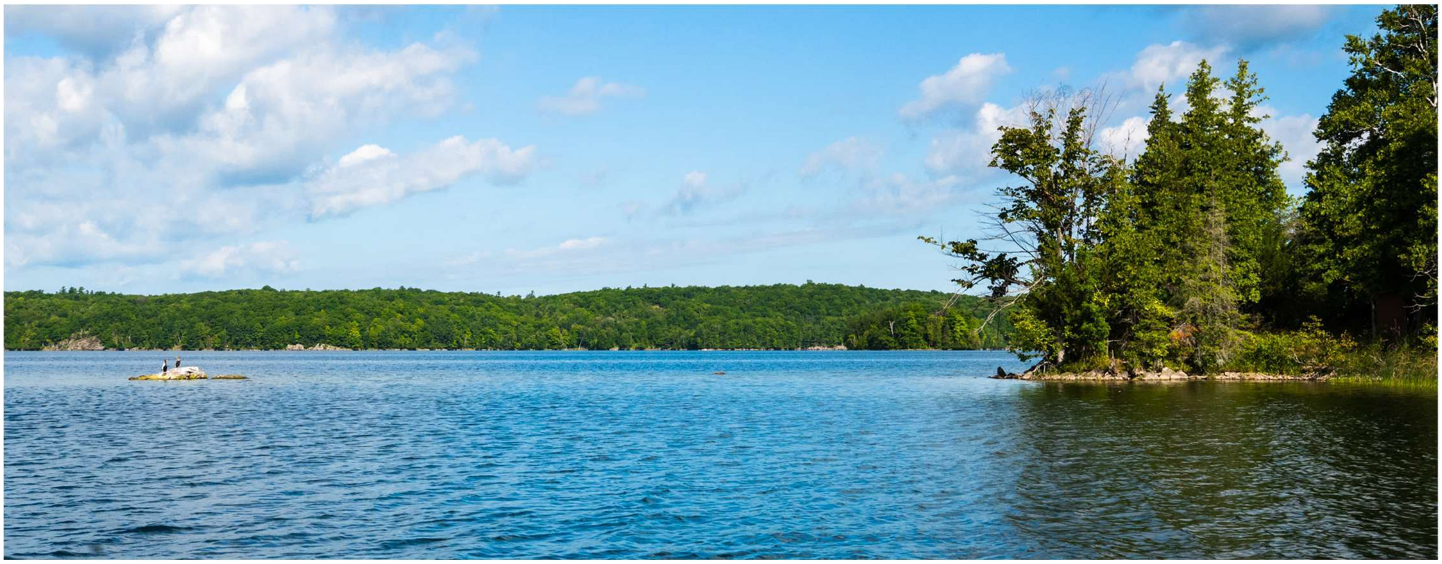


WATER QUALITY | REVIEW 2024

With a focus on Calcium

WATER QUALITY

By Gord Moore

We experienced a decent amount of snowfall in the latter part of the winter, which will hopefully result in healthy lake levels this season. As in previous years, this article includes a summary of the various water quality testing results collected over the past season. As I've noted in past reports, our water quality testing is conducted in partnership with the Rideau Valley Conservation Authority and the Lake Partner Program.

The Lake Partner Program engages volunteers from hundreds of lakes across Ontario to collect water samples. It operates in collaboration with the Ontario Ministry of the Environment, Conservation and Parks (MECP), through the Dorset Environmental Science Centre (DESC), and in partnership with the Federation of Ontario Cottagers' Associations (FOCA)—of which our association is a proud member.

Launched in 1996, the Lake Partner Program (LPP) is now the largest and longest-running initiative of its kind in North America. In January 2025, FOCA released a comprehensive Lake Data Report summarizing data from all participating lakes. While the full report is too lengthy to include here, I thought it would be interesting to share the section that discusses calcium levels in lake water. (Article dated January 16, 2025 – with thanks to FOCA and the LPP.)

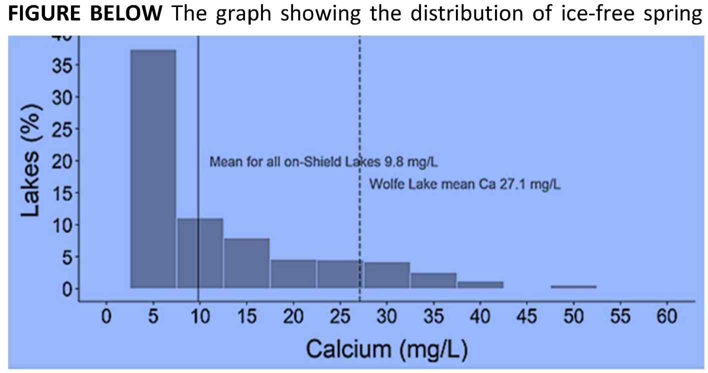
What is calcium?

Calcium (Ca) occurs naturally in soils as a result of weathering rocks, atmospheric deposition, and organic matter decomposition. Ca concentrations in many of Ontario's lakes within the Precambrian Shield have decreased over the last 40 years as a result of acid precipitation, deforestation, and land use change which have depleted watershed stores of Ca (Giardini and Yan, 2015).

Ca is an important nutrient to many lake-dwelling organisms, such as mollusks, clams, amphipods, and crayfish. Daphnia, commonly referred to as water fleas, are an important food source for fish and are susceptible to decreasing calcium levels. Laboratory research has shown that the growth and reproduction of sensitive Daphnia species may be negatively affected at Ca concentrations below 1.5 mg/L. Decreasing Ca levels can be particularly threatening to freshwater lakes when Chlorine levels are high or rising due to the additional stress it adds for zooplankton populations (Arnott et al, 2022). The LPP began monitoring Ca concentrations in lake water samples in 2008 to observe trends and identify lakes that were experiencing changes in lake Ca concentrations.

Wolfe Lake's calcium concentrations compared to other on-Shield lakes

FIGURE BELOW The graph showing the distribution of ice-free spring



average Ca concentrations for 762 lakes located on the Precambrian Shield sampled as part of the Lake Partner Program between the years 2008-2023.

The dashed line represents Wolfe Lake's Spring average ice-free Ca concentration for the years 2008 to 2023 (27.1 mg/L). The solid black line represents the ice-free average calcium concentration of all LPP lakes located on the Precambrian Shield from 2008-2023 (9.8 mg/L). The level at which some aquatic animals (mainly, some Daphnia) become at risk of Ca deficiency is 1.5 mg/L.

Summary: Wolfe Lake's compared to other on-Shield lakes

- The average Ca concentration between 2008 and 2023 is 27.1 mg/L.
- Wolfe Lake falls into the ninety-first percentile of Ca concentrations in on-Shield lakes. This means that 9 percent of lakes have higher Ca concentrations than Wolfe Lake.
- Ca in Wolfe Lake is well above the threshold in which sensitive aquatic species may be at risk (1.5 mg/L).

What do Wolfe Lake's calcium concentrations look like over time?

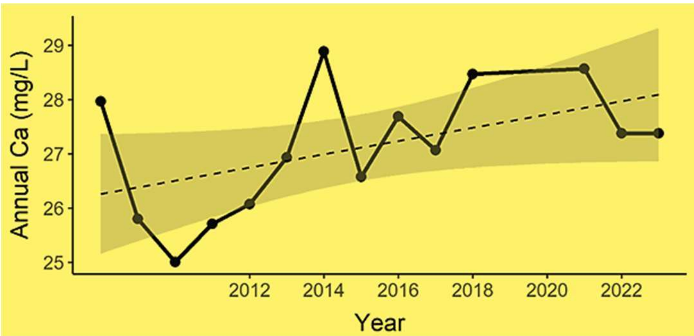


FIGURE ABOVE Ca concentrations in Wolfe Lake increased over time, but this change was not significant. This was determined using a Mann-Kendall trend test, which provided a p-value of 0.06 (a p-value indicates the likelihood of a trend, with a p-value of less than 0.05 providing strong evidence that there is a trend).

The shaded area represents the range of values within which we are 95% confident the true calcium concentration is. All samples were taken shortly after the ice-free period of each season.
Please note: Ontario's inland lakes are complex ecosystems, and many factors beyond the indicators monitored by the LPP can affect lake water quality. The trends shown here are meant to provide general information only and may not capture the full complexity of the lake's water chemistry.

Summary: Wolfe Lake's calcium trends over time

- Between 2008 and 2023 Ca concentrations in Wolfe Lake had no significant statistical change.
- During this time Ca concentrations fluctuated between 25.0 mg/L in 2010 to 28.9 mg/L in 2014.

Calcium in nearby lakes within the past 6 years

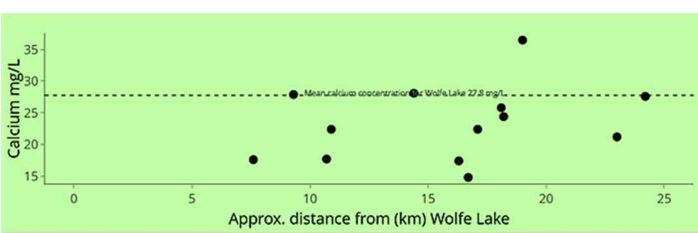


FIGURE ABOVE Scatterplot showing 6-year average calcium concentrations (2018-2023) for lakes sampled within a 25-km radius of Wolfe Lake.

The dashed line represents Wolfe Lake's average calcium concentrations in the LPP since 2018. Lakes with insufficient data were excluded from this analysis. All data were collected by Lake Partner volunteers from 2018-2023.

Summary of observations from nearby lakes

-In the LPP there are 15 lakes that have been sampled in the LPP within the last six years. The average Ca concentrations of these lakes in the last 6 years is 23.4 (mg/L).
- If you or someone you know would be interested in sampling a lake nearby Wolfe Lake please reach out to lakepartner@ontario.ca to sign up to be a lake steward.
- When looking at nearby lakes please keep in mind that these lakes can be characteristically entirely separate from Wolfe Lake and the only aspect that relates Wolfe Lake to these other lakes is location and whether they are on the Canadian Shield or not.

The LPP measures water quality in inland lakes across Ontario. The data are collected through volunteer monitoring efforts. You can download the data set used in this analysis by visiting the Ontario Open Data Catalog at Data.Ontario.ca.

Total Phosphorus (TP) Levels (measured in mg/L)

In 2024, Wolfe Lake levels ranged from 0.003 mg/L to 0.016 mg/L. Anything below 0.020 mg/L falls within the acceptable Provincial Water Quality Objective.

Calcium (measured in mg/L)

Calcium levels ranged from 29.1 mg/L to 29.6 mg/L, which is well within the acceptable range.

Dissolved Organic Carbon (measured in mg/L)

Readings ranged from 4.6 mg/L to 5.5 mg/L—also well within the acceptable range.

E. coli (measured in CFU/100 mL, where CFU stands for *colony-forming units*)

These readings ranged from 0 CFU/100 mL to 92 CFU/100 mL. Provincial guidelines consider levels under 100 CFU/100 mL to be acceptable.
Notably, the 92 CFU/100 mL result—recorded on July 8 in a non-populated area of the lake—is of particular interest. Oddly, a retest conducted on August 19 yielded a significantly lower result of 4 CFU/100 mL. We will continue to monitor this site to determine whether the initial high reading may have been due to a lab error.

Total Kjeldahl Nitrogen (TKN, measured in mg/L)

Results ranged from 0.2 mg/L to 0.5 mg/L, all within the acceptable range.

Secchi Depth (a measure of water clarity or turbidity, measured in meters)

Readings ranged from 6.0 meters to 8.25 meters. This continues the trend of increasing water clarity over the past few seasons.

Dissolved Oxygen (measured in mg/L, from surface to lake bottom at monitored deep points)

Overall, dissolved oxygen concentrations remained fairly consistent throughout the summer. As in previous years, lower oxygen levels were observed at depth during late summer and fall monitoring. This is a common phenomenon, typically caused by factors such as plant decomposition and reduced oxygenation during summer stratification.

In summary, I would once again like to thank **Haley Matschke** from the **Rideau Valley Conservation Authority** for her invaluable contribution to this article. If you have any questions for Haley or would like more information on RVCA's monitoring efforts or stewardship programs, she can be reached at: **haley.matschke@rvca.ca**.

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