

Enemy Swim Lake Water Quality Update 2025

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Composite surface and bottom water samples were collected during June, July, and August 2025 from three sites on Enemy Swim Lake for the following parameters: total phosphorus, nitrate-nitrogen, total kjeldahl nitrogen, ammonia-nitrogen, total suspended solids, and chlorophyll *a*. Field parameters taken by Prairie Coteau personnel include pH, dissolved oxygen, and Secchi depth. RMB Laboratories located in Detroit Lakes, Minnesota conducted analysis of the water samples collected.

Secchi Depth

Secchi depth is a measure of lake transparency or clarity. A Secchi disk is an 8 inch or larger plastic, or metal disk alternately painted black and white. The disk, attached to a measuring tape, is lowered into the water until it is no longer visible from the surface. The depth measured where the disk is no longer visible is called the Secchi depth. Low Secchi depth measurements are typically due to algae blooms or suspended sediments from a lake's bottom or watershed and shoreline soil erosion. Secchi depth usually decreases in eutrophic lakes as the summer season progresses due to increases in algae growth.

In 2025, Secchi disk measurements trended well above average compared to past data, including the greatest secchi disk readings for the month of July and August ever recorded by the watershed project. July was recorded at 14.4 feet and August at 11.5 feet. Figure 1 shows Secchi measurements recorded since 2014. Secchi readings tend to be greater in the months of May and June, and then gradually diminishing in the summer months, although Enemy Swim historically has overall increased water clarity due to being a mesotrophic or "medium rich" lake. In Enemy Swim Lake, decreased summer Secchi depth readings is almost always due to the presence of algae and very rarely suspended sediment for watershed or shoreline erosion.

Zebra mussels are affecting Enemy Swim Lake's water clarity. Enemy Swim was considered infested with zebra mussels in 2022. This year, it was noticed what seemed to be a lower population of zebra mussel populations found on docks, boat lifts and along the shoreline. What was found by project personnel was more zebra mussels and aquatic plants, down to depths of over 20 feet deep (Figure 2) were discovered this year compared to last year. The increased macrophytes and zebra mussels found in deeper depths correlates to the increased water clarity data observed.

Figure 1.

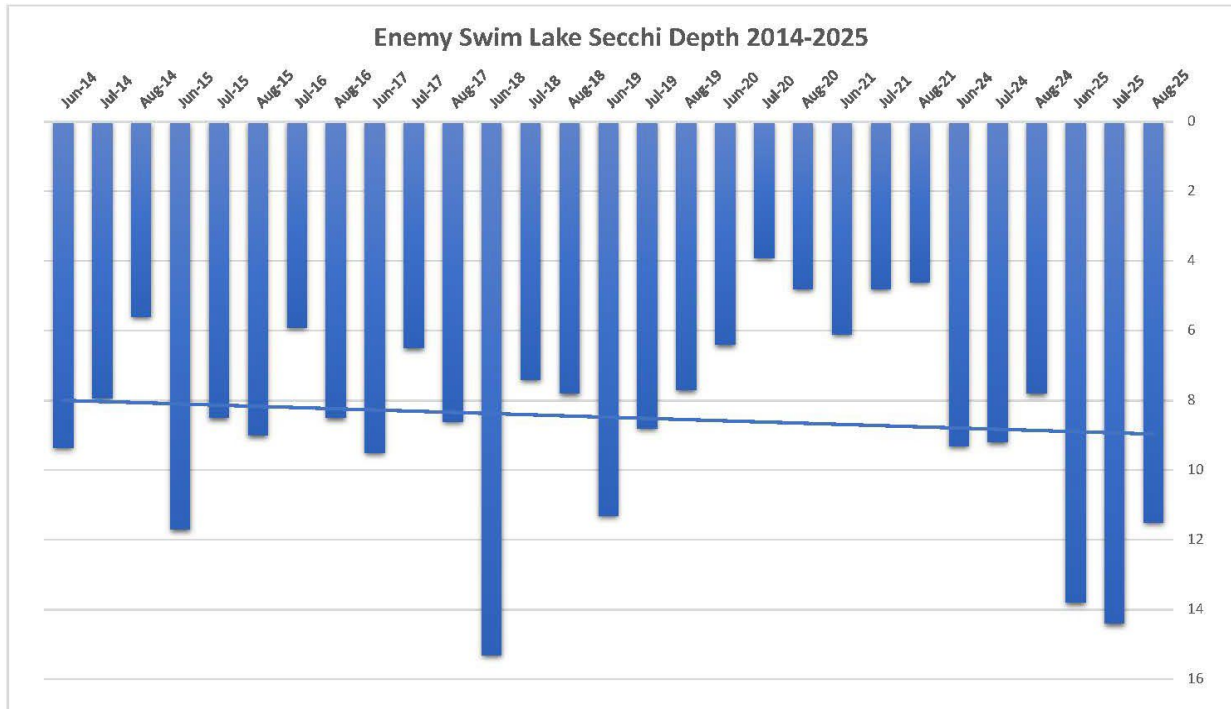


Figure 2.



Dissolved Oxygen (DO)

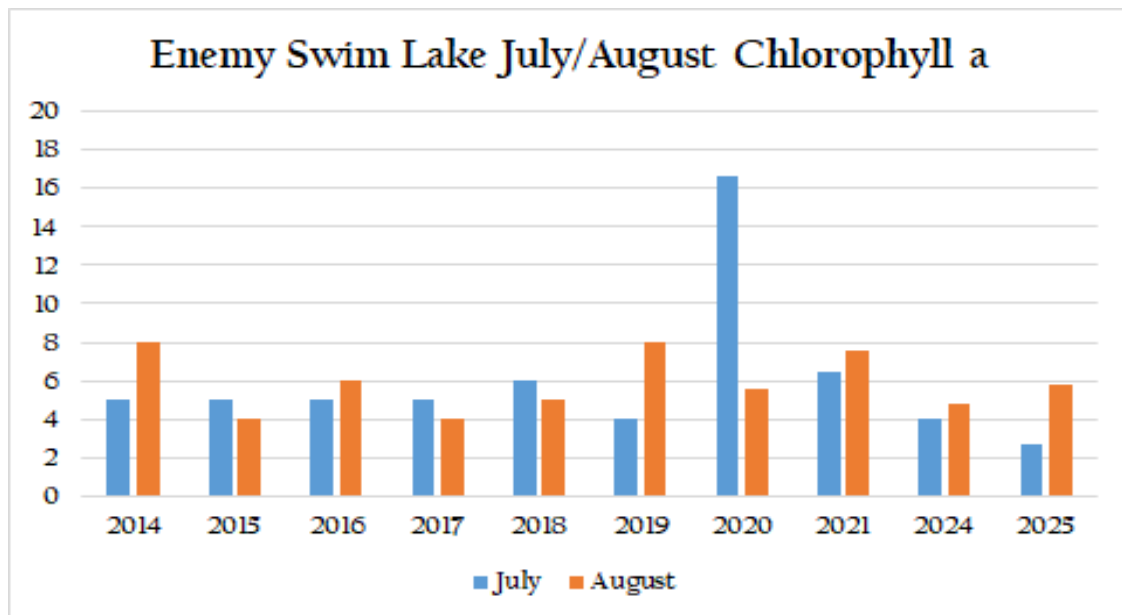
Atmospheric oxygen mixes into lakes naturally, enhanced by wind agitating the surface. Wind also vertically mixes oxygen within the lake. Algae and aquatic plants produce oxygen through photosynthesis where sunlight is available. In deeper, sunless areas (profundal zone), oxygen levels rely on wind mixing. During calm, warm summer periods, lakes can stratify, with warmer water on top and colder water at the bottom, preventing mixing and causing hypoxic conditions, which release phosphorus from sediments. High winds and cooler temperatures disrupt stratification, mixing phosphorus from the bottom to the surface for algae use. Due to Enemy Swim Lakes' greater surface area and shallower depths compared to Pickerel, these events are usually brief. No stratification events were recorded this summer during water quality data collection.

Chlorophyll *a*

Chlorophyll is the green pigment in algae that can be extracted and measured giving a year-to-year comparison of algal biomass in a lake. Higher chlorophyll measurements indicate higher algal biomass. Chlorophyll measurements over 20 ug/l (micrograms per liter) usually indicate a nuisance bloom of blue-green algae. Due to Enemy Swim being a mesotrophic or "medium rich" lake, the chlorophyll measurements have never been over the 20 ug/l threshold in the project's history. Figure 3 shows the history of Chlorophyll *a* data since 2014.

What has been seen on local lakes with history of higher chlorophyll *a* levels, is the ability of zebra mussels to filter large amounts of water. Chlorophyll *a* level in the lake may decrease as green algae and diatoms are consumed by these mussels. This however is not necessarily a good thing as these phytoplankton are an important part of the food chain, unlike blue-green algae which cannot be eaten by zooplankton and are disliked by zebra mussels. Chlorophyll *a* will continue to be a parameter monitored on Enemy Swim Lake for future water quality data collection.

Figure 3.



Total Phosphorus (TP)

Total phosphorus includes plant and animal fragments (mainly plankton) in water and dissolved phosphorus for plant growth. Mesotrophic lakes like Enemy Swim typically have moderate phosphorus levels for algae growth. Sometimes, higher phosphorus levels occur due to internal loadings from sediments when the lake's bottom becomes anoxic during stratification. Both surface and bottom samples from Enemy Swim Lake are tested for total phosphorus, with overall stable levels indicating reduced external phosphorus sources and no internal sediment releases during stratification. The lake can store nutrients in the lake-bed, and monitoring will continue for future water quality assessments.

Figure 4.

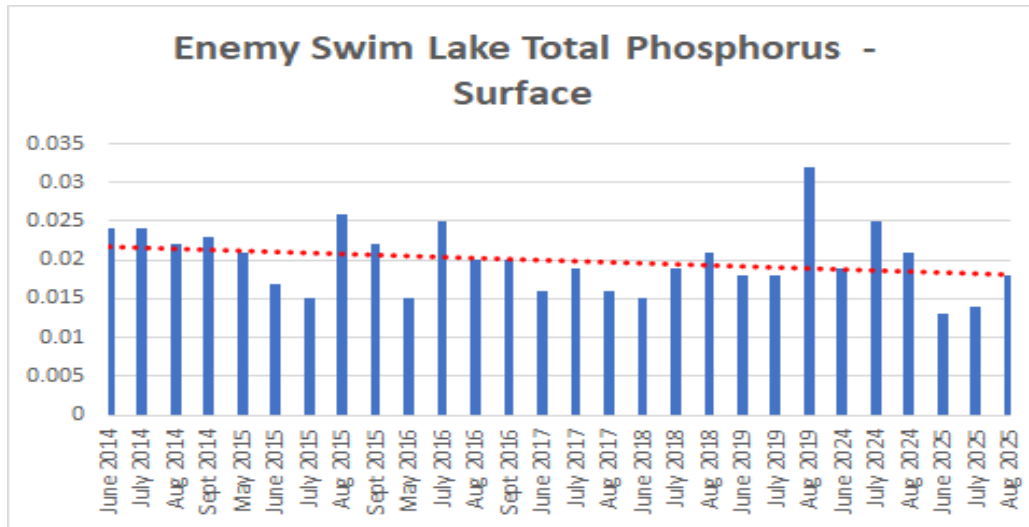
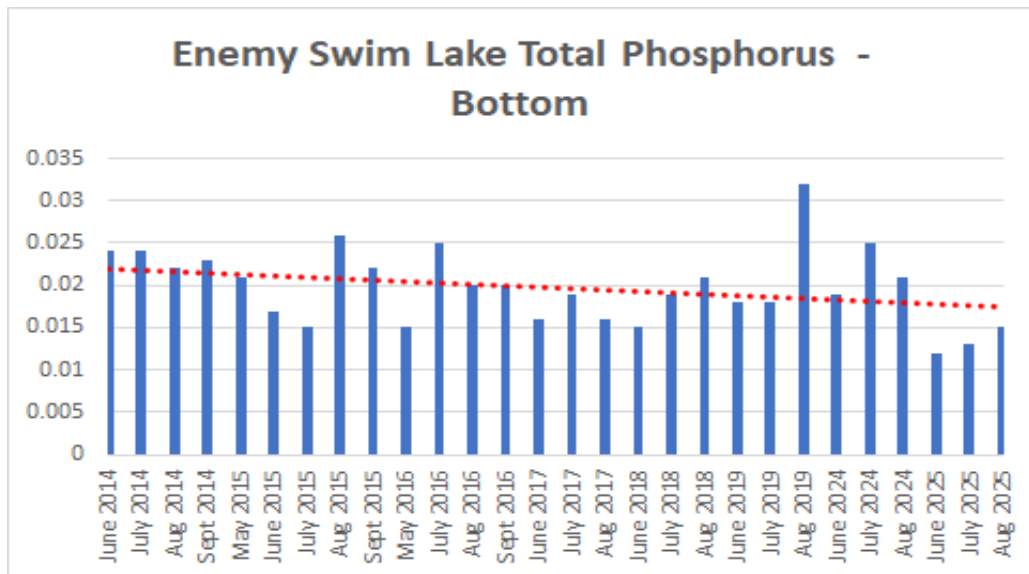


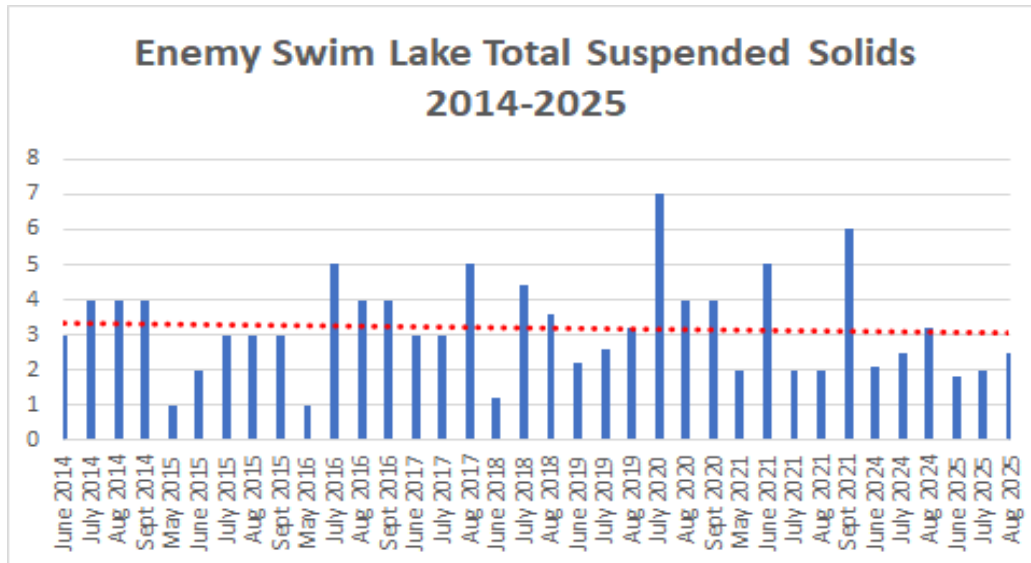
Figure 5.



Total Suspended Solids (TSS)

Total Suspended Solids (TSS) include materials like algae, silt, and decaying matter, filtered from lake water samples. Naturally occurring TSS includes plankton and soil, but shoreline and cropland erosion can increase TSS. In shallow lakes like Blue Dog, wind and boat activity stir up sediments, causing turbidity. In Enemy Swim Lake, higher TSS is often due to algae blooms. Figure 6 shows that in 2025, TSS levels were below average for the last decade, mainly because zebra mussels reduced zooplankton and algae populations.

Figure 6.



Conclusion

In the summer of 2025, secchi disk readings showed the greatest water clarity ever recorded. This is due to the introduction of zebra mussels, which have altered water quality by improving clarity and impacting nutrient distribution in the lake's littoral zone. This change has led to an increase in Cladophora, or "green slime" algae, along shorelines. Despite clearer water, zebra mussels do not remove pollutants like phosphorus, which contributes to lake aging. The project will continue collaborating with the Enemy Swim Sanitation District to monitor and improve and protect Enemy Swim Lake's water quality.

Lake shore owners and users should practice AIS prevention by drying boats, jet skis, and other equipment, and avoiding water transfer from other bodies. Clear aquatic plants from trailers and bait buckets to prevent AIS spread. Curly leaf pondweed is present in Pickerel and Blue Dog Lakes. For potential sightings of curly leaf pondweed, the public is encouraged to report to project personnel or the SD Game Fish and Parks office in Webster.