December

2024

WABEEK LAKE

PROGRAM REPORT

PREPARED FOR:
WABEEK LAKE IMPROVEMENT BOARD
OAKLAND COUNTY, MI

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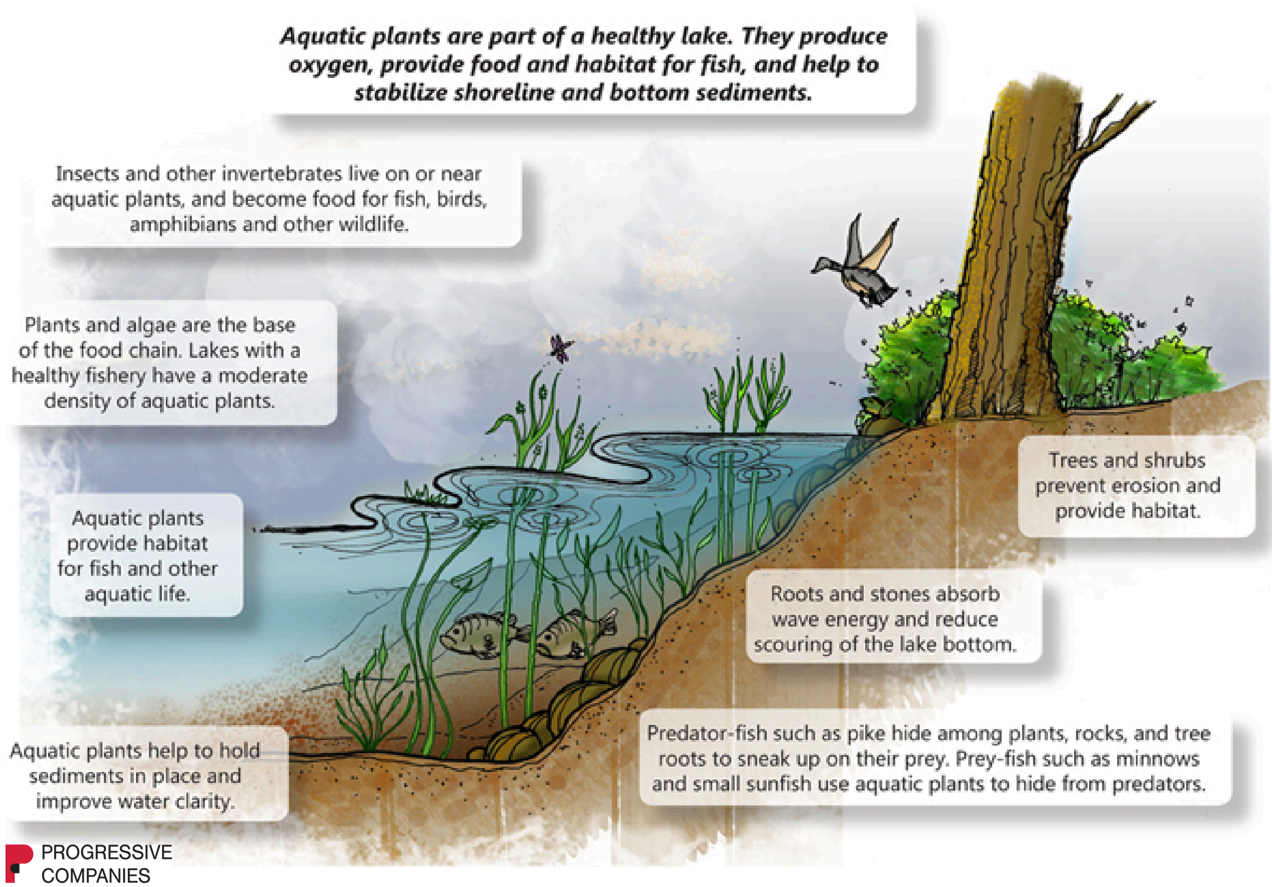
AQUATIC HERBICIDE APPLICATOR

Aqua-Weed Control, Inc.

PROGRAM SUMMARY

The primary objective of the plant control program is to prevent the spread of invasive aquatic plants while preserving beneficial native plant species. This report contains an overview of plant control activities conducted on Wabeek Lake in 2024.

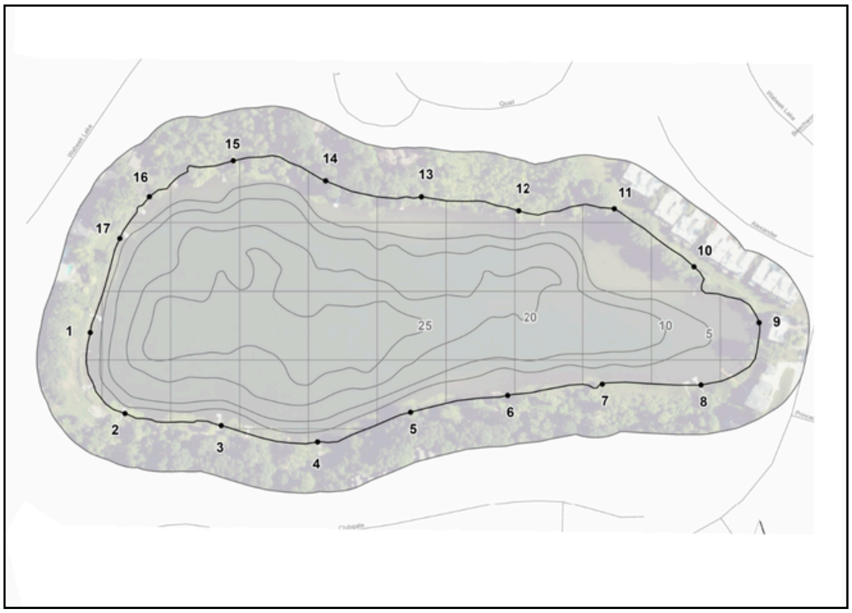


Aquatic plants are an important component of lakes. They produce oxygen during photosynthesis, provide food, habitat and cover for fish, and help stabilize shoreline and bottom sediments. There are four main aquatic plant groups: submersed, floating-leaved, free-floating, and emergent. Each plant group provides important ecological functions. Maintaining a diversity of native aquatic plants is important to sustaining a healthy fishery and a healthy lake. Invasive aquatic plant species have negative impacts to the lake's ecosystem. It is important to maintain an active plant control program to reduce the introduction and spread of invasive species within Wabeek Lake. Plant control efforts in 2024 consisted of two aquatic plant surveys and one herbicide application.

PLANT CONTROL

Plant control activities are coordinated under the direction of an environmental consultant, Progressive Companies. Scientists from Progressive conduct GPS-guided surveys of the lake to identify problem areas, and georeferenced plant control maps are provided to the plant control contractors. GPS reference points are established along the shoreline of the lake. These waypoints are used to accurately identify the location of invasive and nuisance plant growth areas.

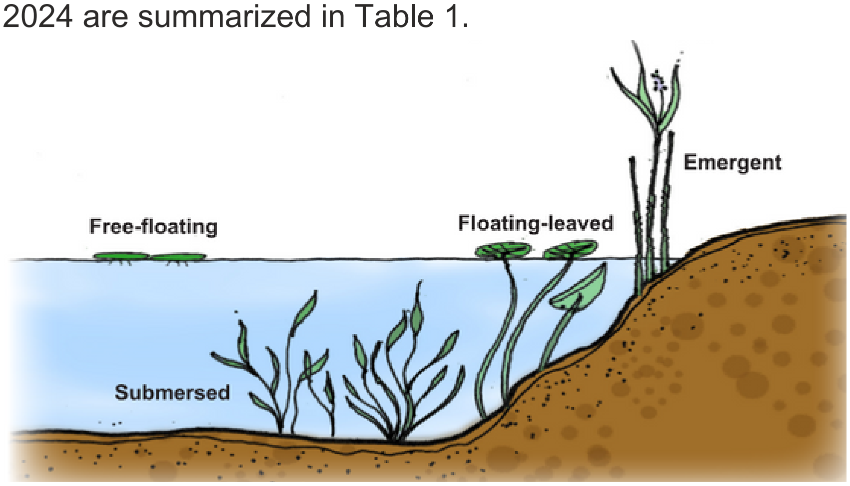
Eurasian milfoil
Myriophyllum spicatum



Purple loosestrife
Lythrum salicaria

Primary plants targeted for control in Wabeek Lake include Eurasian milfoil, purple loosestrife, and *Phragmites*. These plants are non-native (exotic) species that tend to be highly invasive and have the potential to spread quickly if left unchecked. Plant inventory data collected on the lake in 2024 are summarized in Table 1.

Phragmites australis



PLANT INVENTORY SURVEY

In addition to the surveys of the lake to identify invasive plant locations, a detailed vegetation survey of Wabeek Lake was conducted on July 31 to evaluate the type and abundance of all plants in the lake. The table below lists each plant species observed during the survey and the relative abundance of each. At the time of the survey, seven submersed species, two floating-leaved species, and five emergent species were found in the lake. Wabeek Lake has minimal diversity of beneficial, native plant species.

TABLE 1. WABEEK LAKE 2024 PLANT INVENTORY DATA

Common Name	Scientific Name	Group	Percentage of sites where present
Sago pondweed	*Stuckenia pectinata*	Submersed	71
Illinois pondweed	*Potamogeton illinoensis*	Submersed	71
Eurasian milfoil	*Myriophyllum spicatum*	Submersed	65
Coontail	*Ceratophyllum demersum*	Submersed	41
Curly-leaf pondweed	*Potamogeton crispus*	Submersed	29
Chara	*Chara* sp.	Submersed	12
Thin-leaf pondweed	*Potamogeton* sp.	Submersed	6
Yellow waterlily	*Nuphar* sp.	Floating-leaved	53
White waterlily	*Nymphaea odorata*	Floating-leaved	47
Swamp loosestrife	*Decodon verticillatus*	Emergent	71
Cattail	*Typha* sp.	Emergent	65
Purple loosestrife	*Lythrum salicaria*	Emergent	59
Phragmites	*Phragmites australis*	Emergent	24
Pickerelweed	*Pontederia cordata*	Emergent	18

Exotic invasive species

In 2024, a total of 4.5 acres of Wabeek Lake were treated with aquatic herbicides. Eurasian milfoil was treated with a combination of the systemic herbicide, ProcellaCOR, and contact herbicides for season-long control. Purple loosestrife and *Phragmites* were both treated with contact herbicides around the shoreline to keep from spreading around Wabeek Lake.

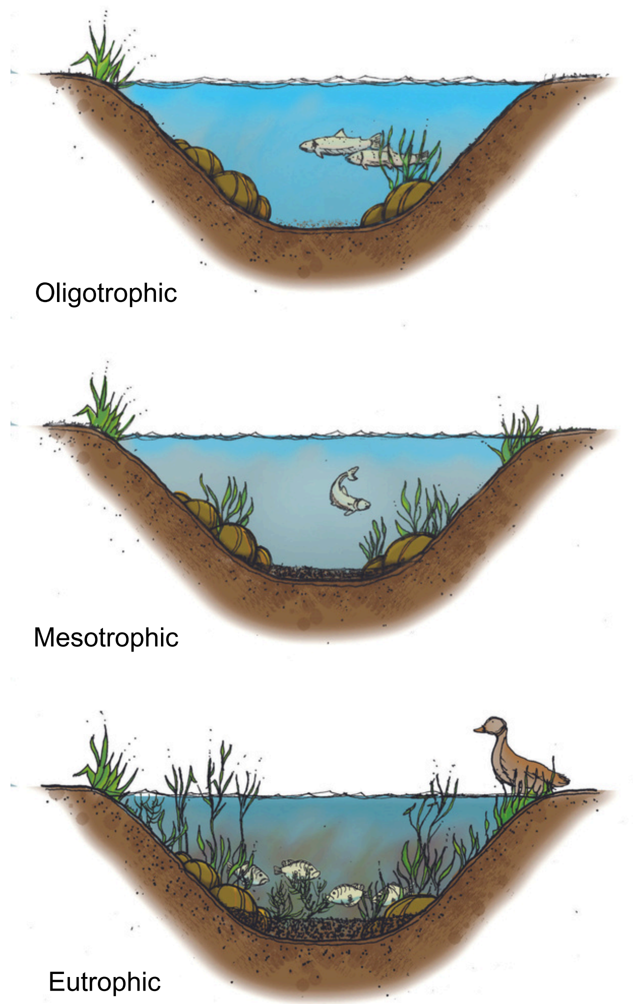
Continued use of systemic aquatic herbicides for Eurasian milfoil is recommended to reduce the population. Emergent invasive species should be treated to prevent their spread around the shoreline that can impede lake access and take over critical habitat.

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. 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 cold-water 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.

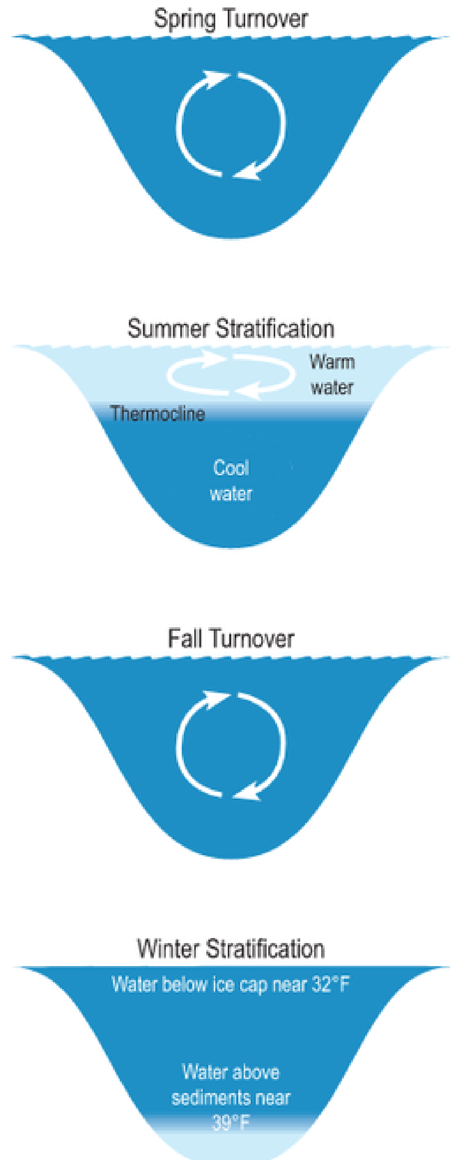
Under natural conditions, most lakes will ultimately evolve to a eutrophic state as they gradually fill with sediment and organic matter transported to the lake from the surrounding watershed. As the lake becomes shallower, the process accelerates. When aquatic plants become abundant, the lake slowly 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.



Lake classifications

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. 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.



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

Phosphorus is the nutrient that most often controls aquatic plant growth and the rate at which a lake ages and becomes more eutrophic. In the presence of oxygen, lake sediments act as a phosphorus trap, making it unavailable for aquatic plant and algae growth. If bottom-water oxygen is depleted, phosphorus will be released from the sediments and may be available to promote aquatic plant and algae growth. In some lakes, the internal release of phosphorus from the bottom sediments is the primary source of phosphorus loading.

By reducing the amount of phosphorus in a lake, it may be possible to limit the amount of aquatic plant and algae growth. In general, lakes with a phosphorus concentration greater than 20 µg/L (micrograms per liter, or parts per billion) are able to support abundant growth and are classified as nutrient-enriched or eutrophic.

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. 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 approximately 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.

Generally, 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 is shown in Table 1.

TABLE 1 - LAKE CLASSIFICATION CRITERIA

Lake Classification	Total Phosphorus (µg/L)*	Chlorophyll-*a* (µg/L)*	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

* µg/L = micrograms per liter = parts per billion

SAMPLING RESULTS AND DISCUSSION

Sampling results from 2021-2024 are provided in Tables 2 and 3. In July of 2024, Wabeek Lake was thermally stratified; the lake was warm and well-oxygenated at the surface, and was cool with low oxygen near the bottom. In 2024, total phosphorus concentrations were elevated in the bottom waters. 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 Wabeek Lake. pH and total alkalinity were generally within the moderate range for Upper Midwest lakes. There was a significantly high chlorophyll-*a* concentration during 2024 summer sampling. Suggesting a large abundance of algae present during the sampling event. This increased algae can use up a significant source of available phosphorus and could explain the reduced phosphorus levels compared to previous years.

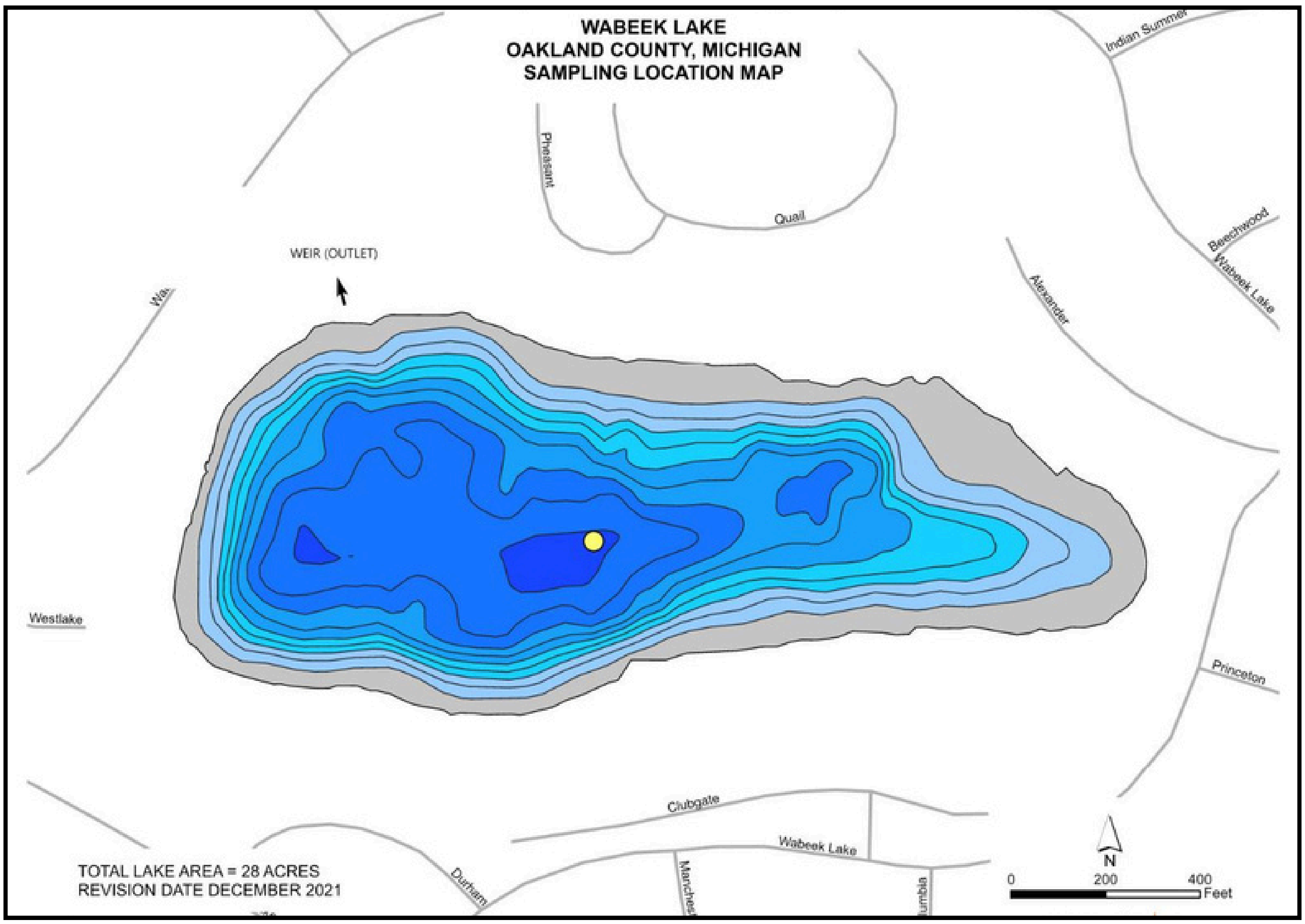


TABLE 2 - WABEEK LAKE 2021-2024 DEEP BASIN WATER QUALITY DATA

Date	Station	Sample Depth (feet)	Temperature (F)	Dissolved Oxygen (mg/L)*	Total Phosphorus (ug/L)*
28-Jul-21	1	1	80	8.7	19
28-Jul-21	1	13	73	2.3	40
28-Jul-21	1	25	48	0.0	127
8-Jun-23	1	1	73	12	<10
8-Jun-23	1	13	59	10	10
8-Jun-23	1	26	45	0.4	202
21-Aug-23	1	1	78	8.8	<10
21-Aug-23	1	13	72	5.7	<10
21-Aug-23	1	26	49	0.2	177
31-Jul-24	1	1	82	8.9	<10
31-Jul-24	1	13	74	0.4	14
31-Jul-24	1	26	53	0.2	61

TABLE 3 - WABEEK 2021-2024 SURFACE WATER QUALITY DATA

Date	Station	Secchi Transparency (feet)	Chlorophyll-*a* (ug/L)*
28-Jul-21	1	8.5	4
8-Jun-23	1	3.5	4
21-Aug-23	1	6.0	3
31-Jul-24	1	8.0	36

* mg/L = milligrams per liter = parts per million
* ug/L = micrograms per liter = parts per billion