November 2026

LAKE OAKLAND

WATER QUALITY & PLANT CONTROL SUMMARY

PREPARED FOR:
LAKE OAKLAND IMPROVEMENT BOARD
OAKLAND COUNTY, MI

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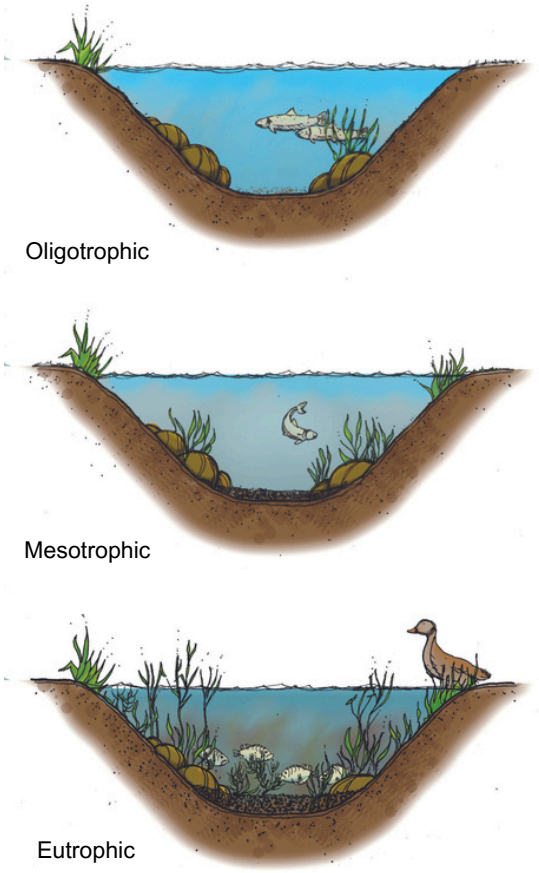


LAKE WATER QUALITY

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. Key parameters used to evaluate a lake's productivity or trophic state include total phosphorus, chlorophyll-*a*, and Secchi transparency.



Lake classification.

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.

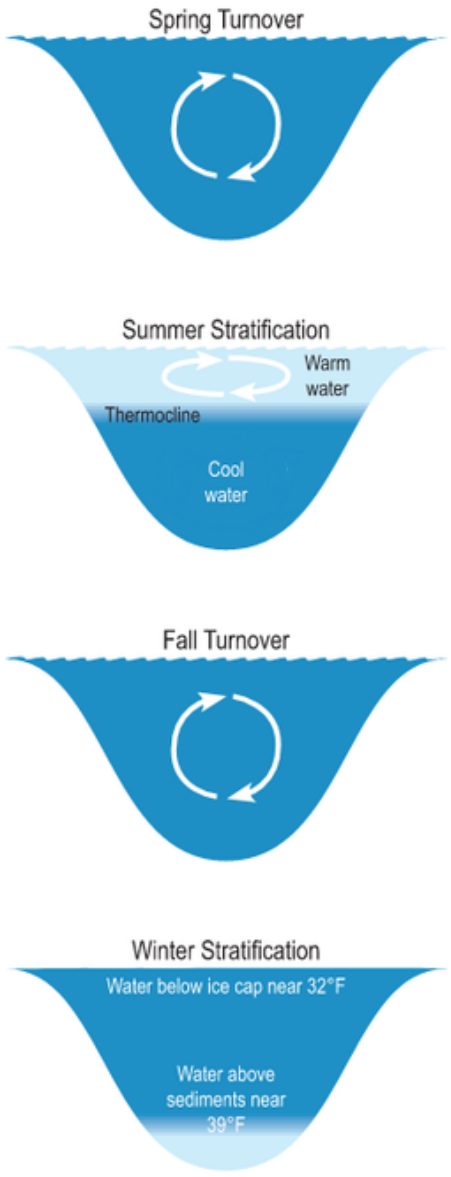
TABLE 1 - LAKE CLASSIFICATION CRITERIA

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

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.



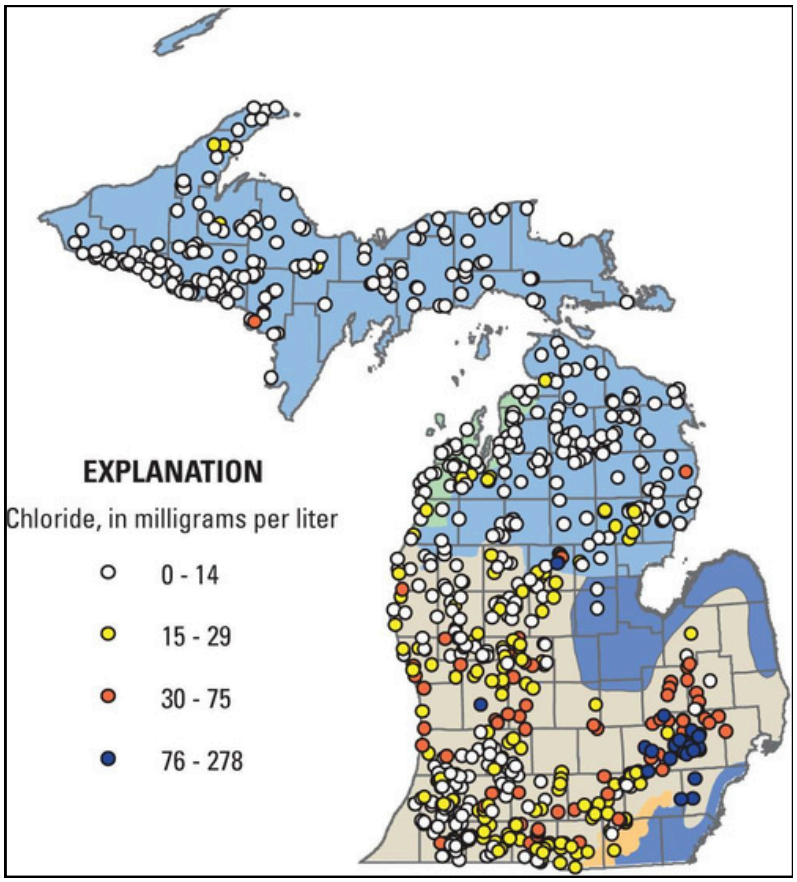
Seasonal thermal stratification cycles.

DISSOLVED OXYGEN

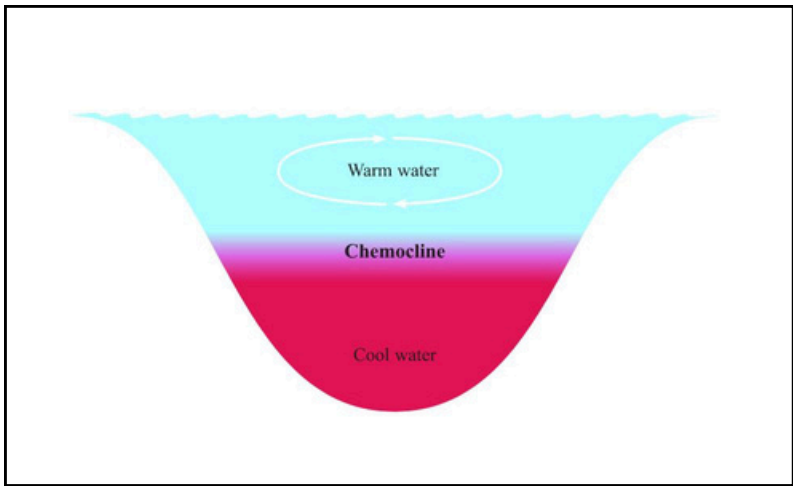
An important factor influencing lake water quality is the quantity of dissolved oxygen in the water column. The major inputs of dissolved oxygen to lakes are the atmosphere and photosynthetic activity by aquatic plants. An oxygen level of about 5 mg/L (milligrams per liter, or parts per million) is required 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.

CHLORIDE

Normally, chloride is a very minor component of freshwater systems and background concentrations are generally less than about 10 milligrams per liter (Wetzel 2001; Fuller and Taricska 2012, Figure 5). However, chloride pollution from sources such as road salting, industrial or municipal wastewater, water softeners, and septic systems can increase chloride levels in lakes. Increased chloride levels can reduce biological diversity and, because chloride increases the density of water, elevated chloride levels can prevent a lake from completely mixing during spring and fall. The U.S. Environmental Protection Agency's acute and chronic standards for protection of freshwater aquatic life are 860 and 230 milligrams per liter of chloride, respectively (USEPA 2021). EPA states that “[a]quatic life criteria for toxic chemicals are the highest concentration of specific pollutants or parameters in water that are not expected to pose a significant risk to the majority of species in a given environment or a narrative description of the desired conditions of a water body being 'free from' certain negative conditions."



Lake chloride levels (2001–10) in USEPA ecoregions. Fuller and Taricska 2012.



High chloride inputs can result in a chemocline, preventing lake mixing.

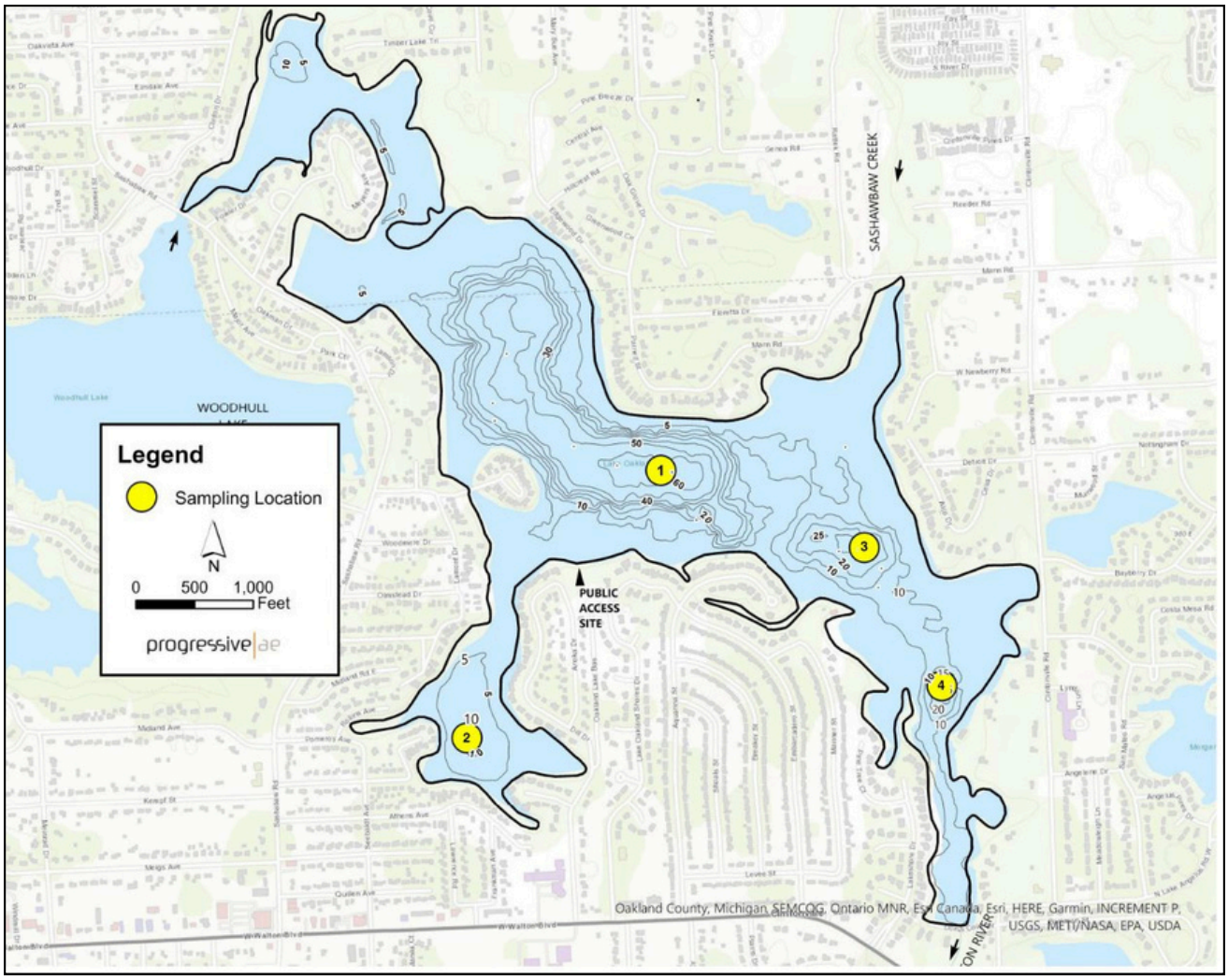
SAMPLING METHODS

Water quality sampling was conducted in the spring and summer of 2026 at four deep basins within Lake Oakland. Temperature and dissolved oxygen were measured using a YSI Prosolo ODO/T probe. Samples were collected at ten foot intervals with a Van Dorn bottle to be analyzed for total phosphorus and chloride. Samples were placed on ice and transported to Paragon Laboratories* for analysis. Total phosphorus and chloride were analyzed at Paragon Laboratories using Standard Methods procedures 4500-P B5+E and EPA 300.0, respectively. 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 Laboratories* using Standard Methods procedure 10200 H.

SAMPLING RESULTS AND DISCUSSION

Sampling results are provided in Tables 2 and 3. In March of 2026, sampling was conducted during spring turnover when water temperatures were cool and dissolved oxygen concentrations were high. During the September sampling period, Lake Oakland was thermally stratified; the lake was warm and well-oxygenated at the surface, and was cool with low oxygen near the bottom. In 2026, total phosphorus concentrations were generally low. Chlorophyll-*a* concentrations were moderate in March and below detection levels in September. Secchi transparency was moderate during both sampling events. Based on recent water quality data, Lake Oakland can be classified as mesotrophic. Chloride levels were elevated, but below the EPA threshold for risk to aquatic life, and within the expected range for an urban watershed in southeast Michigan.

* Paragon Laboratories, Inc., 12649 Richfield Ct, Livonia, MI 48150
* Prein and Newhof Laboratories, 3260 Evergreen Dr NE, Grand Rapids, MI 49525



Lake Oakland sampling location map.

TABLE 2 - LAKE OAKLAND 2026 DEEP BASIN WATER QUALITY DATA

Date	Station	Sample Depth (feet)	Temperature (F)	Dissolved Oxygen (mg/L)*	Total Phosphorus (µg/L)*	Chloride (mg/L)*
30-Mar-26	1	1	43	11.4	21	160
30-Mar-26	1	10	42	11.4	12	160
30-Mar-26	1	20	42	11.3	10	160
30-Mar-26	1	30	42	11.2	10	160
30-Mar-26	1	40	41	11.1	10	160
30-Mar-26	1	50	41	11.0	< 10	160
30-Mar-26	1	60	41	10.5	< 10	160
30-Mar-26	2	1	46	12.2	< 10	150
30-Mar-26	2	12	46	12.0	10	150
30-Mar-26	3	1	44	11.6	< 10	160
30-Mar-26	3	10	44	11.6	18	160
30-Mar-26	3	20	43	11.6	< 10	160
30-Mar-26	3	27	43	11.1	< 10	160
30-Mar-26	4	1	45	11.6	< 10	160
30-Mar-26	4	10	44	11.4	< 10	160
30-Mar-26	4	20	43	11.3	< 10	160
30-Mar-26	4	25	43	11.1	12	160
02-Sep-26	1	1	79	9.4	< 10	170
02-Sep-26	1	10	74	8.9	< 10	170
02-Sep-26	1	20	70	6.4	< 10	170
02-Sep-26	1	30	50	0.5	< 10	150
02-Sep-26	1	40	46	0.5	< 10	150
02-Sep-26	1	50	44	0.5	< 10	150
02-Sep-26	1	60	44	0.5	< 10	150
02-Sep-26	2	1	81	10.0	< 10	160
02-Sep-26	2	10	76	9.9	< 10	160
02-Sep-26	3	1	79	8.8	< 10	180
02-Sep-26	3	10	74	6.9	< 10	180
02-Sep-26	3	20	69	3.3	< 10	170
02-Sep-26	3	26	59	0.8	< 10	150
02-Sep-26	4	1	80	9.5	23	180
02-Sep-26	4	10	74	7.9	< 10	180
02-Sep-26	4	20	65	0.6	< 10	160
02-Sep-26	4	24	59	0.4	< 10	150

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

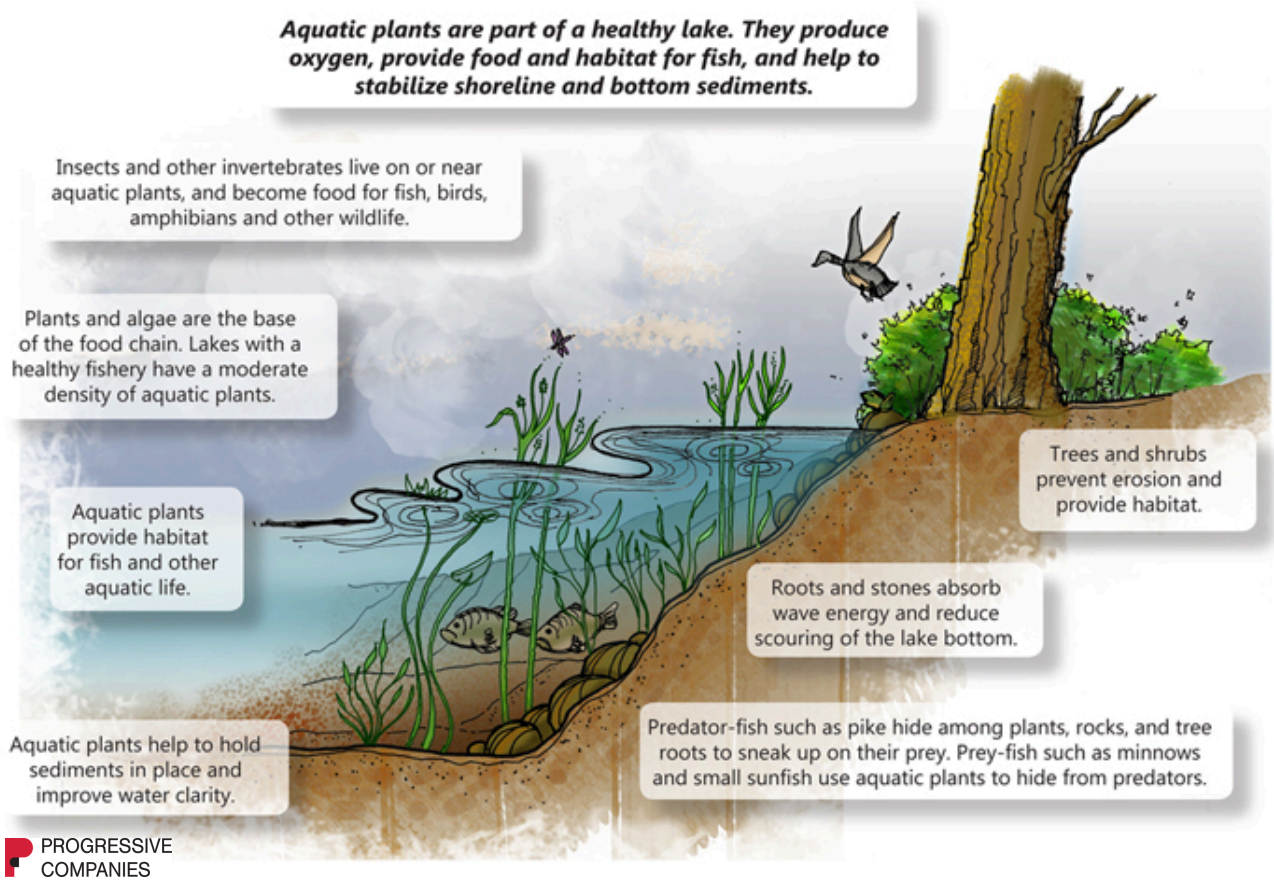
TABLE 3 - LAKE OAKLAND 2026 SURFACE WATER QUALITY DATA

Date	Station	Secchi Transparency (feet)	Chlorophyll-*a* (µg/L)*
30-Mar-26	1	12.0	2
30-Mar-26	2	6.5	3
30-Mar-26	3	9.0	2
30-Mar-26	4	9.0	ND*
02-Sep-26	1	9.0	ND*
02-Sep-26	2	8.0	ND*
02-Sep-26	3	9.0	ND*
02-Sep-26	4	9.0	ND*

* mg/L = milligrams per liter = parts per million
* µg/L = micrograms per liter = parts per billion
* ND = none detected

PLANT CONTROL PROGRAM SUMMARY

A nuisance aquatic plant control program has been ongoing on Lake Oakland for many years. The primary objective of the 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 Lake Oakland in 2026.



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 on the lake's ecosystem. It is important to maintain an active plant control program to reduce the establishment and spread of invasive species within Lake Oakland. Plant control efforts in 2026 consisted of five surveys, five aquatic herbicide applications, and one mechanical harvesting event.

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 contractor. GPS reference points are established along the shoreline and drop-off areas of the lake. These waypoints are used to accurately identify the location of invasive and nuisance plant growth areas.



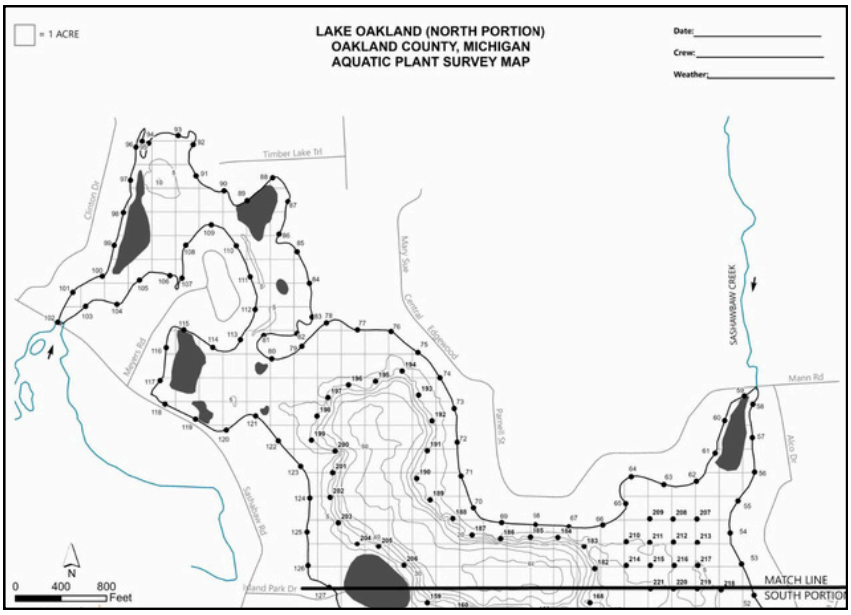
Eurasian milfoil
Myriophyllum spicatum



Curly-leaf pondweed
Potamogeton crispus



Starry stonewort
Nitellopsis obtusa



Primary plants targeted for control in Lake Oakland include Eurasian milfoil, curly-leaf pondweed, and starry stonewort. These plants are non-native (exotic) species that tend to be highly invasive and have the potential to spread quickly if left unchecked. Plant control activities conducted on the lake in 2026 are summarized in Table 4.

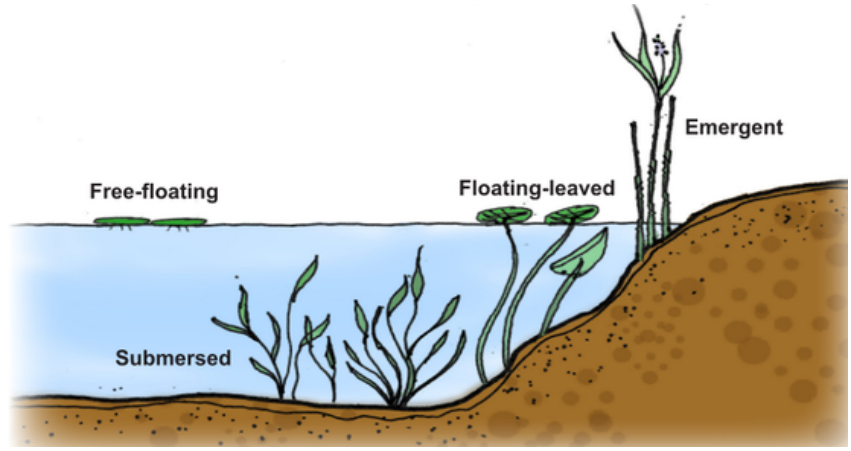


TABLE 4 - LAKE OAKLAND 2026 PLANT CONTROL ACTIVITIES

Date	Work Type	Plants Targeted	Acreage
May 6	Herbicide Treatment	Algae	20.00
May 12	Survey	NA	-
May 18	Herbicide Treatment	Non-native milfoil	112.25
June 8	Survey	NA	-
June 15	Herbicide Treatment	Non-native milfoil, starry stonewort, algae	40.50
July 13	Survey	NA	-
July 21	Herbicide Treatment	Non-native milfoil, starry stonewort, wild celery, algae, water lilies	67.25
August 12	Survey	NA	-
August 19	Herbicide Treatment	Non-native milfoil, starry stonewort, algae, water lilies	9.75
August 31	Harvesting	Nuisance natives, starry stonewort	30.75
September 2	AVAS Survey	NA	-
Total			**280.50**

In 2026, 249.75 acres of Lake Oakland were treated with aquatic herbicides throughout the season. Non-native milfoil was treated with a combination of contact and systemic herbicides. Nuisance algae were treated with copper products. Wild celery and starry stonewort were treated with a combination of contact herbicides and copper products. Water lilies were treated in July and August in select areas to open up navigational lanes. A total of 30.75 acres of mechanical harvesting was performed on the lake. Harvesting addressed nuisance native growth areas as well as some starry stonewort to improve navigation around the lake.

Non-native milfoil did not respond well to herbicide applications as compared to previous seasons. In 2025, non-native milfoil samples were collected and sent to Montana State University for genetic testing. The non-native milfoil found within Lake Oakland is also found in Orchard, Upper Straits, and Island Lakes. This strain of milfoil has been characterized as having poor growth qualities, which could be a factor in its lack of herbicide response as it may not uptake as much herbicide as compared to other genetic strains of non-native milfoil. Higher dosing of select herbicides will need to be utilized to achieve better control.

Wild celery continues to be a management priority on Lake Oakland. The nuisance native plant has become problematic for boating and recreation along most of the eastern and northeast shores and shallows. Due to its robust physical characteristics and permitting limitations, control with aquatic herbicides is difficult to achieve. A combination of aquatic herbicide use in the early summer to keep growth relatively low and mechanical harvesting in late summer to open navigational areas and remove biomass should continue. The shallow flats along the east and northeast sections of Lake Oakland are heavily utilized by boaters. To reduce fragmentation and uprooting of wild celery and other nuisance native plants, boaters are encouraged to operate at no-wake speeds within areas that are less than 10 feet deep.

HARVEST REPORT

Table 5 below includes the harvest load data from 2018 through 2026. In 2026, the total volume harvested (cubic yards) and the yield per acre were increased from 2025, despite a decrease in total acres harvested. This ratio is indicative of the robust plant growth observed in 2026 as well as the timing of the harvest. By delaying the harvest from July to late August, harvesters removed additional biomass generated during the peak growth period in late summer. The delay was partly a function of increased demands on the harvesting contractor in 2026.

TABLE 5 - LAKE OAKLAND 2018-2026 HARVESTING LOAD REPORTS

Year	Date(s)	Total Area (acres)	Yield (cu yds)	Yield (tons)	Cubic yards/acre
2018	June 11-18	39.00	30	1.20	0.75
2019	July 19-26	35.00	350	14.00	10.00
2020*	July 5-12, September 6-14	72.25	370	14.80	5.00
2021	June 28-July 8, August 25-31	54.00	510	20.40	9.50
2023+	July 10-14, August 28-31	37.75	680	28.00	18.00
2024	July 15-19, September 2-6	60.00	1,191	35.75	19.75
2025	July 14-17	33.25	220	6.60	6.50
2026	August 31 - September 3	30.75	380	15.20	12.00

**Start of second harvest*
+No second load report (yield total for first harvest)

PLANT INVENTORY SURVEY

In addition to the surveys of the lake to identify invasive plant locations, a detailed vegetation survey of Lake Oakland was conducted on September 2 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, 15 submersed species, two floating-leaved species, and six emergent species were found in the lake. Lake Oakland maintains a good diversity of beneficial native plant species.

TABLE 6 - LAKE OAKLAND 2026 PLANT INVENTORY DATA

Common Name	Scientific Name	Group	Percentage of sites where present
Chara	*Chara* sp.	Submersed	89
Wild celery	*Vallisneria americana*	Submersed	75
Starry stonewort	*Nitellopsis obtusa*	Submersed	35
Eurasian milfoil	*Myriophyllum spicatum*	Submersed	35
Illinois pondweed	*Potamogeton illinoensis*	Submersed	31
Richardson's pondweed	*Potamogeton richardsonii*	Submersed	15
Thin-leaf pondweed	*Potamogeton* sp.	Submersed	10
Large-leaf pondweed	*Potamogeton amplifolius*	Submersed	5
Bladderwort	*Utricularia vulgaris*	Submersed	4
Water stargrass	*Heteranthera dubia*	Submersed	3
Flat-stem pondweed	*Potamogeton zosteriformis*	Submersed	3
Sago pondweed	*Stuckenia pectinata*	Submersed	3
Variable pondweed	*Potamogeton gramineus*	Submersed	2
Coontail	*Ceratophyllum demersum*	Submersed	2
Slender naiad	*Najas flexilis*	Submersed	1
White waterlily	*Nymphaea odorata*	Floating-leaved	50
Yellow waterlily	*Nuphar* sp.	Floating-leaved	12
Cattail	*Typha* sp.	Emergent	8
Swamp loosestrife	*Decodon verticillatus*	Emergent	6
Purple loosestrife	*Lythrum salicaria*	Emergent	4
Pickerelweed	*Pontederia cordata*	Emergent	2
Lake sedge	*Carex lacustris*	Emergent	1
Iris	*Iris* sp.	Emergent	1

Exotic invasive species