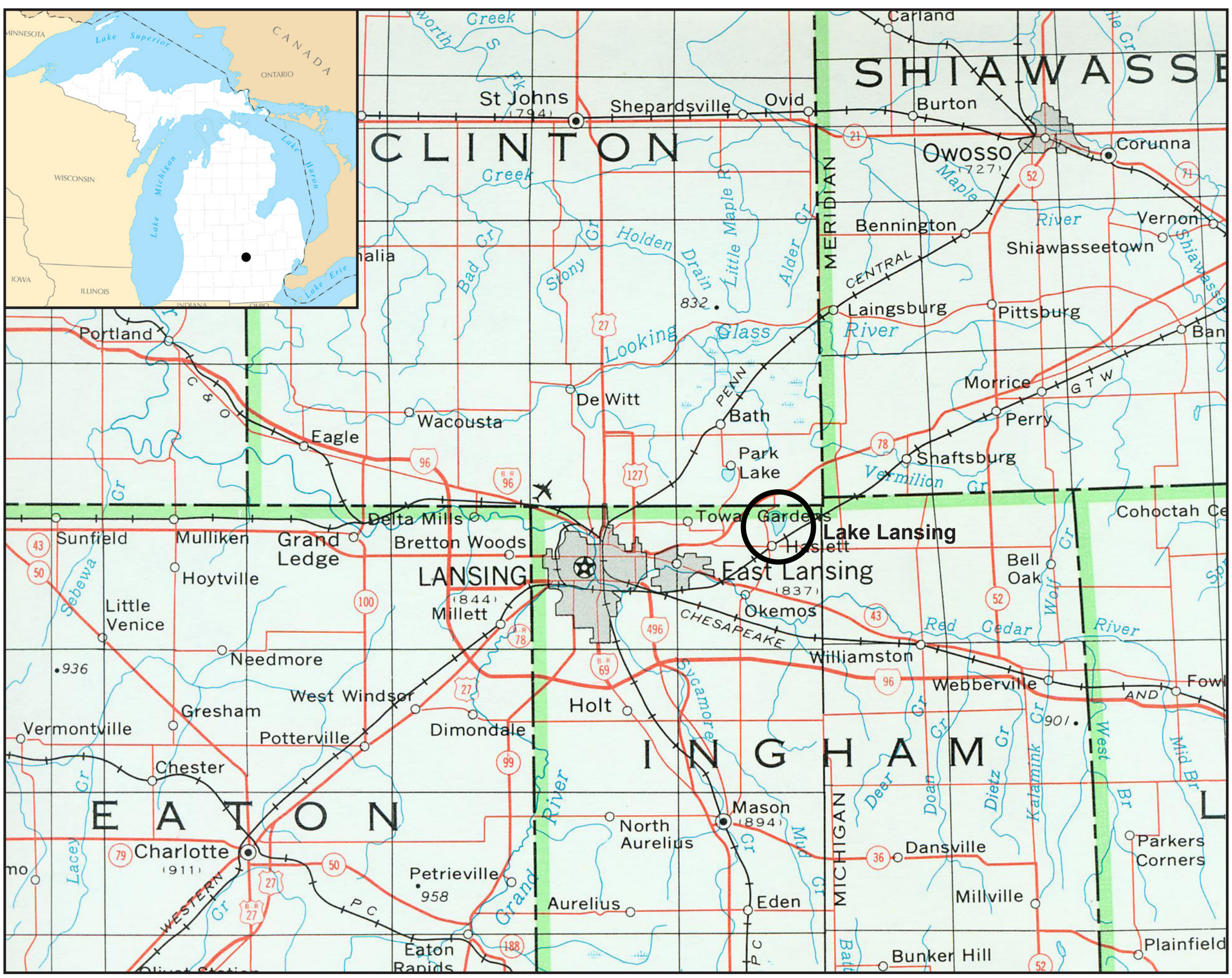

Figure 2. Lake Lansing location map. Source: United States Geological Survey.

Water Quality

LAKE WATER QUALITY

Lake water quality is determined by a unique combination of processes that occur both within and outside of the lake. In order to make sound management decisions, it is necessary to have an understanding of the current physical, chemical, and biological condition of the lake, and the potential impact of drainage from the surrounding watershed.

Lakes are commonly classified as oligotrophic, mesotrophic, or eutrophic (Figure 3). Oligotrophic lakes are generally deep and clear with little aquatic plant growth. These lakes maintain sufficient dissolved oxygen in the cool, deep bottom waters during late summer to support coldwater fish such as trout and whitefish. By contrast, eutrophic lakes are generally shallow, turbid, and support abundant aquatic plant growth. In deep eutrophic lakes, the cool bottom waters usually contain little or no dissolved oxygen. Therefore, these lakes can only support warmwater fish such as bass and pike. Lakes that fall between these two extremes are called mesotrophic lakes.

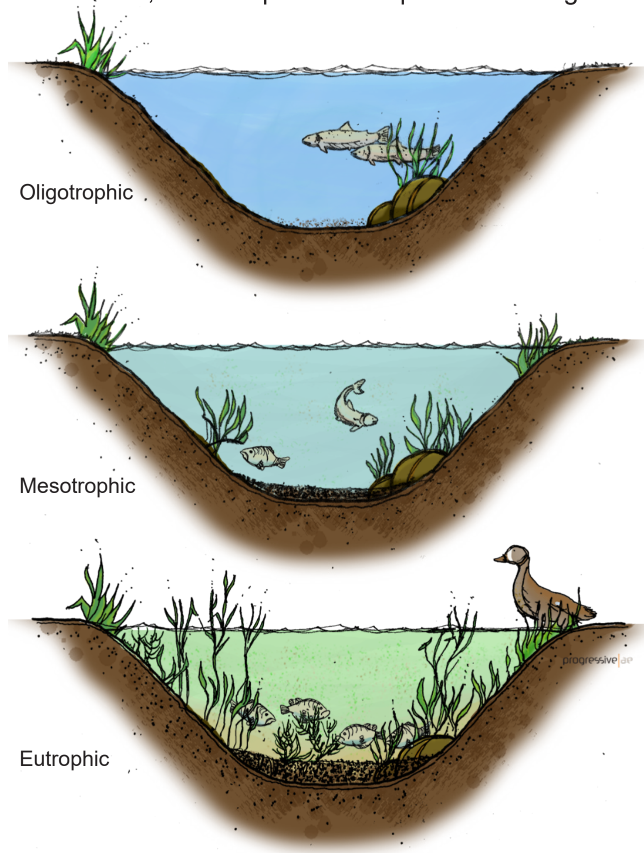

Figure 3. Lake classification.

Under natural conditions, most lakes will ultimately evolve to a eutrophic state as they gradually fill with sediment and organic matter transported to the lake from the surrounding watershed. As the lake becomes shallower, the process accelerates. When aquatic plants become abundant, the lake slowly begins to fill in as sediment and decaying plant matter accumulate on the lake bottom. Eventually, terrestrial plants become established and the lake is transformed to a marshland. The aging process in lakes is called "eutrophication" and may take anywhere from a few hundred to several thousand years, generally depending on the size of the lake and its watershed. The natural lake aging process can be greatly accelerated if excessive amounts of sediment and nutrients (which stimulate aquatic plant growth) enter the lake from the surrounding watershed. Because these added inputs are usually associated with human activity, this accelerated lake aging process is often referred to as "cultural eutrophication." The problem of cultural eutrophication can be managed by identifying sources of sediment and nutrient loading (i.e., inputs) to the lake and developing strategies to halt or slow the inputs. Thus, in developing a management plan, it is necessary to determine the limnological (i.e., the physical, chemical, and biological) condition of the lake and the physical characteristics of the watershed as well. Key parameters used to evaluate the limnological condition of a lake include temperature, dissolved oxygen, total phosphorus, pH and alkalinity, chlorophyll-*a*, and Secchi transparency.

TEMPERATURE

Temperature is important in determining the type of organisms which may live in a lake. For example, trout prefer temperatures below 68°F. Temperature also determines how water mixes in a lake. As the ice cover breaks up on a lake in the spring, the water temperature becomes uniform from the surface to the bottom. This period is referred to as "spring turnover" because water mixes throughout the entire water column. As the surface waters warm, they are underlain by a colder, more dense strata of water. This process is called thermal stratification (Figure 4). Once thermal stratification occurs, there is little mixing of the warm surface waters with the cooler bottom waters. The transition layer that separates these layers is referred to as the "thermocline." The thermocline is characterized as the zone where temperature drops rapidly with depth. As fall approaches, the warm surface waters begin to cool and become more dense. Eventually, the surface temperature drops to a point that allows the lake to undergo complete mixing. This period is referred to as "fall turnover." As the season progresses and ice begins to form on the lake, the lake may stratify again. However, during winter stratification, the surface waters (at or near 32°F) are underlain by slightly warmer water (about 39°F). This is sometimes referred to as "inverse stratification" and occurs because water is most dense at a temperature of about 39°F. As the lake ice melts in the spring, these stratification cycles are repeated.

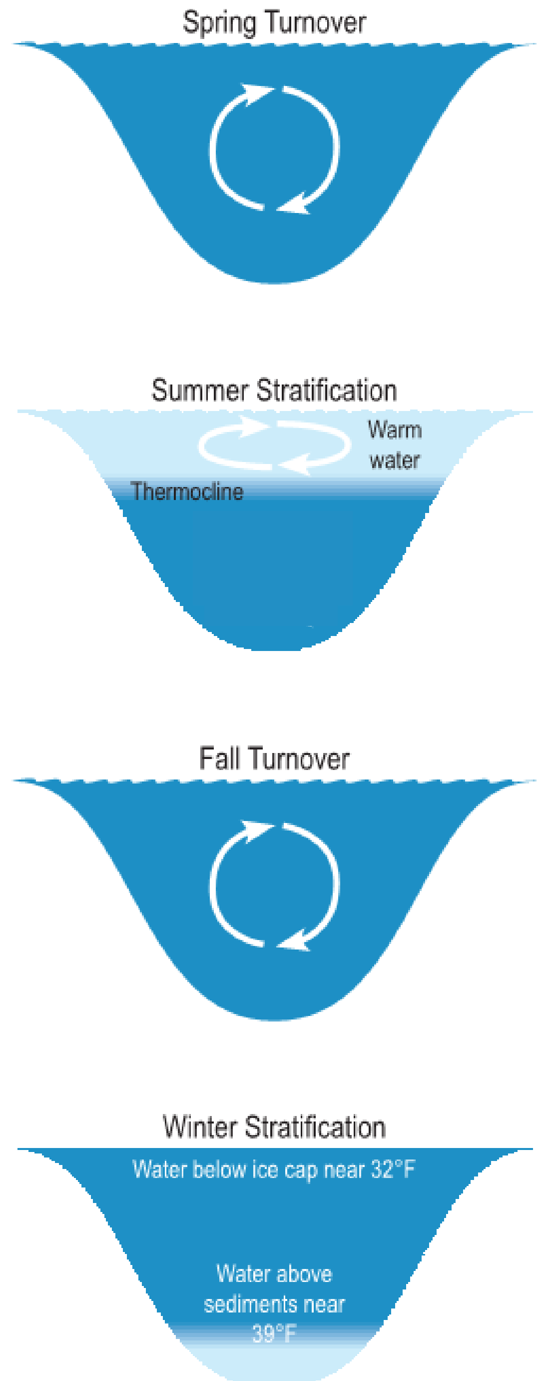

Figure 4. Seasonal thermal stratification cycles.

DISSOLVED OXYGEN

An important factor influencing lake water quality is the quantity of dissolved oxygen in the water column. The major inputs of dissolved oxygen to lakes are the atmosphere and photosynthetic activity by aquatic plants. An oxygen level of about 5 mg/L (milligrams per liter, or parts per million) is required to support warmwater fish. In lakes deep enough to exhibit thermal stratification, oxygen levels are often reduced or depleted below the thermocline once the lake has stratified. This is because the oxygen has been consumed, in large part, by bacteria that use oxygen as they decompose organic matter (plant and animal remains) at the bottom of the lake. Bottom-water oxygen depletion is a common occurrence in eutrophic and some mesotrophic lakes. Thus, eutrophic and most mesotrophic lakes cannot support coldwater fish because the cool, deep water (that the fish require to live) does not contain sufficient oxygen.

PHOSPHORUS

The quantity of phosphorus present in the water column is especially important since phosphorus is the nutrient that most often controls aquatic plant growth and the rate at which a lake ages and becomes more eutrophic. By reducing the availability of phosphorus in a lake, it is often possible to control the amount of aquatic plant growth. In general, lakes with a phosphorus concentration of 20 µg/L (micrograms per liter, or parts per billion) or greater are able to support abundant plant growth and are classified as nutrient-enriched or eutrophic.

Phosphorus enters the lake water either from the surrounding watershed, or from the sediments in the lake itself, or both. The input of phosphorus from the watershed is called "external loading," and from the sediments is called "internal loading." External loading occurs when phosphorus washes into the lake from sources such as fertilizers, septic systems, and eroding land. Internal loading occurs when bottom-water oxygen is depleted, resulting in a chemical change in the water near the sediments. The chemical change causes phosphorus to be released from the sediments into the lake where it becomes available as a nutrient for aquatic plants.

CHLOROPHYLL-*a*

Chlorophyll-*a* is a pigment that imparts the green color to plants and algae. A rough estimate of the quantity of algae present in lake water can be made by measuring the amount of chlorophyll-*a* in the water column. A chlorophyll-*a* concentration greater than 6 µg/L is considered characteristic of a eutrophic condition.

SECCHI TRANSPARENCY

A Secchi disk is often used to estimate water clarity. The measurement is made by fastening a round, black and white, 8-inch disk to a calibrated line (Figure 5). The disk is lowered over the deepest point of the lake until it is no longer visible, and the depth is noted. The disk is then raised until it reappears. The average between these two depths is the Secchi transparency. Generally, it has been found that aquatic plants can grow at a depth of at least twice the Secchi transparency measurement. In eutrophic lakes, water clarity is often reduced by algae growth in the water column, and Secchi disk readings of 7.5 feet or less are common.

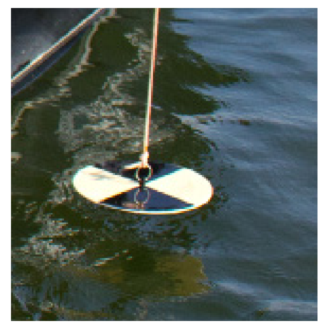

Figure 5. Secchi disk.

Ordinarily, as phosphorus inputs (both internal and external) to a lake increase, the amount of algae the lake can support will also increase. Thus, the lake will exhibit increased chlorophyll-*a* levels and decreased transparency. A summary of lake classification criteria developed by the Michigan Department of Natural Resources (Warbach et al. 1990) is shown in Table 1.

TABLE 1
LAKE CLASSIFICATION CRITERIA

Lake Classification	Total Phosphorus (µg/L)[1]	Chlorophyll-*a* (µg/L)[1]	Secchi Transparency (feet)
Oligotrophic	Less than 10	Less than 2.2	Greater than 15.0
Mesotrophic	10 to 20	2.2 to 6.0	7.5 to 15.0
Eutrophic	Greater than 20	Greater than 6.0	Less than 7.5

1 µg/L = micrograms per liter = parts per billion.

pH and TOTAL ALKALINITY

pH is a measure of the amount of acid or base in the water. The pH scale ranges from 0 (acidic) to 14 (alkaline or basic) with neutrality at 7. The pH of most lakes in the Upper Midwest ranges from 6.5 to 9.0 (Michigan Department of Environmental Quality (MDEQ) 2012; Table 2). In addition, according to the Michigan Department of Environment, Great Lakes, and Energy (EGLE 2021):

> While there are natural variations in pH, many pH variations are due to human influences. Fossil fuel combustion products, especially automobile and coal-fired power plant emissions, contain nitrogen oxides and sulfur dioxide, which are converted to nitric acid and sulfuric acid in the atmosphere. When these acids combine with moisture in the atmosphere, they fall to earth as acid rain or acid snow. In some parts of the United States, especially the Northeast, acid rain has resulted in lakes and streams becoming acidic, resulting in conditions which are harmful to aquatic life. The problems associated with acid rain are lessened if limestone is present, since it is alkaline and neutralizes the acidity of the water.
>
> Most aquatic plants and animals are adapted to a specific pH range, and natural populations may be harmed by water that is too acidic or alkaline. Immature stages of aquatic insects and young fish are extremely sensitive to pH values below 5. Even microorganisms which live in the bottom sediment and decompose organic debris cannot live in conditions which are too acidic. In very acidic waters, metals which are normally bound to organic matter and sediment are released into the water. Many of these metals can be toxic to fish and humans. Below a pH of about 4.5, fish are unable to survive.

The Michigan Water Quality Standard (Part 4 of Act 451) states that pH shall be maintained within the range of 6.5 to 9.0 in all waters of the state.

Alkalinity, also known as acid-neutralizing capacity or ANC, is the measure of the pH-buffering capacity of water in that it is the quantitative capacity of water to neutralize an acid. pH and alkalinity are closely linked and are greatly impacted by the geology and soil types that underlie a lake and its watershed. According to MDEQ (2012):

> Michigan’s dominant limestone geology in the Lower Peninsula and the eastern Upper Peninsula contributes to the vast majority of Michigan lakes being carbonate-bicarbonate dominant [which increases alkalinity and moderates pH] and lakes in the western Upper Peninsula having lower alkalinity and thus lesser buffering capacity.

The alkalinity of most lakes in the Upper Midwest is within the range of 23 to 148 milligrams per liter, or parts per million, as calcium carbonate (MDEQ 2012; Table 2).

TABLE 2
pH AND ALKALINITY OF UPPER MIDWEST LAKES

Measurement	Low	Moderate	High
pH (in standard units)	Less than 6.5	6.5 to 9.0	Greater than 9.0
Total Alkalinity or ANC (in mg/L as $CaCO_3$[1])	Less than 23	23 to 148	Greater than 148

1 mg/L $CaCO_3$ = milligrams per liter as calcium carbonate.

SAMPLING METHODS

Water quality sampling was conducted in the spring and late summer of 2023 at the two deep basins within Lake Lansing (Figure 6). Temperature and dissolved oxygen were measured using a YSI Prosolo ODO/T probe. Samples were collected at the surface, mid-depth, and just above the lake bottom with a Van Dorn bottle to be analyzed for pH, total alkalinity, and total phosphorus. pH was measured in the field using a Hach Pocket Pro pH meter. Total alkalinity and total phosphorus samples were placed on ice and transported to Progressive AE and to Summit Laboratories[1], respectively, for analysis. Total alkalinity was titrated at Progressive AE using Standard Methods procedure 2320 B, and total phosphorus was analyzed at Summit Laboratories[1] using Standard Methods procedure 4500-P E. In addition to the depth-interval samples at each deep basin, Secchi transparency was measured and composite chlorophyll-*a* samples were collected from the surface to a depth equal to twice the Secchi transparency. Chlorophyll-*a* samples were analyzed by Prein and Newhof[2] using Standard Methods procedure 10200 H.

Tributaries were monitored in spring and summer for the most significant storm drains and inlet streams (Figure 6). When streams were flowing, discharge was estimated using the U.S. Geological Survey midsection method (Buchanan and Somers 1969). Stream velocity was measured with a Global FP111 Flow Probe. Summit Laboratories[1] analyzed samples for total phosphorus.

SAMPLING RESULTS AND DISCUSSION

Sampling results are provided in Tables 3-5. A graphic summary of water quality data compiled to date is shown in Figures 7 through 9 and summary statistics are included in Table 6.

In March of 2023, sampling was conducted during spring turnover when water temperatures were cool and dissolved oxygen concentrations were high. During the September sampling period, Lake Lansing was thermally stratified; the lake was warm and well-oxygenated at the surface, and was cool with low oxygen near the bottom. In 2023, total phosphorus concentrations were generally low, with the exception of the deepest sample in late summer which was high. The elevated bottom-water phosphorus is likely due to internal release of phosphorus from the lake sediments. However, sediment phosphorus release occurs in only a very small portion of the lake and, therefore, it is unlikely to be a significant loading source to Lake Lansing. pH and total alkalinity were generally within the moderate range for Upper Midwest lakes.

1 Summit Laboratory, 900 Godfrey Ave SW, Grand Rapids, MI 49503
2 Prein and Newhof Laboratories, 3260 Evergreen Dr NE, Grand Rapids, MI 49525

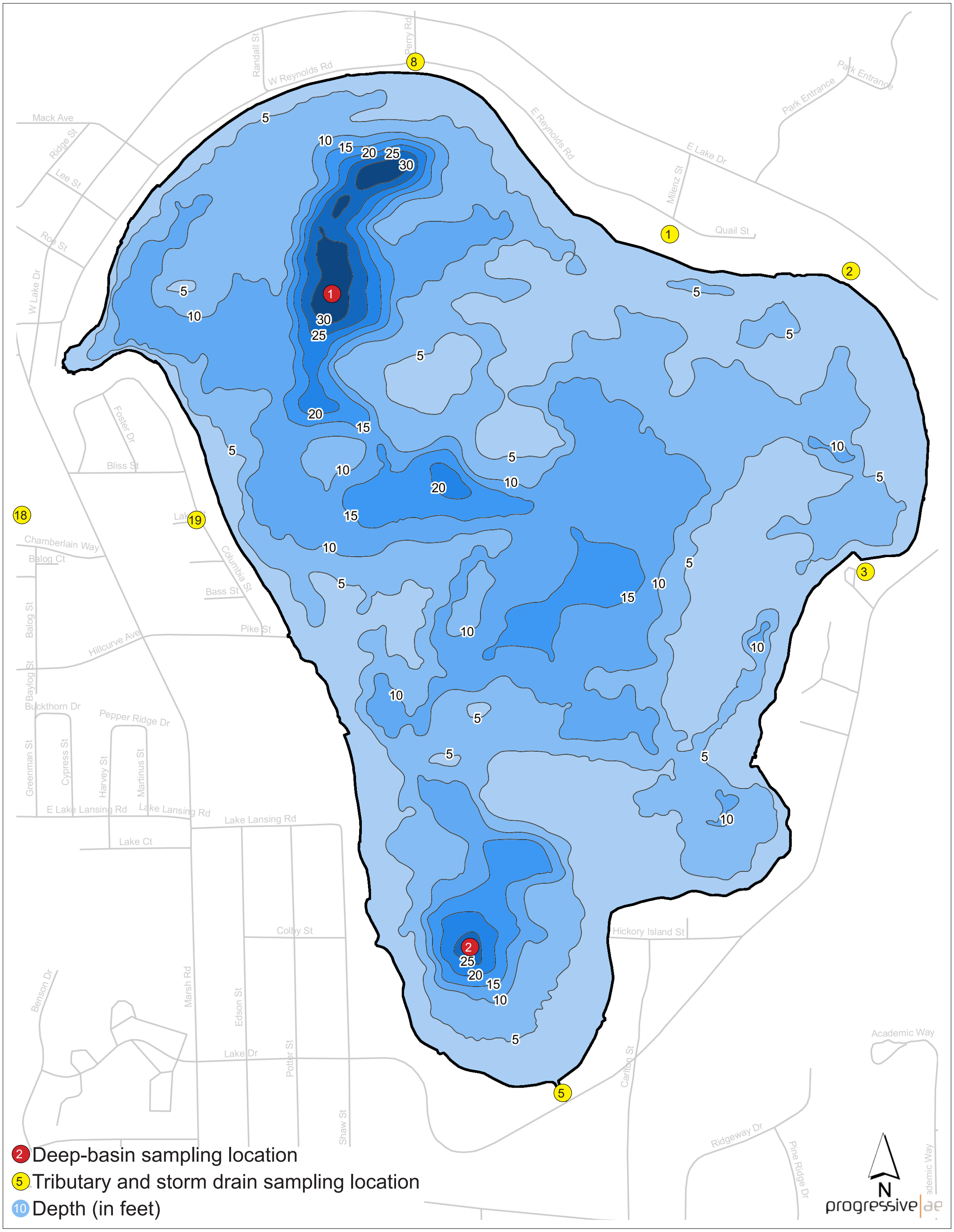

Figure 6. Lake Lansing sampling location map.

TABLE 3
LAKE LANSING
2023 DEEP BASIN WATER QUALITY DATA

Date	Station	Sample Depth (feet)	Temperature (°F)	Dissolved Oxygen (mg/L)[1]	Total Phosphorus (µg/L)[2]	pH (S.U.)[3]	Total Alkalinity (mg/L $CaCO_3$)[4]
21-Mar-23	1	1	38	12.1	<10	8.8	115
21-Mar-23	1	16	38	12.1	<10	8.8	118
21-Mar-23	1	32	38	12.1	<10	8.8	118
21-Mar-23	2	1	39	12.2	<10	8.7	117
21-Mar-23	2	13	39	12.2	11	8.7	120
21-Mar-23	2	25	38	12.2	<10	8.7	120
5-Sep-23	1	1	77	8.1	<10	8.8	94
5-Sep-23	1	16	74	6.8	14	8.5	96
5-Sep-23	1	31	56	0.3	162	7.7	146
5-Sep-23	2	1	76	8.4	<10	8.4	95
5-Sep-23	2	12	73	7.1	10	8.1	96
5-Sep-23	2	24	63	0.3	32	7.1	121

TABLE 4
LAKE LANSING
2023 SURFACE WATER QUALITY DATA

Date	Station	Secchi Transparency (feet)	Chlorophyll-*a* (µg/L)[2]
21-Mar-23	1	8.0	1
21-Mar-23	2	8.0	2
5-Sep-23	1	7.5	2
5-Sep-23	2	7.0	2

1 mg/L = milligrams per liter = parts per million.
2 µg/L = micrograms per liter = parts per billion.
3 S.U. = standard units.
4 mg/L $CaCO_3$ = milligrams per liter as calcium carbonate.

TABLE 5
LAKE LANSING
2023 STORM DRAIN MONITORING DATA

Date	Storm Drain Number	Drain Name	Discharge (cfs)[1]	Total Phosph. (µg/L)[2]	Total Suspended Solids (mg/L)[3]
21-Mar-23	1	Barnhart	0.5	108	<4
21-Mar-23	2	Milliman	0.0		
21-Mar-23	3	Wallace	1.9	26	<4
21-Mar-23	5	South End	0.3	41	17.6
21-Mar-23	8	Perry Road	0.0		
21-Mar-23	18	Marshall Upstream	0.0		
21-Mar-23	19	Marshall Downstream	0.0		
5-Sep-23	1	Barnhart	1.4	119	5.6
5-Sep-23	2	Milliman	0.0		
5-Sep-23	3	Wallace	1.6	59	<4
5-Sep-23	5	South End	0.0		
5-Sep-23	8	Perry Road	0.0		
5-Sep-23	18	Marshall Upstream	0.0		
5-Sep-23	19	Marshall Downstream	0.0		

Chlorophyll-*a* levels indicate algae growth was low and water clarity was moderate during both spring and summer sampling periods (Table 4). Since 1999, water clarity has fluctuated from poor to excellent (Figure 9). Water clarity fluctuations may be related to the presence of zebra mussels which consume algae and often increase water clarity. Water clarity is also likely impacted by wave action from wind or from boating activity in shallow portions of Lake Lansing as this stirs the sediments into the water column. In general, plants can grow to a depth of about twice the Secchi transparency reading. With this year's Secchi transparency averaging about 7.5 feet, the clarity of Lake Lansing was sufficient to allow sunlight to penetrate to about 15 feet of depth, which is over 90 percent of the lake bottom, making nearly all of Lake Lansing habitable for plant growth.

Samples were collected from flowing tributaries in March and September of 2023 (Table 5). The Barnhart and Wallace drains were flowing during spring and summer while the South End tributary was only flowing in the spring. Phosphorus concentrations in the Barnhart drain were elevated and flow rates were average. The Wallace drain had moderate phosphorus and above average flow rates at the time of sampling. The South End inlet had low flow and moderate phosphorus levels. Inflow water volume (or discharge) was within average historical rates and the amount of water flowing into the lake is low compared to the total lake volume.

1 cfs = cubic feet per second.
2 µg/L = micrograms per liter = parts per billion.
3 mg/L = milligrams per liter = parts per million.

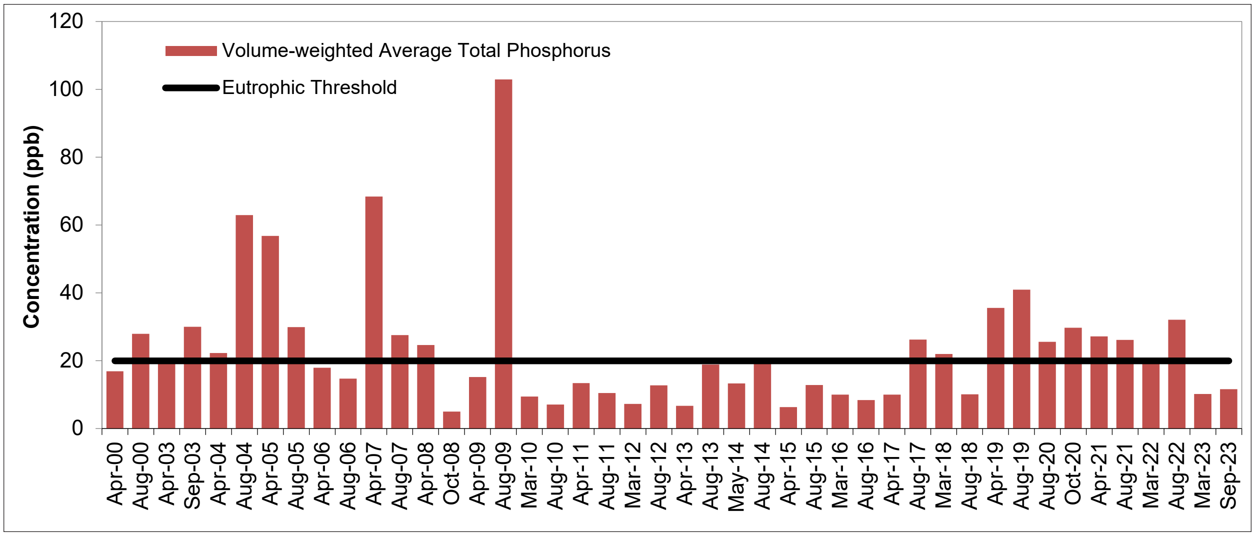

Figure 7. Volume-weighted average total phosphorus concentrations, 1999-2023.

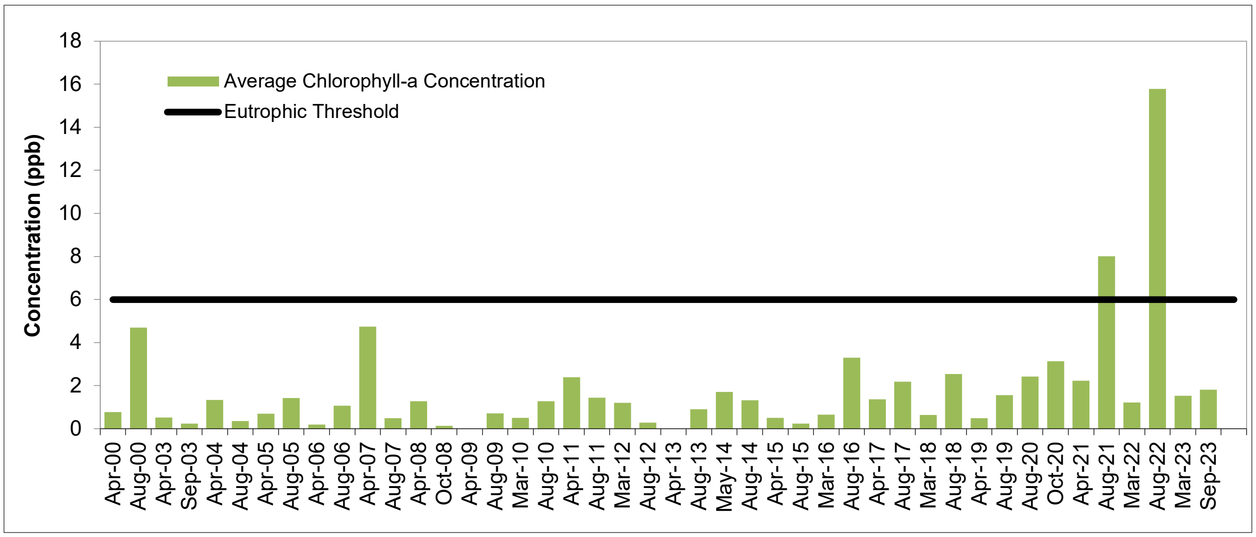

Figure 8. Average chlorophyll-*a* concentrations, 1999-2023.

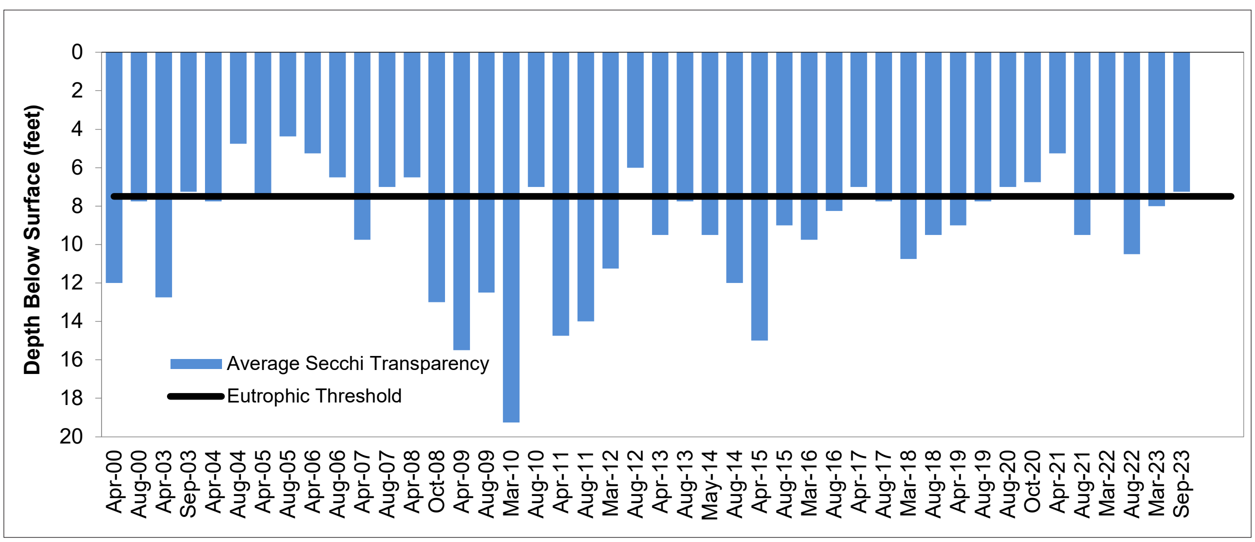

Figure 9. Average Secchi transparency measurements, 1999-2023.

TABLE 6
LAKE LANSING
SUMMARY STATISTICS (1999-2023)[1]

	Total Phosphorus (µg/L)[2]	Chlorophyll-*a* (µg/L)[2]	Secchi Transparency (feet)
Mean	36	2	9.3
Standard deviation	52	3	3.2
Median	21	1	8.5
Minimum	5	0	4.3
Maximum	364	30	19.5
Number of samples	285	90	90

Summary statistics indicate Lake Lansing is borderline between mesotrophic (moderately productive) and eutrophic (nutrient-enriched and productive). Phosphorus levels range from low to high with the mean phosphorus concentration over the 20-ppb eutrophic threshold. Bottom-water oxygen is reduced during summer, and water clarity may fluctuate year to year. Lake Lansing supports significant rooted aquatic plant growth across much of the lake. Algae growth is generally moderate or low, thus it would appear that during the active growing season (May - September), phosphorus is more readily used by rooted plants in the lake rather than algae.

1 Summary statistics include data from sampling stations 1 and 2 only. Historically, samples were also collected from two additional stations near the shoreline, but only deep basin data is included in this analysis.
2 µg/L = micrograms per liter = parts per billion.

Nuisance Aquatic Plant Control

The focus of the plant control program in Lake Lansing is the control of exotic (i.e., non-native) plants (non-native milfoil, curly-leaf pondweed, brittle-leaf naiad, and starry stonewort) and native plants that reach nuisance densities. In 2023, a combined 137.25 acres of non-native milfoil and curly-leaf pondweed required treatment in late May and a 36-acre harvest targeting starry stonewort, brittle-leaf naiad, and nuisance native plant growth occurred in July.

On September 5, the lake was surveyed using methods based on the Department of Environment, Great Lakes, and Energy's Procedures for Aquatic Vegetation Surveys. With these procedures, the type and relative abundance of all plants species present in the lake are evaluated. Lake Lansing was segmented into 70 survey sites and the type and density of plants at each site was recorded (Table 7).

TABLE 7
LAKE LANSING AQUATIC PLANT FREQUENCY
SEPTEMBER 5, 2023

Common Name	Scientific Name	Classification	Percent of Survey Sites Where Plant Was Found
Wild celery	*Vallisneria americana*	Submersed	94
Chara	*Chara* sp.	Submersed	81
Large-leaf pondweed	*Potamogeton amplifolius*	Submersed	57
Non-native milfoil*	*Myriophyllum* sp.	Submersed	39
Starry stonewort*	*Nitellopsis obtusa*	Submersed	36
Thin-leaf pondweed	*Potamogeton* sp.	Submersed	21
Richardson's pondweed	*Potamogeton richardsonii*	Submersed	19
Illinois pondweed	*Potamogeton illinoensis*	Submersed	19
Slender naiad	*Najas flexilis*	Submersed	17
Brittle-leaf naiad*	*Najas minor*	Submersed	16
Sago pondweed	*Stuckenia pectinata*	Submersed	9
Variable pondweed	*Potamogeton gramineus*	Submersed	7
Flat-stem pondweed	*Potamogeton zosteriformis*	Submersed	6
White waterlily	*Nymphaea odorata*	Floating-leaved	14
Yellow waterlily	*Nuphar* sp.	Floating-leaved	13
Water shield	*Brasenia schreberi*	Floating-leaved	3
Cattail	*Typha* sp.	Emergent	17
Swamp loosestrife	*Decodon verticillatus*	Emergent	10
Pickerelweed	*Pontederia cordata*	Emergent	6
Bulrush	*Schoenoplectus* sp.	Emergent	3
Purple loosestrife*	*Lythrum salicaria*	Emergent	1

*Exotic invasive species

During the September survey, 21 aquatic plant species were found, indicating Lake Lansing maintains a healthy diversity of aquatic plants. Wild celery, *Chara*, and large-leaf pondweed were the most common native species found during the late-season surveys from 2019 through 2023, all of which are beneficial species for fish and wildlife. The invasive species, starry stonewort, was found at 36% of sites, which is fewer than in previous years. However, another low-growing invasive species, brittle-leaf naiad, was found at more sites in 2023 than 2022. Brittle-leaf naiad will continue to be monitored and managed with harvesting. Non-native milfoil was found at 39% of sites around Lake Lansing. Continued efforts to suppress starry stonewort and non-native milfoil are vital in maintaining the health of Lake Lansing.

Figure 10. Curly-leaf pondweed. *Potamogeton crispus*

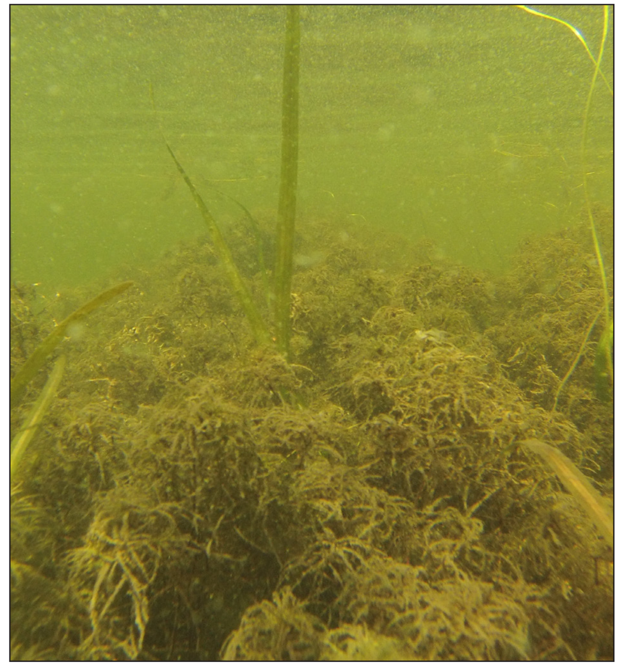

Figure 11. Brittle-leaf naiad. *Najas minor*

Figure 12. Eurasian milfoil. *Myriphyllum spicatum*

Figure 13. Starry stonewort. *Nitellopsis obtusa*

Information and Education

The Lake Lansing Property Owners Association (LLPOA) and the Lake Lansing Advisory Committee participated in several educational efforts in 2023.

Newsletters: Two newsletters were mailed to all residents in March and June, and included updates on harmful algal blooms, water quality monitoring and shoreland management guidelines, and a brief history of Lake Lansing (Appendix A).

Landing Blitz: The annual aquatic invasive species “Landing Blitz” was held on July 9th at the Lake Lansing public boat launch, coordinated by several agencies who partnered with Meridian Township and the LLPOA. The Landing Blitz is a collaborative outreach campaign to raise awareness about preventing the spread of aquatic invasive species (AIS) through recreational boating and related activities (Figure 10).

Clean, Drain, Dry: The Lake Lansing SAD contributed to the installation of a Clean, Drain, Dry (CD^3) waterless boat cleaning station at Lake Lansing Park North in 2023. The station is located on the right hand side of the drive leading to the boat launch. The placement of the CD^3 station allows boaters to easily and efficiently clean their boat prior to launching into Lake Lansing. Boaters also have the convenience of using an on-site boat washing station fitted with a power washer to clean their boat and trailer while exiting the launch.

Figure 14. Clean, Drain, Dry station and signage at Lake Lansing Park North

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Appendix A

Lake Lansing Special Assessment District Advisory Committee

2023 Newsletters

Lake Lansing Special Assessment District Advisory Committee Newsletter

Spring 2023

Lake Lansing Special Assessment District Advisory Committee
c/o Meridian Charter Township
5151 Marsh Road
Okemos, MI 48864

Curt Armbruster, Chair
Tier 1

Susan Andrews
Tier 1

Ron Rowe
Tier 1

Roger Taylor
Tier 1

Steve Culling
Tier 2

Larry Wagenknecht
Tier 2

Younes Ishraidi
Charter Township of Meridian

Coe Emens
Lake Lansing County Park Supervisor

Paul Pratt
Ingham County Drain Commissioner's Office

For the latest updates, be sure to check meridian.mi.us/government/boards-and-commissions/lake-lansing-advisory-committee

Environmental Consultant
Progressive AE

Lake Lansings Fishery

The type and abundance of fish a lake supports can be influenced by several factors such as temperature, dissolved oxygen, depth, and the aquatic plant life community. Fish can be catagorized as warmwater, coolwater, or coldwater species depending on their summer temperature preferences (Figure 1). Deep lakes will form temperature layers during the summer months known as summer stratification. Coldwater fisheries are typically deep lakes that have cold and well oxygenated bottom waters providing a summer refuge for cold- and coolwater fish species. Because Lake Lansing has oxygen depletion in the cool bottom waters during summer it would be classified as a warmwater fishery. The lake contains warmwater species such as bluegill, pumpkinseed, large mouth bass, and crappie. The lake is relatively shallow and oxygen depletes with depth. Some coolwater species have been caught in Lake Lansing such as yellow perch and northern pike. Lake Lansing has summer bottom waters that are cold enough to support cold- and coolwater species, however, the bottom water lacks sufficient oxygen. While water temperature and dissolved oxygen determine what fish species can live in a lake, aquatic plants are important in maintaining a healthy fishery. Aquatic plants provide food, habitat, and cover for fish. An over abundance of aquatic plants can have a negative impact on fish growth and spawning. Aquatic invasive species are known to grow at nuisance levels and dominate ecosystems. An aquatic plant management program helps to control invasive and nuisance plant growth, which in turn, can help to maintain a healthy fishery. Currently, Lake Lansing has an established aquatic plant control program to target invasive species such as Eurasian milfoil and starry stonewort.

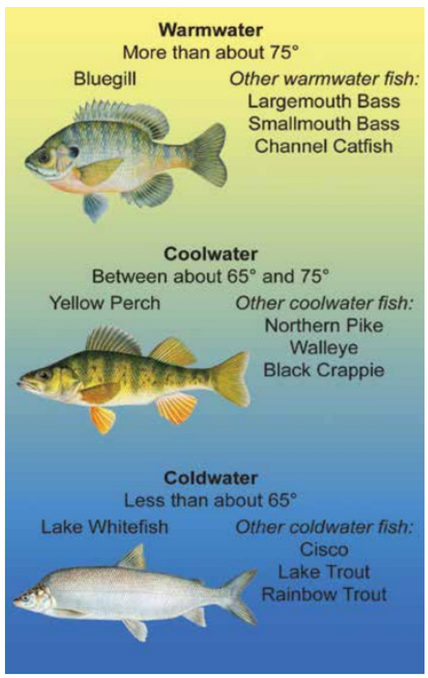
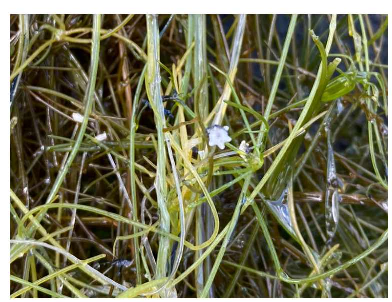
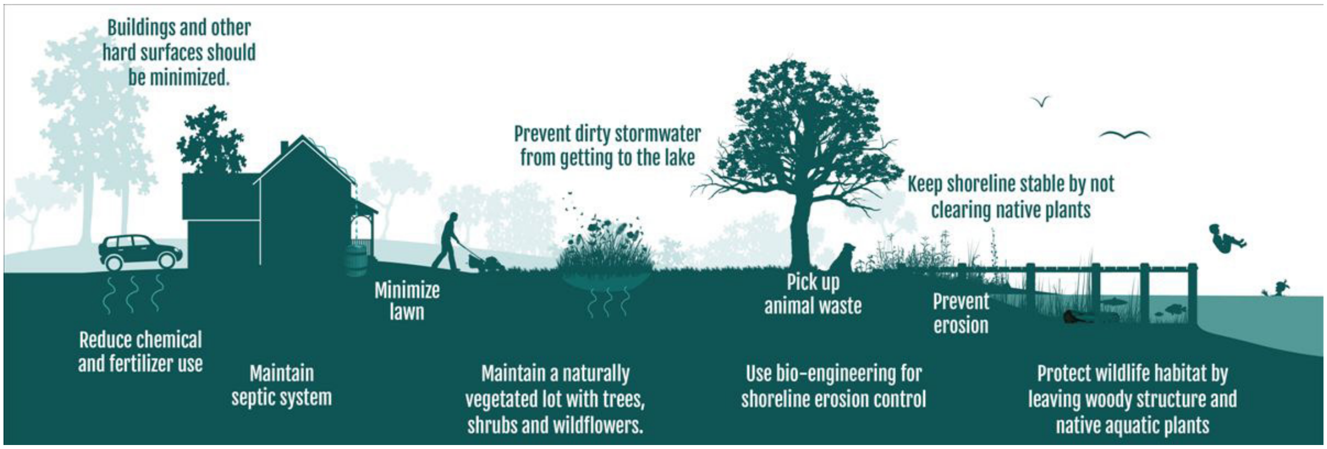


Figure 1. Cold-, cool-, and warmwater temperature ranges and examples of fish species that prefer each range. Fish illustrtions Joseph R. Tomelleri (9537)

Eurasian milfoil



Starry stonewort



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Lake Lansing Natural Shoreline Demonstration Project

The Charter Township of Meridian is pursuing a shoreline restoration project in Lake Lansing Park South. This demonstration project will restore the proposed developed shoreline to a natural state. The goal of the project is to educate residents on maintaining a natural shoreline to better protect Lake Lansing and create a healthier natural environment. The demonstration project will allow residents to see an example natural shoreline restoration project. Natural shorelines are beneficial in reducing nutrient runoff, limiting shoreline erosion and promoting habitat for various species of fish and animal life. Private shoreline restoration projects are strongly encouraged. For more information, please visit mishorelinepartnership.org.

Lake Lansing Plant Control Program

Lake Lansing's aquatic plant control program is overseen by the Lake Lansing Special Assessment District Advisory Committee and their environmental consultant, Progressive AE. The goal of the program is to prevent the spread of invasive species and maintain a healthy abundance of beneficial native plant species. Aquatic plant control on Lake Lansing involves a combination of selective herbicide applications and mechanical harvesting. In 2022, 140 acres of the lake were treated to control invasive Eurasian milfoil and curly-leaf pondweed growth while 56 acres of starry stonewort and nuisance native plants were harvested. A tentative schedule for plant control efforts on Lake Lansing in 2023 can be found on the right.

LAKE LANSING - 2023 TENTATIVE PLANT CONTROL SCHEDULE

Tentative Survey Date	Tentative Treatment Date	Harvesting	Description
May 8-12	May 22-25	-	Treatment focusing on milfoil and curly-leaf pondweed using systemic herbicides for mifoil, contact herbicides for curly-leaf
June 12-16	June 26-29	June 12-16	Treatment primarly focusing on milfoil. Harvesting of native plants and starry stonewort
July 17-21	July 31 - Aug. 3	-	Treatment primarily focusing on milfoil. Possible treatment of starry stonewort where not harvested
August 21-25	September 4-7	TBD if necessary	Treatment unlikely unless milfoil is an issue. Preferred plant control method at this time would be harvesting.

This schedule is tentative and most likely will vary dependent on weather and contractor schedules.

For more information regarding lakes, please visit:

michiganlakeinfo
michiganlakeinfo.com

Lake Lansing Special Assessment District Advisory Committee Newsletter

Summer 2023

Lake Lansing Special Assessment District Advisory Committee
c/o Meridian Charter Township
5151 Marsh Road
Okemos, MI 48864

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For the latest updates, be sure to check meridian.mi.us/government/boards-and-commissions/lake-lansing-advisory-committee

Environmental Consultant
Progressive AE

Lake Lansing SAD Advisory Committee Projects Over the Years

A Special Assessment District (SAD) for the protection and improvement of Lake Lansing was established in 1997 pursuant to provisions of Public Act 188 of 1954, as amended. In 2002, a management plan was prepared for Lake Lansing and its watershed. The Lake Lansing SAD Advisory Committee, whose members include representatives of residents within the SAD, Meridian Township, Ingham County Parks, and the Ingham County Drain Commissioner's Office, was established in 1998 and has managed several important projects over the years to protect Lake Lansing and maintain it as the valuable resource that we have come to know and love. You can find the latest updates at meridian.mi.us/government/boards-and-commissions/lake-lansing-advisory-committee. Over the last 25 years, water quality monitoring has been coordinated by the SAD Advisory Committee.

In addition to the management of exotic plants, the Advisory Committee has implemented many projects according to the watershed management plan (See website) to help filter pollutants and improve water quality. Additional activities of the Committee are provided on the following page.

Natural shoreline restoration demonstration project currently being installed at the south end of the Lake Lansing Park South county park.

Lake Lansing - Special Assessment District Advisory Committee Projects - Chronology

1997-1998 SAD established and SAD Advisory Committee formed with focus areas including: aquatic plant management, water quality, public awareness and education, land use, and water safety and recreational use.

1998 An aquatic plant management plan is approved to improve the overall condition of Lake Lansing's submersed aquatic plant community by addressing the proliferation of invasive exotic plants.

1998 Initial whole-lake fluridone treatment conducted to manage invasive exotic plants.

1999 Lake Lansing Watershed Management Plan developed and approved.

1999 Stormwater outfall (inlets to lake) water quality monitoring intitiated.

2002 Five-year assessment approved focusing on sediment reduction measures and plant control.

2006 Perry Road stormwater investigations and study.

2 **2007** Ten-year assessment approved, Marshall Park stormwater improvements to orphan drain at south end of Marshall Park on west side of Lake Lansing.

2009 Revised plant control program protocol established.

2013 Storm drain review of outfalls to Lake Lansing and report submitted

2014 Installation of bioswale at south end of Lake Lansing South Park to slow sedimentation and assimilate nutrients prior to discharging to Lake Lansing - also Perry Road catch basin improvements.

2015 High-defintion hydro-acoustic (SONAR) mapping of Lake Lansing to create more accurate mapping.

2015 Installation of filtration inserts on two catch basins along Perry Road.

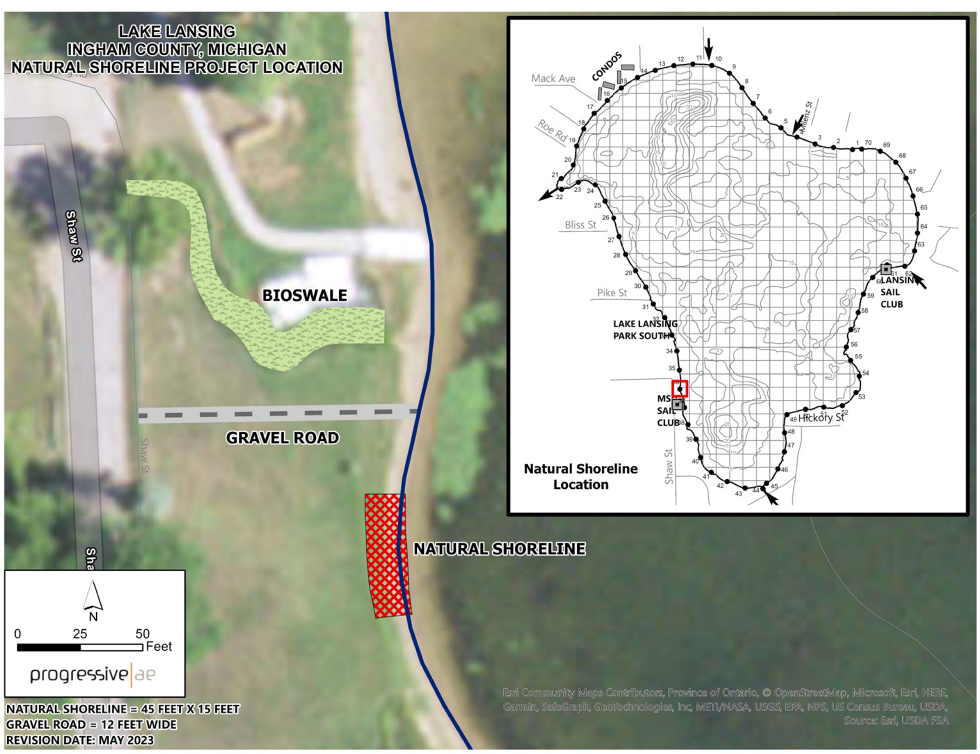
2016 Three additional filtration inserts installed at strategic catch basin locations.

2017 Ten-year assessment approved, informational accomplishments video created and put on website.

2021 Improvements to Nemoka Drain by Ingham County Drain Commissioner's office.

2022 Shoreline inventory determines that 76 percent of Lake Lansing's shoreline is heavily developed. Only 16 percent of Lake Lansing's shoreline is considered natural. Natural shorelines are vital to the Lake Lansing ecosystem as they help filter incoming water and provide critical habitat for aquatic organisms.

2023 Natural shoreline demonstration project begins immediately south of bioswale. This project will be an example for homeowners to visualize what a natural, bio-engineered shoreline might look like on their frontage.



Appendix B

Lake Lansing Natural Shoreline Sign

Lake Lansing Natural Shoreline Demonstration Project

You are looking at a natural shoreline restoration demonstration project. Natural shorelines can be engineered to replace hardened seawalls that are detrimental to a lake's ecosystem. Natural shorelines help reduce erosion and provide essential habitat for fish and wildlife. This project was funded by the Lake Lansing Special Assessment District and the Charter Township of Meridian and is being supported by the Ingham County Parks Department.

What is soft-engineering or bio-engineering?

Natural shorelines can be restored through soft-engineering or bio-engineering. These practices involve the use of live plants and natural structure. When selecting plant materials, it is important to use native, locally-grown plants to ensure successful establishment without the introduction of invasive species.

How do I know if a natural shoreline will work for my site?

A site assessment by a certified natural shoreline professional can help you determine if a natural shoreline restoration project is appropriate for your lakefront. Many variables such as wave energy potential (specific to your lakefront), slope (or run-up), soil types, and lake level controls, can contribute to the design of a natural shoreline. The more challenging the site, the more complex the solution is going to be. For more information on natural shorelines and bioengineering or to find a certified natural shoreline professional, visit the Michigan Natural Shoreline Partnership website at www.shorelinepartnership.org.