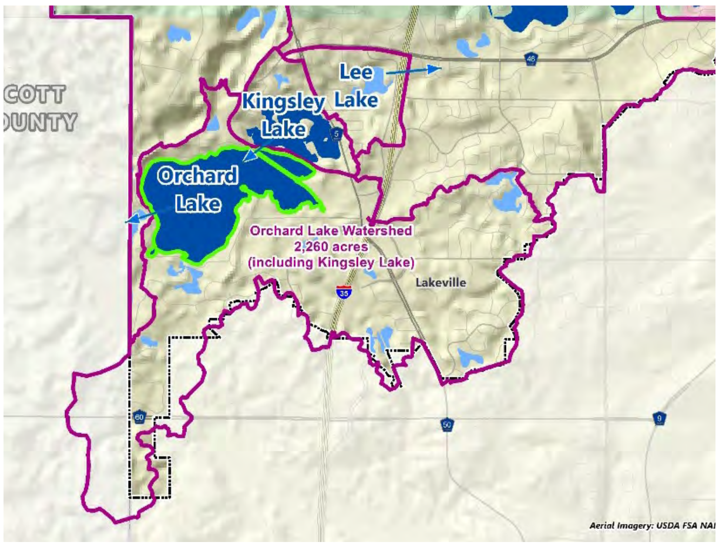
Orchard Lake 2024 Management Level Monitoring



The Black Dog Watershed Management Organization (BDWMO) performs monitoring of its strategic waterbodies on a 5-year rotating basis. BDWMO monitored Orchard Lake in 2024. Monitoring results presented in this report include:

- Water chemistry:
  - Phosphorus
  - Chlorophyll-*a*
  - Secchi Disc Transparency
  - Chloride
- Phytoplankton (algae)
- Water levels
- Aquatic Plants

About Orchard Lake

BDWMO Classification	Strategic waterbody
MDNR ID number	19-0031P
Watershed Area	2,260 acres
Lake Area	243 acres
Average Depth	10 feet
Maximum Depth	33 feet
Ordinary High Water Level	977.6 feet
Normal Water Level	--
100-year Flood Level	979.1 feet
Downstream Resource	Credit River
Location (city)	Lakeville
Public Access	Three city parks
MPCA Classification	Deep lake
MPCA Impairments	Mercury in fish tissue
Aquatic Invasive Species	Curly-leaf pondweed Eurasian watermilfoil

Summary and Recommendations

- Continued good water quality; phosphorus, chlorophyll-*a*, and Secchi disc transparency better than MPCA standards
- Secchi disc transparency has a worsening trend that is not reflected in other parameters
- Chloride is near, but generally below, Minnesota water quality standards
- Low amount of phytoplankton (algae) in summer; algal community includes desirable green algae
- Submergent plant community is diverse; non-native invasive curlyleaf pondweed and Eurasian watermilfoil are present and managed by the City
- Recommend continued water quality monitoring and trend analysis, aquatic plant monitoring and invasive species management, and implementation of stormwater best management practices in the watershed as opportunities allow

Introduction

Orchard Lake is a deep lake that lies in the northwest portion of the City of Lakeville. Orchard Lake receives runoff from a 2,260 acre watershed that includes Kingsley Lake. Orchard Lake discharges west towards the Credit River through Murphy-Hanrahan Park Reserve.

The Orchard Lake watershed includes a mix of land uses including residential, commercial, institutional, park, golf course, and some undeveloped areas. Overall, land use is low density, but includes areas along the Interstate 35 corridor that have undergone recent redevelopment.

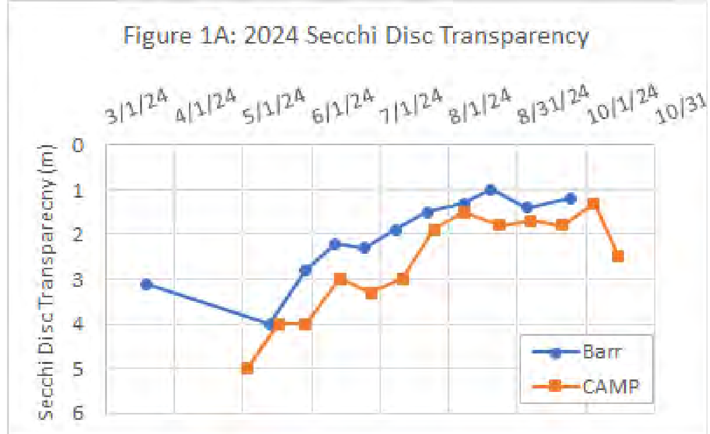
The lake is used primarily for fishing, but swimming, boating, and aesthetic and wildlife viewing are also popular recreational uses. Over seventy private homes are located on the lake. Three city parks are located on Orchard Lake: a public boat access on the south shore (Orchard Lake Park), a public beach on the west shore (Orchard Lake Beach), and Wayside Park.

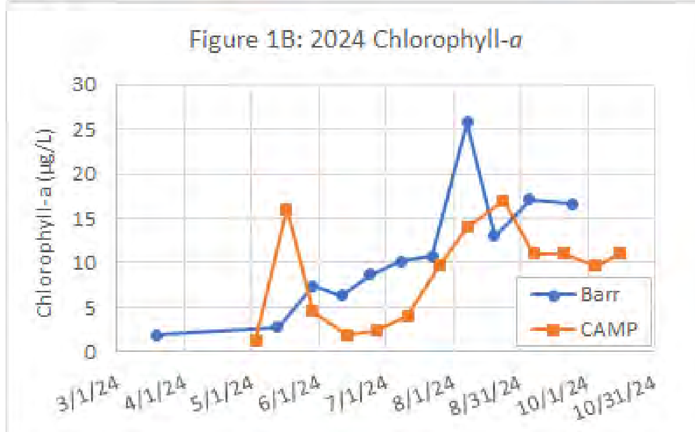
2024 Water Quality Monitoring

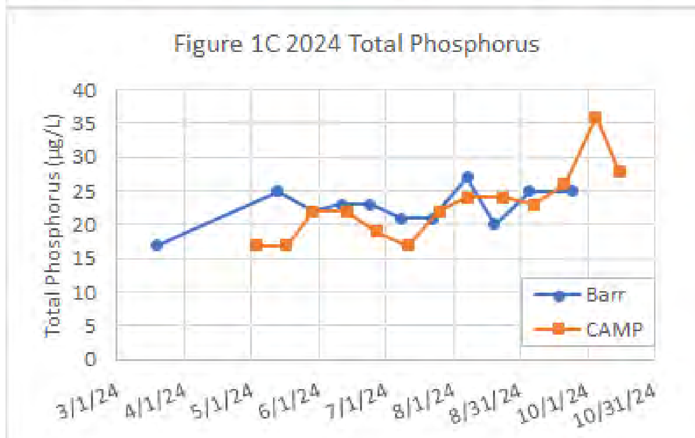
Water quality monitoring performed by BDWMO in 2024 included eleven sampling events between March and September. Measured parameters included:

- Secchi disc transparency
- Chlorophyll-*a*
- Total phosphorus
- Chloride
- Field parameters including:
    - Temperature
    - Dissolved oxygen
    - Specific conductivity
    - pH

City staff also collected water samples in 2024 through the Metropolitan Council's Community Assisted Monitoring Program (CAMP). Results of 2024 BDWMO and CAMP water quality monitoring are presented in Figure 1A through 1C. Data collected in 2024 show low concentrations of total phosphorus and chlorophyll-*a* in the spring. Chlorophyll-*a* concentrations generally increased throughout the growing season, including a spike in early August. This parallelled a decrease in Secchi disc transparency. However, concentrations of total phosphorus remained low throughout 2024 monitoring. The CAMP data is generally consistent with data collected by the BDWMO.







Aquatic plant growth in Orchard Lake observed during the August 19, 2024 water quality sampling event.

Figure 2A. Orchard Lake June-Sept. Secchi Disc Transparency

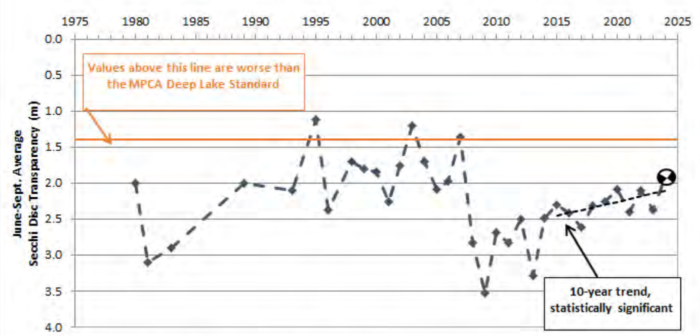


Figure 2B. Orchard Lake June-Sept. Average Chlorophyll *a*

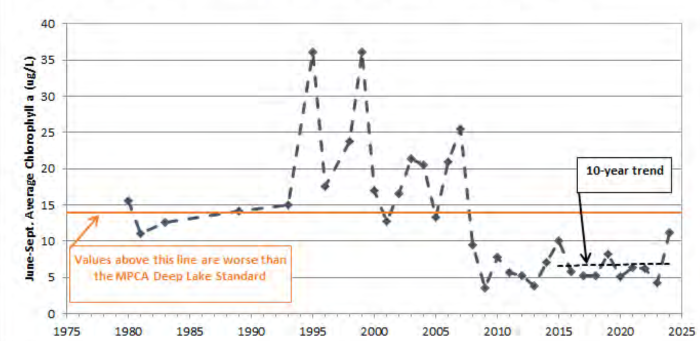
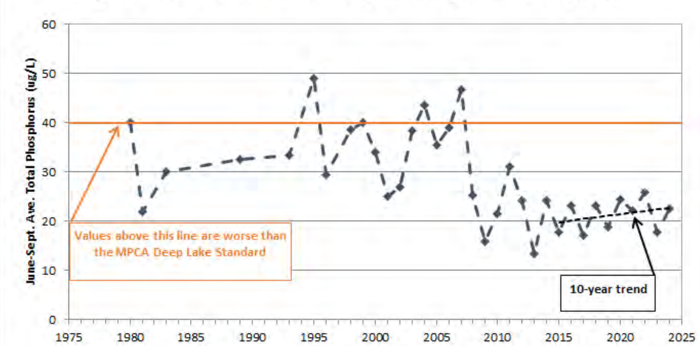


Figure 2C. Orchard Lake June-Sept. Average Total Phosphorus



Parameter	MPCA Standard	BDWMO Goal	2025-2024 June-Sept Average
Secchi Disc Transparency (m)	1.4	2.5	2.3*
Chlorophyll-a (µg/L)	12	6.2	6.8
Total Phosphorus (µg/L)	40	21	21.3

* Secchi disc transparency exhibits a mild declining trend that is statistically significant at a 90% confidence level.

Summer Averages of Water Quality

The 2024 summer (June-September) averages of water quality parameters were calculated for Orchard Lake and plotted with previous years' summer averages (Figure 2).

Orchard Lake's water quality remained good in 2024, and summer averages of total phosphorus (23µg/L), chlorophyll-*a* (11 µg/L), and Secchi disc transparency (1.9 meters [6.2 feet]) were all better than deep lake water quality standards. Orchard Lake monitoring activities in 2024 included management level monitoring as well as routine CAMP level monitoring. Summer average phosphorus concentrations over the past 10 years show annual variability and fluctuate around 20 ug/L, well below the standard of 40 ug/L for deep lakes.

While the 2024 summer average of phosphorus was comparable to or better than other recent years, the summer average of chlorophyll-*a* was the highest observed since 2007 and Secchi disc transparency was the lowest observed since 2007. Summer average chlorophyll-a data show no significant trend over the past 10-years and the higher values (relative to recent years) observed in 2024 may be an aberration.

Summer average Secchi disc transparency data exhibit decreasing (i.e., worsening) trend over the 2015-2024 period. The trend is mild but statistically significant at the 90% confidence level. No statistically significant trend was observed in summer average total phosphorus concentrations. The lack of trends in the chlorophyll-*a* and total phosphorus data suggest that factors might be affecting changes in transparency that are not directly related to changes in the lake's trophic state (e.g., the presence of dissolved organic carbon, subjectivity in reading the Secchi disc). Continued regular monitoring and trend analysis are recommended to assess whether the trend is indicative of a change in Orchard Lake's trophic state or just variability resulting from other factors.

With the addition of the 2024 data, summer averages of water quality parameters in Orchard Lake have been consistently better than the applicable state water quality standards for the last seventeen years (2008-2024). The BDWMO will continue to monitor the water quality of Orchard Lake in in 2025 via CAMP monitoring and management level monitoring scheduled for 2029.

Chlorides

Chloride concentrations in area lakes have increased since the early 1990s largely due to increased use of road salt in winter. Because high chloride concentrations can harm fish and plant life, the MPCA has established maximum chloride standards. A lake is considered impaired if two or more measurements exceed the chronic standard (230 mg/L) within a 3-year period or if one measurement exceeds the maximum standard (860 mg/L).

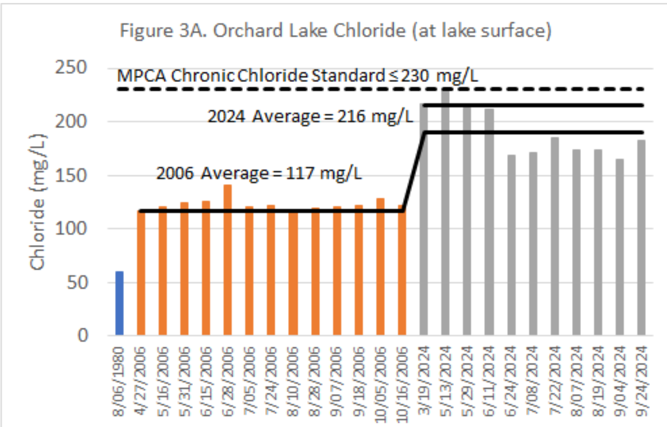


Figure 3A. Orchard Lake Chloride (at lake surface)

Chloride was measured near the lake surface and at the lake bottom in Orchard Lake on several occasions in 2024, 2006, and once in 1980. Data from the lake surface illustrates an increase in average chloride concentrations over that time (Figure 3A). One chloride sample exceeded the chronic standard in 2024, although the average lake bottom chloride concentration of 216 mg/L was below the chronic standard.

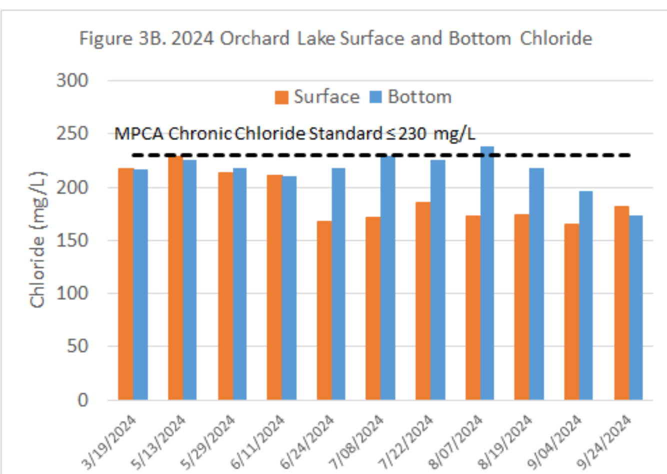


Figure 3B. 2024 Orchard Lake Surface and Bottom Chloride

Surface and bottom chloride concentrations in 2024 were similar through early June and again in September. Bottom chloride samples were consistently higher than surface samples in the interim, during which time Orchard Lake was thermally stratified (Figure 3B).

Phytoplankton (Algae)

Phytoplankton, or algae, are small aquatic plants naturally present in lakes. Phytoplankton derive energy from the sun through photosynthesis and provide food for several types of aquatic organisms, including zooplankton (microscopic animals), which are eaten by fish. Excess phytoplankton can reduce water clarity while low numbers of phytoplankton can negatively impact zooplankton, and consequently, fish populations.

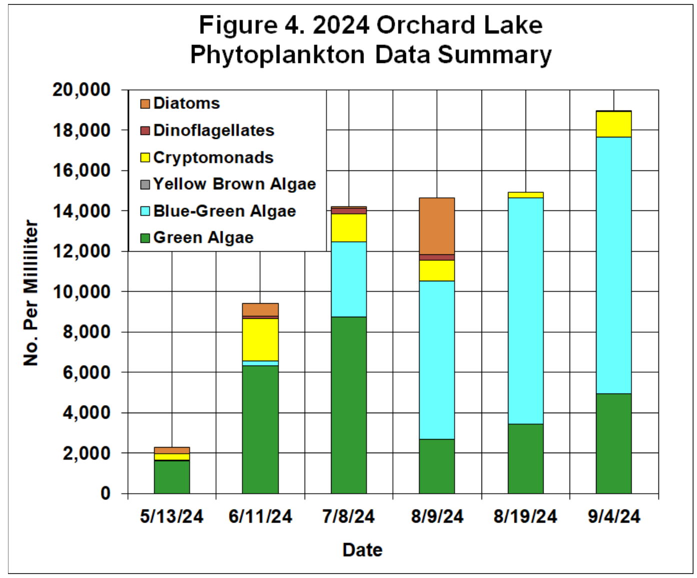


Figure 4. 2024 Orchard Lake Phytoplankton Data Summary

Figure 4 summarizes the number and major groups of phytoplankton observed in Orchard Lake in 2024. Phytoplankton numbers were very low in May. The numbers increased from June through September but remained low to moderate, generally reflecting the lake's good water quality.

Green algae were dominant from may until early July. Green algae are a good source of food for zooplankton and are indicative of healthy aquatic ecosystems. Blue-green algae, diatoms, and cryptomonads were also present in smaller numbers.

Blue-green algae numbers exceeded all other algae types during the August and September sampling events. Blue-green algae thrive in warm, nutrient-rich water and can grow rapidly under certain conditions, causing "blooms." Blue-green algae can produce algal toxins that may be harmful to humans and animals and are also a poor-quality food for zooplankton.

Harmful Algal Blooms

During algal blooms, some blue-green algae (cyanobacteria) can produce toxins that can be harmful to humans and animals if ingested. Such algal blooms can occur rapidly under specific aquatic conditions (e.g., high temperatures). Not all blue-green algae produce toxins and laboratory testing is necessary to determine the presence and concentration of algal toxins in lake water.

BDWMO residents should look to their respective Cities for information and communications regarding harmful algal blooms and associated public health guidance (such as beach closures or bodily contact warnings). Additional information is available from the MPCA and MDH.

Macrophytes (Aquatic Plants)

The BDWMO assesses the health of a lake's submerged aquatic plant community based on the number of species present and the "quality" of the species as measured by the Floristic Quality Index (FQI). The FQI considers the number of different species and the sensitivity of each species to disturbance (referred to as a "C-value"). Higher C-values and FQI indicate better lake health. The BDWMO established goals for the number of native species and FQI of strategic waterbodies.

Parameter	BDWMO Goal	2024 Results
Floristic Quality Index (submergent zone)	≥17.8	26.2
Native Species (submergent zone)	≥11	19

Nineteen aquatic plant species were identified in the submergent zone in 2024, including 17 native species and two non-native aquatic invasive species. The 2024 survey found aquatic plants growing in depths of up to 16 feet.

Aquatic Invasive Species

Curly-leaf pondweed (CLP) was found at 41% of sampling points in May, 2024, following a CLP treatment of about 15 acres performed on April 23. In July, 2025, CLP was observed at 1% of sampling points. CLP often out-competes native vegetation early in the growing season and dies off in early to mid-summer, which releases nutrients into the water that can produce algal blooms and create turbid water conditions. The presence of CLP in Orchard Lake can impact the lake's water quality. This impact has been mitigated through regular CLP treatments performed by the City of Lakeville (from 2004 through 2024).

Eurasian watermilfoil (EWM) can create dense, nuisance growths at the lake surface, and have a negative impact on recreational activities and may also crowd out native plant species. EWM was found at 23% of sampling points in May, 2024, and 52% of sampling locations in July, 2024. The City of Lakeville periodically treats EWM in Orchard Lake but no treatments were performed in 2024.

Native Species

Of the 17 native species present in Orchard Lake, coontail and flatstem pondweed were the most dominant and were observed at 36% and 50% of sampling stations, respectively .

Coontail (*Ceratophyllum demersum*)

Flatstem Pondweed (*Potamogeton zosteriformis*)

Fisheries

A [standard fish survey](#) was most recently conducted on Orchard Lake in 2022 (and previously in 2012). Targeted surveys for were performed annually from 2015 through 2017 for gamefish and gamefish prey. The Minnesota Department of Natural Resources stocks Orchard Lake biennially with tiger muskellunge. Previous walleye stocking efforts have been unsuccessful and were discontinued in 2015.

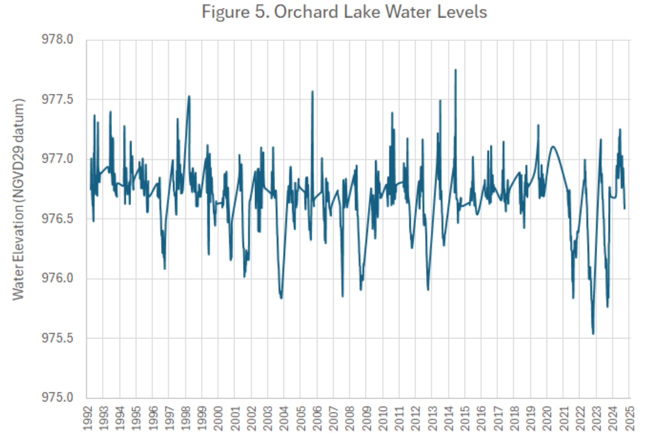
The 2022 survey found bluegill sunfish to be the dominant fish species; hybrid, pumpkinseed, and green sunfish were also present in moderate numbers. Largemouth bass, which prey on bluegill, were the most prevalent game fish. Northern pike, tiger muskellunge, and walleye were also observed in the 2022 survey. Other species observed in the 2022 survey include black and yellow bullhead, yellow perch, and black crappie.

Orchard Lake is listed by the Minnesota Pollution Control Agency as impaired due to concentrations of mercury in fish tissue. To mitigate this risk, the Minnesota Department of Health as published [Fish Consumption Guidance](#).

Water Levels

Orchard Lake drains towards Murphy-Hanrahan Park Reserve over a weir at an elevation of approximately 976.6 feet (NGVD29). Water elevations have been measured dating back to 1992, although there are some gaps in the record (Figure 5). Orchard Lake water levels have been relatively stable, fluctuating within 2.5 feet from a low of about 975.5 feet in late 2022 to a high of about 977.8 feet in 2014.

Figure 5. Orchard Lake Water Levels



Water levels in Orchard Lake over the past 15 years reflect the local climatic record. Water levels remained high during most of the 2010-2019 decade (the wettest decade on record) before decreasing to the lowest recorded elevations during a period of drought that occurred from approximately 2020 through 2024 (although less severe in 2024).

Management Recommendations

Orchard Lake continues to demonstrate excellent water quality that meets applicable state standards for transparency, chlorophyll-*a*, and total phosphorus. Based on the 2024 monitoring results, Barr Engineering Co. (Barr) staff recommend that the BDWMO and/or the City perform the following management actions:

- Continue CAMP water quality monitoring annually.
- Continue to monitor trends to determine if the worsening transparency represents a change in Orchard Lake's trophic state.
- Perform BDWMO management level monitoring in 2029.
- Continue aquatic vegetation monitoring and curlyleaf pondweed management.

Ways to Get Involved

Because runoff from stormwater can be generated anywhere, anyone in the watershed can help protect ponds and lakes through their own actions!

The Dakota County Soil and Water Conservation District also offers the Landscaping for Clean Water program which includes free educational classes, garden design courses, natural shoreline and garden maintenance workshops, and grants for homeowners that install a raingarden, native garden, or native shoreline planting.

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