2020 Clearwater Lake Water Quality Report

Clearwater Lake Association members and other lakeshore owners have been diligent over the years to track the health of Clearwater Lake. Hundreds of trips have been made to designated locations on the lake since the late 1980's to measure and track changes in water quality. All this information creates a picture of the current health of the lake and reveals trends in water quality.

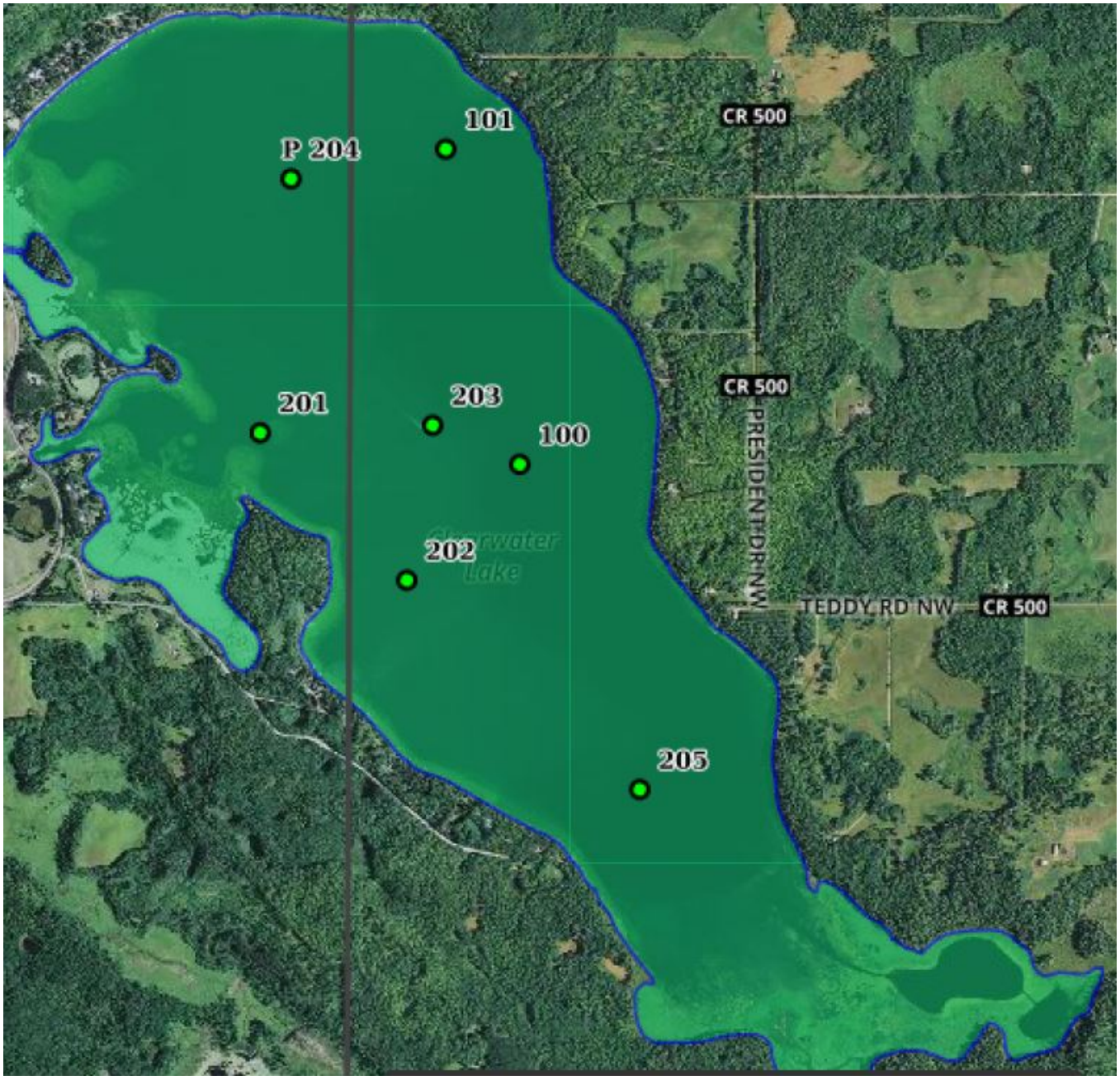

Figure 1: Designated monitoring locations established with the Minnesota Pollution Control Agency (MPCA). Site 204 has been the primary monitoring location since at least the early 2000's. Most of the sampling that is reported to the MPCA is collected by volunteers at this site. Graphic Source: RMB Environmental Labs.

What is water quality? What affects it?

In reference to lakes and streams, water quality is often described as a body of water's ability to support recreational uses including; swimming, fishing or other recreational activities. The ability of a lake to provide these opportunities is most often impacted by the amount of nutrients it is receiving. As nutrients in a lake increase, so do algae and weed growth. Algae reduces clarity and can at times even be toxic if enough nutrient are available to support certain algae species. This condition makes swimming much less desirable or even dangerous in extreme instances. Excessive weed growth can also limit recreational use by impeding boat traffic.

Common sources of nutrients include lawn fertilizers, agricultural runoff, detergents, lawn clippings, and eroded sediments. All these items are often high in phosphorus, the nutrients plants and algae need to grow. Limiting contributions of these items can help ensure Clearwater Lake maintains its good water quality.

What is water quality monitoring?

In general, water quality monitoring entails measuring the amount of nutrients and algae in a body of water, as well as water clarity.

Tracking water quality is most often done indirectly by measuring the clarity of water. This is accomplished utilizing an 8 inch, round, white disk, known as a Secchi disk. The disk is lowered into the depths of the lake until it disappears and then slowly raised until it reappears. The average of these points produces a Secchi depth reading. This simple method of data collection has proven to be a powerful tool in assessing the health of lakes all across our state, as these measurements provide a strong indication of algae and nutrients levels.

The amount of nutrients and algae can also be directly measured from samples of lake water. Samples are collected once a month from May – September at a predetermined site on the lake. For Clearwater Lake, that site is 204. This location is indicated in **Figure 1** above as **P 204**. The site is far enough out from shore and deep enough that the water is well mixed and provides a good representation of all the water in the lake. Secchi disk readings are also taken from this location allowing all of this information to be compared.

Secchi disk being lowered into a lake.

Why is it important?

Tracking water quality provides a picture of what is going on in Clearwater Lake at the time of collection and reveals trends in water quality over time. It allows problems to be identified and addressed as soon as possible. **Figure 2** below shows 389 Secchi disk readings taken from fives sites dating back to 1989. It is expected that most readings will be between 8' and 15' deep as represented by the yellow lines.

Over time it is possible to see if particular events have impacted Clearwater Lake's water quality. One of the most notable examples of this are the readings taken in the summer of 1997 through the spring of 1998. On August 4, 1997 a Secchi disk reading of only 3 feet was recorded, compared to several readings around 15' the year before. Clarity was reduced significantly over the entire summer and into the next year. This drastic change in clarity was cause for concern. As more time unfolded it was determined that there had been a failure of the City of Bagley's wastewater treatment system. Tons of nutrients were released from the site into the Clearwater

River which ultimately found their way into Clearwater Lake. The result was extensive plant growth and nuisance algal blooms.

Times of great water quality have been captured as well, as was seen in June of 2000. On June 11th, a clarity reading of 21.5' was recorded by Robert Widerski. The unusual clarity was maintained only for a short period, but is a fascinating event nonetheless. Information such as this is not possible without a regular water quality monitoring program. The monitoring program provides a means to substantiate changes in water quality. As John Cucci used to say "we can remember and talk about those years, but by keeping these actual records we have proof of what we speak."

A Closer Look at Water Quality Results

The results from Clearwater Lake's water quality monitoring can be compared to other similar lakes. The Minnesota Pollution Control Agency has established a system for this comparison based on "ecoregions". An ecoregion is a geographical area where the land use, geology, and plant communities are relatively similar. Lakes are expected to behave similarly within these regions. Clearwater Lake is situated in the Northern Lakes and Forest Ecoregion which is home to some of Minnesota's cleanest and clearest lakes.

Ecoregions of Minnesota. (Source: RMB Environmental Laboratories)

The Northern Lakes and Forest Ecoregion also has the highest standards. Standards are set for nutrients (phosphorus), algae (chlorophyll-a), and clarity (Secchi depth) based on the typical ranges seen in the ecoregion. Lakes are considered able to fully support recreational use if the average of five samples collected from May-September does not exceed the standards set for phosphorus and chlorophyll-a and at least reach the minimum Secchi depth. In cases where these criteria are not met, a more extensive look at the lake is taken to decide whether it is impaired and in need of restoration efforts.

Secchi disk monitoring results, in **Figure 3** below, show that since 2000 the summer average of Secchi depths has always met and usually exceeded the impairment threshold of 6.6 feet. Most summer averages were in the mid to lower limit of the expected range. This is reasonable, knowing that the Clearwater Lake watershed lies on the fringe of the North Lakes and Forest Ecoregion and is impacted by more land based activities than other areas of this region. There is a slight indication that Secchi disk depth is diminishing but there is not enough data to be certain of that yet. Overall the Secchi results indicate a fairly stable trend in water quality.

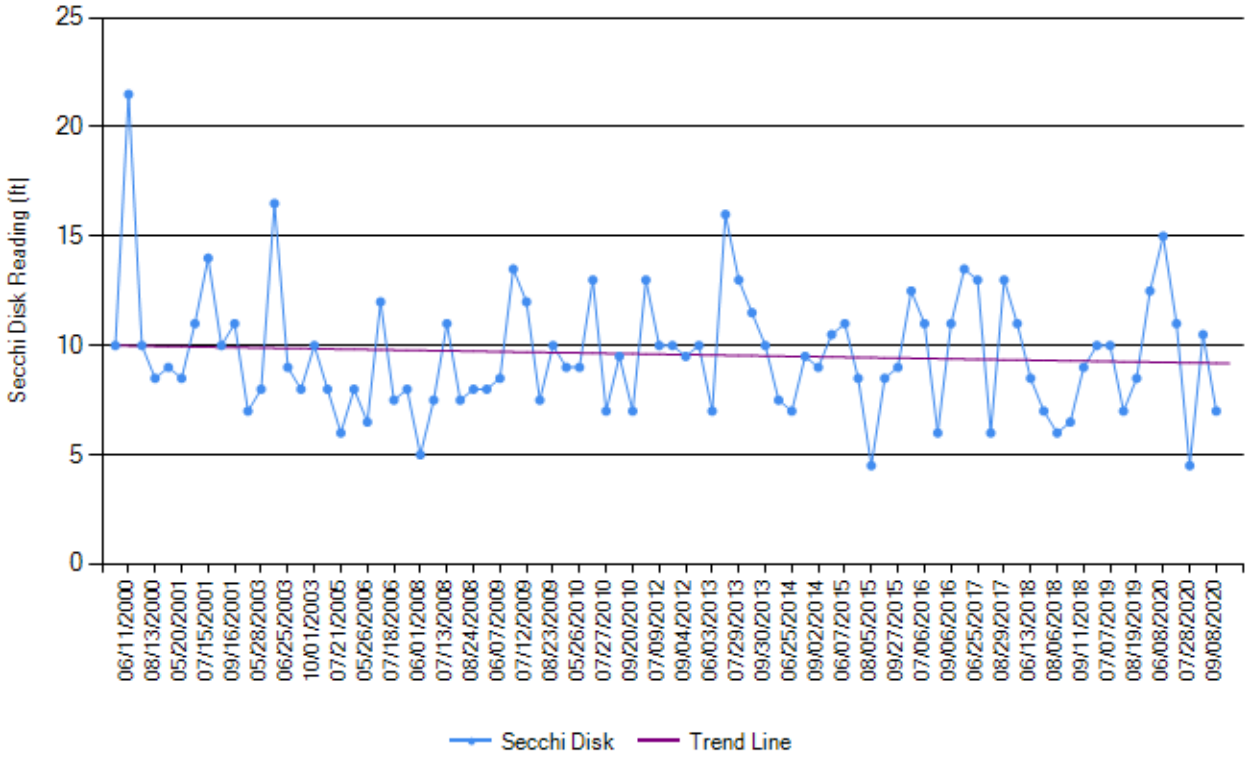

Figure 3: Secchi disk depths reported from 2000-2020 at the primary monitoring site (204) on Clearwater Lake. Red line signifies Minnesota Pollution Control Agency's designated impairment threshold standard (6.6') for lakes within the Northern Lakes and Forest Ecoregion. (Secchi depth readings less than 6.6' in depth fall short of the standard. The red horizontal line is an estimated trend line. The trend line suggests a reduction in Secchi disk depths over the given period, but it is not statistically significant. A trend cannot be confidently determined from the given set of data.

That same stable trend in water quality can be seen in the phosphorus and chlorophyll-a testing results shown in **Figures 5 & 6** below. From 2000-2020, the average summer phosphorus and chlorophyll-a levels were within the expected range, with chlorophyll-a levels even falling below the expected range in 2012 and 2016. Chlorophyll-a levels represent the amount of algae in the lake. Low levels of chlorophyll-a, translates to low levels of algae. Water quality within Clearwater Lake has largely remained within the expected ranges for nutrients, algae, and clarity. Even though, Clearwater Lake seems to be a fairly stable system, it has shown itself vulnerable to inputs of excess nutrients, as was the case in 1997. Continued monitoring will provide insights into the trend of water quality in the lake, and will allow for a timely response to issues if they should arise.

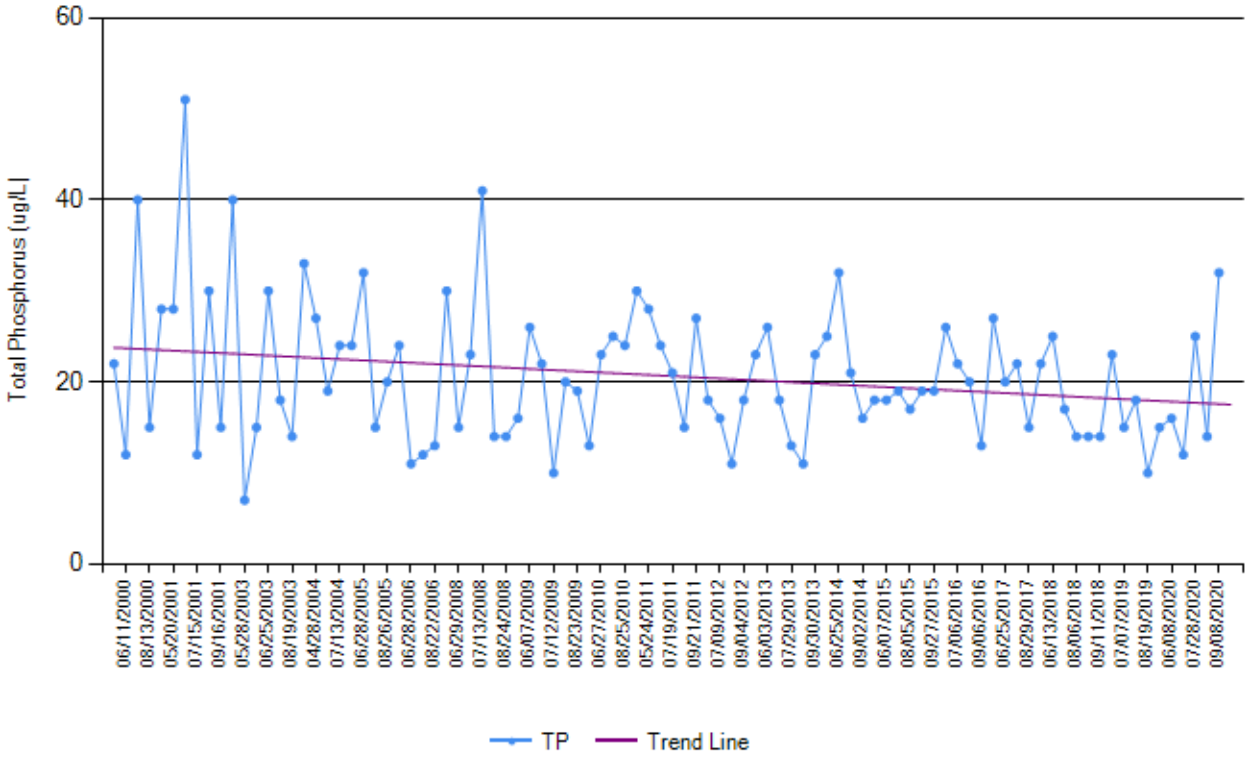

Figure 4: Season average (June-September) of total phosphorus results collect from 2000-2020 at the primary monitoring site (204) on Clearwater Lake. Minnesota Pollution Control Agency's designated impairment threshold standard (30ug/L) for lakes within the Northern Lakes and Forest Ecoregion (Total phosphorus results greater than 30ug/L exceed the standard). Red Horizontal line is an estimated trend line. The trend line suggests a reduction in phosphorus load over the given period, but it is not statistically significant. A trend cannot be confidently determined from the given set of data.

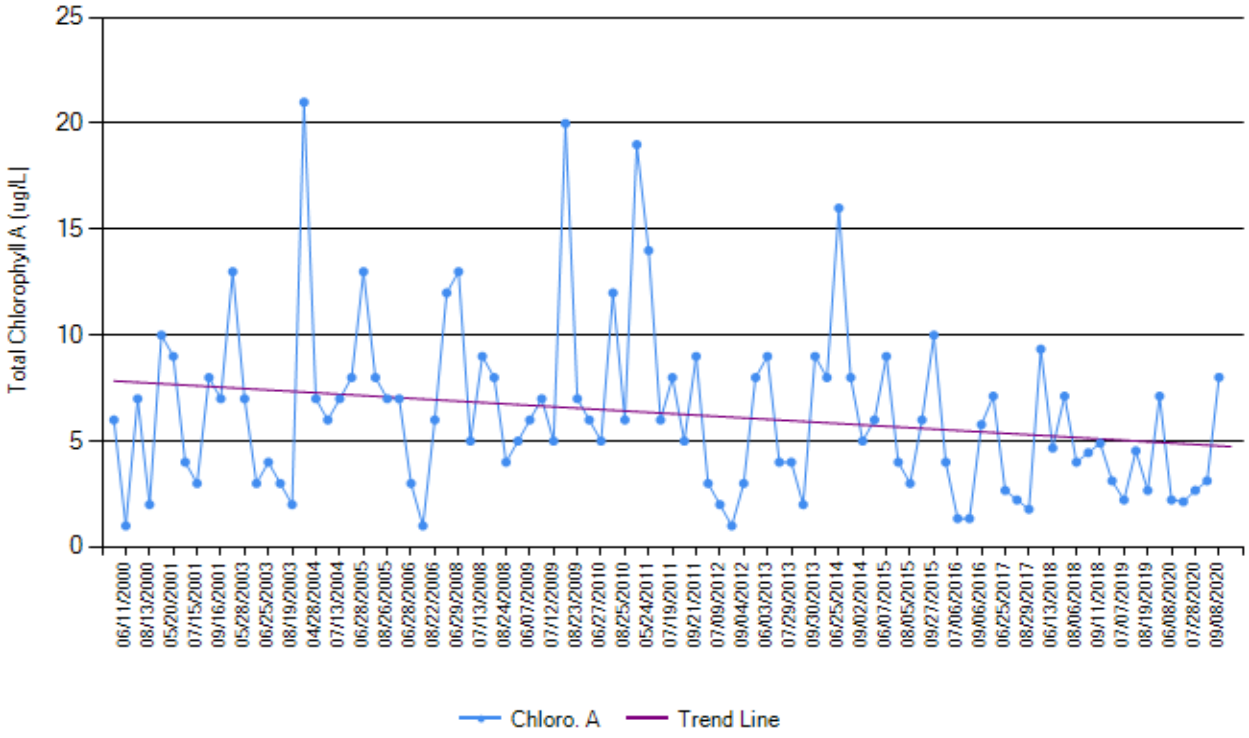

Figure 5: Season average (June-September) of chlorophyll-a results collect from 2000-2020 at the primary monitoring site (204) on Clearwater Lake. Minnesota Pollution Control Agency's designated impairment threshold standard (<10ug/L) for lakes within the Northern Lakes and Forest Ecoregion (Chlorophyll-a results greater than 10ug/L exceed the standard). Red Horizontal line is an estimated trend line. The trend line suggests a reduction in chlorophyll-a levels over the given period, but it is not statistically significant. A trend cannot be confidently determined from the given set of data.