CRWD 2025 Lakes Data Summary

February 25, 2026

CRWD 2025 Lakes Data Summary

Saint Paul, Minnesota

Cover image: Crosby Lake [CRWD Staff]

Contents

1 Background

1.1 Report Purpose

The *CRWD 2025 Lakes Data Summary* presents a subset of the 2025 Capitol Region Watershed District (CRWD or District) lakes monitoring data and includes data collection methods, overall and lake-specific results from the 2025 monitoring season, and a comparison to previous monitoring years. Additionally, a large part of lake health is influenced by annual variation in climatic factors, including total precipitation, air temperature, total winter snowfall and snowpack, and ice-in/ice-out dates. Information on these factors can be found in the *CRWD 2025 Climatological Summary* (CRWD, 2026).

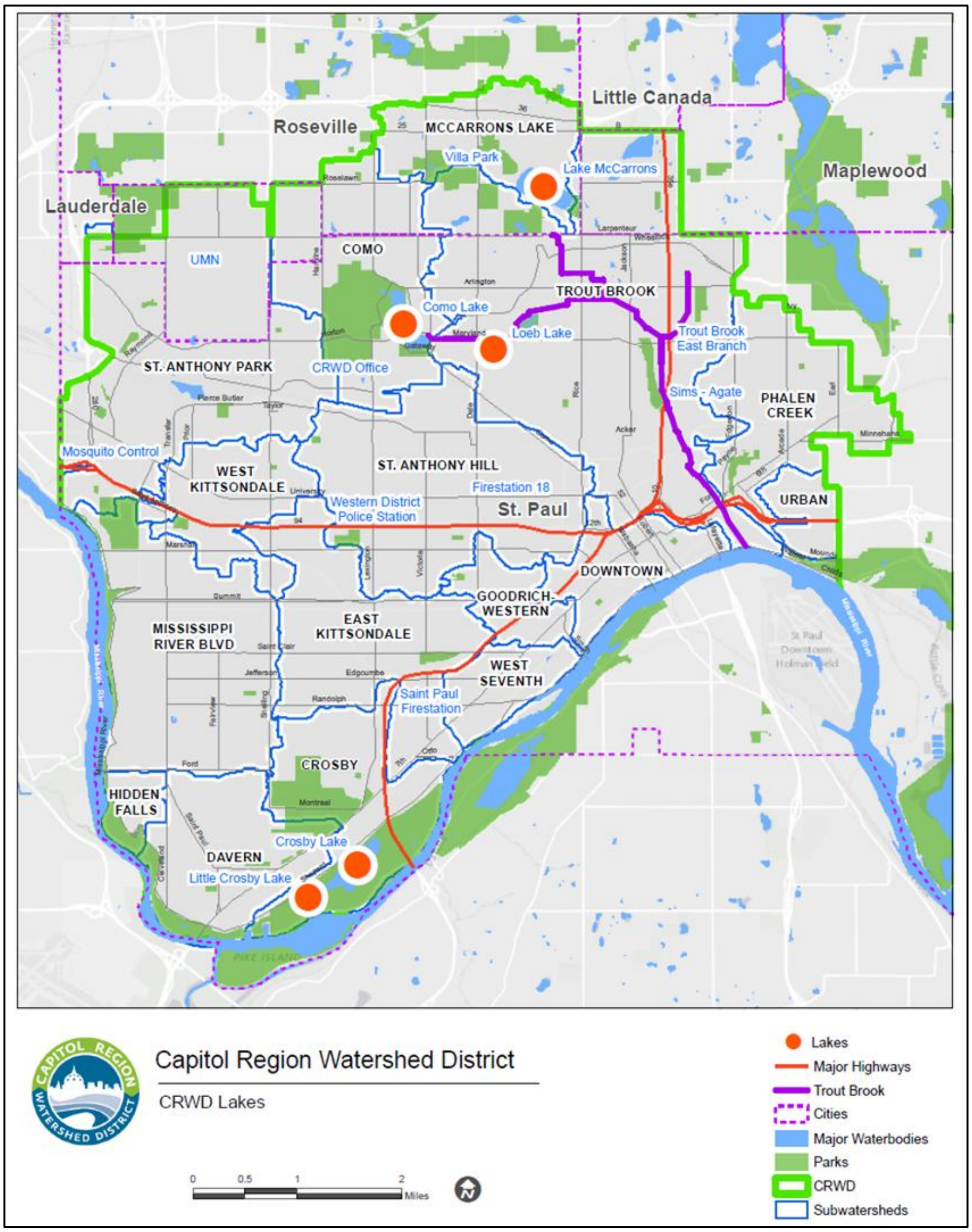

Figure 1: Map of CRWD Lakes

1.2 CRWD Lakes Overview

CRWD was formed to better protect and manage local water resources, including District Lakes. There are five lakes within the boundaries of CRWD: Como Lake, Crosby Lake, Little Crosby Lake, and Loeb Lake in St. Paul, and Lake McCarrons in Roseville (Figure 1).

1.2.1 Como Lake

Como Lake is a shallow lake with primarily parkland and residential land uses in its watershed (Table 1). Como Lake is classified as a shallow lake because nearly 100% of the lake is considered the littoral zone. Como Lake's large contributing watershed (1,711 acres) is highly connected with 22 major storm sewer outfalls discharging directly to the lake. Como Lake has been monitored since 1984, with observed poor water quality resulting in a nutrient impairment listing for phosphorus in 2002. Poor water quality has impacted the lake's ecosystem, aesthetics, and usability. In an effort to improve water quality in the lake, the *Como Lake Management Plan* (CRWD, 2019) was developed to provide adaptive management strategies including an alum treatment, herbicide applications for invasive species control, and watershed projects to reduce external loading. Como Lake is currently listed on the MPCA's 303(d) impaired waters list for mercury in fish tissue (1998), nutrients (2002), and chloride (2014) impairments.

1.2.2 Crosby and Little Crosby Lakes

Crosby and Little Crosby Lakes (Table 1) are shallow lakes situated in the Mississippi River floodplain in Saint Paul. Additionally, the lakes are part of the Crosby Farm Regional Park and the Mississippi River National River and Recreation Area. The lakes are located within the 1,522 acres of Crosby Lake subwatershed; 197 acres of the subwatershed drain to Crosby Lake while 37 acres drain to Little Crosby Lake. The lakes are divided into two separate water bodies by a marsh that is 825 ft long. Crosby Lake is classified as a shallow lake because it has a maximum depth of 17 ft, and the littoral zone covers 100% of the lake area. Little Crosby Lake is also considered a shallow lake even though it has a maximum depth of 34 ft, because it has a littoral area of 90% (<15 ft in depth).

The watershed land uses for both waterbodies are primarily parkland, single family residential, and industrial. The water quality of both lakes is greatly affected by flooding periods of the Minnesota and Mississippi Rivers, since they are located in the floodplain of their confluence. When river flooding occurs due to spring snowmelt or periods of heavy rainfall, it brings an influx of nutrients, sediment, and other pollutants to the lakes that can result in both short-term and long-term effects on water quality. Both lakes are considered unimpaired and are not currently on the MPCA 303(d) list. In 2012 the *Crosby Lake Management Plan* was developed to outline water quality goals and management possibilities for Crosby and Little Crosby Lakes (CRWD, 2012).

1.2.3 Loeb Lake

Loeb Lake is a shallow lake located in Marydale Park, and the predominant land uses in the surrounding drainage area are mixed residential and parkland (Table 1). The lake has a small drainage area with no outlet and has therefore exhibited relatively stable water quality since monitoring began in 2003. Loeb Lake is an unimpaired water body and is not currently on the MPCA 303(d) list. To preserve the stable water quality of the lake, the *Loeb Lake and Willow Reserve Management Plan* was developed in 2009 to provide a framework for the protection and improvement of both Loeb Lake and Willow Reserve, a nearby wetland (CRWD, 2009). The plan is set to receive an update in 2026.

1.2.4 Lake McCarrons

Lake McCarrons is considered a deep lake, with a drainage area (1,070 acres) consisting of mainly mixed residential and open space, and includes the entire Villa Park wetland system, which discharges directly to the lake (Table 1). Lake McCarrons has been monitored since 1988, is the only District lake that allows swimming, and is the only lake with residential shoreline development. Lake McCarrons received an alum treatment in 2004, and the water quality of the lake has shown improvement since this occurred. The *Lake McCarrons Management Plan* was created in 2020 to maintain a healthy lake and support recreational uses (CRWD, 2020). Lake McCarrons is currently listed on the MPCA's 303(d) impaired waters list for mercury in fish tissue (2010) and perfluorooctane sulfonate (PFOS) in fish tissue (2022), which primarily impact fish consumption.

Table 1: Morphometric data for District lakes

Lake	Surface Area (acres)	Maximum Depth (ft)	Littoral Area	Volume (acre-ft)	Watershed Area (acres)	Watershed: Lake Area (ratio)
Como	70.5	15.5	97%	469	1,711	24.3
Crosby	45.0	17.0	100%	130	197	4.4
Little Crosby	8.0	34.0	88%	59	37	4.6
Loeb	9.7	28.0	81%	84	44	4.5
McCarrons	74.7	57.0	34%	1,892	1,070	14.3

1.3 Monitoring Goals and Methods

All five District lakes are monitored from early spring until late fall on an annual basis to characterize overall health, evaluate trends over time, determine if each lake supports their designated uses for swimming, fishing, and/or aesthetics, and inform lake management decisions for continued protection and improvement. The lakes are also monitored as needed during ice on periods, generally January through March, depending on additional data needs.

Lake data is collected by CRWD, Ramsey County Public Works, Ramsey Conservation Division of Ramsey County, and the Minnesota Department of Natural Resources (MN DNR). CRWD organizes and coordinates the monitoring and analysis of this data including chemical parameters (nutrients, pH, chloride, and conductivity), physical parameters (water clarity, dissolved oxygen, and temperature), and biological parameters (chlorophyll-a, aquatic vegetation type and abundance, and phytoplankton, zooplankton, and fisheries populations). For more information on the detailed methods for monitoring and analysis of these parameters, see Appendix A.

2 Overall Results of 2025 Lake Water Quality Data

District lakes showed mixed water quality results in 2025. Crosby Lake, Loeb Lake, and Lake McCarrons all improved compared to 2024, and Little Crosby Lake had similar water quality in both years. Como Lake decreased slightly in water quality compared to 2024.

One key influence on a lake's water quality is precipitation and the stormwater runoff it generates. Stormwater runoff carries pollutants, sediment, and nutrients that can negatively affect a lake's water quality. 2025 had lower annual precipitation totals compared to 2024 (30.30 and 32.12 inches respectively); however, in June and July 2025 alone there was a total of 12.52 inches of rain– nearly 2 more inches than the 10.57 inches received during those months in 2024. This extra input of nutrients during a time of year when conditions are already conducive to algal blooms can have a compounding negative effect on water quality. Further stormwater data and analyses will be available in the upcoming *2025 CRWD Stormwater Summary* (CRWD, 2026a).

Lakes have different levels of resiliency to year-to-year fluctuations in climate due to factors such as size, depth, native plant population, and source waters, as is demonstrated by the varying water quality responses across District lakes in 2025. Because of this, it is important not only to compare 2025 water quality to 2024, but also to historical averages and long-term trends.

Tables 2 and 3 use lake grades as a measure of water quality for a given year, and Table 4 directly compares the 2025 data to the MPCA state water quality standards for the three eutrophication parameters (total phosphorus (TP), chlorophyll-a (Chl-a), and Secchi disk depth). See Appendix A for further information on how lake grades and state standards are developed and calculated.

2.1 Comparison Between 2024 and 2025 Monitoring Years

When comparing 2025 lake grades to 2024 lake grades in Table 2, Crosby Lake, Loeb Lake, and Lake McCarrons showed an increase in grade (green arrow), Little Crosby Lake stayed the same (yellow arrow), and Como Lake decreased in grade level (red arrow).

Table 2: 2024 and 2025 lake grade comparison for all District lakes

Lake	2024 Lake Grade	2025 Lake Grade
Como Lake	D+ →	D
Crosby Lake	C →	B
Little Crosby Lake	B →	B
Loeb Lake	B →	A
Lake McCarrons	B →	B+

2.2 Comparison Between 2025 and Historical Monitoring

When comparing 2025 lake grades to historical lake grades (which is calculated using the range of annual lake grades from when monitoring began for each lake through 2024), Table 3 shows that Loeb Lake aligned with its historical average, Crosby and Little Crosby Lakes had higher grades, and Como Lake and Lake McCarrons had slightly lower grades this year. Lake water quality varies year-to-year due to many different factors, so it is important to compare any given year to the historical dataset to view how one year compares to "typical" for that individual lake.

Table 3: Lake grade comparison between historical grade and 2025 grade for all District lakes.

Lake	Historical Lake Grade	2025 Lake Grade
Como Lake	D+ →	D
Crosby Lake	C →	B
Little Crosby	C+ →	B
Loeb Lake	A →	A
Lake McCarrons	A →	B+

2.3 Comparison of 2025 Water Quality Data to the MPCA State Standards

Table 4 shows whether the annual average of each of the eutrophication parameters met the state standard by lake, where a green checkmark indicates that the lake met the standard, and a red "x" indicates that it did not (explanation of state standards available in Appendix A, Section 2.2). Based on these results for 2025, Como, Crosby, and Little Crosby Lakes would be considered impaired, while Loeb Lake and Lake McCarrons would not be considered impaired. It is important to note that to list or delist a lake for impairment, an extensive process must be completed in collaboration with the MPCA that evaluates current and historical data as well as the lake's potential to maintain current conditions.

Table 4: Comparison of eutrophication parameters to the MPCA state standards for all lakes

Lake	Total Phosphorus Standard	Chlorophyll-a Standard	Secchi Depth Standard
Como Lake	✗	✗	✗
Crosby Lake	✗	✓	✓
Little Crosby Lake	✗	✓	✓
Loeb Lake	✓	✓	✓
Lake McCarrons	✓	✓	✓

3 Individual Lake Results for 2025

3.1 Como Lake

3.1.1 Water Quality Data

In 2025 Como Lake declined slightly in water quality compared to 2024 after back-to-back years of high summer precipitation. June was a particularly wet month, bringing an influx of phosphorus to Como Lake during peak algal bloom conditions. As an example of the degree of pressure the lake was under this year, the Como 3 monitoring station, which measures water volume and quality coming from one of Como Lakes largest subwatersheds, showed the highest total June TP load into the lake since 2013. The effects of this heavy phosphorus loading can be seen in Figure 2, which shows an increase in TP and Chl-a paired with a decrease in Secchi depth in June.

The effects were also noted anecdotally, as algal blooms and green water were observed by staff during monitoring visits. Some algal blooms can be hazardous, so in order to characterize the blooms, additional Harmful Algal Bloom (HABs) testing was done in partnership with RCPW and Minnesota Department of Health (MDH). Initial results from 2025 showed excessively high levels of microcystin in early July. Microcystin is one of the most common detectable algal toxins that can be released by cyanobacteria during an algal bloom. A high level of microcystin is a concern as it can be hazardous to the health of humans and animals (EPA, 2026). Additional HABs testing will continue in 2026.

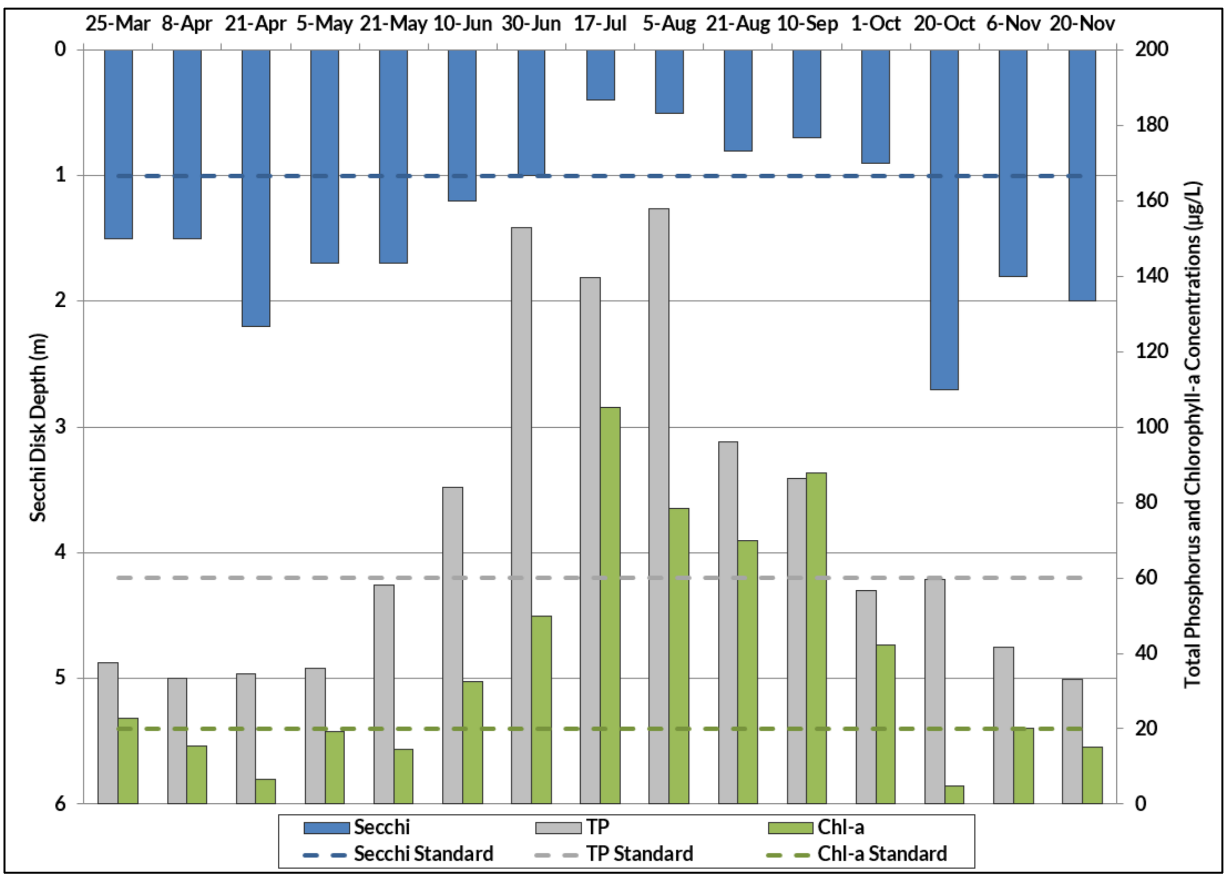

Figure 2: Como Lake 2025 daily epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

Because Como Lake is shallow and heavily stormwater-fed, it is more susceptible to acute climatological variations than other District lakes, as was shown in this year's water quality decline. This makes it all the more important to look at long-term trends to contextualize the overall response to District efforts to improve water quality. Although this was certainly a challenging year for Como Lake, it is still encouraging to note that the 2025 average TP concentration (101 µg/L) was below the 1984-2024 historical average (162 µg/L). The historical frequency of significantly higher average TP in Como Lake can be seen in Figure 3.

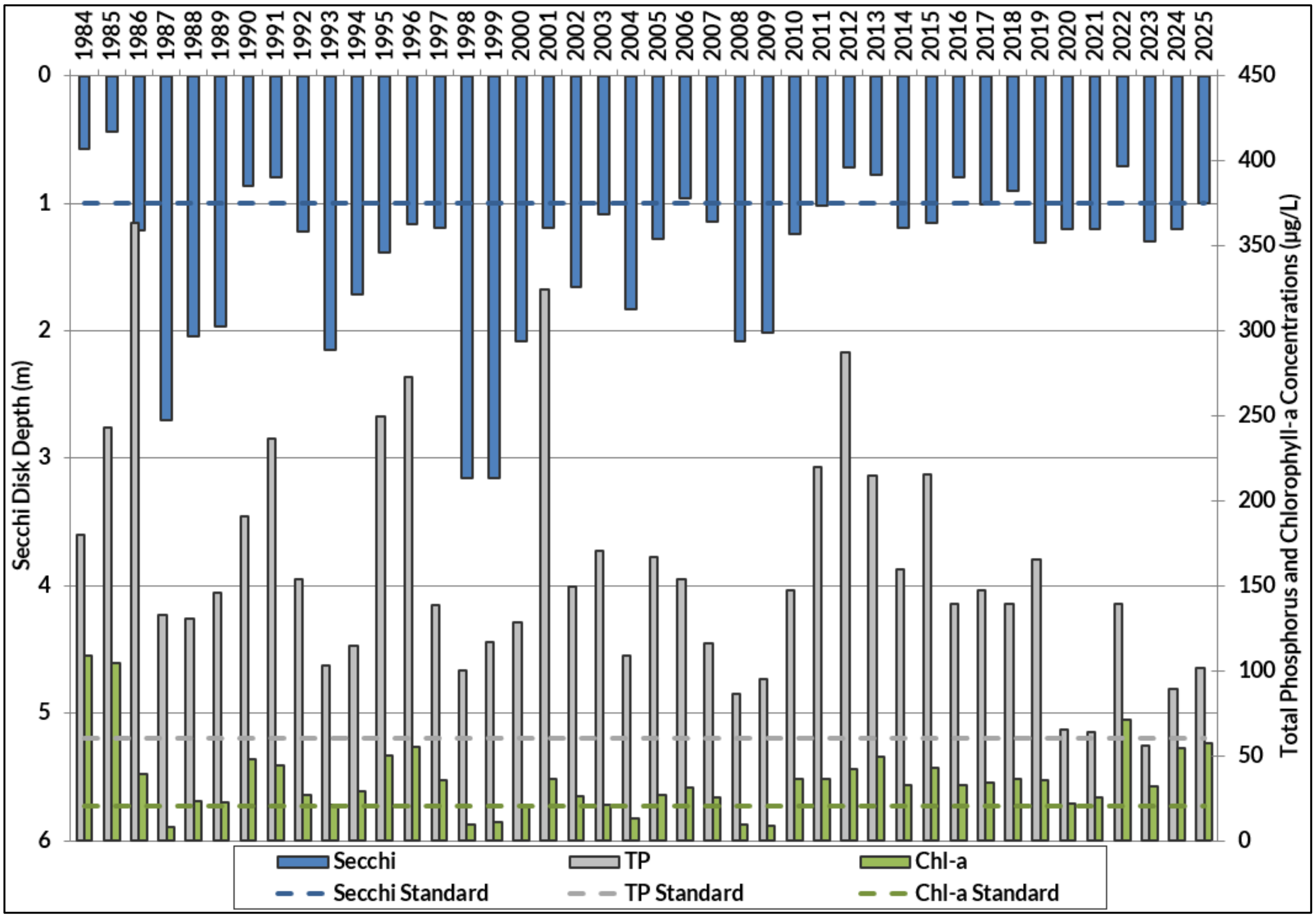

Figure 3: Como Lake historical average annual epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

3.1.2 2025 Highlight: Internal Phosphorus Loading

As discussed in the preceding section, Como Lake is vulnerable to external phosphorus loading from the surrounding watershed, but managing internal phosphorus loading is also critical to improving water quality. Internal loading, or the resuspension of phosphorus into the water column from sediment and organic matter, can contribute to algal activity and decrease water quality even when external phosphorus loading is reduced. One method of addressing internal loading is an alum treatment, during which aluminum sulfate is injected into the water, binding with phosphorus and creating a layer on the bottom of the lake to continue binding and containing phosphorus for years to come. An alum treatment was done on Como Lake in May 2020 for this purpose.

The longevity of an alum treatment's effectiveness, or the degree to which it can continue suppressing phosphorus re-release, varies lake-to-lake depending on a complex set of conditions including oxygen levels, degree of organic decay, aquatic plant abundance, and external loading from the watershed. One method of tracking the impact of an alum treatment is to monitor the hypolimnetic (i.e. lake bottom water) phosphorus, more specifically soluble reactive phosphorus, as this is the type of phosphorus that reacts with the aluminum sulphate from the alum treatment. It is also the type of phosphorus that can be used by plants and therefore fuel algal activity.

Figure 4 shows the annual average hypolimnetic soluble reactive phosphorus (SRP) from 1984 to 2025 in comparison to the pre-treatment average (1984-2019). There is a clear drop in average SRP in 2020, when the alum treatment was done. SRP remains relatively stable for about four years before climbing in 2024 and 2025, nearing pre-treatment levels again. However, at 64 µg/L, hypolimnetic SRP in 2025 was still below the pre-treatment average of 84 µg/L.

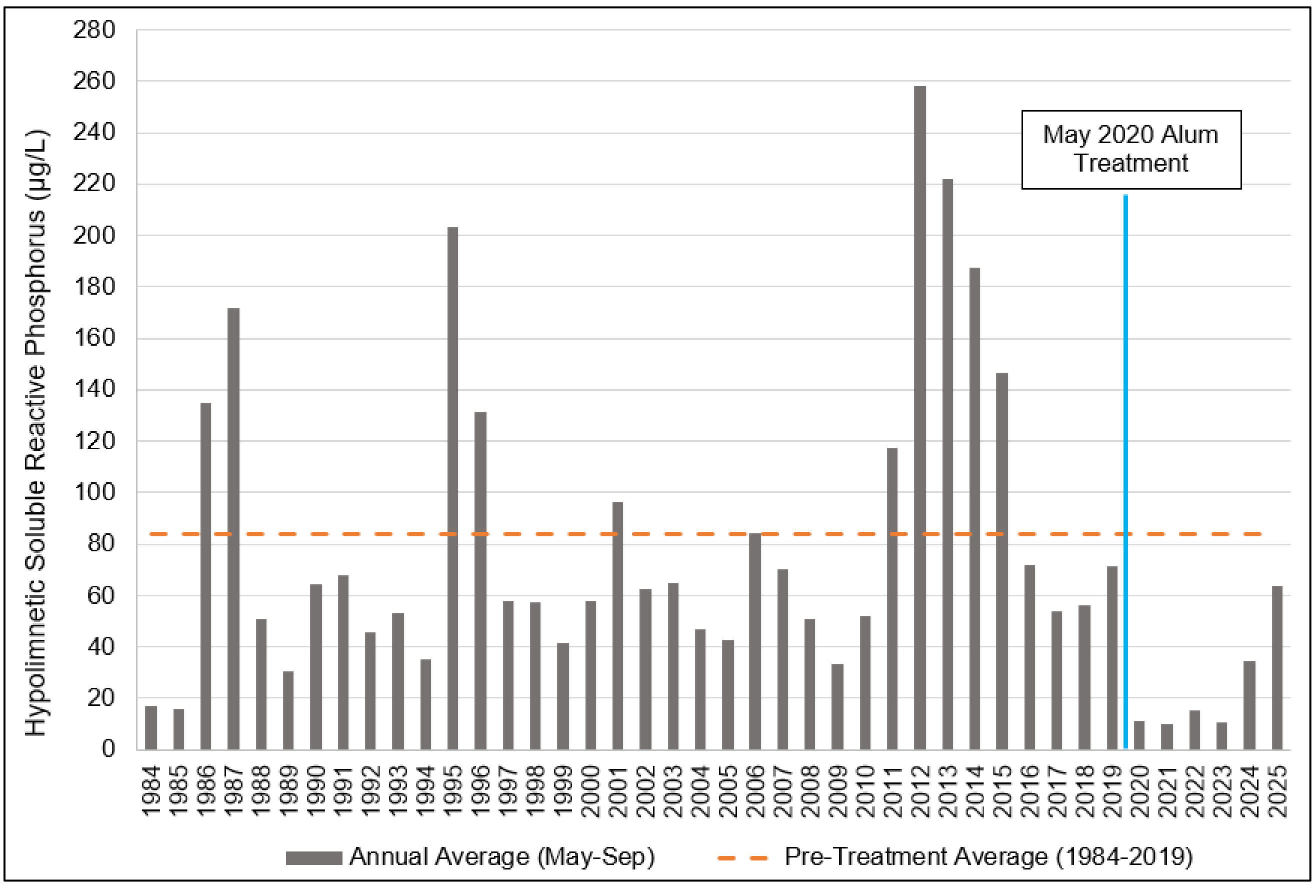

Figure 4: Como Lake annual average hypolimnetic soluble reactive phosphorus from 1984 to 2025 in comparison to the pre-alum treatment average (1984-2019)

As was outlined in the *2019 Como Lake Management Plan*, supplemental alum treatments may be necessary given the high external phosphorus loading from the watershed and the sediment burial rates (CRWD, 2019). The rise in hypolimnetic phosphorus seen in the last couple of years was an anticipated likelihood, emphasizing the importance of continued monitoring and assessment. An analysis will be completed in the near future to determine the effectiveness of the alum treatment.

3.2 Crosby Lake

3.2.1 Water Quality Data

Crosby Lake had better-than-average water quality in 2025, both when compared to 2024 and to historical averages. Its lake grade improved from 2024, increasing from a C (which is also the historical average), to a B (Tables 2 and 3). It met the state standards for Secchi depth and Chl-a for all 2025 samples, and it only exceeded the threshold for TP during peak summer months from mid-June through August (Figure 5).

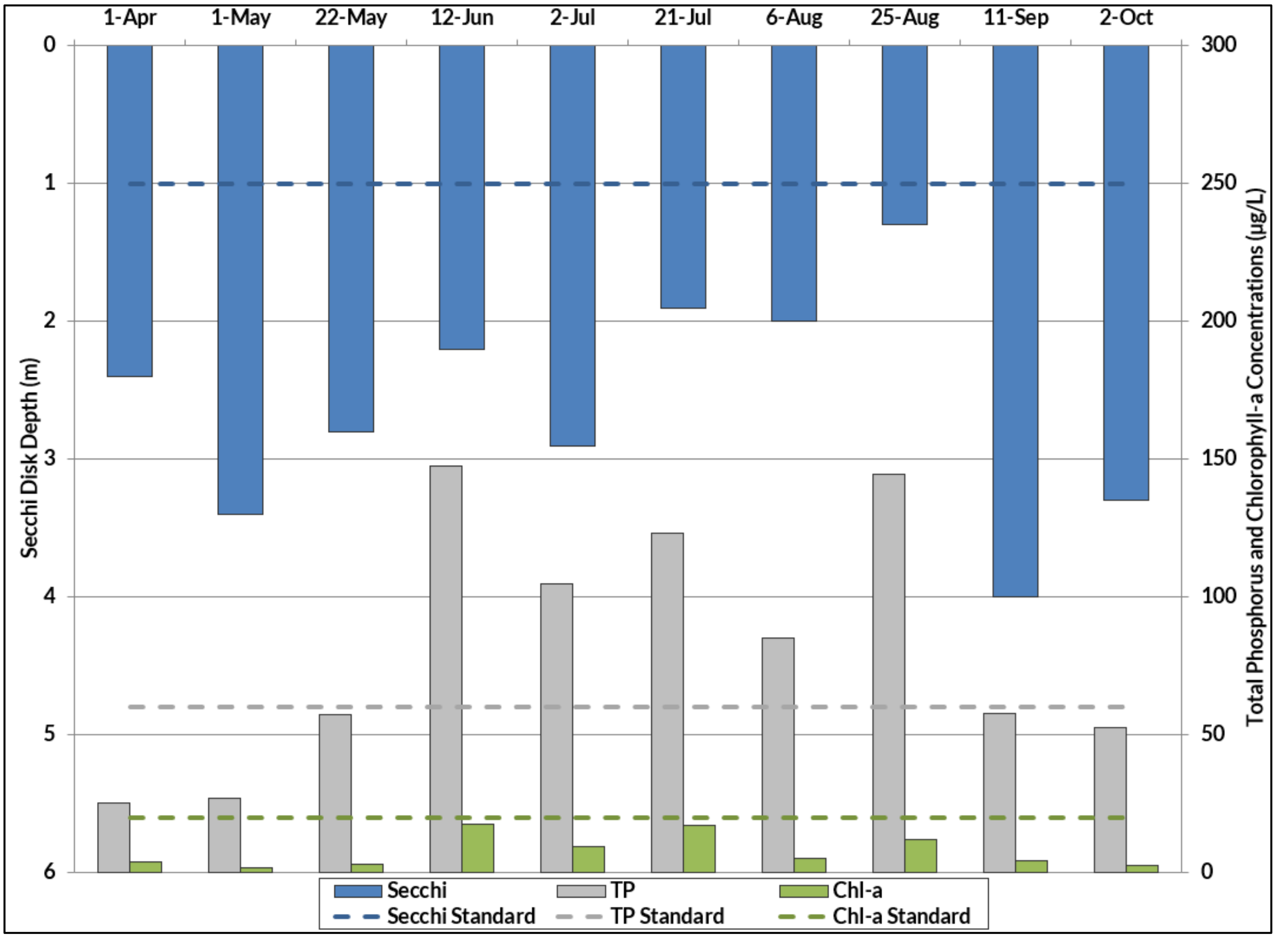

Figure 5: Crosby Lake 2025 daily epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

Historically, Crosby has experienced fluctuations in its water quality, rather than having strong trends (Figure 6). This is due in part to the fact that Crosby Lake (and Little Crosby Lake) lies in the Mississippi River floodplain, and its water quality is heavily influenced year-to-year by whether or not the river floods, the degree of flooding, and even the time of year that flooding occurs (e.g. spring snowmelt vs. mid-season heavy rains). In 2024 the Mississippi River flooded Crosby and Little Crosby Lakes for several weeks, resulting in poor mid-season water quality. The absence of flooding in 2025 helps to contextualize the improvement in water quality seen in 2025 by comparison.

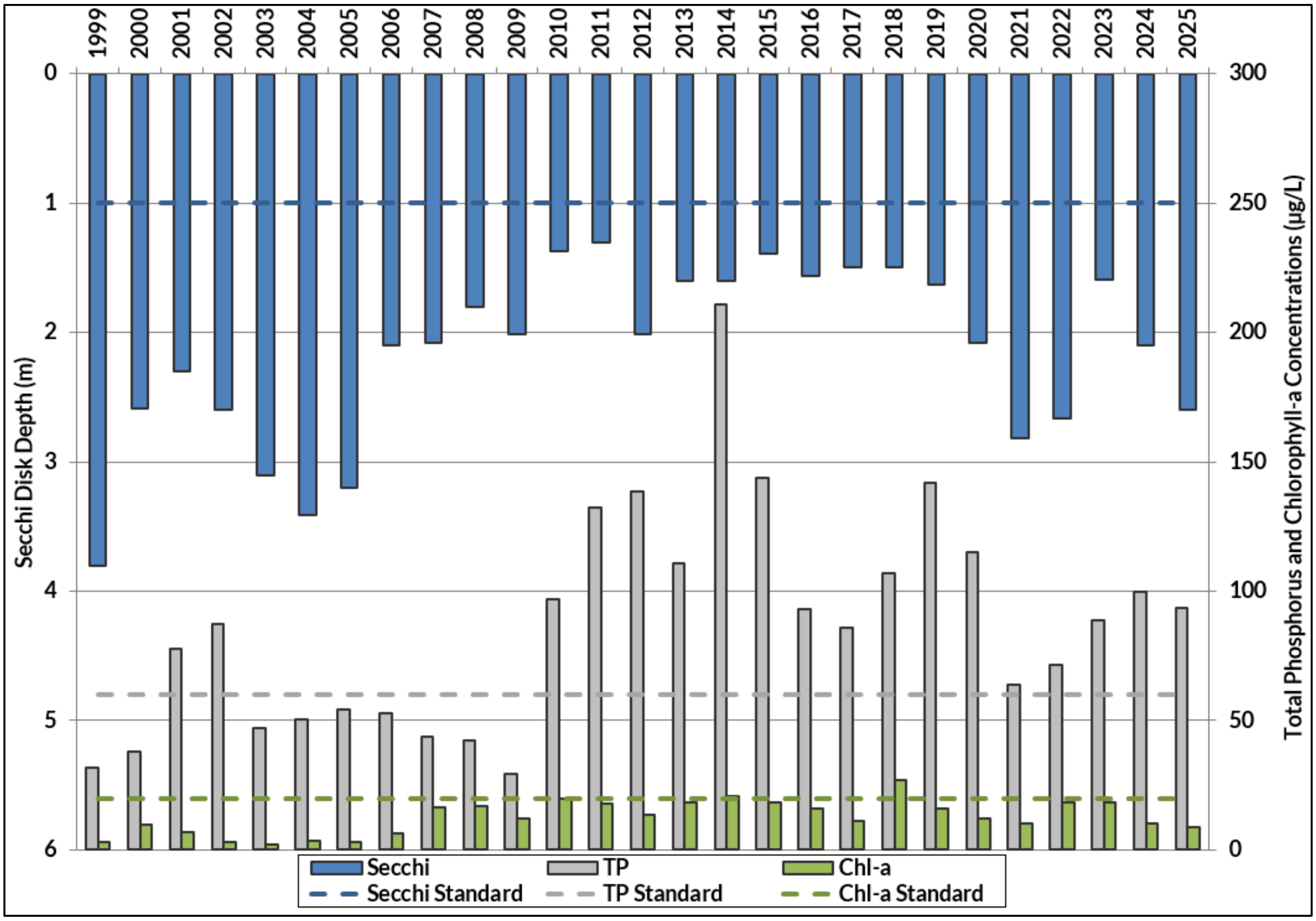

Figure 6: Crosby Lake historical average annual epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

3.2.2 2025 Highlight: High Risk for Chloride Impairment

In 2025 the District learned that Crosby Lake (as well as Little Crosby Lake) is considered "high risk" for chloride impairment by the MPCA, meaning it has had at least one chloride sample that exceeded a concentration of 120 mg/L (MPCA, 2025). Exceeding the threshold does not cause a lake to be listed as impaired for chloride, but rather it is used by the MPCA to flag lakes that are at an elevated risk for potential future impairment.

The District has chloride data for Crosby Lake dating back to 1999. Of the 458 chloride samples on record for Crosby Lake, there have been 94 samples that exceeded the high risk threshold. As can be seen in Figure 7, there is not a strong pattern or trend for annual average chloride, which, as was discussed in the water quality section above, is reflective of the strong influence that the Mississippi River has on the lake's water quality year-to-year.

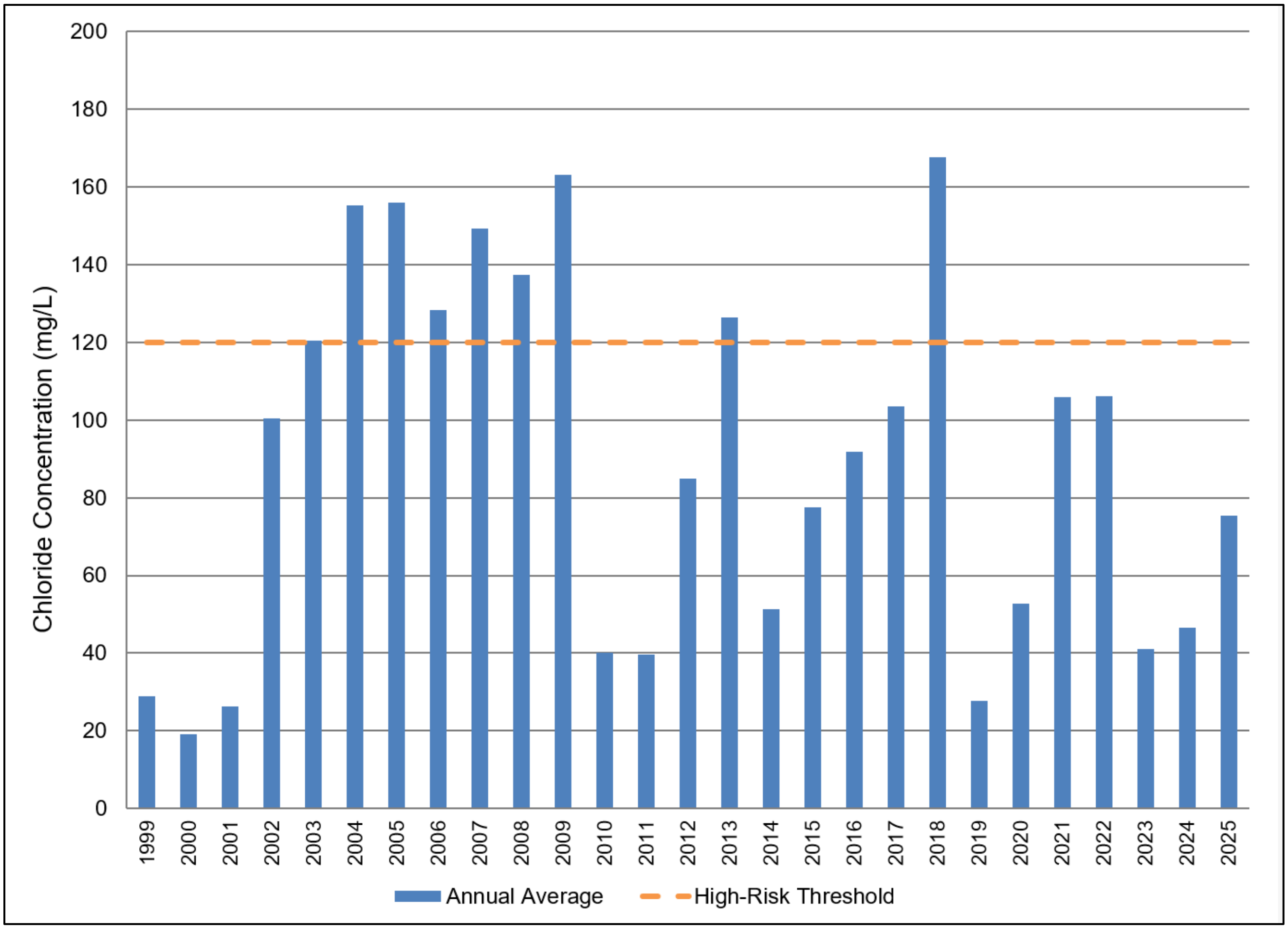

Figure 7: Crosby Lake annual average chloride concentration from 1999-2025 compared to the high-risk threshold of 120 mg/L

While it is good news that chloride remains relatively low in Crosby Lake on average, continued accumulation of chloride across the Mississippi River watershed upstream could change that in the future. This illustrates not only the need for chloride to be managed on a large scale but also serves as a reminder that the chloride that leaves the District via the Mississippi River has the potential to similarly affect other downstream waterbodies.

3.3 Little Crosby Lake

3.3.1 Water Quality Data

Little Crosby Lake had mixed results for water quality in 2025, earning the same grade as 2024 (Table 2). With the exception of early August, Chl-a remained low, and Secchi depth met the standard with wide margins for the entire sampling period, even during the peak algal conditions typically seen in late summer (Figure 8). However, TP exceeded the state standard for all but one sample, demonstrating that while it is generally expected that Chl-a correlates with TP, it is not always the case. Other factors, such as native plant abundance or zooplankton and phytoplankton distribution, also impact the degree to which excess TP fuels algal activity.

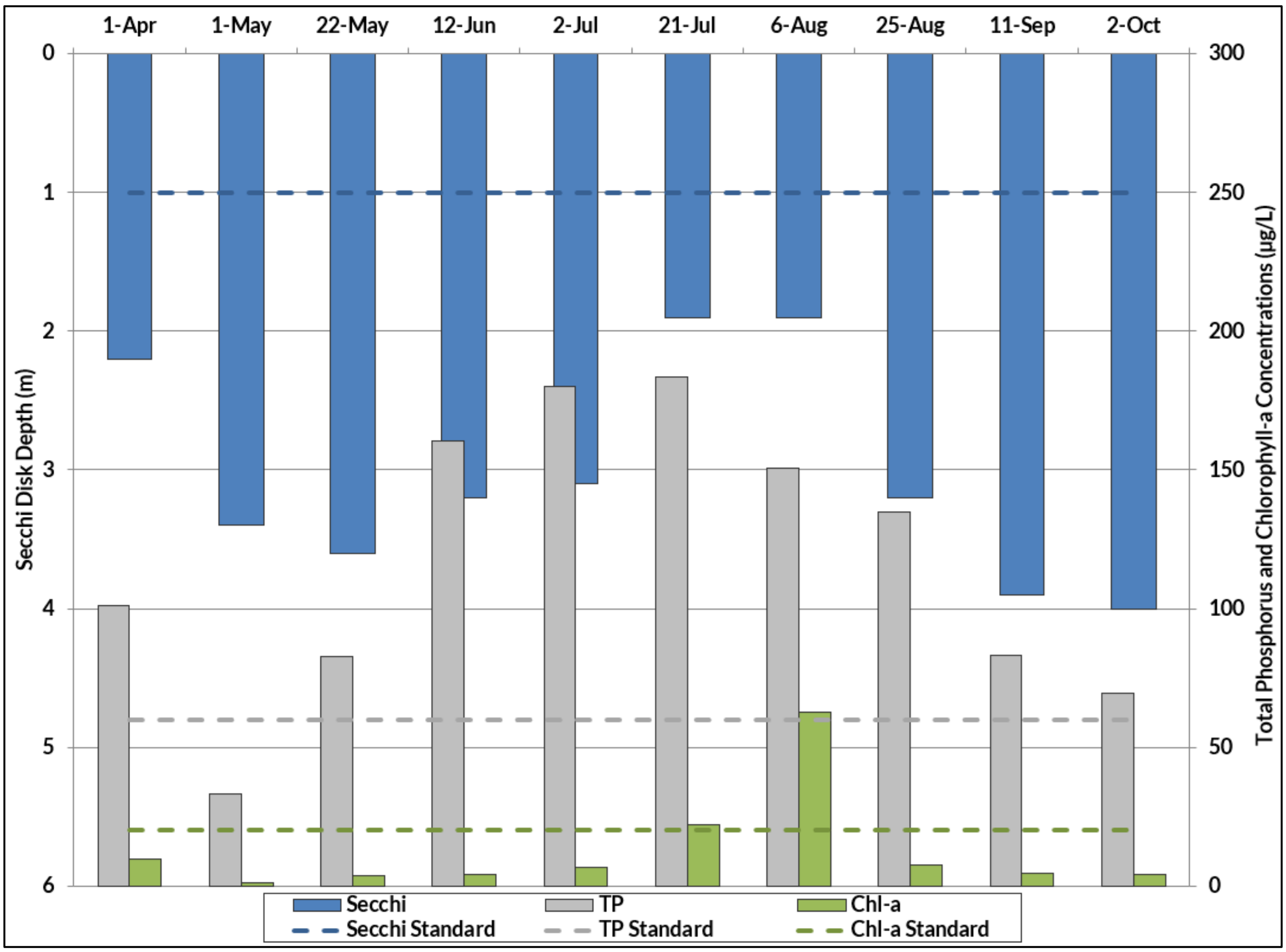

Figure 8: Little Crosby Lake 2025 daily epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

In comparison to historical averages, the three eutrophication parameters followed the same pattern, with better than average Chl-a and Secchi disk values but slightly worse than average TP (Figure 9).

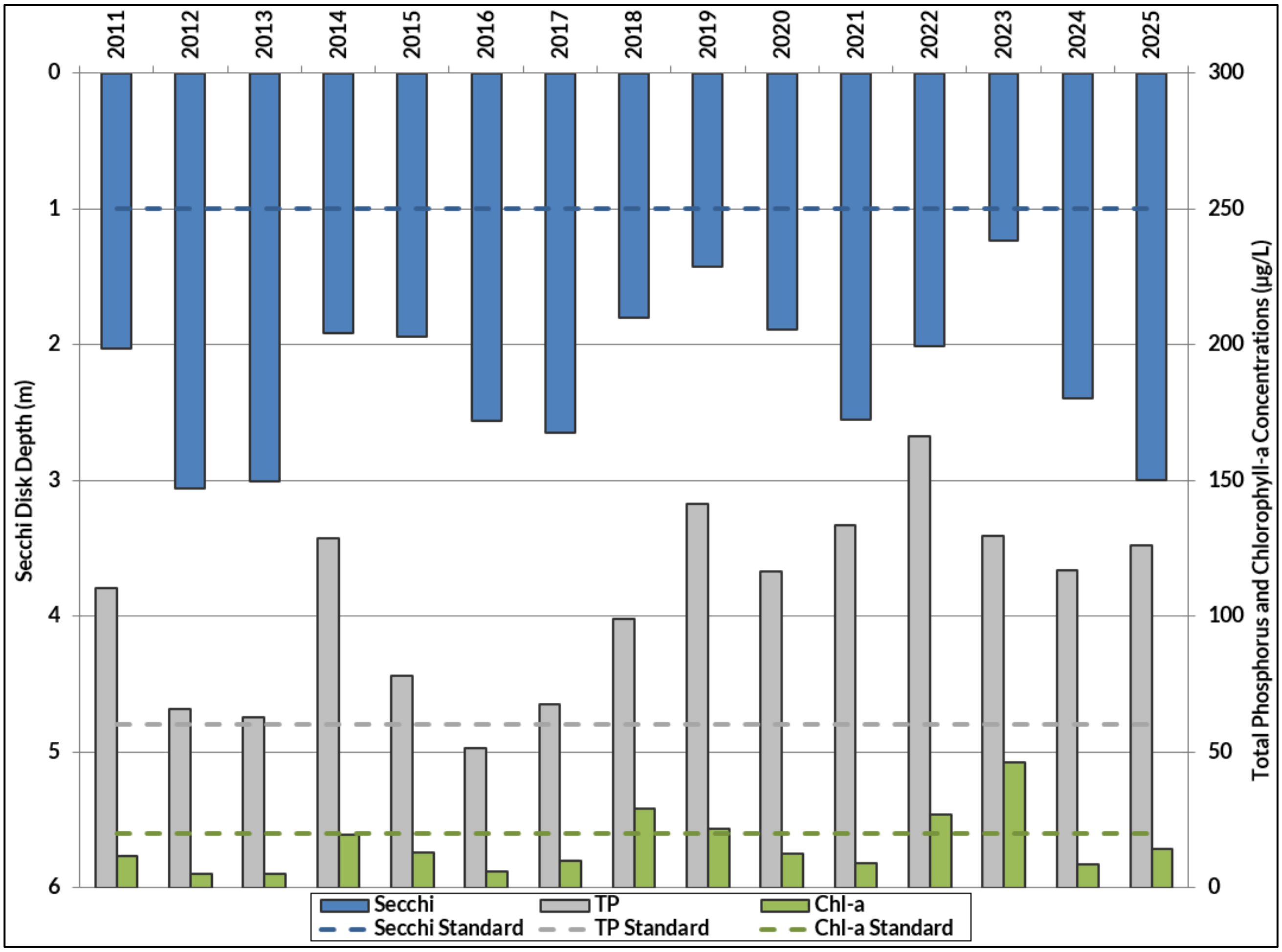

Figure 9: Little Crosby Lake historical average annual epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

3.3.2 2025 Highlight: Hypolimnetic Total Phosphorus

Little Crosby Lake has been monitored since 2011 and consistently exhibits high hypolimnetic (i.e. lake bottom) TP (Figure 10). This can be due to many factors, including river flooding. As mentioned in the Crosby Lake water quality section, when the lake experiences flooding from the Mississippi River, nutrients that otherwise would not enter this system can flow in and contribute to excess phosphorus that can negatively affect lake water quality.

In 2019 the Mississippi River experienced one of the biggest flooding events in recent years, and there was a large response in hypolimnetic TP in the years following this flooding. Similarly, there was a large, multi-week flooding event during the summer of 2024, and from 2024 to 2025, the average hypolimnetic TP increased by nearly 300 µg/L (Figure 10). Despite high hypolimnetic TP, Little Crosby Lake continues to maintain good water clarity and often meets the Chl-a standard.

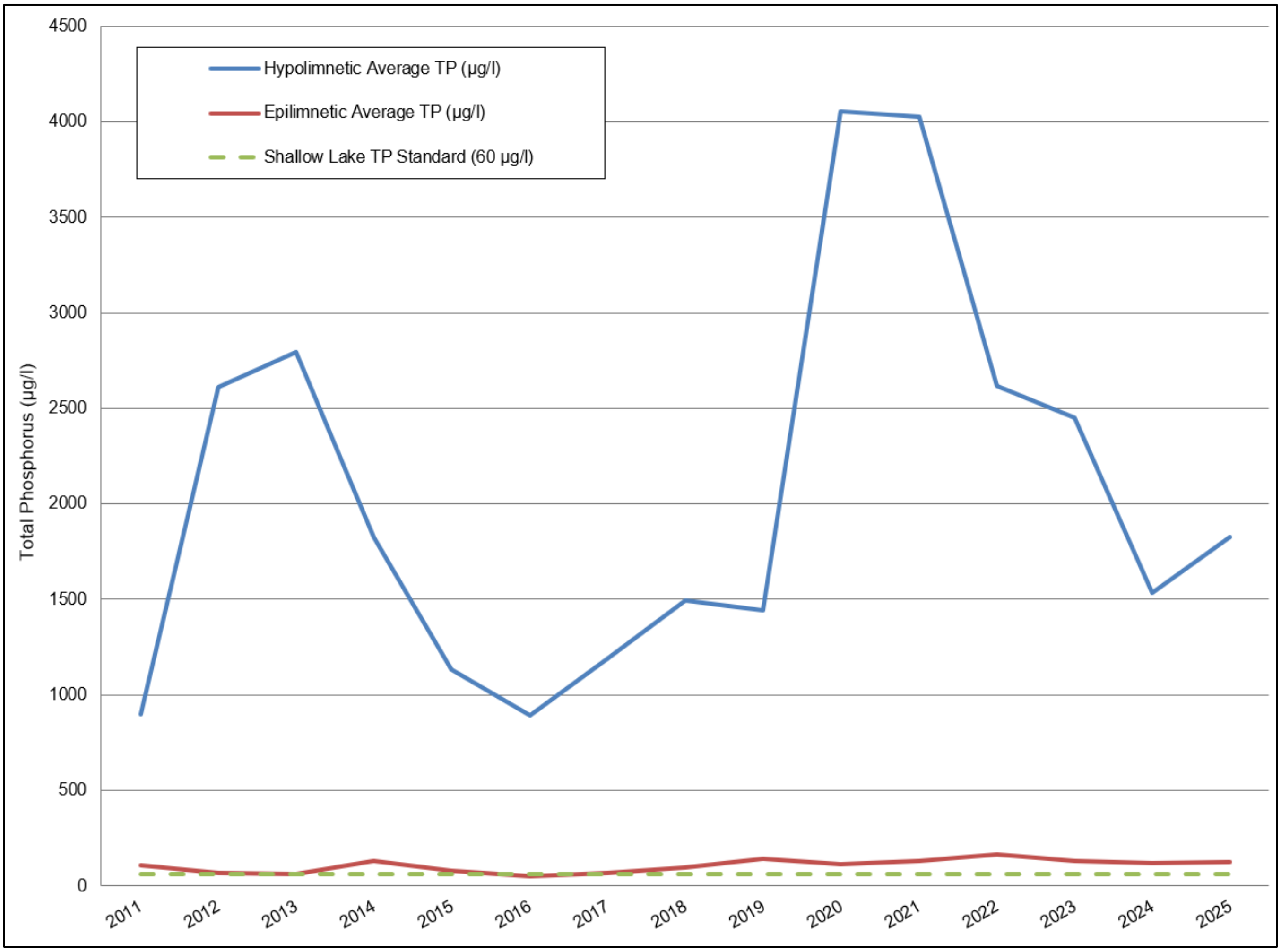

Figure 10: Little Crosby Lake historical average annual hypolimnetic total phosphorus, epilimnetic total phosphorus, and comparison to the shallow lake state standard

3.4 Loeb Lake

3.4.1 Water Quality Data

In 2025 Loeb Lake had excellent water quality, rising from a B grade in 2024 to an A in 2025, matching its historical average (Tables 2 and 3). All three eutrophication parameters met their standards for every sample taken in 2025 (Figure 11). Even with the intense summer precipitation events seen this year, Loeb continues to thrive, due in part to the fact that it receives very little stormwater input and is therefore not as affected by external nutrient runoff as a lake like Como. In comparison to historical annual averages, Loeb Lake had one of its best years on record for Secchi depth and Chl-a and was an average year for TP (Figure 12).

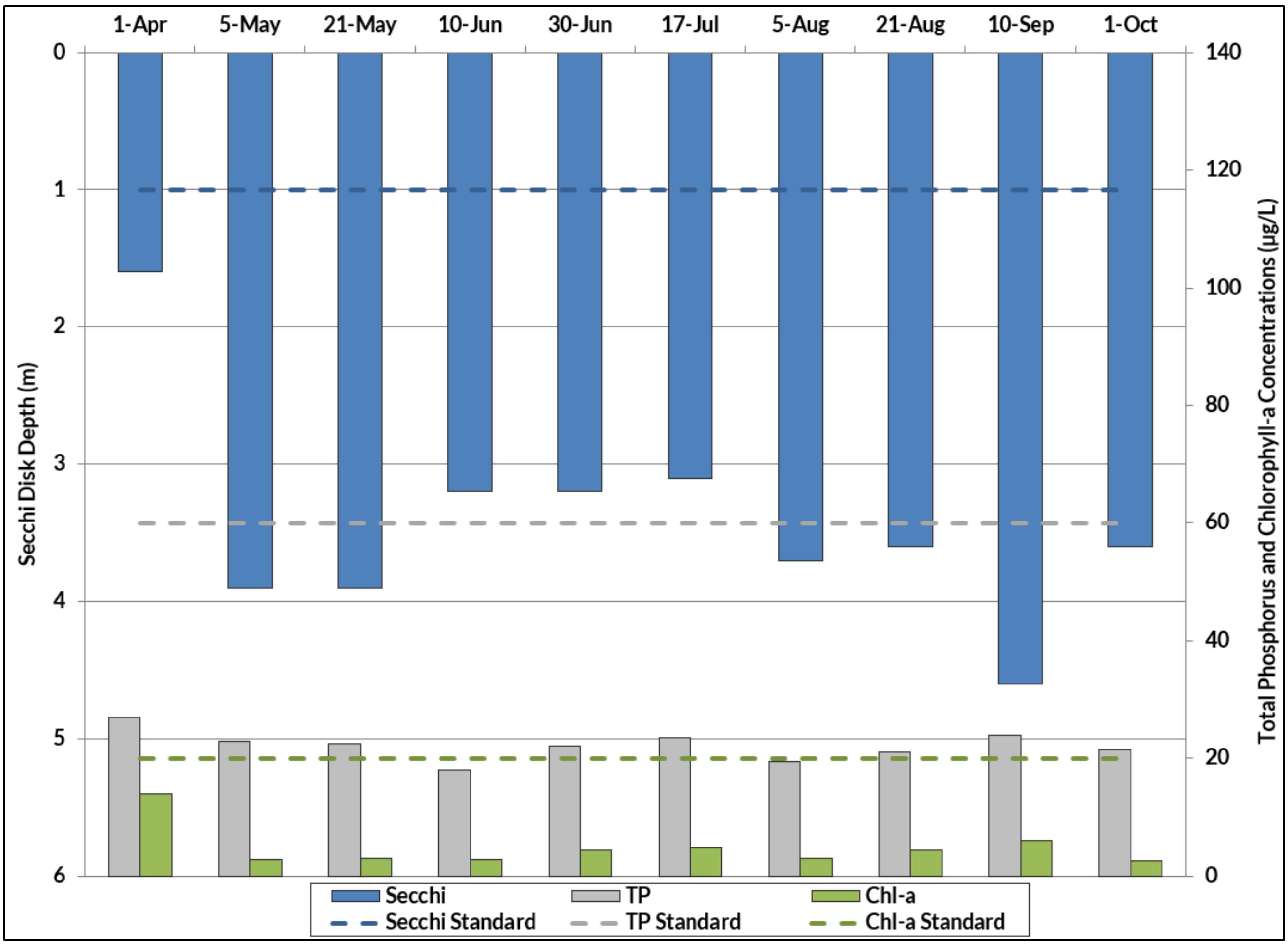

Figure 11: Loeb Lake 2025 daily epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

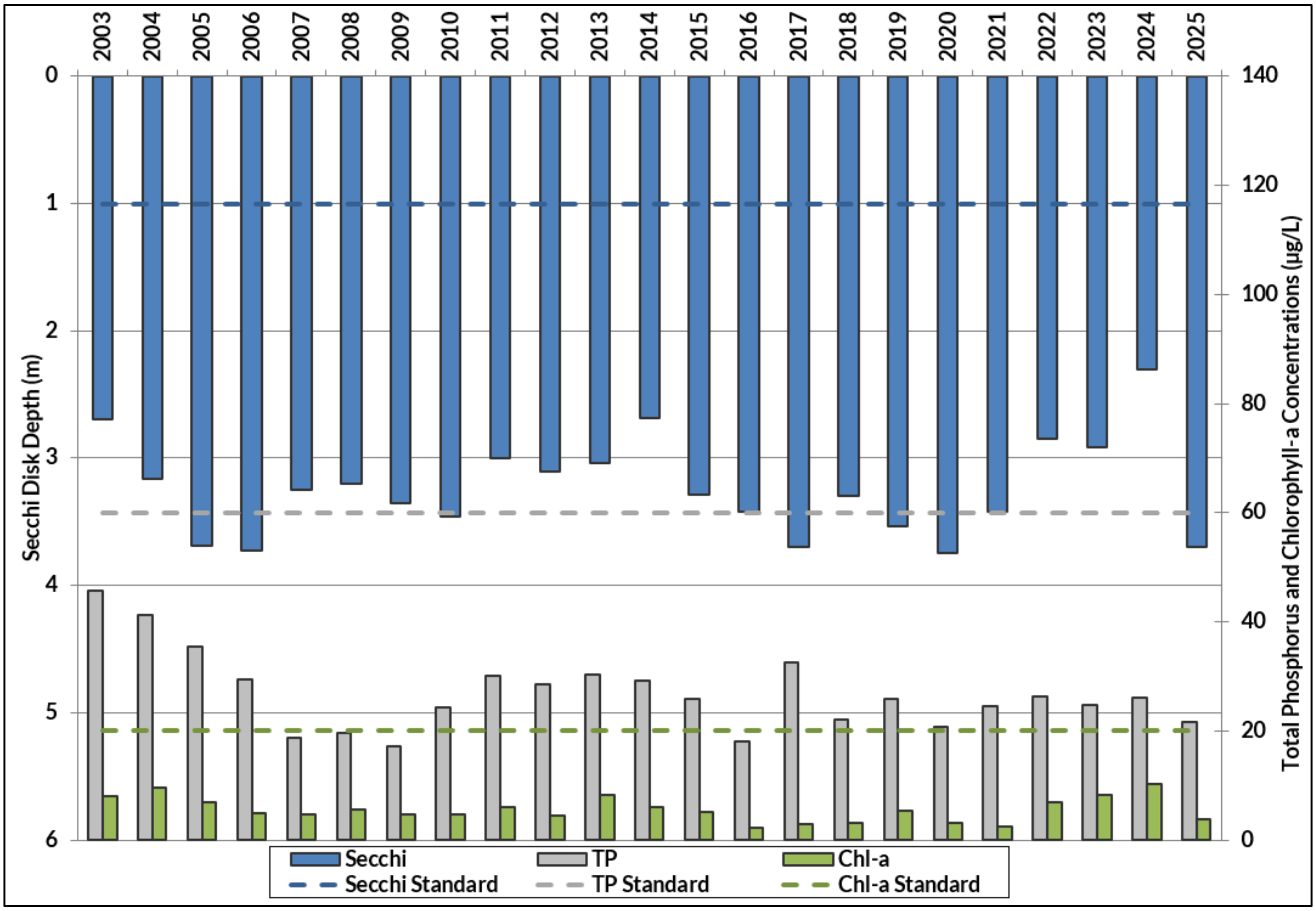

Figure 12: Loeb Lake historical average annual epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to shallow lake state standards

3.4.2 2025 Highlight: Aquatic Vegetation

One of the reasons that Loeb Lake is able to maintain such excellent water quality is its robust native plant population. Contributing factors include the bathymetry of the lake providing a conducive habitat as well as consistently low levels of phosphorus and Chl-a in the lake, resulting in fewer algae blooms, higher water clarity, and better overall conditions for native plants to thrive. Despite the presence of multiple aquatic invasive species (curly-leaf pondweed and Eurasian watermilfoil), the native aquatic plants continued to do well in 2025, with an additional two native species found during routine plant surveys compared to 2024.

To support the healthy plant population, CRWD continued its partnership with Ramsey County and the MN DNR to remove additional prickly waterlily (*Eurayle ferox*) (MN DNR, 2025). This unlisted non-native species was first spotted by CRWD staff in September of 2024, and an initial removal was conducted on September 30th with partners from the MN DNR, City of Saint Paul, and Ramsey County. In order to make the 2025 removal easier, it was scheduled earlier in the year on August 12th before the plants had the chance to fully mature. This meant that the pads, which can reach several feet in diameter, were much smaller and easier to remove (Figure 13). This also ensured that no pods had matured and released their seeds, further limiting future growth.

Figure 13: Large prickly waterlilies in September 2024 (above) and smaller prickly waterlilies in August 2025 (below) during removal events

The benefits of the extensive removal effort in 2024 paid off in 2025. Overall, there were fewer plants, and their biomass was significantly reduced, with 50-75 large plants removed in 2024 and only 25-35 smaller plants removed in 2025. With continued monitoring and removal as needed, the District is optimistic that prickly waterlily will continue to decline in Loeb Lake.

3.5 Lake McCarrons

3.5.1 Water Quality Data

Lake McCarrons had good overall water quality in 2025 and improved from 2024. Lake grade improved from a B in 2024 to a B+ in 2025, bringing it closer to its historical average A grade (Tables 2 and 3). With the exception of the first sample of the year on 4/1, all individual samples collected in 2025 met state standards for TP, Chl-a, and Secchi depth (Figure 14). All three eutrophication parameters also improved as compared to 2024 when comparing annual averages (Figure 15).

There is a slight upward trend for both TP and Chl-a since the 2004 alum treatment (Figure 15), which the District will continue to evaluate by following guidance from the *2020 Lake McCarrons Management Plan* . Overall, however, Lake McCarrons continues to maintain some of the best water quality of all District lakes.

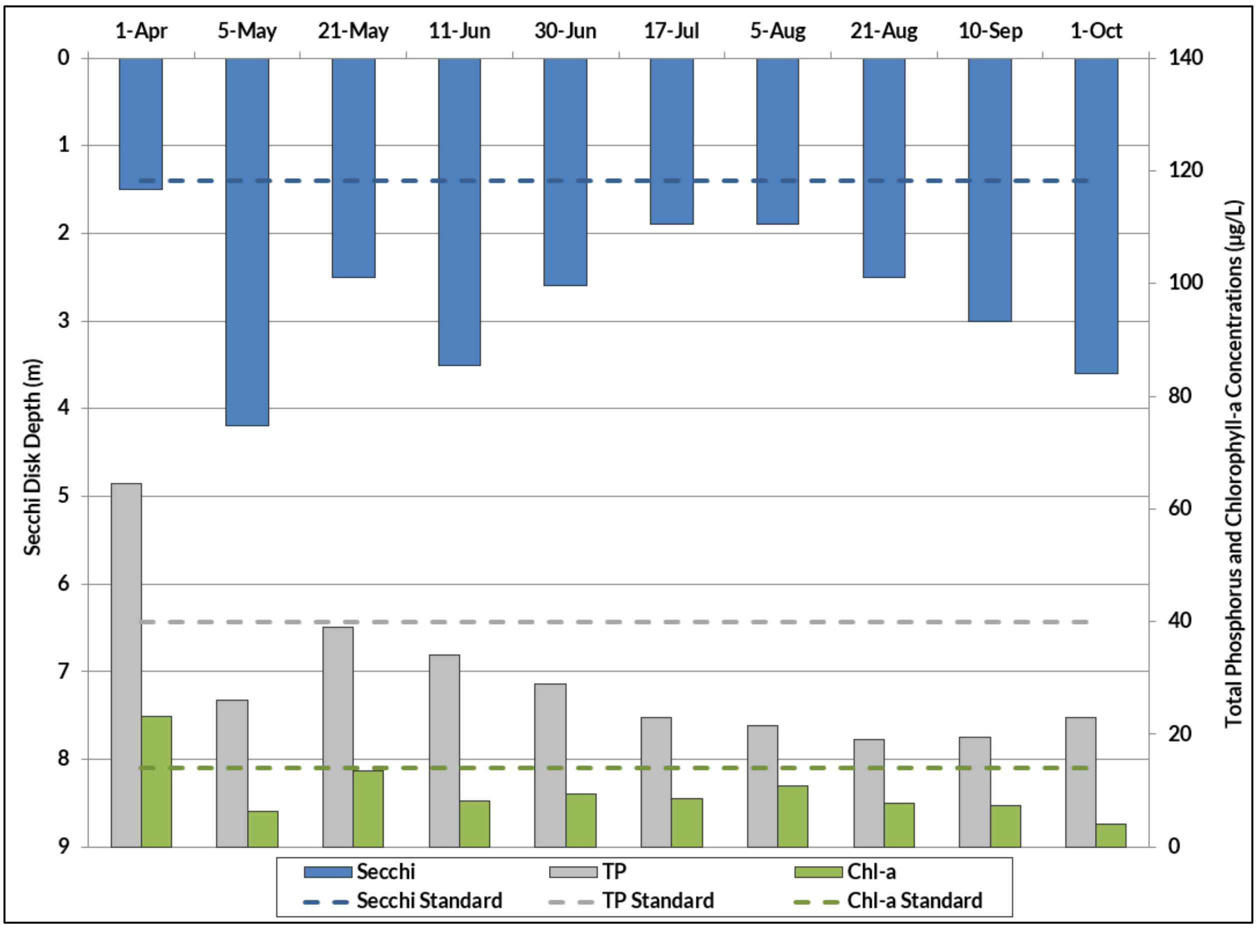

Figure 14: Lake McCarrons 2025 daily epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to the deep lake state standards

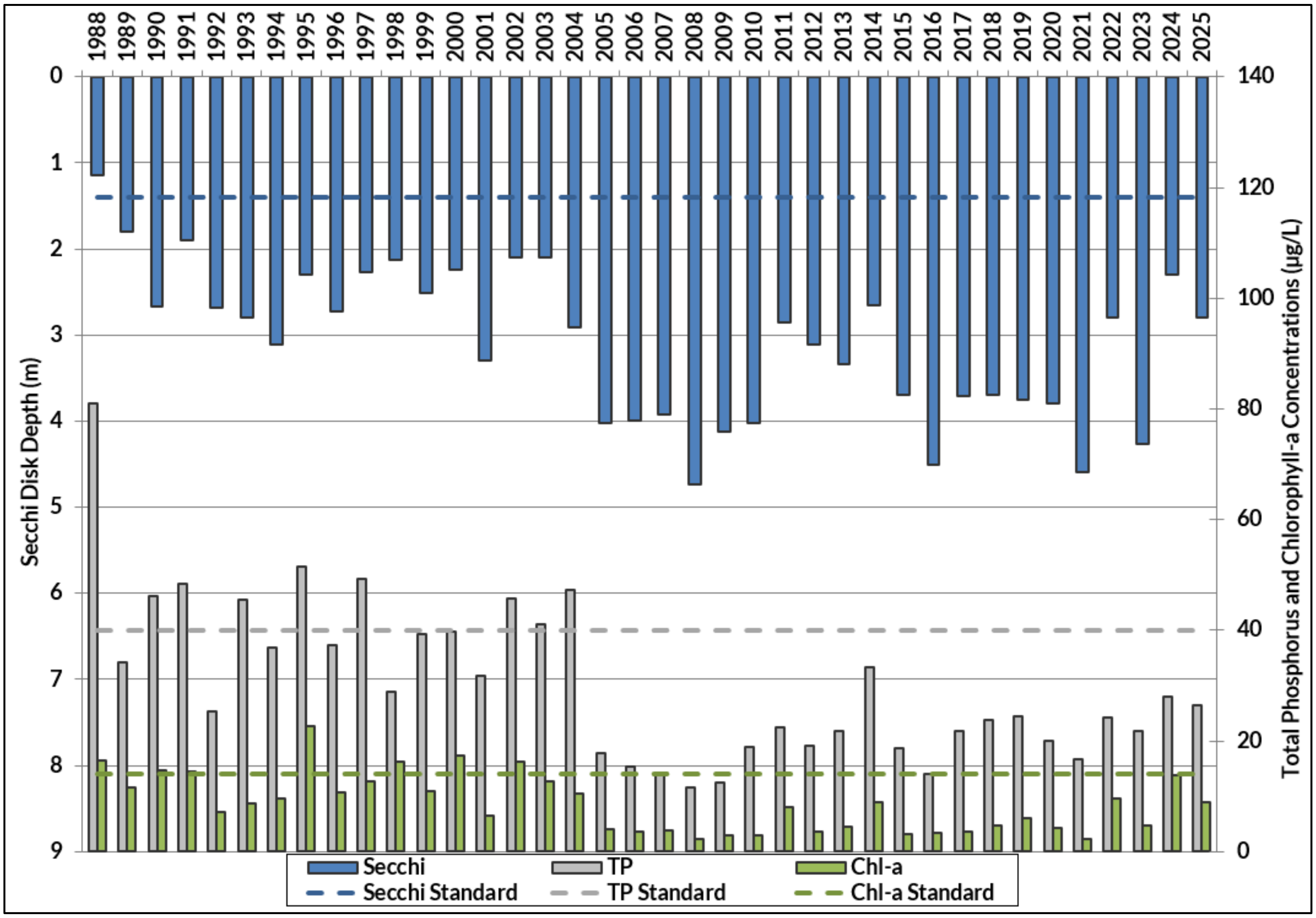

Figure 15: Lake McCarrons historical average annual epilimnetic total phosphorus, chlorophyll-a, and Secchi disk depth in comparison to the deep lake state standards

3.5.2 2025 Highlight: Fisheries

Supporting a healthy, balanced fishery is one of the goals outlined in the *2020 Lake McCarrons Management Plan.* In 2025 multiple steps were taken in support of this goal. In June the MN DNR conducted a routine fish survey, which was last completed in 2019 (typically done every five years). Using trap nets and gill nets over the course of two days, they found an array of native fish, including northern pike, walleye, yellow perch, and a variety of small panfish (R. Bullers (MN DNR), personal communication, February 20, 2026). There were fewer captured bluegill in 2025 as compared to the 2019 survey, but the 2019 survey showed a higher-than-average bluegill abundance, and 2015 abundance was still within normal range. There was also a higher capture rate of northern pike in 2025 compared to 2019. Another key difference in the two surveys was that in 2019, an electrofishing survey was included, which showed a healthy largemouth bass population. No electrofishing was done by the MN DNR in 2025, and bass are not typically caught in gill or trap nets, so their population cannot be directly compared between the two surveys (MN DNR, 2026). Neither the increase in pike or decrease in bluegill are a cause for concern at this time, and the MN DNR will evaluate potential fisheries management needs after another survey is completed in five years (R. Bullers (MN DNR), personal communication, February 20, 2026).

Another facet of Lake McCarrons fisheries that was assessed in 2025 was its common carp population. Common carp are invasive to North America, and in high numbers, they can degrade a lake's water quality by rooting through bottom sediments, releasing phosphorus and uprooting native vegetation. They can also displace native fish and disrupt a balanced fishery. Carp first appeared in Lake McCarrons MN DNR surveys in 1973, so their presence has been known for many decades, but the current density of their population was unknown. To ensure that they were not abundant enough to pose a threat to lake health, CRWD contracted with an outside consultant to do a population assessment via electrofishing in 2025.

In three electrofishing surveys, only six carp were caught in total. Using a Catch Per Unit Effort calculation (a common measure to estimate total density based on a measure of a subset of the population), the overall population density for the lake was estimated to be 57 lbs/acre. The threshold above which carp are a cause for concern is widely accepted as 89.9 lbs/acre (Bajer, et al., 2016), meaning that Lake McCarrons does not presently have a concerning density of carp. Another good sign for the lake is that all of the carp were within the same size class (Figure 16), and no young of year carp (i.e. carp born in the current calendar year) were seen, which indicates there is low reproduction.

It was also anecdotally noted during the electrofishing surveys that a variety of size classes of largemouth bass and pike were seen. The healthy native fishery in Lake McCarrons is likely one of the reasons that the carp population is still so low after decades in the lake. Bluegill and pike, which predate on carp eggs and small carp respectively, continue to have a robust population in the lake (Poole & Bajer, 2019). These two surveys together demonstrate the importance of maintaining a balanced fishery so that the lake can continue to naturally suppress carp and maintain good water quality.

Figure 16: Three carp caught in Lake McCarrons during the 2025 electrofishing surveys, all measuring approximately 26 inches

4 Summary

District lakes showed mixed results in water quality compared to 2024. While 2025 had less precipitation overall compared to 2024, it experienced significantly heavier rain in the peak summer months of June and July. Lake McCarrons, Loeb Lake, and Crosby Lake improved in water quality and were not heavily affected by those intense summer rains. Como Lake was more heavily impacted and declined in water quality in 2025 due to the corresponding high phosphorus inputs of this stormwater input. However, looking at long-term trends, Como Lake still maintained lower total phosphorus than the historical average. This variation across the lakes is indicative of the complexity of lake health.

As climate change continues to create varying extremes, such as warmer winters and earlier springs, drought, and high-intensity precipitation events, District lakes will experience fewer typical or average years. This only further emphasizes the importance of climate resiliency in lake management planning and projects.

In summary, lake monitoring and lake management will continue to be a priority for the District. In 2026 and future years, we will:

- Continue to monitor all five lakes to add to our robust dataset that forms the basis of all future management strategies
- Complete the *Chloride Pollution Prevention Plan*
    - Includes continuing to build on our chloride dataset and analyses with routine chloride monitoring and supplementary winter chloride monitoring on all District lakes
- Evaluate actions guided by the *2020 Lake McCarrons Management Plan*, including:
    - Alum treatment effectiveness monitoring and sediment coring
- Continue to implement *2019 Como Lake Management Plan* actions, namely:
    - Herbicide treatment to address CLP and EWM regrowth
    - Aquatic plant transplanting and monitoring
    - Lakeshore vegetation management and erosion control
    - Lakeshore access path construction
    - Watershed BMP construction – McMurray Field
- Update the *Loeb Lake Management Plan*
- Evaluate opportunities to incorporate the District's Climate Resiliency Framework into lake monitoring and water quality improvement projects

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Appendix A: CRWD Lake Monitoring and Analysis Methods

1 Monitoring Methods

1.1 Lake level

Lake elevation monitoring is organized by the Minnesota Department of Natural Resources (DNR) Lake Level Minnesota Program (DNR, 2024c). This program coordinates the monitoring by organizations and volunteers to gather weekly data of elevations on lakes throughout the state. Lake levels are measured using staff gages that are placed near the lakeshore in a stable and accessible location. Data on lake levels is collected by Ramsey County staff and provided to the DNR for inclusion in the LakeFinder database that can be accessed online to view historical lake levels for a particular lake (DNR, 2024b). Lake elevation monitoring by the DNR within CRWD occurs on Como Lake, Loeb Lake, and Lake McCarrons (via staff at Ramsey County Public Works (RCPW)).

CRWD has been collecting continuous lake level data since 2014 from early spring to late fall on Como Lake, Crosby Lake, Loeb Lake, and Lake McCarrons. Little Crosby Lake is hydrologically connected to Crosby Lake, and Crosby Lake data can therefore serve as a proxy for Little Crosby Lake. Continuous lake level is measured using Onset HOBO pressure sensors.

As this data continues to be compiled, a lake elevation graph is updated annually to view historical fluctuations in lake levels. The ordinary high water level (OHWL) is one other parameter that is shown on these graphs (where applicable). The OHWL is defined as the "highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial" (Scherek, 1993). The OHWL is used to determine regulatory controls, with the Minnesota DNR regulating activity below the OHWL and local units of government regulating activity above the OHWL. By including this as a part of the lake elevation graph, observations can be made as to how current and past years compare to the "normal" lake level. This does not always mean that the lake level ever reaches or surpasses the OHWL, as this level is based on landscape evidence indicating the historical water level and is not an average of past monitored water levels.

1.2 Chemical and physical data collection

Lake water quality data is collected by RCPW throughout the growing season (~April through October), resulting in ~8-10 samples for each year (RCPW, 2009). The initial monitoring day is dependent upon ice out on any given year. At each lake, RCPW staff anchor a watercraft over the deepest part of the lake and monitor for various water quality parameters. The physical and chemical parameters of depth, temperature, dissolved oxygen, conductivity, and pH are measured at one-meter sampling intervals for the full depth profile of the lake using a multi-probe. From these recordings, the depths of the epilimnion (i.e. top, warmer layer), thermocline (i.e. middle/temperature mixing layer), and hypolimnion (i.e. colder, bottom layer) are recorded.

Additionally, at the lake sampling location, water chemistry samples are collected at multiple depths along the profile of the lake. At all lakes, two samples arere obtained within the epilimnion, or mixed water layer at the surface. RCPW staff also identify if thermal stratification (where depths for the divisions between the epilimnion, thermocline, and hypolimnion) can be identified on the day of sample collection. Additional water samples within the thermocline (if present), and within the hypolimnion are also collected, and a bottom sample is collected on every visit. Any water samples collected are then stored and transported back to the lab and analyzed for the following parameters: chlorophyll-a (Chl-a), total phosphorus (TP), soluble reactive phosphorous (SRP) (i.e. ortho phosphorus), total Kjeldahl nitrogen (TKN), nitrate (NO_3), ammonia (NH_3), and chloride ion concentrations (Cl). Historically, these samples were processed by RCPW at the RC lab. Beginning in 2022, RCPW staff contracted with RMB labs to complete sample analysis. Methods between each lab were determined to be similar.

Water transparency, or water clarity, data is determined with the use of a Secchi disk. A Secchi disk is a black and white patterned disk that is connected to a line or pole. To take a measurement, the Secchi disk is lowered slowly into the water column until the pattern is no longer visible. The depth at which the disk is no longer visible is then recorded.

Monitoring is conducted by CRWD, RCPW, and/or hired consultants as needed during the period of time from ice on through ice out, dependent upon ice conditions. This monitoring can include the collection of profile data, epilimnetic and hypolimnetic chloride samples, or sediment cores. Access holes are created through the ice using an auger. Profile data collection follows the same methods as above. Water quality samples are collected using a kemmerer sampler and sent to the Metropolitan Council Environmental Services lab for analysis. Sediment cores are collected using a gravity sediment coring device that penetrates the lakebed.

1.3 Phytoplankton and zooplankton collection

Phytoplankton and zooplankton data collection occur at the same time as water quality data collection by RCPW. For phytoplankton analysis, a composite sample is collected using a plastic tube inserted vertically 2 m into the upper layer of the water column. This sample is emptied into a bucket, thoroughly mixed, and a sub-sample is collected and preserved. This water sample is placed in an enclosed cooler and taken back to the RC lab for analysis (RCPW, 2012).

To collect a zooplankton sample, a net tow is lowered down to the observed thermocline to collect samples from the oxygenated layer of the lake. The net tow is allowed to settle and then pulled back up to the water surface at a rate of 1 m/sec. The net and capture bucket are drained by swirling the capture bucket which allows the water to drain out of the net and screen. Once the volume has been reduced to 100 mL, the contents of the capture bucket are poured into another container and preserved in a 5% formaldehyde solution, then taken back to the RC lab for analysis (RCPW, 2012).

1.4 Aquatic vegetation surveys

1.4.1 Point-intercept survey method

All lakes are surveyed by the Soil and Water Conservation Division of Ramsey County (RC) (previously called Ramsey Conservation District) for aquatic vegetation presence and abundance using the point-intercept method. This method consists of using a GPS to pre-select specific monitoring points throughout the full area of the lake. At each evenly spaced (70 m distance) point, a double-tined metal rake is thrown out 1 m from the boat, dragged a distance of 1 m and brought back into the boat. Plant species are identified and given an abundance ranking based on the amount collected on the rake. Any plants floating on the water surface are also identified. RC staff survey all CRWD lakes a minimum of two times throughout the course of the year in June and August.

Data collected from 2014 – 2018 used an abundance ranking with a 1 – 5 ranking scale (Table 1). Beginning in 2019, Ramsey County staff switched to a 1 – 3 scale for the abundance ranking to make it easier to interpret in the field, resulting in a more accurate representation of abundance (Table 2).

Table 1: Average abundance rating and description for aquatic vegetation (2014 – 2018)

Percent Cover of Tines	Abundance Ranking
81-100	5
61-80	4
41-60	3
21-40	2
1-20	1

Table 2: Average abundance rating and description for aquatic vegetation (2019 – Current)

Percent Cover of Tines	Abundance Ranking
41-100	3
21-40	2
1-20	1

Prior to 2014, aquatic vegetation sampling was conducted by both CRWD and Ramsey Conservation District staff, but not at regular intervals for any of the 5 lakes.

1.4.2 Biovolume survey method

To collect data on submerged aquatic vegetation as well as data about the lake bottom, RC uses a Lowrance HDS-5 GPS enabled depth finder to assess evenly spaced transects at a minimum distance of 40 meters. The sonar log data that is collected is analyzed by CI BioBase software to determine the depth of the lake and the amount of aquatic vegetation (biomass) along each transect. These surveys also produce information estimating lake area, bathymetry, and lake water volume.

1.5 Fish stocking and surveys

Fish stocking occurs annually through the Minnesota DNR in an effort to improve fishing conditions on select Minnesota lakes. Roughly 25% of Minnesota's 5,400 fishing lakes have a set stocking schedule (DNR, 2024a). Fish are stocked at different life stages depending on the desired effect in the lake. Table 3 describes the different types of fish used for stocking.

Table 3: Minnesota DNR fish stocking size definitions (DNR, 2024a)

Fry	Fish stocked in lakes shortly after hatching from eggs.
Fingerling	Fish harvested from rearing ponds after one summer of growth.
Yearling	Fish that are a year old at the time of stocking.
Adult	Fish more than 1 year old, usually transferred from other waters.

Fish surveys are conducted every 5-10 years by the DNR on the majority of Minnesota lakes to aid in fisheries management decisions. Surveys occur more frequently, however, on lakes of higher fishing importance. Fish are collected using various field techniques based on the type and size of fish to be collected. These survey techniques include: gill netting (to capture larger, predator fish), trap netting (to capture smaller panfish), trawl and shoreline seines (to capture young fish), and electrofishing (to survey for bass, crappies and young walleyes). Once captured, information is recorded on the species, count, weight, and length, as well as how these measures compare to the normal expected range for the species (DNR, 2024a). If CRWD requires fish surveys in a year when the DNR is not conducting surveys on the desired lake, CRWD staff hires a consultant to complete this work.

2 Data analysis methods

2.1 Morphometric data

Morphometric data is compiled for each lake. This includes information regarding lake surface area, mean and maximum depth, littoral area percentage, lake water volume, watershed area, and watershed-to-lake area ratio. The watershed-to-lake area ratio represents how large the watershed is compared to the size of the lake. A high ratio indicates a large portion of land for potential runoff to the lake, while a low ratio indicates a smaller area conducting runoff. In general, having a lower ratio in urban areas decreases external nutrient loading to lakes, which in turn can result in improved water quality.

2.2 Water quality standards comparison

A lake is considered eutrophic if it has high nutrient levels, low dissolved oxygen concentrations, and frequent algal blooms. Although some lakes are naturally eutrophic, many have become eutrophic as a result of anthropogenic activities. In order to identify eutrophic water bodies in Minnesota, the MPCA establishes eutrophication numeric surface water quality standards in lakes for TP, Chl-a, and Secchi depth, which were updated in 2014 (Table 4) (MPCA, 2014). To account for differences in natural trophic state, the standards vary by ecoregion and lake type. In the NCHF ecoregion, a different standard exists for shallow and deep lakes. Annual seasonal means are determined for each of these parameters based on the monitoring events that occur between June and September each year. A lake is considered impaired under MPCA standards if the annual seasonal mean exceeds the standard for TP concentration and either the Secchi disk depth or Chl-a concentration. Lakes that do not meet the standards may be placed on the MPCA 303(d) list of impaired waters.

Table 4: Deep and shallow lake state water quality standards (MPCA, 2014)

Parameter	Deep Lake Standard[a,b]	Shallow Lake Standard[a,c]	Units	Source
TP*	<40	<60	µg/L	Minn. Stat. § 7050.0222
Chlorophyll-*a*	<14	<20	µg/L	Minn. Stat. § 7050.0222
Secchi depth	≥1.4	≥1.0	m	Minn. Stat. § 7050.0222

[a] Standards apply to Class 2B waters in the North Central Hardwood Forest ecoregion. Class 2B waters are designated for aquatic life and recreational use. All standard concentrations apply to chronic exposure.
[b] A deep lake is defined as a lake with a maximum depth > 15 feet or one in which < 80% of the lake is in the littoral zone.
[c] A shallow lake is defined as a lake with a maximum depth < 15 feet or one in which > 80% of the lake is in the littoral zone.
*MPCA standard for TP is listed in mg/L, but has been converted to µg/L.

In order to calculate an annual seasonal mean for both TP and Chlorophyll-a (there is only a single value inherently collected for Secchi depth), there needs to be a daily surface value found for each parameter for each monitoring event. In CRWD lakes, there are generally two samples collected within the surface (upper 2 m) of the lake. Where two samples are collected in the upper 2 m of the water column and both of these samples are considered to be in the epilimnion (i.e. the stratification depth on the day the samples were collected was deeper than 2 m), then the average of these values was calculated. If the lake stratified above 2 m, then only samples collected shallower than the stratification depth are used for the daily average. If there was a single sample collected to represent the surface, then this single value is used for the daily value.

To determine the seasonal mean for each parameter, the average of the daily means from May – September was calculated. The MPCA considers the growing season for the state of Minnesota as a whole to be June – September, but the CRWD growing season is generally from May – September. Comparisons to the MPCA state standards need to be made using June – September averages.

2.3 Lake grading system

CRWD uses a lake grading system to give a qualitative measure to the water quality data and compare between years monitored (Table 5). This is based on the lake grading system developed by the Metropolitan Council that is used to compare lakes across the metro region and to offer a non-technical value of lake water quality that is more understandable to a wide variety of audiences (Osgood, 1989). The range is weighted such that a certain percentage of Minnesota lakes fall into each grade. Each grade corresponds not only to ranges in the three lake eutrophication parameters (TP, Chl-a, and Secchi depth), but also to a recreational value for the lake that provides a description of user quality (Johnson, 2014).

CRWD assigns each letter grade a numerical value (A = 5, B = 4, C = 3, D = 2, F = 1), and the average of these three values provide an overall annual lake grade (Table 3-5). The ranges in Table 6 are based off methods used by the Minnehaha Creek Watershed District in their monitoring reports (MCWD, 2015).

Table 5: Water quality parameter lake grade ranges, percentile ranges, and description of lake grade user quality (Johnson, 2014; Osgood, 1989)

Grade	Percentile	TP (µg/l)	Chl-*a* (µg/l)	Secchi (m)	Description of User Quality
A	<10	<23	<10	>3.0	Full recreational use capability
B	10-30	23-32	10-20	2.2-3.0	Very good water quality but some recreational use impairment
C	30-70	32-68	20-48	1.2-2.2	Average water quality but are recreationally impaired
D	70-90	68-152	48-77	0.7-1.2	Severly impaired recreational use
F	>90	>152	>77	<0.7	Extremely poor water quality; little to no recreational use

Table 6: CRWD overall lake grade ranges (MCWD, 2015)

Grade	Range
A	4.67 - 5.00
A-	4.34 - 4.66
B+	4.01 - 4.33
B+	3.67 - 4.00
B-	3.34 - 3.66
C+	3.01 - 3.33
C	2.67 - 3.00
C-	2.34 - 2.66
D+	2.01 - 2.33
D	1.67 - 2.00
D-	1.34 - 1.66
F	< 1.33

2.4 Phytoplankton and zooplankton lab analysis

All methods for lab analysis of phytoplankton and zooplankton are obtained from Ramsey County Lake Management Laboratory (RCLML), a part of RCPW (RCPW, 2012). In the lab, the preserved phytoplankton sample is analyzed and identity/counts are recorded. The classes/phylums identified are listed and described in Table 7 (Kalff, 2002; UCMP, 2015).

Table 7: Phytoplankton types, taxonomic classification, description, and water quality significance

Phytoplankton	Classification	Description	Water Quality Significance
Bacillariophyta	Class	Diatoms	Large populations suggest higher levels of dissolved silica needed to build external skeletons
Chlorophyta	Phylum	Green algae	Greatly contribute to freshwater lake species richness; contribute most significantly to biomass of eutrophic systems
Chrysophyta	Class	Golden-brown algae	Not overly abundant in eutrophic lakes; more plentiful in oligotrophic, clear-water lakes
Cryptophyta	Phylum	Cryptomonads	Most prevelant in oligotrophic and mesotrophic lakes; division does not contain an abundance of species types
Cyanophyta	Phylum	Blue-green algae	Indicative of highly nutrient-rich (eutrophic and hypereutrophic) lakes; large blooms are aesthetically displeasing and some can be toxic
Euglenophyta	Phylum	Euglenoids	Generally small contribution to overall biomass except in small, highly eutrophic bodies of water
Pyrrophyta	Phylum	Dinoflagellates	Typically contribute small portion of total biomass or species richness in temperate lakes

To analyze zooplankton, the preserved sample from the field is measured and a subvolume is analyzed for identity/counts. The zooplankton that are identified in this process are shown and described in Table 8 (Kalff, 2002). The Cladocerans identified during analysis consisted of Daphnia, Bosminae, Chydorus, Ceridaphnia, Diaphnosoma, and Leptodora. These genus-level organisms are combined and grouped under the heading 'Cladocera' for analysis.

Table 8: Zooplankton types, taxonomic classification, description, and water quality significance

Zooplankton	Classification	Description	Water Quality Significance
Cyclopoida	Order	Carniverous copepods	Primarily carniverous crustaceans; feed on other zooplankton and fish larvae but also eat algae, bacteria, and detritus
Calanoida	Order	Omnivorous copepods	Crustaceans that feed on ciliates as well as algae; change diet based on multiple variables including season and food availability
Nauplii	Genus	Juvenile copepods	Classified as *nauplii* during the first 5 or 6 molts (motling occurs 11 times before adulthood) during the life span of a copepod
Rotifera	Phylum	Soft-bodied, multicellular invertebrates	Name originates from rotating wheel of cilia by mouth; important among invertebrates as many species can produce multi-generations per year
Cladocera	Suborder	Type of crustacean	Mainly important filter-feeders covered by a hard cover; specific species *Daphnia* are main food source for planktivorous fish

There are two figures for both phytoplankton and zooplankton. The first figure for phytoplankton compares total phytoplankton concentration (divided by type) and TP concentration for all individual visits between April and October. The first figure for zooplankton compares total zooplankton density (divided by type), and Chl-a concentration for all individual visits between April and October. The second figures depict the relative abundance of each type of phytoplankton and zooplankton to examine changes in their populations between individual visits between April and October.

2.5 Aquatic vegetation analysis

2.5.1 Biovolume analysis

Sonar data is entered into CI BioBase software that generates aquatic vegetation and bathymetric maps (CIBB, 2015). The biovolume heat maps are coded by different color zones to highlight differences in cover of aquatic vegetation. Red indicates that 100% of the water column is being taken up by biovolume, or vegetation is growing to the water surface, and blue indicates 0%, or bare lake bottom. Statistics calculated along with the maps include plant biovolume (the percentage of the water column that is vegetation) and percent area covered (the amount of the lake area where vegetation exists) (CIBB, 2015).

2.5.2 Point-intercept analysis

Aquatic vegetation has been monitored infrequently in past years on CRWD lakes. Establishing a baseline of vegetation data for all lakes is a key factor in making management decisions. Aquatic vegetation within a lake is dependent on many different factors, including: water clarity, water chemistry, and physical lake parameters (including depth, sediment substrate type, lake size/shape, and shoreline vegetation). Not only does aquatic vegetation stabilize bottom sediment, plants also provide habitat for aquatic animals and are usually the main primary producers in shallow lakes (Kalff, 2002). Collecting data on aquatic vegetation provides baseline information on what vegetation is in the lake, where it exists on the lake, and how much is present. Measuring annual changes in these factors can help identify trends in aquatic vegetation and water quality.

Collecting data on aquatic vegetation using the point-intercept method allows for two primary analyses to occur: computation of frequency of occurrence and average abundance. Previously, Ramsey County staff used “Percent occurrence” to describe plant cover in a lake. Percent occurrence represents the number of times a plant species was observed divided by the number of total sample sites where vegetation was observed. In 2022, Ramsey County staff switched to using the method “Frequency of occurrence” to be more consistent with DNR standards. Frequency of occurrence is the number of times a plant species was observed within the littoral zone divided by the total number of sample points within the littoral zone. Therefore, while most plants in CRWD lakes are found within the littoral zone, caution should be used when comparing data before and after this switch in 2022, since pre-2022 data calculations use all sample points in the lake to calculate the occurrence, where 2022 and future data calculations use only the littoral zone sample points.

Average abundance is calculated as the average of the abundance rankings (measured at each location found) for a species on each sample date. This shows how much vegetation of each species is occurring at the locations where vegetation is noted. A high average abundance ranking indicates thick cover of a species where it is observed. Conversely, a low average abundance ranking indicates minimal growth of a species.

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