

Kawartha Highlands Water Quality Report 2026

We have much to report from our research and monitoring of the Kawartha Highland lakes from the past year. Before doing that, we would like to thank all of the cottage associations and groups that helped support us financially this year. These funds are invaluable as they help cover costs of travel, sampling equipment, student salaries, and lab analyses. Support from the Kawartha Highland Provincial Park has once again been tremendous. They assist us with sampling efforts on park lakes, many of which are quite difficult to access for sampling purposes. Their assistance in deploying and retrieving monitoring buoys this past summer was also invaluable. A final word of thanks to our own group: Shirina Begum, Emily Christian, Sen Han, Ella Honey, Joanna Gauthier, Vedanti Ghatwala, Kendra Jasper-Fayers, Emily McCormack, Abbey McGuire, Jack Millar, Sherryann Prowell, and Claire Stevens. These are the folks who make it all happen whether its long days in the field, processing samples in the lab, or completing the extensive list of analyses in the laboratory. Our program is built on teamwork and couldn't happen without the contributions of you all.

Our research activities this past year (2025) included the normal mid-summer lake sampling and a number of other sampling efforts. With a project headed by Sherryann Prowell, we installed two buoys, one in Bottle Lake and one in Long Lake, to track changes in lake oxygen and dissolved organic matter in surface and bottom waters. Shirina Begum contributed with her project sampling dissolved gases (carbon dioxide, methane, and nitrous oxide) in many of our lakes at multiple locations (close to shore, deepwater). A new member of our lab, Joanna Gauthier, took samples for analysis of lake fungal communities. The analyses of all of these efforts are on-going but we will share results in the future when they become available.

We would like to hear back from you. Email us if you have something else water quality related to discuss whether that's a concern or just a general question. We are happy to share our knowledge of water in the Kawartha Highlands. You can reach us by emailing the Trent Aquatic Research Program at paulfrost@trentu.ca.

This report is produced by the Trent Aquatic Research Program, Trent University, Peterborough, Ontario. Please direct all questions and inquiries about this report to Dr. Paul Frost. Email: paulfrost@trentu.ca

About the Trent Aquatic Research Program

The Trent Aquatic Research Program includes a range of research and monitoring projects on lakes and rivers in southern Ontario. In addition to monitoring water quality, we are involved in projects studying oxygen dynamics at the bottom of our lakes, examining nutrient dynamics in our lakes, and assessing long-term change. Our work in the Kawartha Highlands is an important part of this program as it couples our research into water quality trends and lake foodwebs to our goal of collecting and sharing knowledge about the health of our water with shoreline owners, cottagers, and other local stakeholders.

All communications regarding this sampling program should be directed to Dr. Paul Frost (paulfrost@trentu.ca). If you would like to learn more about your lake and/or help out with our sampling efforts, send us an email. We look forward to continuing on our water quality program, sharing our results, and working together with all of you to better understand our lake ecosystems.

How can you support the Trent Aquatic Research Program?

If you like the limnology and water science presented in this report, please consider supporting the Trent Aquatic Research Program with a donation. The health of our program is connected to your support, which allows us to hire and train students interested in water science. We greatly benefit from indirect and in-kind contributions that allow us to access and sample lakes. Financial contributions from individuals and cottage associates are also especially valuable to us as these funds directly support our program personnel. It is these staff members (students and research associates) that sample lakes, collect and archive high-quality water quality data, and respond quickly to reports of potential water quality issues.



To learn more about our program and how you can donate, visit: <https://mycommunity.trentu.ca/tarp>. Click on support TARP and choose “Kawartha Lake Monitoring Program” or “TARP Endowment” from the drop down menu. All questions and related inquiries about how to support TARP should be directed to:

Emily Vassiliadis
Senior Development Officer, Sciences

What do we measure?

Our water research program at Trent has access to world-class facilities and highly specialized equipment to study water quality in and between lakes. Below is a partial list of parameters that we measure as part of our program. For information on each of these parameters, please refer to our Primer Report 2021 or send us an email. All of these data (for any lake and any year) that we sampled are available on request. Parameters that are bolded are shown on the following pages for the lakes included in our on-going monitoring activities.

Parameter	Units
Specific conductivity	µS/cm
Dissolved oxygen, concentration	mg/L
Dissolved oxygen, percent saturation	%
Water temperature	°C
Secchi depth	m
pH	
Total suspended solids	mg/L
Dissolved organic carbon	mg C/L
Absorbance at 280 nm	cm ⁻¹
Molar absorptivity at 280 nm	L mol C ⁻¹ cm ⁻¹
Total phosphorus	µg P/L
Total dissolved phosphorus	µg P/L
Particulate phosphorus	µg P/L
Total dissolved nitrogen	µg N/L
Nitrate	µg N/L
Ammonium	µg N/L
Chlorophyll a	µg/L
Dissolved calcium	mg Ca/L

When and where did we sample?

We collect water quality data from about 30 lakes in the Kawartha Highlands region each summer. Many of the lakes we sample every year whereas others, primarily more remote lakes in the Kawartha Highlands Provincial Park, are sampled on a less frequent basis (every 2 or 3 years). In 2025, we sampled lakes listed here on the dates indicated below.

Lake	Date Sampled
Adams	August 5, 2025
Anstruther	August 7, 2025
Beaver	August 4, 2025
Big Cedar	July 30, 2025
Bottle	August 8, 2025
Buzzard	August 6, 2025
Catchacoma	August 4, 2025
Chandos	July 23, 2025
Crab	August 7, 2025
Crystal	July 24, 2025
Eels	July 25, 2025
Galloway	July 25, 2025
Gold	August 4, 2025
Jack	July 23, 2025
Kasshabog	July 28, 2025

Lake	Date Sampled
Long	July 29, 2025
Looncall	August 8, 2025
Loucks	July 29, 2025
Lower Stoney	July 21, 2025
Mississauga	August 4, 2025
Oak	July 26, 2025
Pencil	August 13, 2025
Picard	July 24, 2025
Raccoon	August 1, 2025
Rathbun	August 7, 2025
Salmon	July 31, 2025
Sucker	August 8, 2025
Upper Stony	July 21, 2025
Wolf	July 29, 2025



Chlorophyll a

Lake	Average*	2025
Adams	2.83	1.14
Anstruther	2.90	1.20
Beaver	3.42	1.55
Big Cedar	2.76	1.66
Bottle	4.65	2.55
Buzzard	2.38	1.09
Catchacoma	2.35	1.80
Chandos	2.48	1.38
Crab	3.49	2.05
Crystal	2.08	1.75
Eels	3.16	1.81
Galloway	3.02	2.73
Gold	2.42	1.39
Jack	2.66	1.44
Kasshabog	2.79	1.67
Long	2.11	1.00
Looncall	3.29	1.23
Loucks	2.77	1.26
Lower Stoney	6.71	3.83
Mississauga	2.66	1.62
Oak	1.28	1.28
Pencil	2.62	1.06
Picard	2.16	0.92
Raccoon	3.61	2.12
Rathbun	2.44	1.33
Salmon	1.54	1.07
Sucker	3.78	0.88
Upper Stony	3.62	2.67
Wolf	3.37	1.25

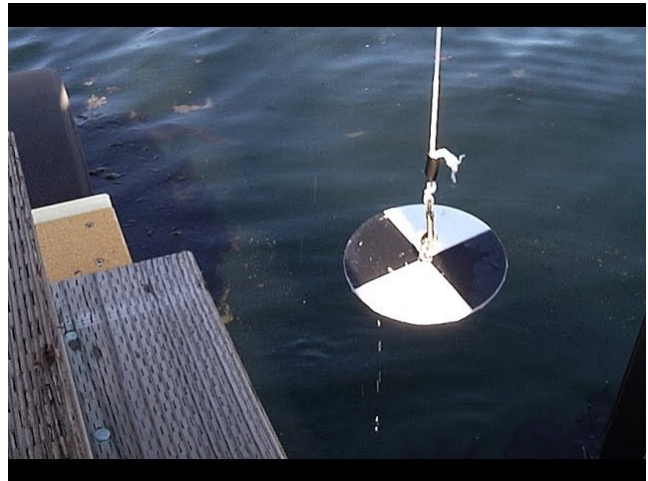
Background. *Chlorophyll a* ($\mu\text{g/L}$) is a plant pigment that we measure to estimate algal biomass in the surface waters. Values close to or below $5 \mu\text{g/L}$ are generally considered good and a sign of low algal biomass.

2025 results. *Chlorophyll a* concentrations continue were found to be very low in most Kawartha Highlands lakes in 2025. These values indicate continue to indicate very low algal biomass and very good water quality in all of the lakes. In almost every lake, values were lower in 2025 than the long-term mean. Lower Stoney Lake had the most chlorophyll, which is consistent with it receiving water from the upper Kawartha Lakes and generally having higher algal biomass.

*The average was calculated using all of the data we have for each lake between the years of 2015-2025 which for most lakes is 7 or 8 sampling years.

Secchi Depth

Lake	Average*	2025
Adams	5.12	4.50
Anstruther	4.54	5.00
Beaver	4.46	4.00
Big Cedar	5.16	5.00
Bottle	2.74	3.40
Buzzard	5.45	5.70
Catchacoma	3.78	3.50
Chandos	5.37	7.00
Crab	3.86	5.00
Crystal	6.07	5.00
Eels	3.89	3.50
Galloway	3.15	3.00
Gold	4.92	4.25
Jack	5.54	7.00
Kasshabog	4.84	5.50
Long	4.86	5.00
Looncall	4.63	5.00
Loucks	4.31	4.50
Lower Stoney	3.48	4.00
Mississauga	4.58	4.50
Oak	5.50	5.50
Pencil	4.11	5.00
Picard	5.29	5.50
Raccoon	4.07	4.00
Rathbun	4.54	4.80
Salmon	6.89	6.50
Sucker	4.60	5.00
Upper Stony	4.74	5.00
Wolf	4.35	5.20



Background. *Secchi depth* (m) is a measure of water clarity based on how deep you can see a disk dropped into the water. Generally, deeper depth indicates clearer waters and Secchi depths of less than 2 m are generally considered to be of concern.

2025 results. There were no unusual observations for Secchi depth found in summer of 2025. Values for every lake were close to the long-term mean for the Kawartha Highlands. Shallower depths were found in Bottle, Eels, and Galloway but likely reflect somewhat darker water colour in these lakes. We are currently working on a scientific paper on Secchi depths in the Kawartha Highlands using all of the data collected over the past ten years or so. Our preliminary results show limited directional change over longer time periods and Secchi depth largely being controlled by both water colour and algal density in our lakes.

*The average was calculated using all of the data we have for each lake between the years of 2015-2025 which for most lakes is 7 or 8 sampling years.

Dissolved Calcium

Lake	Average*	2025
Adams	5.38	6.40
Anstruther	5.49	5.82
Beaver	6.52	7.81
Big Cedar	29.02	31.06
Bottle	3.17	3.37
Buzzard	2.21	2.57
Catchacoma	6.31	7.76
Chandos	22.52	28.56
Crab	2.99	3.86
Crystal	32.56	40.60
Eels	7.85	9.39
Galloway	32.13	37.58
Gold	5.70	6.72
Jack	24.94	30.08
Kasshabog	8.36	10.43
Long	4.61	5.73
Looncall	7.85	10.10
Loucks	4.32	4.77
Lower Stoney	30.54	34.91
Mississauga	6.60	8.27
Oak	23.34	23.34
Pencil	16.06	19.25
Picard	30.70	38.44
Raccoon	18.99	26.90
Rathbun	1.64	1.88
Salmon	28.61	35.50
Sucker	2.97	3.33
Upper Stony	25.95	31.31
Wolf	5.93	7.10

Background. *Dissolved calcium* (mg/L) is an important nutrient that is connected to whether your lake has hard or soft water. Values lower than 5 mg/L indicate soft water lakes whereas values above 10 mg/L are a sign that your lake has relatively harder water in our area. It has been reported that some lakes are experiencing reduced Ca concentrations in the Muskoka and Haliburton regions. These reductions have led to concerns about effects on zooplankton communities and lake health.

2025 results. As in the past, Kawartha Highlands lakes show a wide range of dissolved Ca concentrations. It is interesting to note that most lakes had somewhat higher Ca concentrations in 2025 compared to the long-term average. See page 12 for a more detailed analysis of long-term trends in Ca concentrations. In a nutshell, we see no evidence of Ca declining in Kawartha Highland lakes and, if anything, marginal annual increases in some lakes.

*The average was calculated using all of the data we have for each lake between the years of 2015-2025 which for most lakes is 7 or 8 sampling years.

Total Phosphorus

Lake	Average*	2025
Adams	4.56	5.85
Anstruther	4.67	4.87
Beaver	6.13	5.18
Big Cedar	6.19	7.64
Bottle	8.92	8.68
Buzzard	5.65	5.35
Catchacoma	5.45	4.01
Chandos	6.72	7.13
Crab	7.14	8.37
Crystal	6.86	8.18
Eels	6.00	6.31
Galloway	12.31	8.61
Gold	5.89	5.06
Jack	5.55	10.95
Kasshabog	4.82	5.14
Long	6.36	3.83
Looncall	6.18	4.27
Loucks	5.63	5.89
Lower Stoney	14.88	16.43
Mississauga	5.37	5.78
Oak	5.27	5.27
Pencil	5.96	5.00
Picard	5.67	5.86
Raccoon	5.68	7.28
Rathbun	7.31	7.71
Salmon	5.74	5.44
Sucker	6.46	6.40
Upper Stony	8.13	10.03
Wolf	6.66	8.88

Background. *Total phosphorus* ($\mu\text{g/L}$) is an important water quality parameter as phosphorus is a growth-limiting nutrient that limits the proliferation of algal biomass in the Kawartha Highlands.

2025 results. Most Kawartha Highlands lakes had total phosphorus (TP) concentrations below $10 \mu\text{g/L}$ as has been the case since we began monitoring in 2015. All of these low values are indicative of good water quality and would be unlikely to support rapid algal growth or sustained algal blooms.

*The average was calculated using all of the data we have for each lake between the years of 2015-2025 which for most lakes is 7 or 8 sampling years.

Specific Conductivity

Lake	Average*	2025
Adams	36.98	39.28
Anstruther	34.40	36.03
Beaver	49.55	52.23
Big Cedar	192.71	192.03
Bottle	24.54	22.90
Buzzard	18.77	19.79
Catchacoma	49.21	50.75
Chandos	147.07	153.72
Crab	21.82	25.00
Crystal	187.49	187.69
Eels	49.91	50.50
Galloway	225.05	229.59
Gold	39.17	41.59
Jack	144.71	151.39
Kasshabog	86.65	86.43
Long	33.69	36.90
Looncall	54.06	63.02
Loucks	28.05	29.36
Lower Stoney	206.66	196.21
Mississauga	46.59	48.64
Oak	140.86	140.86
Pencil	96.30	98.57
Picard	221.60	227.51
Raccoon	113.21	117.06
Rathbun	15.13	23.71
Salmon	171.51	174.25
Sucker	22.16	24.03
Upper Stony	181.86	171.92
Wolf	41.30	46.04

Background. *Specific conductivity* ($\mu\text{S}/\text{cm}$) is a measure of electrical conductance through water. This tells us about the hardness of water with more mineral-rich water having more ions and higher conductivity. Conductivity generally increases when rocks dissolve into groundwater. For Kawartha Highland lakes, this is generally reflective of the relative contribution of rainwater and of certain geological features in each lake's catchment. These ions are not especially biologically reactive and so this number doesn't vary much seasonally or year to year.

2025 results. Specific conductivity varied widely among Kawartha Highland lakes in 2025 with few/small differences from the long-term mean. It does appear that most lakes had somewhat higher specific conductivity (similar to what we saw with Ca) in 2025. It is not readily apparent why these values would be increasing and would be worth further investigation if this pattern continues over the next few years.

*The average was calculated using all of the data we have for each lake between the years of 2015-2025 which for most lakes is 7 or 8 sampling years.

Dissolved Oxygen– Bottom of Lake

Lake	Average*	2025
Adams	5.43	4.89
Anstruther	68.94	65.48
Beaver	25.52	38.85
Big Cedar	9.88	4.88
Bottle	45.31	44.45
Buzzard	25.59	6.93
Catchacoma	76.25	68.24
Chandos	73.27	65.58
Crab	59.38	77.73
Crystal	32.27	42.10
Eels	41.82	40.58
Galloway	52.77	18.97
Gold	71.45	69.74
Jack	56.18	51.74
Kasshabog	17.32	14.23
Long	37.17	46.32
Looncall	7.90	4.79
Loucks	20.46	11.44
Lower Stoney	40.80	23.30
Mississauga	73.33	68.01
Oak	25.80	25.80
Pencil	41.09	20.14
Picard	12.23	7.97
Raccoon	16.41	4.44
Rathbun	58.00	26.02
Salmon	15.53	5.47
Sucker	29.63	8.49
Upper Stony	42.57	43.97
Wolf	56.43	11.99

Background. *Dissolved oxygen* is the amount of O₂ found dissolved in the water. Shown here is the % saturation value, which if less than 20% indicates sustained O₂ consumption in the lake's hypolimnion.

2025 results. Dissolved oxygen concentrations at the bottom of Kawartha Highlands lakes varies a lot from lake to lake. Lower values are generally found in shallower and darker lakes. We are currently assessing year to year variability in these lakes and suspect it relates to the timing of ice-off and weather conditions in April.

*The average was calculated using all of the data we have for each lake between the years of 2020-2025 which for most lakes is 5 or 6 sampling years.

News from the Program

The Trent Aquatic Research Program produces numerous scientific publications and presentations each year. These papers include studies across the southern Ontario and the Great Lakes. Here is a sampling of some of our more recent papers.

Publications

Frost, P.C. 2025. Modelling calcium-limitation in *Daphnia* with consideration of food quantity and phosphorus content. *Oecologia* 207: 138 (<https://doi.org/10.1007/s00442-025-05778-1>)

Pearce, N., J.H. Larson, R.M. Kreiling, M.A. Evans, S.W. Bailey, K.J. Breckner, L.A. Bartsch, M.A. Xenopoulos and P.C. Frost. 2025. River-to-lake transitional areas contribute disproportionately to in-lake nutrient loading. *Ocean-Land-Atmosphere Research* 4: 0109. DOI: 10.34133/olar.0109

McKnight, E.G.W., A.B.A. Shafer and P.C. Frost. 2024. Quantifying the effect of lake chemistry on eDNA degradation using microcosm and bioassay experiments. *Environmental DNA* 6:e530

Edwards, K.D., C.L.C Jones, N. Pearce, M.A. Xenopoulos, P.C. Frost. Accepted. Hypolimnetic anoxia in oligotrophic lakes and its effects on nutrient supply and phytoplankton communities. *Ecosphere*

Conference Presentations

Begun, M.S., P.C. Frost and M.A. Xenopoulos. 2025. Incorporating biogeochemistry into urban stormwater pond management Society of Canadian Aquatic Sciences. Hamilton, ON.

Frost, P.C., N.J.T. Pearce, S.A Berger, M.O. Gessner, A.K. Makower, V. Marzetz, J.C. Nejtgaard, A. Pralle, S. Schälicke, A. Wacker, N.D. Wagner and M.A. Xenopoulos. 2025. Interactive effects of nitrogen and phosphorus on growth and stoichiometry of lake phytoplankton. Association for the Sciences of Limnology and Oceanography. Charlotte, NC.

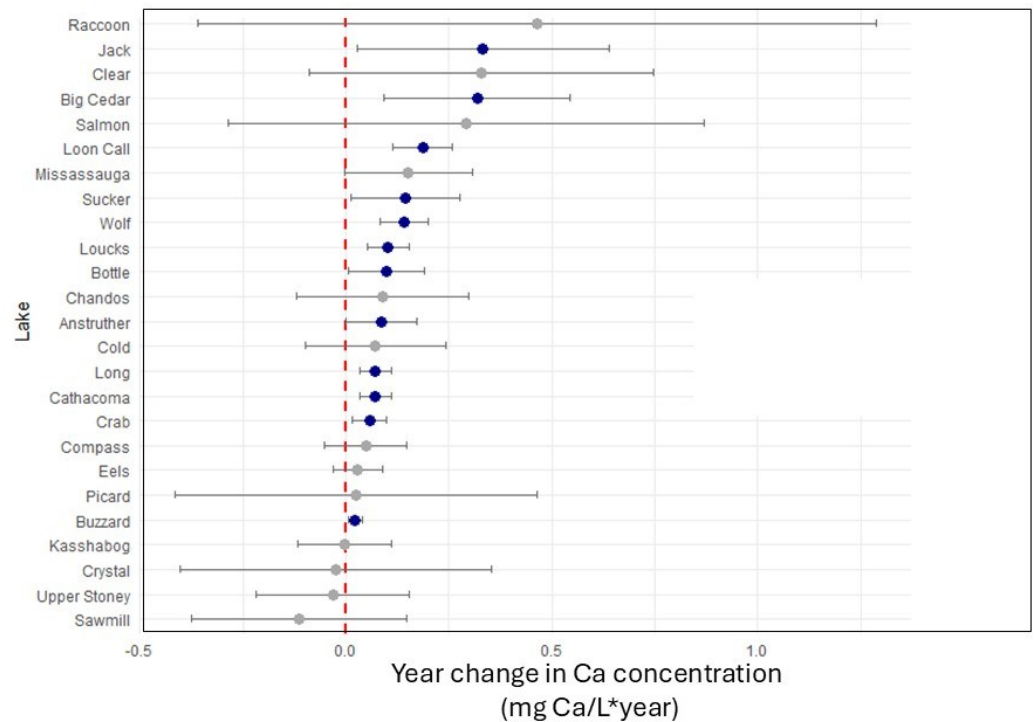
Frost, P.C., K. Cottingham, J. Gardner, H.-P. Grossart, M. Heudenyrych, A.R. Ignatius, S. McCord, I. Oleksy, C. Robbins, M. Saccò, N. Wagner, M. Xenopoulos. 2024. Emerging methods and technological opportunities in freshwater science. Association for the Sciences of Limnology and Oceanography. Madison, WI.

(We would be pleased to share our papers and presentations over email. If you see something that is interesting, send us an email at: paulfrost@trent.ca to request an electronic copy)

Calcium concentrations: Are they changing in the Kawartha Highlands lakes?

We began sampling Kawartha Highland lakes in 2015 and for many lakes have collected data each year since 2017. With these 8-10 years of data, we are able to look at annual trends and patterns in water quality for many lakes in our study region. In other words, we can ask if there are sustained directional changes in water quality parameters? This type of question is one we will be returning to with most of our water quality parameters over the coming years as we add more lake-years to our dataset. One question we hear a lot is whether we see any evidence of changing Ca concentrations in our lakes. To answer this question, we linked our data to Ca data found the Lake Partner Program database. In this expanded dataset, we have 27 lakes with Ca concentrations going back to 10+ years with most lakes having data back to 2008. Our analysis should be considered a preliminary analysis given the limited number of years we have Ca data for some lakes, gaps in our records, our simple linear analysis and the two different sources of data (LPP vs. TARP). Nonetheless this is a quick way to see if Ca concentrations are increasing or decreasing.

Some of the noteworthy results are seen in the graph below: 1) almost all lakes have no change or have increased in Ca concentration, 2) multiple lakes have significantly increased with annual increases of about 0.2-0.4 mg Ca/L, and 3) very wide error bars and high uncertainty for some lakes due to erratic Ca concentrations through time. Overall, our data show no evidence of Ca concentration declines and instead show increasing concentrations of this valuable element. At this time, we do not have readily available explanations for these increases, which would likely involve atmospheric and/or catchment processes that we do not normally assess. This is something we will continue to monitor and examine further with future research activities.



Yearly change in Ca concentrations (mg Ca/L*year) in Kawartha Highland lakes. Shown is the slope of the relationship between lake [Ca] and year with error bars being 95% confidence intervals. Significant slopes are shown in blue.