Item 5Ciii.
BCWMC 7-17-25

Westwood Lake

2024 Water Quality Monitoring



The Bassett Creek Watershed Management Commission

Stewardship of the Ȟaȟá Wakpádaŋ/Bassett Creek Watershed
to improve ecosystem health and reduce flood risk

The Bassett Creek Watershed Management Commission (BCWMC) has monitored water quality conditions in the watershed's 10 priority lakes since 1972. This monitoring is performed to detect changes or observe trends in water quality, inform pollution modeling and studies, and target future projects and programs. A summary of 2024 monitoring efforts on Westwood Lake is provided below.

At a glance: 2024 monitoring results

In 2024, the BCWMC monitored Westwood Lake for the following:

- Water chemistry (nutrients, chlorophyll a, chloride)
- Water clarity and dissolved oxygen
- Phytoplankton and zooplankton (microscopic plants and animals)
- Macrophytes (aquatic plants)

Results of 2024 monitoring show that Westwood Lake met the applicable Minnesota Pollution Control Agency (MPCA) and BCWMC water quality standards for chlorides, Secchi disc (a measure of clarity), total phosphorus, and chlorophyll a. Trend analyses show no significant changes in Secchi disc measurements, total phosphorus, or chlorophyll a over the past 10 years. Other results include::

- The number of plant species observed in the lake was better than the Minnesota Department of Natural Resources (MNDNR) Plant Index of Biotic Integrity (IBI) threshold in both June and August.
- Floristic Quality Index (FQI) values, a measure of plant species quality, were better than the MNDNR Plant IBI threshold in June but poorer than the threshold in August.
- Aquatic invasive species (AIS) observed in 2024 were curly-leaf pondweed (CLP), purple loosestrife, reed canary grass, and narrow-leaved cattail. CLP was problematic in 2024 due to its increased frequency in presence and increased density of plants.
- The 2024 phytoplankton summer average was higher than summer averages from 2018 and 2021, but within the range of averages observed since 1982, and was consistent with good water quality.
- Although 2024 zooplankton numbers were within the range observed since 1982, the 2024 summer average was higher than summer averages from 1993 to 2021, indicating increased food availability and/or decreased predation in 2024.
- The results of an AIS suitability analysis indicate that the water quality of Westwood Lake meets the suitability requirements for rusty crayfish, faucet snail, zebra mussel, and starry stonewort, but only partially meets the suitability requirements for spiny waterflea and Chinese mystery snail.

About Westwood Lake

BCWMC classification	Priority-1 shallow lake
Watershed area	463 acres
Lake size	38 acres
Average depth	4.2 feet
Maximum depth	6 feet
Ordinary high water level	887.8 feet (NGVD29)
Normal water level	887.6 feet (NAVD88)
Downstream receiving waterbody	Main stem of Ḣaȟá Wakpádaŋ/ Bassett Creek
Location (city)	St. Louis Park
MPCA impairments	None
Aquatic invasive species	Curly-leaf pondweed, purple loosestrife, reed canary grass, narrow-leaved cattail
Public access	Yes (canoe access in park)



Recommendations

- Management of CLP is recommended to protect the water quality of Westwood Lake.
- Continue to provide education and information to the Westwood Hills Nature Center and lake users to reduce the chance of AIS introduction.
- Continue water quality and biological monitoring at a 3-year frequency.

2024 water chemistry

2024 was a very wet year, and according to data from the Minnesota Department of Natural Resources, April through June was the wettest on record for Minnesota. During this period, the Twin Cities received 17.3 inches of precipitation, 5.9 inches above normal. March, July, and August were also wet, with 13.5 inches of precipitation in the Twin Cities, 3.4 inches above normal. As shown in the figures to the right, phosphorus and chlorophyll concentrations in Westwood Lake increased during March through August when above normal precipitation increased stormwater runoff to the lake.

Total phosphorus levels

While phosphorus is necessary for plant and algae growth, excessive phosphorus leads to excessive algae growth, decreased water clarity, and water quality impairment. Some common sources of phosphorus are fertilizers, leaves and grass clippings, atmospheric deposition, soil erosion, and aquatic plant die-off (such as curly-leaf pondweed). Phosphorus can also be released from lake sediments when dissolved oxygen concentrations are very low.

- BCWMC/MPCA standard: Summer average of 60 micrograms per liter (µg/L) or less
- Observed range: Low of 12 µg/L in March to a high of 44 µg/L in late August following a rainstorm.
- Summer average: 33 µg/L (met BCWMC/MPCA standard)

Chlorophyll a levels

Chlorophyll *a* is a pigment in algae and generally reflects the amount of algae growth in a lake. Lakes that appear clear generally have chlorophyll *a* levels of less than 15 micrograms per liter (µg/L).

- BCWMC/MPCA standard: Summer average of 20 µg/L or less
- Observed range: Low of 1.8 µg/L in mid-April to a high of 26.2 µg/L in late August following a rainstorm
- Summer average: 14.0 µg/L (met BCWMC/MPCA standard)

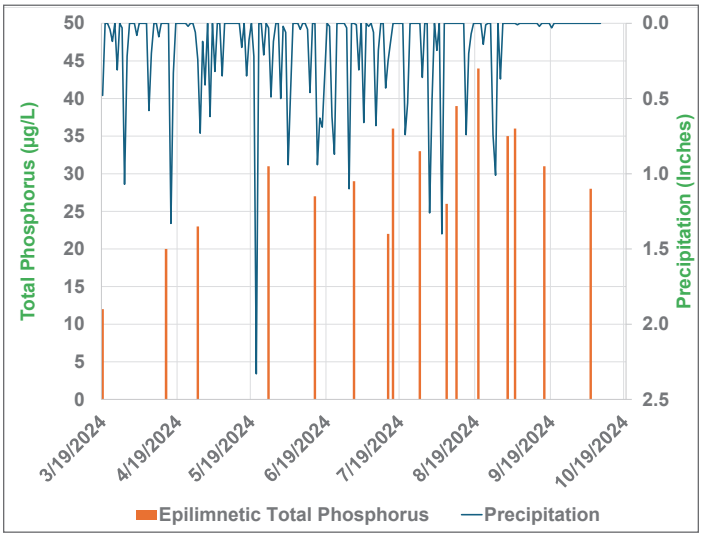
Water clarity

Water clarity is often affected by the number of algae or other photosynthetic organisms in a lake. It is usually measured by lowering an 8-inch “Secchi” disc into the lake; the depth at which the disc’s alternating black-and-white pattern is no longer visible is considered a measure of the water’s clarity.

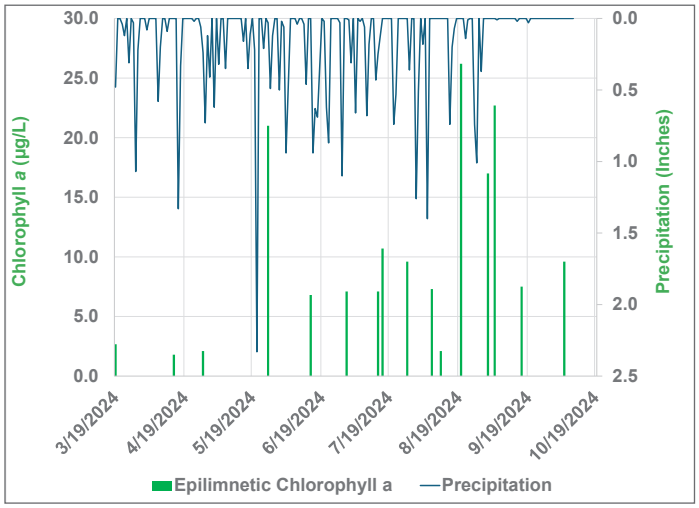
- BCWMC/MPCA standard: Summer average of 1.0 meter or more.
- Observed range: From a low of 1.0 meters in late August following a rainstorm to a high of 1.9 meters in late May and mid-July. The Secchi disc was on the top of submerged aquatic plants in March (1.8 meters), mid-July (1.2 meters), early August (1.3 meters), and early September (1.1 meters).
- Summer average: 1.5 meters (met BCWMC/MPCA standard).

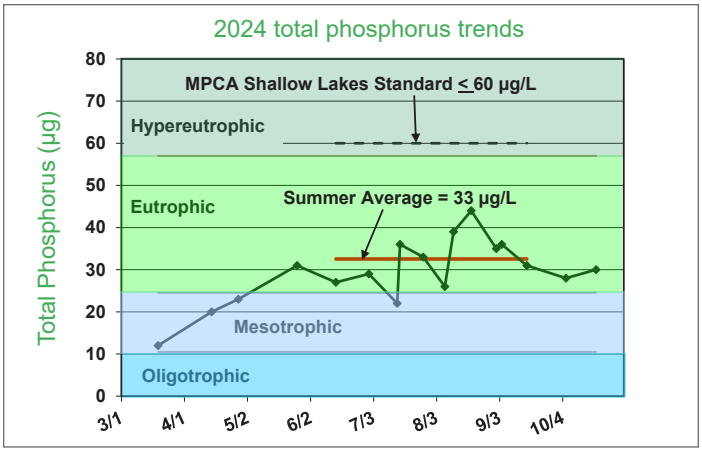
The graphs below and on the following page include data collected from Westwood Lake by a volunteer participating in the Community Assisted Monitoring Program (CAMP), which was coordinated and funded by the Metropolitan Council with assistance and additional funding from the BCWMC.

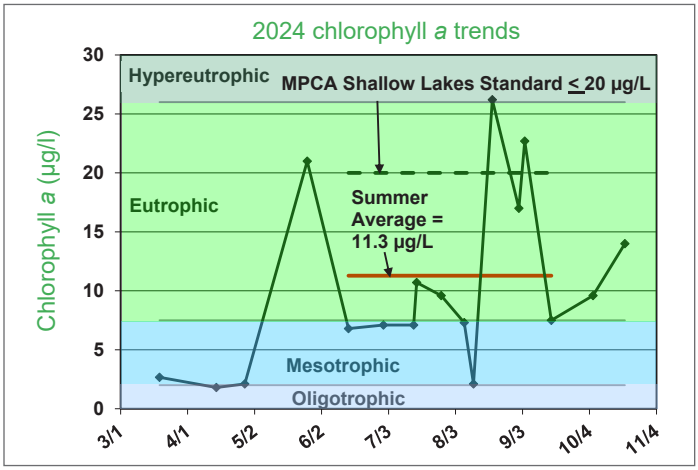
2024 Precipitation and total phosphorus

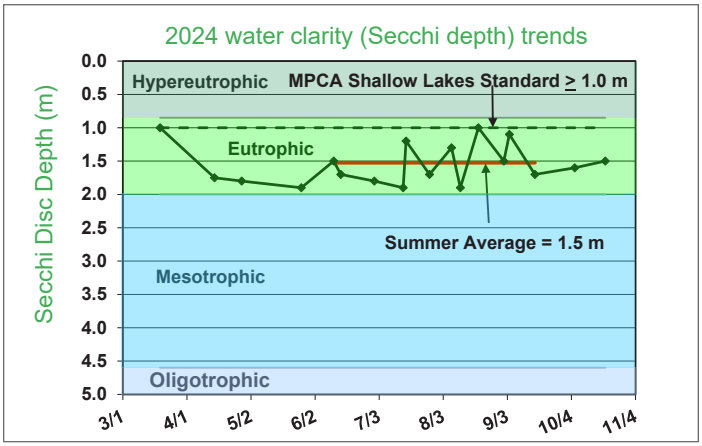


2024 precipitation and chlorophyll a









Definitions

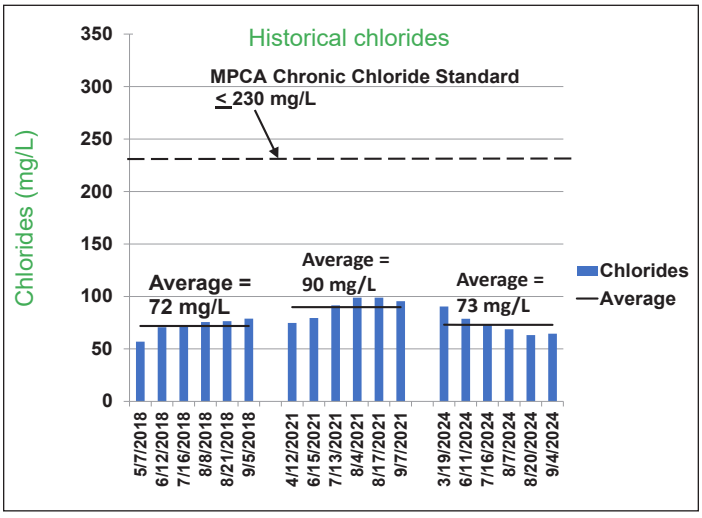
- **Hypereutrophic:** Nutrient-rich lake conditions characterized by frequent and severe algal blooms and low water clarity; excessive algae can significantly reduce lake oxygen levels.
- **Eutrophic:** Lake condition characterized by abundant accumulation of nutrients supporting dense growth of algae and other organisms; decay of algae can reduce lake oxygen levels
- **Mesotrophic:** Lake condition characterized by medium levels of nutrients and clear water
- **Oligotrophic:** Lake condition characterized by a low level of dissolved nutrients, high oxygen content, sparse algae growth, and very clear water

Chloride levels in 2018, 2021, and 2024

Chloride concentrations in area lakes have increased since the early 1990s, when many government agencies switched from sand or sand/salt mixtures to salt for winter road maintenance. When snow and ice melt, the salt goes with it, washing into lakes, streams, wetlands, and groundwater. It only takes 1 teaspoon of road salt to pollute 5 gallons of water, to a point where it can no longer support freshwater life. The pollution is essentially permanent, as there is no easy or affordable way to remove chloride from water.

Because high chloride concentrations can harm fish, zooplankton, and plant life, the MPCA has established maximum and chronic chloride standards. The maximum standard is the highest concentration of chloride that aquatic organisms can be exposed to for a brief time with zero-to-slight mortality. The chronic standard is the highest chloride concentration that aquatic life can be exposed to indefinitely without causing chronic toxicity. Chronic toxicity is defined as a stimulus that lingers or continues for a long period, often one-tenth of the life span or more. Chronic effects can be mortality, reduced growth, reproduction impairment, harmful changes in behavior, and other nonlethal effects. A lake is considered impaired for chlorides if two or more measurements exceed the chronic criterion (230 mg/L) within a 3-year period or if one measurement exceeds the maximum criterion (860 mg/L).

All 2018, 2021, and 2024 chloride measurements in Westwood Lake were well below both the maximum and chronic chloride standards. The 2024 average annual chloride concentration (73 mg/L) was similar to the 2018 average (72 mg/L) and lower than the 2021 average (90 mg/L).



Water chemistry monitoring from 1977–2024: historical trend

Summer water quality in Westwood Lake has been monitored since 1977. Summer averages (June through September) of total phosphorus, chlorophyll *a*, and Secchi disc depth from 1977 to 2024 are shown in the figures at right. In 1977 and 1982, these averages mostly failed to meet BCWMC/MPCA standards, but have generally met the standards since 1982. Exceptions include high chlorophyll *a* values in 2001, high total phosphorus values in 2005 and 2006, and a low average Secchi disc depth in 2017. During the period of record, 86 percent of total phosphorus and 93 percent of chlorophyll *a* and Secchi disc summer averages met the Minnesota State Water Quality Standards for shallow lakes in the North Central Hardwood Forest Ecoregion published in the Minnesota Rules (Minn. R. Ch. 7050.0222 Subp. 4).

The 2024 summer average chlorophyll *a* concentration was more than double summer average concentrations from 2020 through 2023 without a comparable increase in average summer average total phosphorus concentration or decrease in summer average Secchi disc transparency. The reason for the 2024 increase in average summer chlorophyll *a* concentration is not apparent from review of the available data.

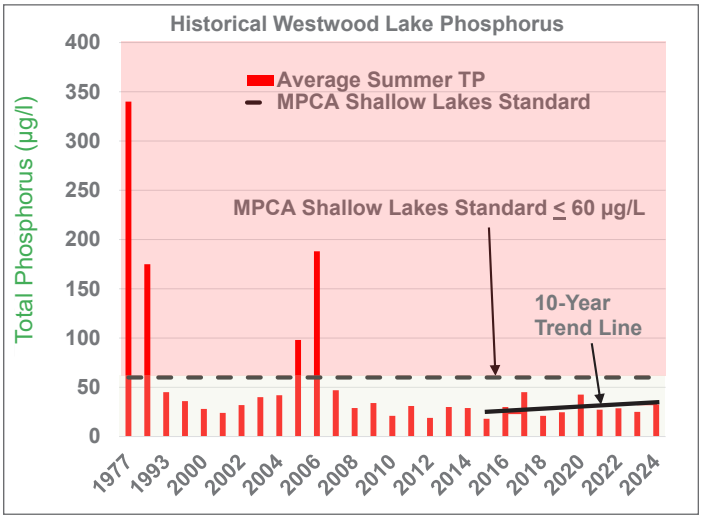
Trend analyses for the last 10 years show:

- Increasing summer average total phosphorus concentrations.
- Increasing summer average chlorophyll *a* concentrations.
- No change in summer average Secchi disc depths.

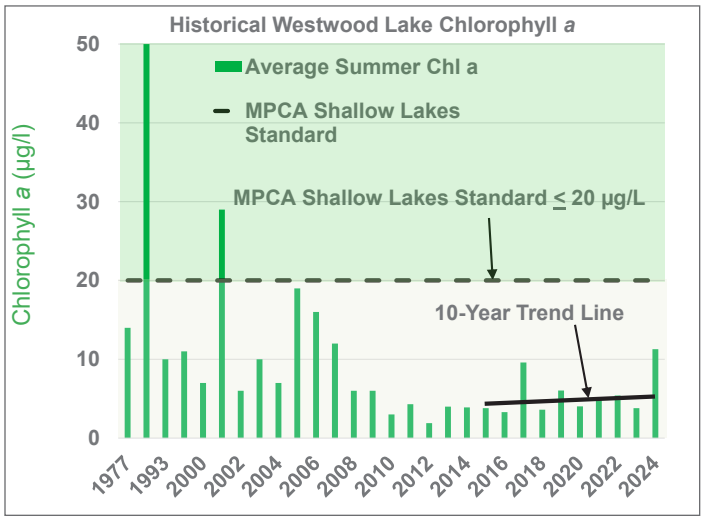
None of these changes is statistically significant (95 percent confidence level).



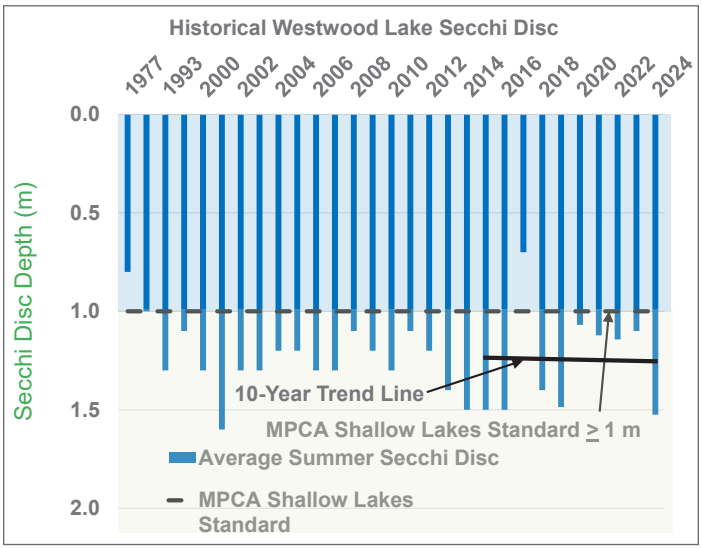
Historical total phosphorus trends



Historical chlorophyll *a* trends



Historical water clarity (Secchi depth) trends



Macrophytes (aquatic plants)

Lake Plant Eutrophication Index of Biological Integrity (IBI)

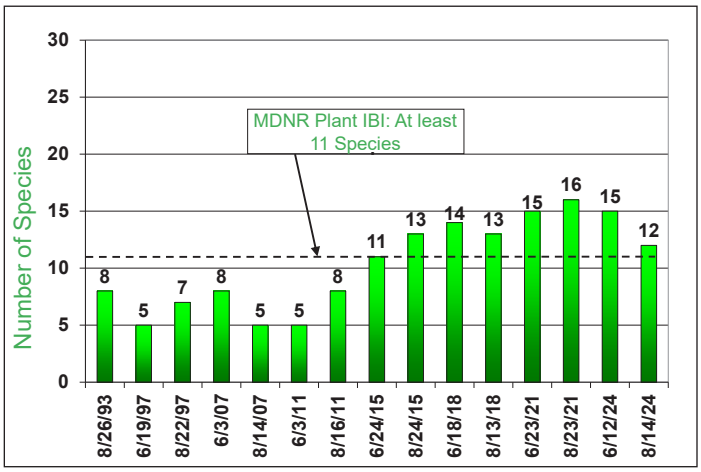
Eutrophication (excessive nutrients) can have detrimental effects on a lake, including reducing the quantity and diversity of plants. The MNDNR developed a Lake Plant Eutrophication Index of Biological Integrity (IBI) to measure the response of a lake plant community to eutrophication. The Lake Plant Eutrophication IBI includes two metrics: (1) the number of species in a lake and (2) the "quality" of the species, as measured by the Floristic Quality Index (FQI). The MNDNR has determined a threshold for each metric. Lakes that score below the thresholds contain degraded plant communities and are likely stressed from anthropogenic (human-caused) eutrophication.

Westwood Lake plant survey data from 1993 to 2024 were assessed to determine Plant IBI trends. The figures at right show the number of species and the FQI scores for that period compared to the MNDNR Plant IBI thresholds.

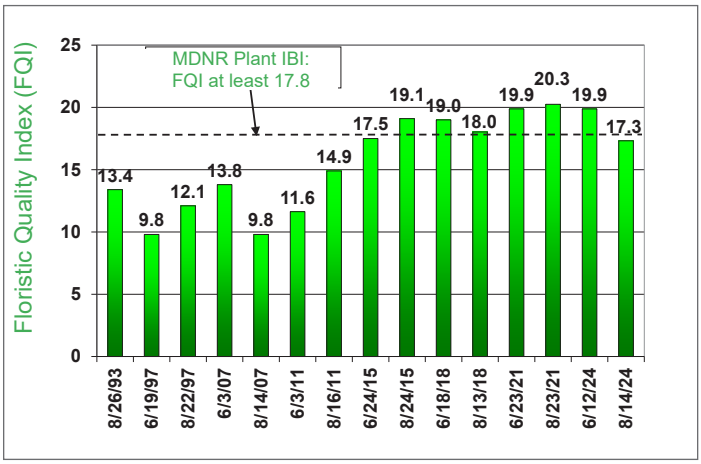
- Number of species: A shallow lake, such as Westwood Lake, meets the MNDNR Plant IBI threshold when at least 11 species are present. During the period examined, the number of species in Westwood Lake ranged from 5 to 16, exceeding the MNDNR Plant IBI threshold from 2015 through 2024.
- FQI values (quality of species): The MNDNR Plant IBI threshold for shallow lakes, as measured by FQI, is a minimum value of 17.8. During the period examined, FQI values in Westwood Lake ranged from 9.8 to 20.3 and exceeded the MNDNR Plant IBI threshold from August 2015 through June 2024.
- 2024 results: The number of species observed in the lake and the FQI (19.9) values were better than the MNDNR Plant IBI thresholds in June, but in August fell below this threshold (FQI value = 17.3).

  The number of species in the lake declined from 15 in June to 12 in August, but a healthy and diverse plant community was present throughout 2024. The decline in number of species was largely favorable because two of the three species not observed in August were aquatic invasive species: curly-leaf pondweed (CLP) and reed canary grass. The seasonal die-off of CLP in late June is typical. In August, reed canary grass was not seen at the single location where it was observed in June. The third species not observed in August was small pondweed, a native species. Although the frequency of this species generally declines between June and August, its absence in August was likely due to displacement by coontail and/or bearded stonewort that significantly increased in frequency between June and August.

MNDNR plant IBI: number of species



MNDNR plant IBI: floristic quality index (FQI)





Aquatic invasive species

In 2024, four aquatic invasive species (AIS) were found to be present in Westwood Lake.

- **Curly-leaf pondweed (*Potamogeton crispus*):** Curly-leaf pondweed (CLP) was problematic in 2024 due to an increased frequency in presence and increased density of plants. The frequency in June 2024, 40 percent, was significantly higher than the frequency of 10 percent in June 2021. Visual sightings increased from four in 2021 to 25 in 2024.

  Rake fullness was used to determine the overall quantity (density) of CLP. Rake fullness is measured on a scale of 1 to 3 where 1 indicates a few plants on the rake, 2 indicates the rake head was about half full, and 3 indicates the rake head is overflowing with curly-leaf pondweed plants. Average rake density in Westwood Lake increased from 1.25 (a few plants on the rake) in 2021 to 1.74 (the rake head was about half full) in 2024. In 2024, some areas of CLP formed dense mats on the lake's surface, and 22 percent of the sample points with CLP had a density of 3.

  The increased abundance of CLP in Westwood Lake in 2024 may be due to limited ice and snow cover during the preceding winter, allowing CLP to grow throughout the winter. Increasing frequency and density of CLP is of concern due to its potential as a source of internal phosphorus loading that can adversely impact the lake's water quality. CLP dies out in early to mid-summer, and the decay of the plant releases nutrients and consumes oxygen, exacerbating the internal release of phosphorus. Management of CLP is recommended to protect the water quality of Westwood Lake.
- **Purple loosestrife (*Lythrum salicaria*):** This emergent species was found at one location in the northwestern corner of the lake in 2015, 2018, 2021, and 2024. It was found at additional locations in 2015, 2018, and 2021. Purple loosestrife was not problematic in 2024 because it was found at fewer locations than in previous years.
- **Narrow-leaved cattail (*Typha angustifolia*):** In 2024, narrow-leaved cattail was observed at seven sample points along the lake's shoreline in June and eight sample points in August. It was found in similar areas but at fewer sample points in previous years: four to six sample points in 2015, five in 2018, and two to four in 2021.
- **Reed canary grass (*Phalaris arundinacea*):** Reed canary grass was first found in Westwood Lake in 2018, at three locations along the north shoreline in June and one location in August. It was observed at two locations in June 2024 and at one location in August 2019, June and August 2021, and August 2024.

Bearded stonewort in Westwood Lake

Bearded stonewort (*Lychnothamnus barbatus*) was first observed in Westwood Lake in 2015. This was also the first observation of this species in all of Minnesota.

Bearded stonewort is an alga in the family Characeae, which resembles rooted aquatic plants. This species was not seen in North America until 2012; few populations have been documented worldwide. Bearded stonewort obtains all of its nutrients from the water. This nutrient absorber can reduce phosphorus concentrations and improve water quality.

Displacing another species in the Characeae family (*Chara contraria* or fetid stonewort), the bearded stonewort in Westwood Lake expanded its extent by approximately an order of magnitude from 2015 to 2018 and was observed at 34 percent of sample locations in August 2018. It continued expanding its extent to 40 percent in August 2019, 44 percent in August 2021, and 77 percent in August 2024. In 2024, bearded stonewort dominated most lake areas and was the only species in some areas.

The continued expansion of bearded stonewort and displacement of other species such as *Chara contraria* is concerning. However, because MNDNR has placed bearded stonewort on the MNDNR plant watchlist as a newly discovered species and considers bearded stonewort to be a sensitive species, its management may not be permitted.



Bearded stonewort in Westwood Lake

Suitability of Westwood Lake for other AIS

Many aquatic invasive species (AIS) residing in Minnesota have not yet been observed in Westwood Lake but could be introduced. For example, both zebra mussels and starry stonewort are present in nearby Medicine Lake but have not been observed in Westwood Lake. A suitability analysis was performed to evaluate whether Westwood Lake water quality would support the introduction of six AIS (starry stonewort, zebra mussels, spiny waterflea, faucet snail, Chinese mystery snail, and rusty crayfish).

The analysis compared 2024 water quality in Westwood Lake with the water quality conditions required for each species, specifically evaluating total phosphorus, chlorophyll a, Secchi disc depth, trophic state index (TSI), water temperature, dissolved oxygen, specific conductance, pH, calcium, magnesium, sodium, alkalinity, hardness, and calcium carbonate. The results indicate that the water quality of Westwood Lake meets the suitability requirements for rusty crayfish, faucet snail, zebra mussel, and starry stonewort, but only partially meets the suitability requirements for spiny waterflea and Chinese mystery snail. Hence, these species would likely survive but may not thrive in Westwood Lake.

Phytoplankton and zooplankton

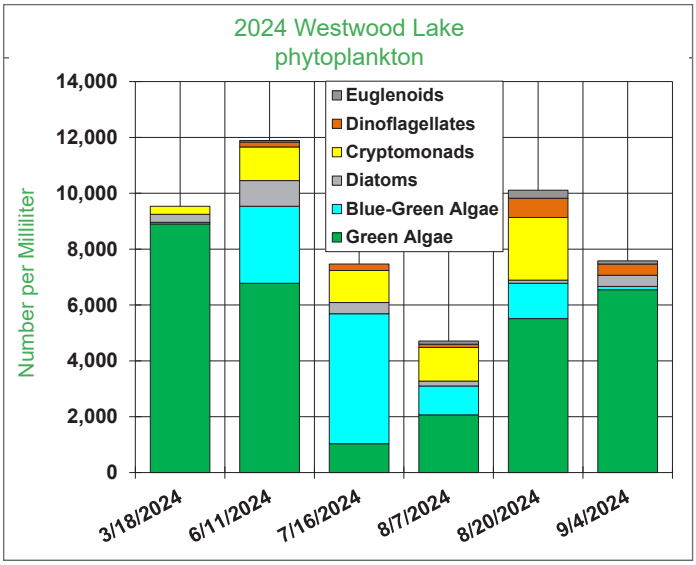
Samples of phytoplankton, microscopic aquatic plants, were collected from Westwood Lake to evaluate water quality and the quality of food available to zooplankton (microscopic animals). Phytoplankton numbers were low throughout 2024, reflecting good water quality (see figure at right). Green algae, a good food source for the lake's zooplankton, were dominant throughout the monitored period except for mid-July when blue-green algae were dominant. Although blue-green algae are associated with water quality problems and can be a source of health concerns, the low numbers of blue-green algae present in Westwood Lake throughout 2024 are consistent with good water quality and no adverse health concerns.

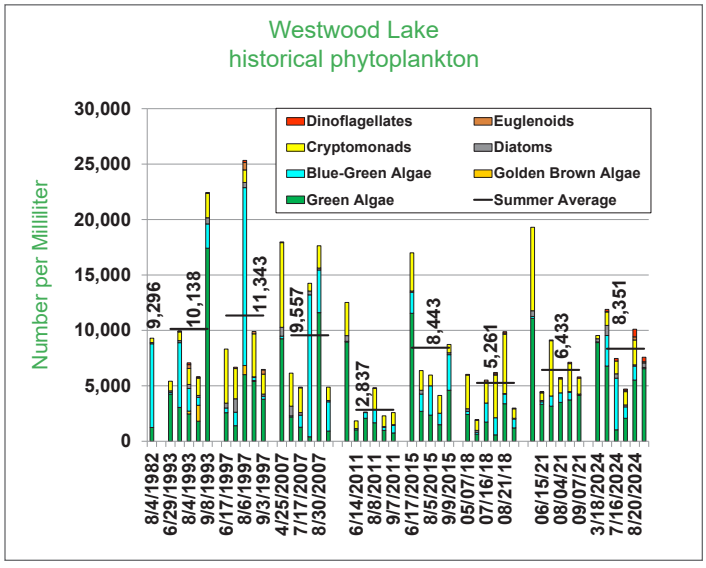
The 2024 phytoplankton summer average (8,351) was higher than summer averages from 2018 (5,261) and 2021 (6,433) but within the range of summer averages observed since 1982 (2,837–11,343). All summer averages during the monitored period are consistent with good water quality.

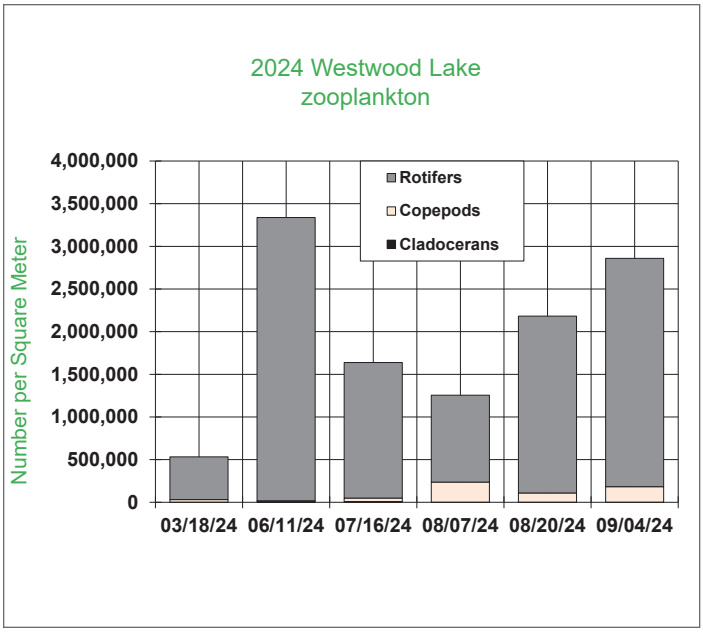
Unlike phytoplankton, zooplankton do not produce their own food. As "filter feeders," they eat millions of small algae. Given the right quantity and species, they can filter the volume of an entire lake in a matter of days. They are also valuable food for planktivorous fish and other organisms.

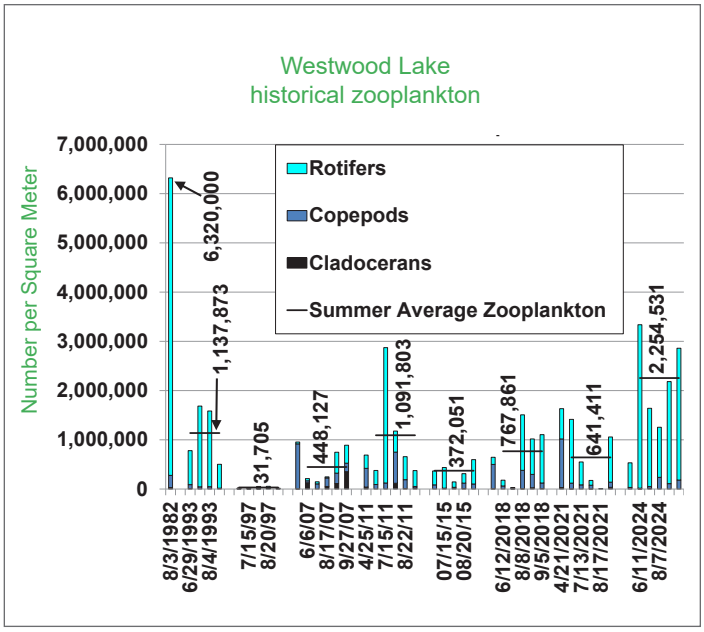
The 2024 zooplankton composition (see figure on the following page) reflects the impact of fish predation on the community. Fish generally select the largest zooplankters they see and prefer cladocerans to copepods because they swim slowly and lack the copepods' ability to escape predation by jerking or jumping out of the way. Rotifers, the least preferred food for fish, dominated the community in Westwood Lake throughout 2024, and copepods consistently occurred in higher numbers than cladocerans. Because rotifers and copepods do not graze as heavily on algae as the larger cladocerans, they generally have a limited impact on the lake's water quality. This suggests that future Westwood Lake water quality improvement efforts should focus on phosphorus management to reduce the nutrients contributing to algae growth.

Although 2024 zooplankton numbers were within the range observed since 1982 (see figure on the following page), the 2024 summer average (2,254,531) was higher than summer averages from 1993–2021 (31,705–1,137,973). Because zooplankton are limited by food availability and predation, the higher summer average suggests increased food availability and/or decreased predation in 2024.






2024 Westwood Lake
zooplankton
Number per Square Meter
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Rotifers
Copepods
Cladocerans
03/18/24
06/11/24
07/16/24
08/07/24
08/20/24
09/04/24


Westwood Lake
historical zooplankton
Number per Square Meter
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Rotifers
Copepods
Cladocerans
Summer Average Zooplankton
6,320,000
1,137,873
31,705
448,127
1,091,803
372,051
767,861
641,411
2,254,531
8/3/1982
6/29/1993
8/4/1993
7/15/97
8/20/97
6/6/07
8/17/07
9/27/07
4/25/11
7/15/11
8/22/11
07/15/15
08/20/15
6/12/2018
8/8/2018
9/5/2018
4/21/2021
7/13/2021
8/17/2021
6/11/2024
8/7/2024

