Lake Water Quality 2024 Scorecards

Available Online: https://srwdmn.org/monitoring

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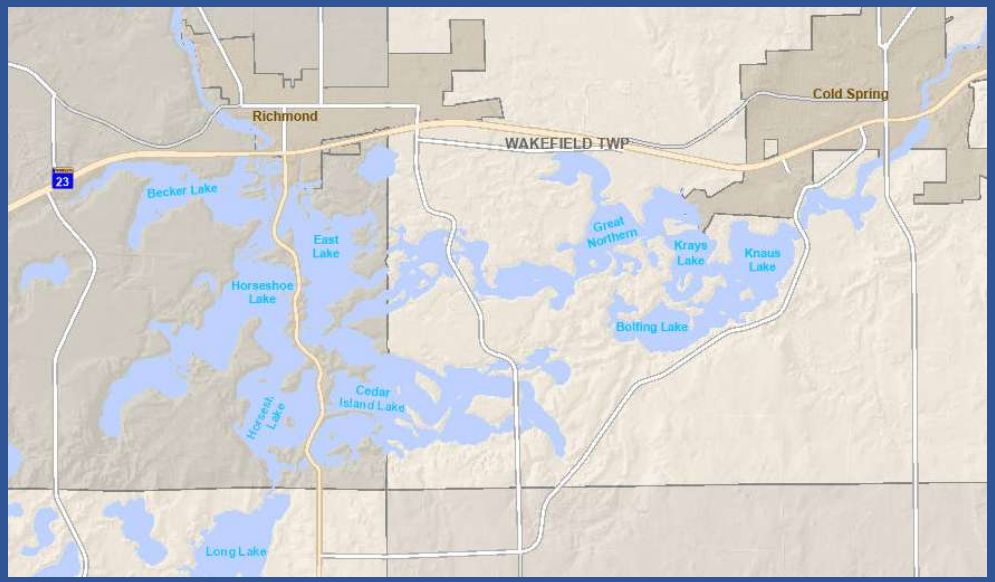
Mission Statement

"The Mission of the Sauk River Watershed District is to apply our unique abilities and authorities in ways that protect and enhance our watershed's resources for today and tomorrow."

Overview of 2024 Lakes



Waterbody	Water Quality Grade	Shore Length (mi)
Horseshoe	C-	13.42
Cedar Island	C-	27.07
Bolfing	C-	2.7
Schneider	C+	1.99
Krays	C	2.7
Knaus	C	4.51

Introduction

Sauk River Watershed District staff collected lake surface water quality samples on six lakes within the watershed in 2024. Each lake was sampled nine times during the monitoring season. The samples were tested for: chlorophyll-a (Chl-a), total phosphorus (TP), ortho-phosphate (OP), and total Kjeldahl nitrogen (TKN). A Secchi disk measurement to determine water clarity was also taken during every sampling event. The parameters taken into account to assign a water quality (WQ) grade in this report are **Chl-a**, **TP**, and **Secchi disk**.

These six lakes are on a 5-year rotational monitoring plan. They are included in the Sauk River Comprehensive Watershed Management Plan (CWMP) and are being assessed to determine if they are reaching their nutrient-reduction goals. Some parameters within each lake have improved, and others have progressed backwards. All six lakes (Horseshoe, Cedar Island, Bolfing, Schneider, Krays, and Knaus) are priority lakes within the watershed. All six lakes are listed as impaired by the MN Pollution Control Agency (MPCA) for excessive nutrients.

Water Quality Grades

Water Quality Grading Scale				
A	B	C	D	F
Excellent All or most samples meet quality standard	**Good** Many samples meet quality standard	**Fair** Some samples meet quality standard	**Marginal** Many samples do not meet quality standard	**Poor** Most samples do not meet quality standard

Trophic Status

Oligotrophic –
- **A** Clear water with high levels of oxygen
- **A–** Deeper lakes still clear with high dissolved oxygen, but some shallow lakes' oxygen levels depleted in summer months

Mesotrophic –
- **B** Moderately clear water, but increased probability of low oxygen conditions in shallow lakes

Eutrophic –
- **C+** Moderately clear water, but increased probability of low oxygen conditions during summer for all lake depths
- **C–** Water cloudy with low visibility; algal scum likely, extensive aquatic plant growth

Hypereutrophic –
- **D** Heavy algal blooms possible throughout summer; dense aquatic plant growth, but extent limited by light penetration
- **F** Heavy algae and aquatic plant growth throughout summer, low oxygen conditions, summer fish kills

Total Phosphorus: A measure of both organic and inorganic forms of phosphorus, which is a nutrient needed by plants and animals to survive. It can cause harmful algal blooms if too much of it is available. Some common sources of phosphorus are fertilizer, animal waste, and soil erosion.

Chlorophyll-a: A measure of the amount of algae in a waterbody, since algae perform photosynthesis. While algae are an important part of freshwater ecosystems, too much can result in decreased levels of oxygen, a process called eutrophication. Other issues include green scum, bad odors, and fish-kill events.

Secchi Disk: Water clarity is affected by abundance of algae and sediment (solids) in the water column. It is dependent on many factors including nutrients, temperature, wind, rain, and boat traffic. Low clarity means less sunlight to power photosynthesis in aquatic plants. These plants are beneficial for wildlife and stabilize the lakebed.

Horseshoe Scorecard

Waterbody Facts

Horseshoe Lake is located just south of Richmond, MN on the west side of the Sauk River Chain of Lakes (SRCL). It is 628 acres in size and has a maximum depth of 57 feet. The land use around the lake is partially developed and row crops/cultivated land. As far as aquatic invasive species (AIS), Horseshoe contains zebra mussels (*Dreissena polymorpha*) and Eurasian watermilfoil (*Myriophyllum spicatum*). A variety of over 30 fish species can be found in Horseshoe Lake: crappie, perch, northern pike. Horseshoe is listed as impaired for excessive nutrients and has been since 2004.

Water Quality

The Sauk River Chain of Lakes underwent a Total Maximum Daily Load (TMDL) study that was released in July April 2021. TP and Chl-a concentrations on average were above the water quality standard. For 2024 data, an improvement was observed for Chl-a and Secchi, but TP levels almost doubled from 2023, which had an average of 73.6 µg/L (TP: **146.67 µg/L** on average; Chl-a: **34.1 µg/L** on average; Secchi disk depth: **6.13 feet** on average).

Overall Grade:

C-

Water Quality Parameter	Water Quality Standard	Grade
Secchi Disk Depth	≥ 4.6 ft	B
Chlorophyll-A	≤ 32 µg/L	C-
Total Phosphorus	≤ 55 µg/L	D

Water Quality Grading Scale					Explanation/Notes
A	B	C	D	F	Horseshoe received an average grade out of the 6 lakes due to not meeting water quality standards. Chl-a had a measurable improvement in 2024, but is still above WQ standards. Average water clarity (measured with a Secchi disk) was greater than 4.6 feet, earning a higher grade. TP is a major concern, more than double compared to levels in 2023.
Excellent	Good	Fair	Marginal	Poor	

Cedar Island Scorecard

Overall Grade:

C-

Waterbody Facts

Located just south of Richmond, MN, Cedar Island Lake is 985 acres and has a maximum depth of 75 feet (deepest lake sampled in 2024). Being within the Sauk River Chain of Lakes, most of the surrounding landscape is comprised of hayed/row crop or developed land. It is the second flowage lake in the SRCL. AIS listings on the lake are zebra mussels (*Dreissena polymorpha*) and Eurasian watermilfoil (*Myriophyllum spicatum*). Commonly reported fish species are northern pike, largemouth bass, channel catfish, and black bullhead. Cedar Lake has been listed as impaired since 2004 for excessive nutrients.

Water Quality

Lake data for Cedar Island was collected by the University of MN LakeBrowser technology using satellite-derived imagery to detect water clarity, which was measured 14 times from 1975-2020. All data from 2018 onward was collected annually and every month throughout the open water season and also includes chlorophyll data. Water clarity in Cedar Island has remained steady since 1975, averaging 3.6 feet, which does not meet the WQ standard of 4.6 feet. Chl-a levels from 2017-2021 remained relatively stable (20.34 µg/L on average), but have varied more in recent years. In comparison, the average Secchi disk depth measured by the SRWD in 2024 was **4.84 feet**. The average Chl-a concentration was **35.59 µg/L**, and average TP was **73.2 µg/L**.

Water Quality Parameter	Water Quality Standard	Grade
Secchi Disk Depth	≥ 4.6 ft	C+
Chlorophyll-A	≤ 32 µg/L	C-
Total Phosphorus	≤ 55 µg/L	C-

Water Quality Grading Scale					Explanation/Notes
A	B	C	D	F	Cedar Island Lake received a C- grade since the majority of parameters did not meet WQ standards. TP and Chl-a both remained above their WQ standards. However, Secchi depth just barely meets the WQ standard of ≥4.6 feet. The high levels of nutrients are likely due to a combination of surrounding agriculture and flowage coming from Horseshoe Lake upstream.
Excellent	Good	Fair	Marginal	Poor	

Bolfing Scorecard

Waterbody Facts

Bolfing Lake is located south of State Highway 23 between Richmond and Cold Spring, MN. It is about 108 acres and has a maximum depth of 36 feet. The lake's small watershed (only 981 acres) is primarily agricultural. AIS listings only include zebra mussels (*Dreissena polymorpha*). Fish species that can be found include northern pike, channel catfish, brown bullhead, and yellow perch. Bolfing Lake has been listed as impaired since 2004 for excessive nutrients.

Water Quality

Secchi disk measurements were taken by volunteers intermittently on Bolfing from 2001-2024. Surface water data has been collected periodically since 1974, for a total of 13 years of data. This data is available on the MPCA Surface Water Data dashboard (see sources at end of document). Data collected by the SRWD in 2024 found an average Secchi disk depth of **3.61 feet**. The average Chl-a concentration was **36.89 µg/L**, and average TP was **60.2 µg/L.**

Overall Grade:

C-

Water Quality Parameter	Water Quality Standard	Grade
Secchi Disk Depth	≥ 4.6 ft	C-
Chlorophyll-A	≤ 32 µg/L	C-
Total Phosphorus	≤ 55 µg/L	C-

Water Quality Grading Scale					Explanation/Notes
A	B	C	D	F	Bolfing's water quality could use some improvement for the Chl-a and TP water quality standards, which is the reason for the average score. Secchi depth is the closest to meeting the standard. TP and Chl-a still need improvement to meet standards, but they were both lower than in 2023. Although Secchi depth was below the WQ standard, there was a 2' increase in depth in 2024.
Excellent	Good	Fair	Marginal	Poor	

Schneider Scorecard

Waterbody Facts

Schneider Lake is located just south of State Highway 23 between Richmond and Cold Spring, MN. The lake is nearly 60 acres and has a maximum depth of 52 feet. Its watershed is larger in relation to the lake's size (11,933 acres) and is dominated by agriculture and pasture. AIS listings only include zebra mussels (*Dreissena polymorpha*). Fish species that can be expected are largemouth bass, walleye, white sucker, channel catfish, and bowfin. A nutrient impairment has been listed for Schneider Lake since 2004.

Water Quality

Past monitoring data on Schneider Lake was taken from the University of MN LakeBrowser tool. Water clarity since 1975 has remained fairly steady, averaging 5.58 feet. Chl-a levels jumped in 2020 (13.9 µg/L seasonal average) when compared to the average from 2017-2021 (7.6 µg/L). The SRWD measured an average Secchi disk depth of **7.96 feet** in 2024. The average Chl-a concentration was **15.26 µg/L**, and average TP was **56.3 µg/L**.

Overall Grade:

C+

Water Quality Parameter	Water Quality Standard	Grade
Secchi Disk Depth	≥ 4.6 ft	B
Chlorophyll-A	≤ 14 µg/L	B
Total Phosphorus	≤ 40 µg/L	C-

Water Quality Grading Scale				
A	B	C	D	F
Excellent	Good	Fair	Marginal	Poor

Explanation/Notes

Schneider Lake received the best grade of the SRCL lakes in 2024, resulting from the higher Secchi depth and lowest Chl-a concentrations. TP levels still need some improvement to meet WQ standards. Average Chl-a concentrations were still around 7 µg/L above the 2017-2021 average. Secchi depth met the WQ standard by over 3 feet, which is an improvement from the 2023 average (5.59 ft.).

Krays Scorecard

Waterbody Facts

Krays Lake is located in south central Stearns County, south of Cold Spring. This 95-acre lake has a maximum depth of 40 feet. It is one of the final flowage lakes within the Sauk River Chain of Lakes. The only AIS species listed for the lake is zebra mussels (*Dreissena polymorpha*). Fish species that can be found in the lake include small/largemouth bass, northern pike, walleye, and black crappie. The lake has been listed as impaired for excessive nutrients since 2004.

Water Quality

Secchi disk depth measurements have been taken intermittently on Krays Lake since 1983. Water clarity has increased since 1983, with a 2017-2021 average of 3.14 ft. Surface water data has been collected on Krays since 1997, and is available on the MPCA website (see sources at end of document). More recently, Chl-a levels from 2017-2021 averaged at 29.9 µg/L. Data collected by the SRWD in 2024 found an average Secchi disk depth of **6.25 feet**, and the average Chl-a concentration was **33.9 µg/L**. The average TP level was **146.2 µg/L**.

Overall Grade:

C

Water Quality Parameter	Water Quality Standard	Grade
Secchi Disk Depth	≥ 2.6 ft	B
Chlorophyll-A	≤ 45 µg/L	B
Total Phosphorus	≤ 90 µg/L	D

Water Quality Grading Scale					Explanation/Notes
A	B	C	D	F	Krays also received a fair grade, mainly due to the higher levels of TP, but there are improving Chl-a concentrations and Secchi depths. The 2024 average Secchi depth was greater than 4.6 feet, and the average Chl-a level was below the WQ standard of 45 µg/L**.** However, TP levels remained above the WQ standard of 90 µg/L. Average Chl-a concentrations were slightly above the 2017-2021 average.
Excellent	Good	Fair	Marginal	Poor	

Knaus Scorecard

Waterbody Facts

Knaus Lake is located in south central Stearns County, south of Cold Spring. This 215-acre lake has a maximum depth of 20 feet. It is the final flowage lake within the Sauk River Chain of Lakes. It has the largest watershed of the lakes in the chain at 592,275 acres, which is combined with the drainage from the Long Lake subwatershed to the south. AIS listings for the lake include zebra mussels (*Dreissena polymorpha*) and Eurasian watermilfoil (*Myriophyllum spicatum*). Notable fish species are muskie, northern pike, crappie, yellow perch, and small/largemouth bass. A nutrient impairment has been listed for Knaus Lake since 2004.

Water Quality

Secchi disk depth measurements have been taken in various locations on Knaus Lake since 1974. Water clarity has increased since measurements began, with the 2017-2021 average being 4 ft. Chl-a levels from 2017-2021 averaged at 33.64 µg/L. Data collected by the SRWD in 2024 found an average Secchi disk depth of **6.13 feet**, and the average Chl-a concentration was **34.11 µg/L**. The average TP level was **146.67 µg/L**, which remains above the 2023 average of 133.6 µg/L.

Overall Grade:

C

Water Quality Parameter	Water Quality Standard	Grade
Secchi Disk Depth	≥ 2.6 ft	B
Chlorophyll-A	≤ 45 µg/L	B
Total Phosphorus	≤ 90 µg/L	D

Water Quality Grading Scale					Explanation/Notes
A	B	C	D	F	Knaus also received an average C grade from a combination of good Secchi depth and elevated TP concentrations. The average Secchi depth is greater than 4.6 feet, but TP levels remain above WQ standard. Chl-a levels continue to be around the average levels of 2017-2021. The 2024 Chl-a average was below the WQ standard of 45 µg/L, earning it a B grade for that category.
Excellent	Good	Fair	Marginal	Poor	

Sources

1. Lake County Water Atlas, Trophic State Index (TSI): https://www.lake.wateratlas.usf.edu/library/learn-more/learnmore.aspx?toolsection=lm_tsi
2. Lake-Link Inc.: https://www.lake-link.com/minnesota-lakes/stearns-county/eden-lake/9607/
3. Minnesota Department of Natural Resources LakeFinder: https://www.dnr.state.mn.us/lakefind/index.html
4. University of Minnesota LakeBrowser Tool: https://lakes.rs.umn.edu/
5. Minnesota Pollution Control Agency, Sauk River Watershed 2023 TMDL: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.pca.state.mn.us/sites/default/files/wq-iw8-63e.pdf
6. Minnesota Pollution Control Agency, Surface Water Data: https://webapp.pca.state.mn.us/surface-water/search

All photos and visuals courtesy of Sauk River Watershed District