Kawartha Lake Stewards Association

2023 Annual Lake Water Quality Report

Lake Health: A Delicate Balance

MAY 2024

LAKE HEALTH: A DELICATE BALANCE

The Kawartha Lake Stewards Association (KLSA) is a volunteer-driven, non-profit organization of cottagers and year-round residents in the Kawartha Lakes region. The Association's programs include the testing of lake water for phosphorus, clarity, calcium and *E. coli* bacteria, and research and public education about water quality issues. KLSA has partnered with universities, colleges and governmental agencies to conduct research studies and produce publications. KLSA is led by a twelve member Board of Directors. A list of the members of the Board is provided in Appendix A.

Please Note:
To obtain copies of our report or to find out more about KLSA, please contact:

Kawartha Lake Stewards Association
264 Bass Lake Road, Trent Lakes ON K0M 1A0
Email: **klsa@klsa.info**

You can view Adobe pdf versions of KLSA reports on the new KLSA website: **www.klsa.ca**

Cover photo: Children Playing in Lake
Photo credit: Thomas Craig, Sturgeon Lake

Graphic Design by Danielle Shaw (Gull's Graphic Design)

Mission Statement

The Kawartha Lake Stewards Association was founded to carry out a coordinated, consistent water quality testing program (including bacteria and phosphorus) in lake water in the Kawartha Lakes. KLSA ensures that water quality test results, prepared according to professionally validated protocols with summary analysis, are made available to interested parties. KLSA has expanded into research activities that help to better understand lake water quality and may expand its program into other related issues in the future.

Editorial Committee:

Chair: Sheila Gordon-Dillane
Members: Carol Cole, Tom McAllister, Jacqui Milne, Kimberly Ong and Carolyn Sutton

Please support our advertisers (Pages 70-72)

KLSA

Table of Contents

INTRODUCTION

FEATURE ARTICLES

APPENDICES

Chair's Message

Ed Leerdam, Chair
Kawartha Lake Stewards Association

As I write this message on World Water Day (March 22), in the words of the United Nations: "*As climate change impacts increase, and populations grow, there is an urgent need, within and between countries, to unite around protecting and conserving our most precious resource…water*".

Welcome to KLSA's 23rd annual Lake Water Quality Report (LWQR) with the title "Lake Health: A Delicate Balance".

As this edition of our annual Lake Water Quality Report is being prepared, we are coming out of the warmest winter on record in Canada, and perhaps the driest with very little snow falling this winter season here in the Kawarthas. A plus is we might see an earlier start to cottage and boating (and fishing!) season. But water levels are being reported as the lowest we have seen in memory, and there is only so much Parks Canada and MNRF can do in their efforts to manage water levels.

Many welcome the milder days and are relieved we didn't have to shovel much snow, but our fellow Canadians in the Atlantic Provinces witnessed a different winter than we did here in the Kawarthas – record-breaking snowfalls one after the other stranded Cape Bretoners in their homes for days and digging themselves out of snow accumulations higher than their doorways. And last summer, wildfires in Canada burned over 15 million hectares, more than doubling the previous record set 35 years ago of 6.7 million hectares. With such a dry winter we may yet see another record-breaking year of wildfires across our country. Climate change is real and our environment is *out of balance*. Governments at all levels need to heed what we are experiencing and take action to mitigate greenhouse gases, and include emergency preparedness plans for all kinds of severe events. We as private citizens must also take action wherever possible, and prepare ourselves for more violent fires and storms.

The Kawartha Lake Stewards Association focuses on the health of our lakes, rivers and streams. All of our programs monitor or take action to try to maintain the delicate balance between impacts such as climate change, invasive species, and human interactions towards trying to keep our waterways healthy. In the next 60 or so pages you will read about these programs and other insights and efforts related to the health of our waters.

A nice pike! *Photo by Ed Leerdam*

Of note, we were very fortunate to win an EcoAction Community Grant from the Federal Government last year so we could continue our Natural Edge Program for another two years, and pilot the Love Your Lake program. And, new in 2024, we just agreed to support and partner on a nearshore sampling program on four lakes with Kawartha Conservation. You will have the opportunity to read about this program in next year's Lake Water Quality Report.

Just in time for our AGM last September we published our new Aquatic Plants Guide which has since been highly sought after. We are fortunate to have enough funding to offer this publication to our members and the general public at no charge. Contact us at klsa@klsa.info for a copy.

We are always very thankful to those people who choose to volunteer their time and talents on our Board of Directors. Last year we bade a fond farewell to Tom McAllister, who served from October 2015 to September 2023, serving as Vice-Chair and Director of Fundraising for many years. Tom's experience and wise counsel helped to keep KLSA on track and increase its abilities and reputation in the water stewardship community. We also bade farewell to Cindy Lee last year, after serving on the Board from October 2019 to January 2023, and running our *E.coli* testing program for a few years. Thanks also to L'Anne Greene who served on the Board for one year and assisted us with last year's Lake Water Quality Report.

Chair's Message

Joining our Board in September 2023 is Roland van Oostveen, who brings with him many skills which will help us in our Mission. Roland is currently working on a much-needed update to our website. Please note that effective immediately, our website domain is changing from the current www.klsa.wordpress.com to **www.klsa.ca**.

Our Board is always in need of people who can devote time and energy to our Mission. Every organization needs a mixture of skills and experience, and KLSA's Board needs not just aquatic biologists and scientists, but also needs administrative, legal, accounting, communications, grant-writing and proposal skills. Please contact us at klsa@klsa.info if you have an interest in the health of our waters, and have time to give in the pursuit of our Mission.

We are especially grateful to our other volunteers 'in the field', doing the water-sampling on our lakes, shrub plantings in our Natural Edge program, water temperature monitoring and dissolved oxygen sampling, aquatic plants identification, and other programs we run or partner on from time to time. Without these volunteers we would have no data and no Association. Again, please contact us at klsa@klsa.info if you would like to volunteer in any of these programs – they take little time and effort.

We could not do anything without our supporters – lake/cottage associations, businesses, individuals, and local municipal governments who give us donations and grants, and our advertisers who support us by buying ad spots at the back of our report. Please support these local businesses whenever possible.

Chillaxing at Nogie's Creek. *Photo by Ed Leerdam*

Lastly, thank you to everyone who submitted photos in our contest for the front cover of this Report. The lovely photos show how much we all love this area (I've added two of my own in this message) and it was difficult for us to choose a winner. You will find all the submitted photos throughout this Report. Enjoy!

Please plan to attend our annual Spring Public Meeting, this year being held on Saturday, May 25, from 10AM – noon (doors open at 9:30AM), at the Buckhorn Community Centre on Lakehurst Road. Terry Rees, former Executive Director of FOCA for 20 years, and Vickie Hartog from PLiiNK will be our guest speakers. However, we will have less "speaking" and more interactive exhibits and displays, with seven or eight organizations with tables set up in the hall. We will have more time to interact with them and each other. Stay tuned for our announcements via email, on our website and Facebook page.

To contact me directly, please send an email to Ed.Leerdam@klsa.info or feel free to call me at 416-453-4472.

For general inquiries please send an email to klsa@klsa.info. Have a wonderful summer!

Heron - on shore. *Photo by Anne & Steve Wildfong, Burleigh (Stony Lake)*

A Few Lessons I Learned About Algae and Aquatic Plants

John D. Wehr, PhD. Professor
Fordham University

Many residents of lake communities, as well as professional lake managers and scientists, are often concerned with the negative effects of algae blooms or with too many aquatic "weeds." My work on aquatic ecosystems over several years has taught me a few lessons about this issue. Organisms exist in a kind of equilibrium or 'balance' among diverse members of the biological communities within that environment. This idea is not new. Many decades ago, Raymond Lindeman (1942) formalized a new idea of a lake ecosystem (Figure 1), with a scheme to show how the diversity of organisms - bacteria, algae, zooplankton, aquatic macrophytes, fish, nutrients, and the energy they contain - are interconnected by their diverse roles. Among these, algae are amazingly diverse, and their many roles and connections are the key. Hence, my first lesson.

Lesson 1: Algae are extremely diverse.

Any curious visitor to a lake soon realizes that this is true. One can see a remarkable diversity of organisms from the shore or boat. Young students of biology with the aid of a microscope soon discover many more microscopic organisms, including algae (Figure 2). The algae are an amazing group of organisms, with biodiversity estimates ranging from more than 60,000 currently known species to perhaps more than a million, with many still undescribed. These

Figure 2. Left:The author, some years ago; Right: The author, in a more recent photo. Each was amazed by the diversity they observed.

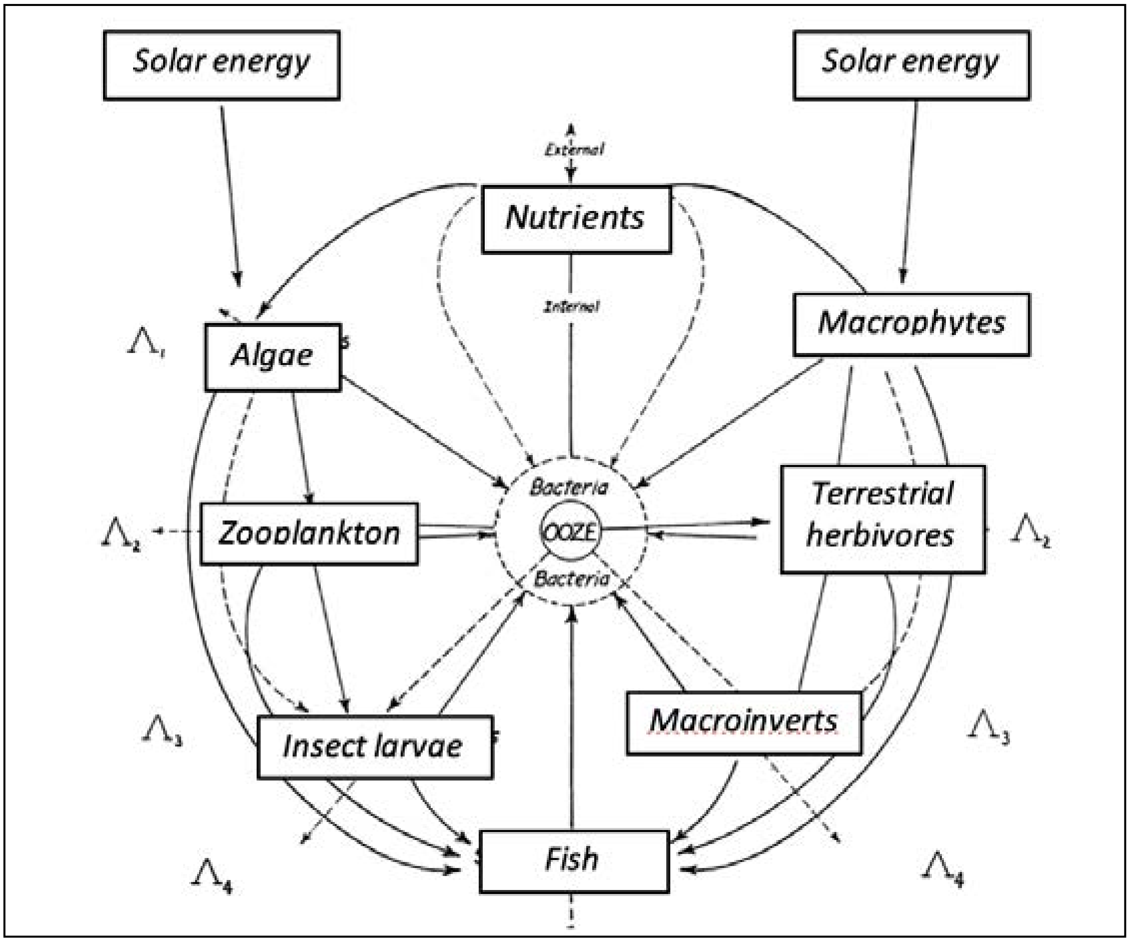


Figure 1. A generalized food-cycle for aquatic ecosystems showing energy flow among major trophic levels, and unconsumed matter processed by decomposers (modified, after Lindeman 1942).

A Few Lessons I Learned About Algae and Aquatic Plants

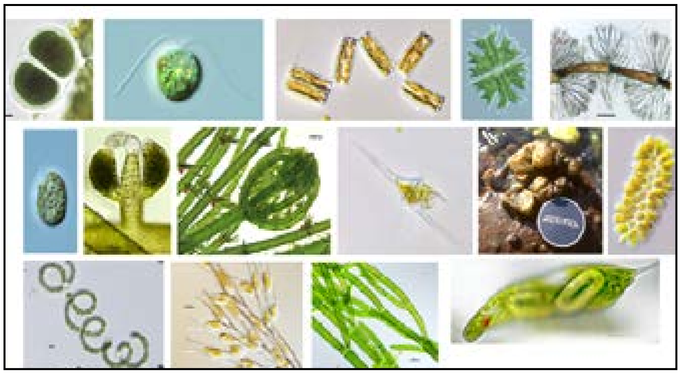


Figure 3. A few examples of the enormous diversity of freshwater algae found in lakes and rivers.

Figure 4. Common aquatic plants in lakes and rivers. A: *Pontederia cordata* (Pickerelweed), B: *Vallisneria americana* (Tapegrass); C: *Potamogeton amplifolius* (Pondweed); D: *Typha angustifolia* (Cattail).

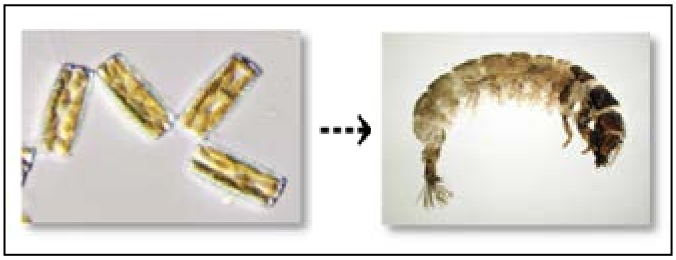


Figure 5. Diatoms produce high concentrations of essential fatty acids (EFAs) that most animals cannot synthesize; they must obtain this from their food.

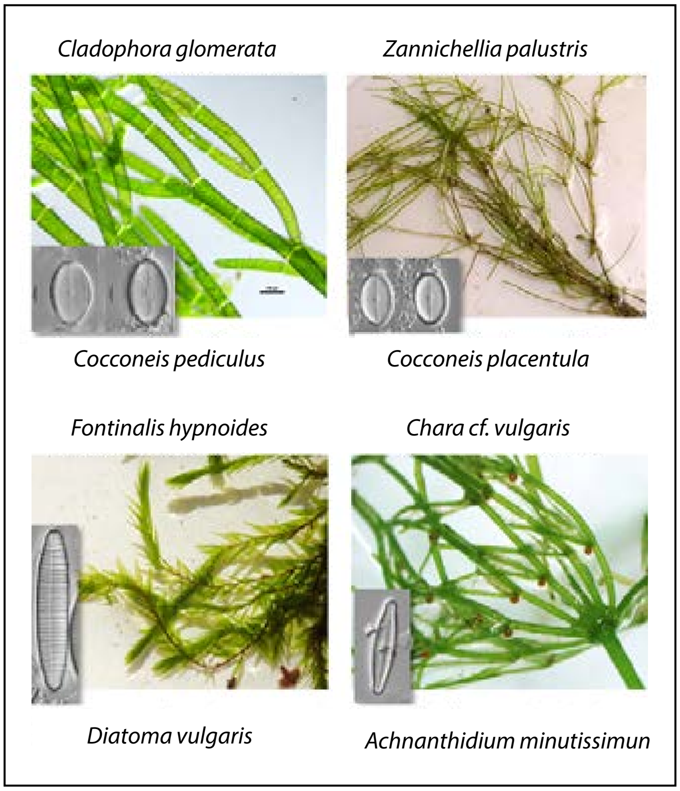


Figure 6. Four major macrophytes in the Colorado River downstream of Glen Canyon Dam (AZ), with the most common species of epiphytic diatom occurring on each plant.

diverse and charismatic species range in size from less than one micrometer (1 µm, about 0.00004 inch) to many meters in size. They comprise the phytoplankton communities in small ponds to huge lakes, but also colonize springs, large rivers, bogs, soils, snow and ice, and form symbioses with plants and animals.

Aquatic plants are less diverse in species but exhibit an enormous range of sizes, forms, and ecological niches. They serve as attractants for pollinators (Figure 4A), food for waterfowl and aquatic mammals (Figure 4B), while sediment-nutrient sinks to reduce eutrophication (Figure 4C) and stabilizes sediments and mitigates shoreline flooding (Figure 4D). This was my second lesson.

Lesson 2: Algae and aquatic plants have essential roles.

Many aquatic plants function as critical habitat for attached 'epiphytic' algae, which in turn provide a nutrient-rich food source for grazing animals. Algae are the largest source of carbon (= energy) to planktonic and benthic consumers in lakes and rivers. Rich

A Few Lessons I Learned About Algae and Aquatic Plants

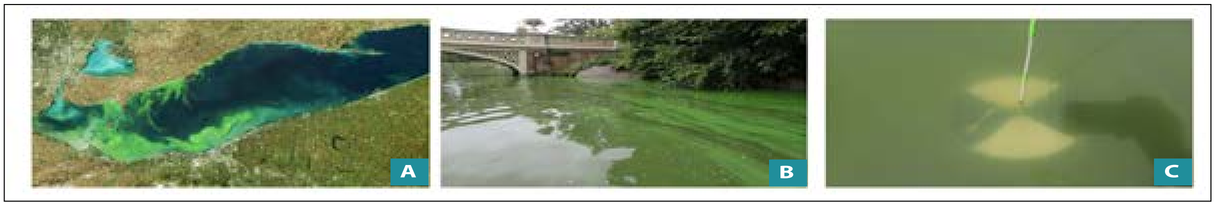


Figure 7. Examples of eutrophication of inland waters. A: Satellite view of a bloom of cyanobacteria in Lake Erie; B: hyper-eutrophic bloom in a lake in Central Park, NYC; C: very poor water clarity caused by an algae bloom in a eutrophic lake, as indicated by a Secchi disk at 5 cm depth.

communities and complex food webs revolve around this consortium of larger plants and microscopic algae. Indeed, some algae, such as *Chara* (AKA musk-grass or stonewort) are themselves macrophytes. The algae (diatoms) that associate with aquatic plants are an important source of nutrients such as essential fatty acids for invertebrates and ultimately fish (Figure 5).

In addition, different species of algae provide a different complement of fatty acids, so a diverse community strengthens the alga, plant, animal links within the ecosystem. With these studies we have learned that invertebrates are what they eat, and even omnivores and carnivores eat algae!

This plant-diatom association can be very specific. In a study of aquatic macrophytes in the Colorado River in Arizona we found that species of diatoms have a preference for particular aquatic plant hosts (Figure 6).

These associations and equilibria between aquatic plants and algae, however, are not static. Climate change, land-based human activities such as agriculture, and changes in water use policies can shift or remove keystone species, including the addition or removal of an important macrophyte in a lake or river. This in turn alters or may short-circuit important food web connections. The spread of invasive species such as non-native fish, zebra mussels, and New Zealand mudsnails can also profoundly affect the ecosystem. This leads to a third lesson I have learned.

Lesson 3: Algae and aquatic plants can sometimes become a problem.

There is a global problem of massive algal populations or blooms in inland waters caused primarily by the release of excess nutrients, mainly nitrogen and phosphorus, from agriculture, sewage and septic fields, and other human-based activities in the process known as eutrophication (Figure 7).

The cyanobacteria most often associated with blooms in eutrophic lakes are species in three genera: *Dolichospermum, Aphanizomenon*, and *Microcystis* (Figure 8). Their importance lies not only in their propensity to form huge populations in nutrient-rich lakes, but also in their ability to synthesize and release taste and odor compounds (and occasionally several toxins) into domestic water supplies. Researchers have demonstrated that while these three genera of cyanobacteria are most commonly reported, there are other species that can create surface blooms: species of *Planktothrix*, *Cylindrospermopsis*, and *Limnoraphis* (Figure 9). There is even diversity within the bloom-formers! The lesson we have learned in recent years is that it is not always the 'usual suspects' that lake managers need to look out for. Each of these species has different factors that trigger their explosive growth, which requires care not to overgeneralize the causes and consequences of algal blooms. It is important to note that not all bloom-forming cyanobacteria species are toxin producers.

Aquatic plants may also cause problems when present in very large amounts. Rather than offer yet another list, one very common nuisance species is a lesson in itself: Eurasian milfoil, *Myriophyllum spicatum* (Figure 10). Its first arrival in North America, perhaps in the early 1900s, is unclear, but it has rapidly spread across North America. It is found in all US states, at least six Canadian provinces, and on all continents other than Antarctica. As a non-native, its spread may have been hastened by a lack of local pathogens or predators. It creates canopy-like structures that crowd out native species and reproduce through vegetative fragmentation, so physical removal can at times create more propagules, enabling further spread. There are native species of *Myriophyllum*, which can be a challenge for management removal plans. But even more sneaky is the fact that Eurasian milfoil can hybridize with native species, including northern watermilfoil, *Myriophyllum sibiricum*, an equally invasive hybrid that requires

A Few Lessons I Learned About Algae and Aquatic Plants

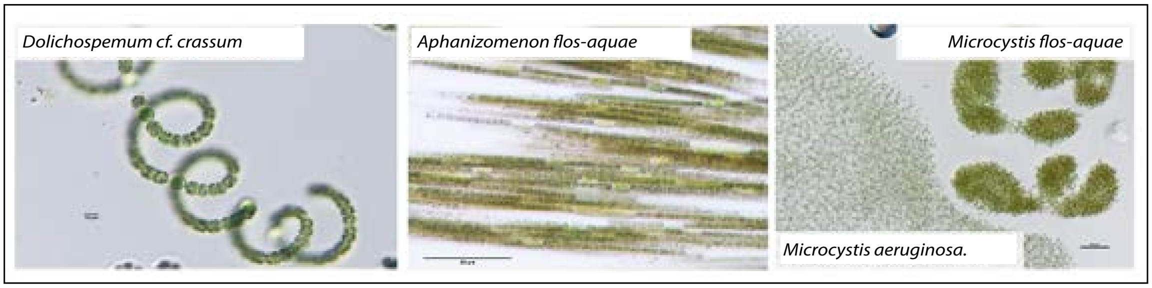


Figure 8. Examples of cyanobacteria that often form surface blooms in eutrophic lakes, as seen under a microscope.

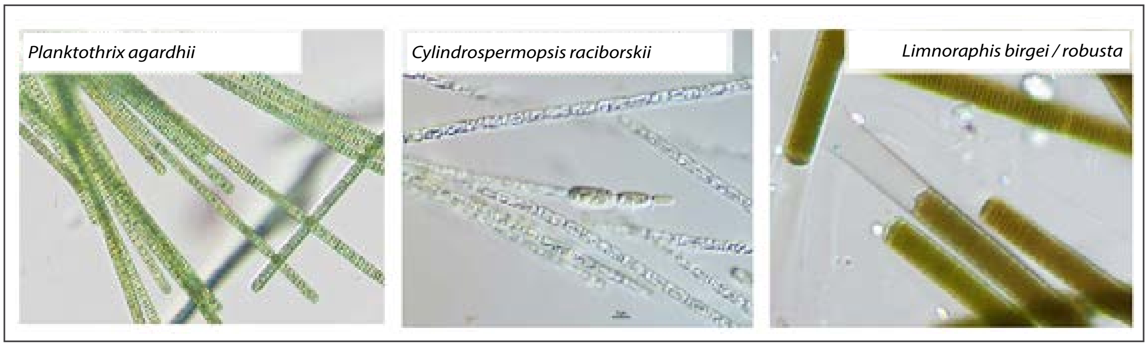


Figure 9. Examples of a few other cyanobacteria that can form surface blooms in eutrophic lakes, as seen under a microscope.

genetic analysis to confirm identification. Besides physical removal, biocontrol control measures include an aquatic weevil (*Euhrychiopsis lecontei*) and triploid grass carp (*Ctenopharyngodon idella*). The latter method has proven successful in many lakes, but unintended consequences can occur! So, on to the fourth lesson I have learned.

Lesson 4: There is a balance.

As an example, I have been assisting in a management study of a small lake in New York State, in which the control of aquatic weeds was a priority for local residents. The agreed solution was to introduce grass carp to reduce vegetation. Initially, this worked very well with much reduced weed cover and increased water clarity. However, the treatment, fish + lake, is an imprecise methodology. And the outcome had some unintended consequences:

Carp overgrazed vegetation → Nutrient release from sediments → Cyanobacteria blooms

Fig. 10

One lesson seemed to be that cyanobacterial blooms increase when macrophytes are removed. This made sense, as phytoplankton and macrophytes existed in a kind of equilibrium with each other.

Gradually, over several years as carp began to die off and vegetation began to return, the blooms and densities of cyanobacteria decreased, resulting in greater water clarity. Because lake sediment is a rich source of nutrients, a new target needed to be a balance between modest plant cover and water clarity, with low (but not zero) plant or algal densities.

Many see algae in a lake as 'bad'. In reality, there aren't really any bad species of algae or bad aquatic plants; they simply respond to ecological conditions, most of which were modified or created by humans.

I started this essay by emphasizing the amazing diversity of organisms in a lake or river, and the many roles and connections they provide. They maintain a well-functioning aquatic ecosystem. Algae and aquatic plants provide many of these essential ecosystem services. Algae and aquatic plants also create problems when they are abundant. A key feature of a system out of balance is one in which there is a loss of species. Clearly, non-native, invasive species affect this imbalance by reducing species diversity, which harms ecosystem integrity. In the current Anthropocene, with human-disturbed ecosystems the rule rather than the exception, a balance should be sought using a modest degree of control, with the aim to restore biological diversity, which can in turn lead to ecosystem stability and balance that most people would welcome.

2023 Water Temperature Monitoring Summary

Brett Tregunno, *KLSA Director*
Nathan Rajevski, *Kawartha Conservation*

Introduction

Climate change is expected to have an impact on the water temperatures in our lakes. As shown in previous KLSA Annual Lake Water Quality Reports, air temperature is directly related to water temperature. This means our lakes will warm as our climate continues to warm.

Warming lakes will undoubtedly have spinoff effects on things influenced by water temperatures, such as the timing of fish migration and spawning, the growth of aquatic plants, the severity of algae blooms, the amount of dissolved oxygen, and how long people can comfortably swim.

Given the significance of water temperature to all life in our lakes (human and otherwise), you might be surprised this topic remains poorly understood and significantly understudied. KLSA is taking action to change this, and since 2020 volunteers have been tracking water temperatures at their dock using a portable digital device that 'logs' temperature readings.

Building a water temperature almanac

Our database now spans 4 years (2020 to 2023), in which there have been 47 logger deployments, at 31 unique sites, on 13 lakes across the Kawartha Lakes. Every hour a data point is logged, so this is the equivalent of one person taking 150,000 individual thermometer readings! This would not be possible without the use of the data logging technology, the cost of which is between $100-300 per device.

Figure 1 provides a summary of all data collected through the program since 2020. This is the early stages of a 'thermograph' that shows the spread of water temperatures across the Kawartha Lakes. Think of it like a daily almanac for water temperature. We now have a reasonable idea of what the temperature in our lakes will be on any given day of the year.

These types of almanacs are well developed for air temperature and water levels for the Kawartha Lakes, but not for water temperature. The more data we collect, the more likely we are to accurately capture baseline conditions, which include 'typical' (i.e., average) and 'atypical' (i.e., extreme) water conditions. If a long enough data period exists, say decades to centuries, we can feel confident in making statements such as: "this was the hottest day on record", "values are above average for this time of year", and "with climate change we expect temperatures to rise by X degrees from baseline".

2023 summary – comparing offshore vs. nearshore temperatures

Every year, more data is added to our database. Last

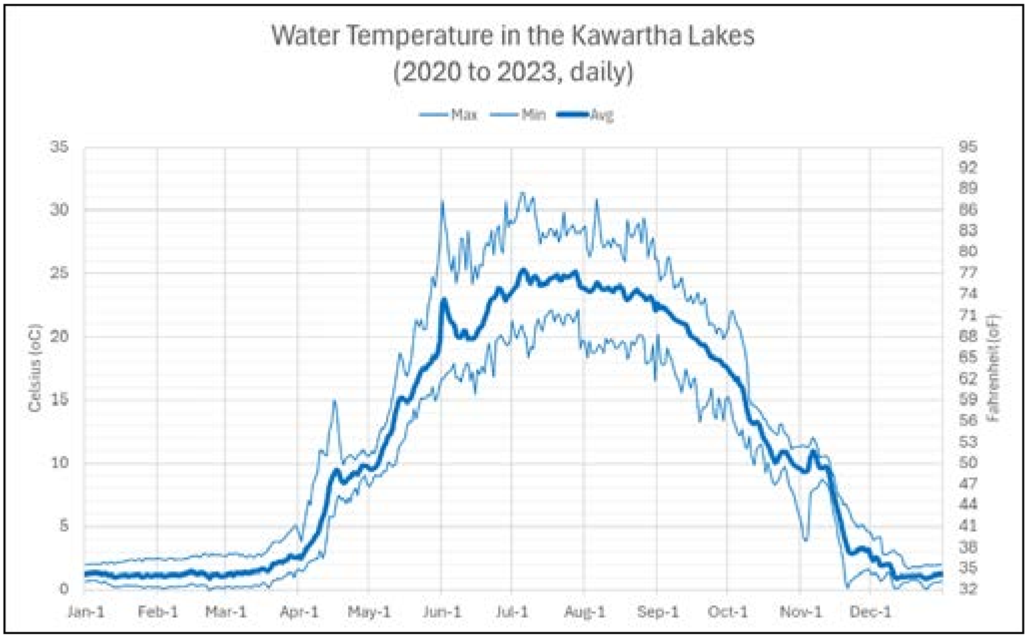


Figure 1. Daily water temperatures of the Kawartha Lakes from January to December, based on 4 years of data (2020 to 2023).

2023 Water Temperature Monitoring Summary

The portable water temperature logging device that was attached to the buoy at the outlet of Pigeon Lake, west of Gannon's Narrows.

year (2023) saw a significant increase in data because KLSA combined forces with Kawartha Conservation, who just recently initiated a comparable climate change water temperature monitoring program. This project is now a combined effort of both organizations, and in 2023 water temperatures were tracked by 24 volunteers, at 29 total locations, in 10 waterbodies across the Kawartha Lakes. This included 24 nearshore sites (at peoples' docks) that captured data over the summer (June, July, August), 1 creek site, and for the first time 5 offshore sites (on Trent-Severn Waterway buoys) that captured data over the entire preceding year (June 2022 to September 2023). Figure 2 and Figure 3 show our nearshore and offshore lake data, respectively. Key results per site can be found in Appendix G.

2023 data shows us that during the summer period, nearshore water temperatures are consistently more variable, and warmer, than offshore water temperatures (Table 1).

In all locations, temperatures fluctuate daily, with highest values typically occurring in late afternoon (4:00 to 6:00 pm), and minimum values in mid-morning (7:00 to 9:00 am). Nearshore daily fluctuations are on average 2.4C whereas offshore fluctuations are only 0.9C.

The highest recorded water temperature in 2023 was observed at a nearshore site (31.4C) which was 4.0C warmer than the highest recorded value at any offshore site. Nearshore sites had more than double the number of days greater than 25C than offshore sites.

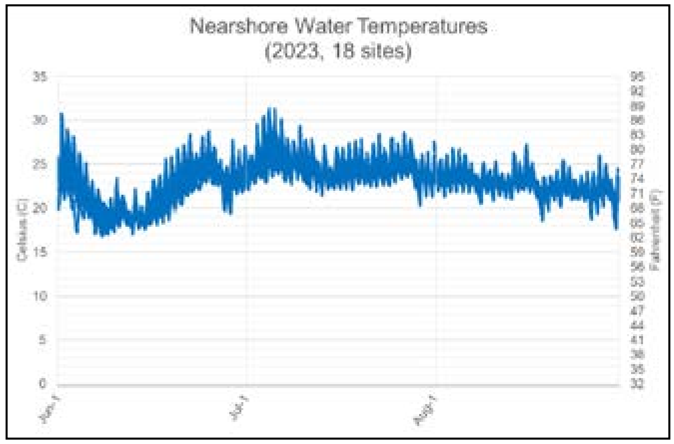


Figure 2. Nearshore hourly water temperatures, collected between June 1st and August 31st, 2023.

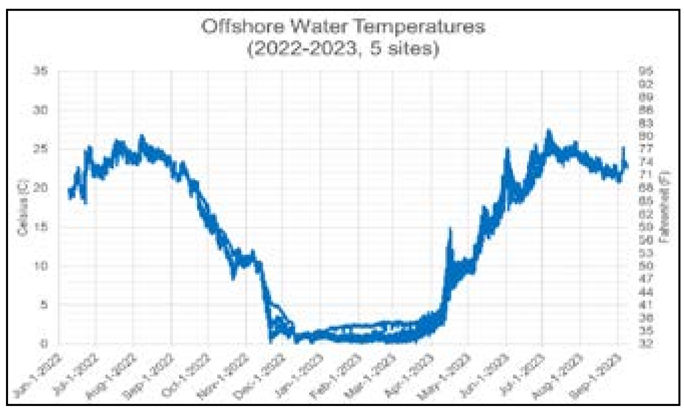


Figure 3. Offshore hourly water temperatures, collected between June 2022 and September 2023.

2023 Summer Water Temperatures (June 1st to August 31st, 2023)	Offshore (5 sites)	Nearshore (18 sites)
Daily Fluctuation (C)	0.9	2.4
Average (C)	22.9	23.2
Maximum (C)	27.5	31.4
Days Above 25C (#)	17.6	41.2
July 1st at 6:00pm (C)	23.7 (+/- 0.9)	24.9 (+/- 3.9)

Table 1. Comparison of nearshore versus offshore water temperatures between June 1st and August 31st, 2023.

2023 Water Temperature Monitoring Summary

A great example that shows the differences among sites is when we compare water temperature at a 'point-in-time'. Figure 4 shows the water temperature at all 2023 sites on Canada Day at 6:00pm. As you were - hopefully - enjoying your family holiday barbeque at your lake, water temperatures varied up to 3.9C across the system. The water next to your shoreline was on average 1.2C warmer than out in the lake. Nearshore sites at this time differed by as much as 3.9C whereas the offshore sites only differed by 0.9C.

The key take-home message is that in the summer you can expect warmer and more variable temperatures close to shore off the main flow-path, and cooler and more stable temperatures in the well-mixed waters on the main flow-path.

Next steps and partnership opportunities

Over the next few years, we would like to continue adding data to our water temperature almanac. This means we keep monitoring the sites we have currently, while also striving to expand our coverage across the Kawartha Lakes by adding new volunteers at new sites.

We would also like to establish a partnership with a college or university to help us determine how much data we need to collect to capture baseline conditions. We also want to establish a mathematical relationship between air and water temperature, which will help us estimate the warming rate of our lakes depending on climate change emission scenarios. This will help us better understand the impacts of climate change on fish, aquatic plants, algae, ice cover, and other important features of our lakes.

If you are interested in participating in this program, please contact us!

We would like to give a special thanks to all the program volunteers since 2020. Without you this project is not possible.

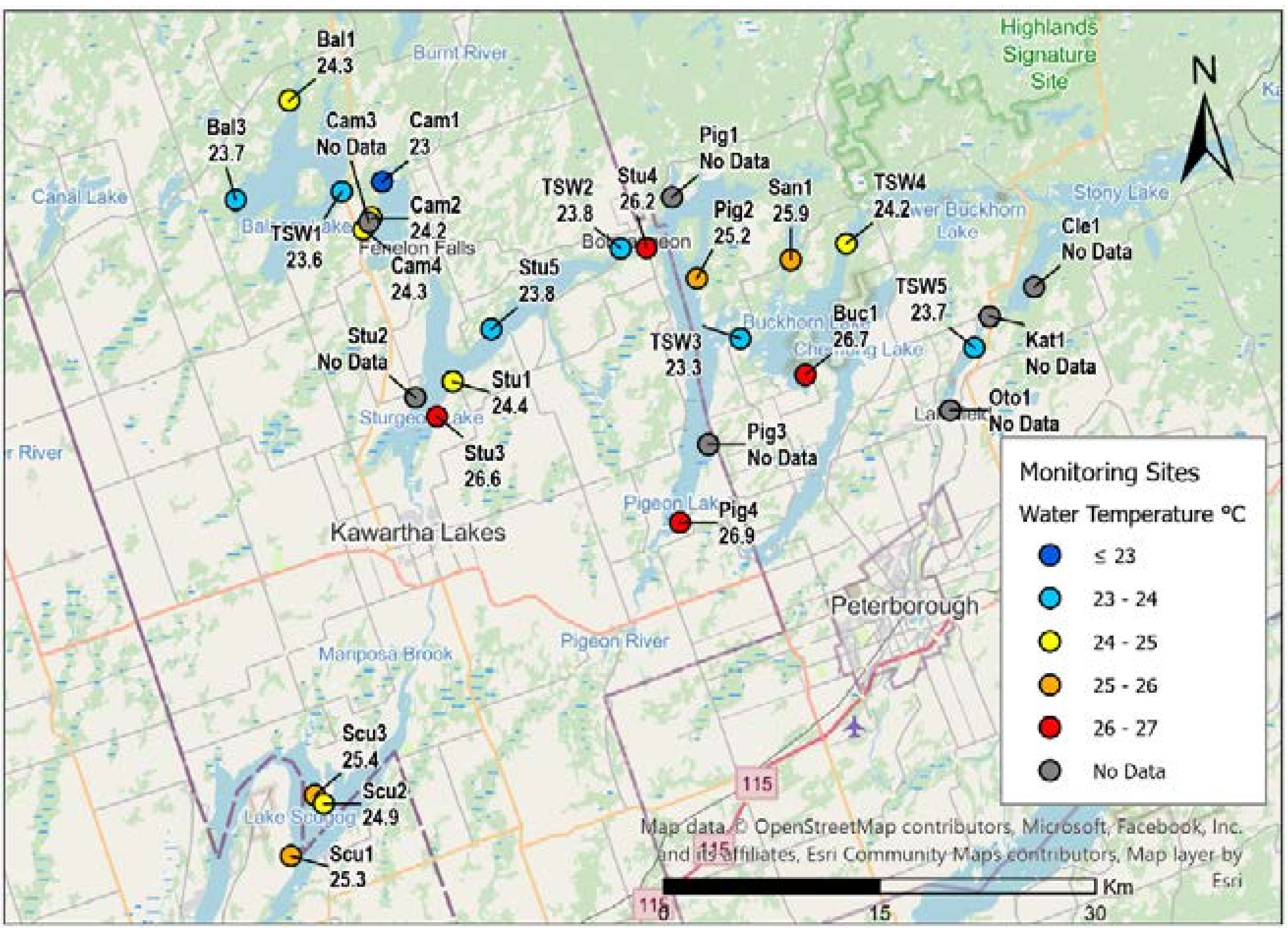


Figure 4. Map of all 2023 sites, showing water temperatures on July 1st, 2023 at 6:00pm.

Empowering Communities: Kawartha Conservation's Impact on Water Quality and Biodiversity

Carolyn Snider, Administrative Support, Conservation Programs
Colleen Cathcart, Forestry and Landowner Service Technician
Ola Pasternak, Landowner and Community Support,
Kawartha Conservation

Over the past decade, Kawartha Conservation's dedicated effort to the Lake Management Planning process has played a pivotal role in addressing concerns related to the health and appeal of the Kawartha Lakes. This effort has resulted in the identification of key issues and priority recommendations for each of the lakes, leading to the formulation of the Lake Management Implementation Action Plan in 2019. The Action Plan proposed science and stewardship-based programs that attract community investment and build partnerships that leverage knowledge, effort, and impact to help achieve the Lake Management Plan recommendations. Notably, Kawartha Conservation introduced initiatives like the 50 Million Tree Program, which collaborates with private landowners to augment forest cover through diverse tree planting options, and the Water Fund program, providing financial support for environmental projects crucial to the lakes' well-being. These endeavours underscore a commitment to the long-term vitality of the Kawartha Lakes region.

Large-Scale Tree Planting

Tree planting was identified as a high priority stewardship action in lake management planning which led us to seek out partnerships to bring tree planting to landowners at a reduced cost. The partnership developed between Forests Ontario and Kawartha Conservation allows us to deliver large-scale tree planting projects on private land to aid landowners in restoring and regenerating forest canopy cover.

This program works with landowners who have enough open land that afforestation or reforestation plantings can be implemented as well as landowners looking to implement long-distance windbreaks and riparian buffers. This unique program covers 40-85% of the costs associated with tree planting, including site visits, soil typing, planting prescriptions, tree acquisition, planting, and subsequent quality and survival assessments.

Since the initiation of the tree planting program in 2019, Kawartha Conservation has increased tree canopy cover within the watershed by 84 acres through the planting of 62,765 trees. In 2023 alone, 39,090 trees were planted across 44 acres of open land in collaboration with 22 landowners, thus showcasing the program's growing impact on the region's environmental stewardship. The passionate commitment of the landowners in the region has helped to improve water quality, increase biodiversity, tree canopy cover and sequester carbon for years to come.

Landowners are not sure what to expect from their first-year planting (photo above). After five years they can expect surviving trees to be over 2 metres (6 feet) tall (photo below). *Photos by Kawartha Conservation.*

Water Fund

Kawartha Conservation's Water Fund stands as a beacon of environmental stewardship, supporting projects within our watershed that safeguard water quality and enhance environmental health. Since its inception, the Kawartha and Scugog Water Fund has

Empowering Communities: Kawartha Conservation's Impact on Water Quality and Biodiversity

Before (left) and after (right) photos of a 2023 Water Fund project. To enhance cattle health and water quality, this applicant installed a solar-powered pump. This innovation redirects water away from the pond, providing safe drinking water for the cattle while maintaining pond water quality.

Before (left) and after (right) photos of a 2023 Water Fund project. This applicant had a mission to revitalize their Sturgeon Lake waterfront. With granted funds, over 100 trees, shrubs, and perennials were planted, stabilizing the shoreline, absorbing runoff, and creating a thriving wildlife habitat.

disbursed over $700,000 to landowners and community groups, who undertook initiatives such as tree planting, erosion control, exclusion fencing, well decommissioning and more.

In 2023, the Kawartha and Scugog Water Fund achieved noteworthy milestones, including a waterfront restoration length of 309 meters and a habitat restoration area spanning 42 acres. The planting of 1,300 trees, 820 shrubs, and 870 perennials further contributed to the watershed's biodiversity and aids with maintaining and improving our lakes. The approval of 33 landowner grants in 2023 underscores the ongoing commitment of communities to environmental stewardship, with the Water Fund allocating $75,500 in municipal grant funding, leveraging an additional $248,264 from the community.

Kawartha Conservation's impactful strides in 2023 owe their success to the wholehearted commitment of dedicated landowners and communities. Together, significant enhancements have been made to water quality, biodiversity, and the overall health of the region. The collaborative efforts under programs such as the 50 Million Tree Program and the Water Fund exemplify the transformative potential of community-driven environmental initiatives. As we express gratitude for the achievements of the past year, we look forward with enthusiasm to the ongoing journey toward a sustainable and thriving future, where our collective stewardship continues to make a lasting positive impact on the Kawartha Conservation Watershed.

Water Quality of Stony, Upper Stoney and Clear Lakes

Brigitte Simmatis, Ph.D.,
The Ministry of the Environment, Conservation & Parks, Eastern Region

Introduction

Inland lakes represent major environmental, recreational, and economic resources in Ontario. Increased demand for waterfront properties has resulted in considerable development, for which lakes have a finite capacity. Land use changes and shoreline development can detrimentally influence water quality, often through increased nutrient inputs.

Nutrients such as phosphorus and nitrogen act as fertilizer for aquatic plants, promoting the growth of phytoplankton and macroalgae (e.g., submergent macrophytes). The proliferation of algae can result in blooms or excess macrophyte growth, leading to equipment fouling, blooms, scums, and reduced aesthetic or chemical water quality.

Algal proliferation can also lead to indirect effects, such as oxygen depletion. When large quantities of algae die, they sink to the sediments and decompose, consuming deep-water oxygen. In stratified lakes, deep-water oxygen is required for healthy communities of sensitive taxa (e.g., lake trout). Late-summer depletion or absence of dissolved oxygen can occur in highly productive (i.e., eutrophic) lakes as an indirect result of nutrient additions.

Climate can complicate the relationship between algae, nutrients, and oxygen. Across Ontario, late-summer cyanobacterial blooms no longer solely occur in highly productive waters (Favot et al., 2023). Longer ice-free periods, warmer epilimnetic (shallow water) temperatures, and stronger thermal stratification can favour cyanobacteria (blue-green algae). In the Kawarthas, increasing temperatures since ~1970 in combination with more spring precipitation have been highlighted as important regional drivers of nutrient loading and algal production (Laird et al., 2023).

Stony Lake is relatively large (surface area of 28.3 km^2; mean depth of 5.9 m; maximum depth of 32 m). The underlying bedrock of the region is primarily Ordovician limestone with the exception of northern Upper Stoney Lake, where Precambrian igneous bedrock can be found.

Stony Lake is located downstream of Pigeon Lake which boasts a predominantly agricultural catchment. Despite this, Stony Lake historically had low total phosphorus concentrations, driven by high flows of dilute drainage from a small catchment (mostly forested lands along the northern shore; Laird et al., 2023). Despite recent relative stability in nutrient concentrations in Stony Lake, colonial cyanobacteria were inferred to have become more common since the 1990s based on sedimentary pigment analysis, potentially driven by changes in lake warming and stratification strength (Laird et al., 2023). One approach to examine this hypothesis would be to examine Schmidt Stability over time or, as a proxy of stratification strength in the absence of lake depth-volume data, the difference in temperature between hypolimnetic (deep) and epilimnetic (shallow) waters.

Here, data collected as part of the Lake Partner Program and temperature-oxygen profiles are presented, then discussed in a subsequent "Results and Discussion" section.

Total Phosphorus and Secchi Disc Depth

Total phosphorus and Secchi disc data, compiled from all Lake Partner Program stations on each lake, are presented in Tables 1 and 2.

Lake Name	Data Range	Total Observations	Total Phosphorus Concentration (µg/L)			
			Mean Annual	Mean Spring	Maximum	Minimum
Upper Stoney	2002-2021	524	8.0 (±3.3)	7.6	37.7	2.7
Stony	2002-2021	418	14.0 (±5.5)	10.9	63	6.8
Clear	2002-2021	270	15.5 (±5.6)	11.8	74.8	6.5

Table 1: Long-term geometric mean total phosphorus concentrations. Note that "Spring" measurements include samples collected in April, May, and June.

Water Quality of Stony, Upper Stoney and Clear Lakes

Lake Name	Data Range	Total Observations	Mean Secchi depth (m)	Maximum Secchi depth (m)	Minimum Secchi depth (m)
Upper Stoney	1996-2020	80	5.6 (±1.0)	7.2	0.5
Stony	1996-2021	72	4.1 (±0.7)	6.5	2.4
Clear	1996-2020	59	3.7 (±0.5)	5.3	2.6

Table 2: Long-term Secchi disc measurements.

Temperature and Dissolved Oxygen Profiles

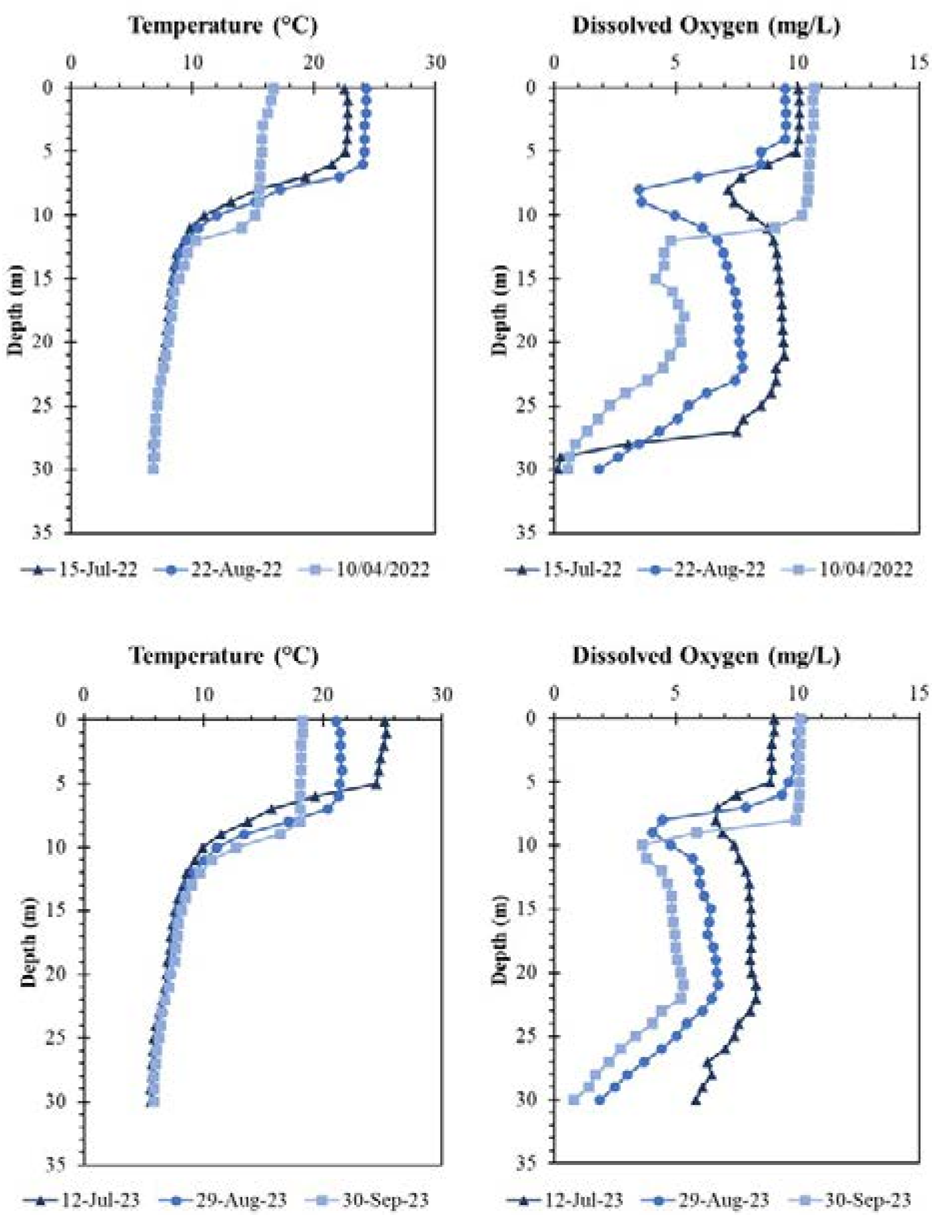


Figure 1: Upper Stoney Lake temperature and dissolved oxygen concentration profiles.

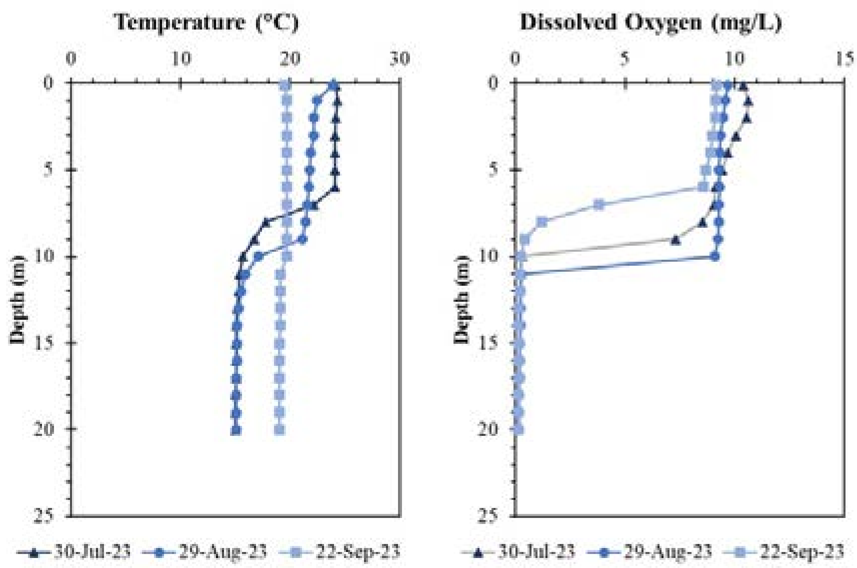
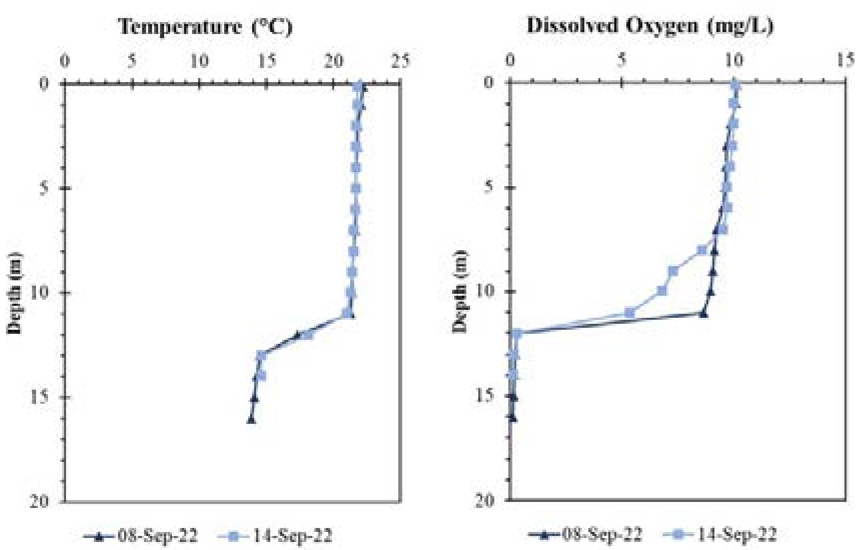


Figure 2: Stony Lake temperature and dissolved oxygen concentration profiles.



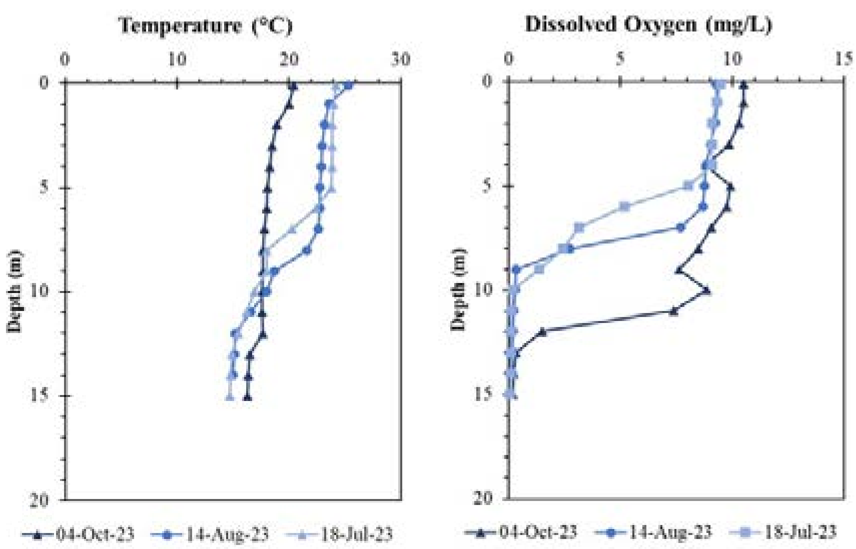


Figure 3: Clear Lake temperature and dissolved oxygen concentration profiles.

Water Quality of Stony, Upper Stoney and Clear Lakes

Results and Discussion

Upper Stoney Lake

Phosphorus concentrations are typically low, likely precluding nuisance algal growth. Water clarity, as indicated by Secchi disc depth, is 5.6 m on average, indicating that the lake has excellent water clarity.

Trend analysis over the span of all observations indicated that Secchi disc depth has been modestly increasing over time; however, this trend was driven primarily by high water clarity in 2012-2013 and 2016-2017 (multiple observations >6.5 m). No inter-annual trends in total phosphorus concentrations were apparent.

Dissolved oxygen and temperature profiles for 2022 and 2023 are presented in Figure 1. The profiles appear similar to those recorded in 2017, 2018 and 2019. The temperature profiles indicate that Upper Stoney Lake stratifies in July and August, with lake cooling starting to occur at the end of September and October. As in previous years, the dissolved oxygen profiles are indicative of a negative heterograde: organic matter settles in the metalimnion resulting in a distinct decrease in dissolved oxygen concentrations. The bottom-most waters of Upper Stoney Lake indicate deep-water anoxia (i.e., lack of oxygen). The top of the hypolimnion occurred at 11 to 15 m depth, consistent with previous profiles.

Stony Lake

Total phosphorus concentrations are moderate, but the variability and spread were higher in 2021 compared to samples collected before 2014. At the recorded concentrations, algal proliferation may occur. Secchi disc clarity is good (4.1 m on average). Therefore, Stony Lake can be classified as mesotrophic.

Trend analysis over time did not indicate any clear trends in total phosphorus or Secchi disc depth.

Dissolved oxygen and temperature profiles for 2023 are presented in Figure 2. Temperature profiles indicate that the lake weakly stratifies and mixing occurred in September. Rapid anoxia was evident in all profiles, beginning at the top of the hypolimnion (9-11 m below water surface).

Clear Lake

Total phosphorus concentrations are moderate and stable over the span of the long-term record, albeit the highest of the three lakes examined here. Secchi disc depth in Clear Lake indicates moderate to good water clarity. Over time, Secchi disc depth has appeared to modestly decline, with values <4 m more commonly observed after 2015 than before 2015. The lake can be classified as mesotrophic.

The temperature profiles indicate that Clear Lake weakly stratifies in summer, and has a warm hypolimnion. Mixing had occurred by October, based on the isothermal profile. As in Stony Lake, rapid anoxia occurred in the hypolimnion in 2022 and 2023.

Conclusions

- Upper Stoney Lake has low total phosphorus concentrations (<10 µg/L) and high water clarity indicating that the lake can be considered oligotrophic; however, deep-water oxygen is low and becomes anoxic at the bottom of the profile. Any trends in total phosphorus and Secchi disc depth were not consistent across time.
- Stony Lake is moderately productive (mesotrophic) with good water clarity. Higher phosphorus concentrations relative to Upper Stoney Lake indicate that Stony Lake may be more likely to develop nuisance algal growth. Deep-water anoxia can be detrimental to aquatic biota and, in some cases, promote the recycling of phosphorus from the sediments to the lake in a process coined internal loading. Nuisance algal blooms in some systems have been attributed to internal loading when nutrient influx from the catchment has remained stable or declined.
- Clear Lake is moderately productive (mesotrophic) with moderate to good water clarity. High total phosphorus values indicate that Clear Lake may develop algal blooms or nuisance algal growth. As in Stony Lake, deep-water anoxia can be detrimental to lake health.

<u>Literature Cited</u>

Favot EJ, Holeton C, DeSellas AM (2023) Cyanobacterial blooms in Ontario, Canada: continued increase in reports through the 21st century. *Lake and Reservoir Management*, 39, 1-20. DOI 10.1080/10402381.2022.2157781

Laird K, Li S, Gushulak CAC, Moir KE, Wang Y, Leavitt PR, Cumming BF (2023) Influence of cultural eutrophication, climate, and landscape connectivity on 3 Kawartha Lakes (Ontario, Canada) since the early 1800s. *Lake and Reservoir Management*, 39, 120-140. DOI 10.1080/10402381.2023.2204061

Teaching an Old Dog New Tricks: The Lake Partner Program Continues to Grow, Even in its 28th Year!

Gavin Vance, Assistant Coordinator,
Lake Partner Program

When the Lake Partner Program (LPP) was formed 28 years ago by the Ministry of the Environment, Conservation and Parks in partnership with the Federation of Ontario Cottagers' Associations (FOCA), there was a single goal of determining the nutrient status of Ontario's freshwater lakes. With the help of organizations like the Kawartha Lake Stewards Association and other passionate lake stewards across Ontario, the LPP has been able to far exceed the original goal of the program.

As of the end of 2023, LPP volunteers had sampled over 500 lakes across Ontario. The long-term data collection on these lakes allows those studying Ontario lakes to detect trends in important water quality parameters, through an established and trusted citizen science program. But, despite the program's large number of sampled lakes, FOCA is always trying to increase the geography covered by its monitoring efforts. To that end, I have provided a list of lakes within the KLSA network that are currently not being sampled through the LPP. If anyone reading these lives on or is near any of these lakes and would like to become a lake steward and LPP volunteer, please reach out to lakepartner@ontario.ca. I will be sure to get you signed up and provide you with all the information and materials you need to participate! A reminder that participating in the LPP is completely free of cost and FOCA provides all necessary materials.

List of Lakes in KLSA Network Without a LPP Sampler:

- MITCHELL LAKE
- SHADOW LAKE
- SILVER LAKE
- SANDY LAKE
- MISSISSAGUA LAKE
- MOORE LAKE
- WHITE LAKE
- COON LAKE
- JULIAN LAKE

What changed for the LPP in 2023?

As the program entered 2023, FOCA had a goal of fostering interest in, and promoting the stewardship of water quality across Ontario while maintaining our long-term database of water quality for Ontario's inland lakes. This has only been possible with the help of the more than 600 LPP volunteers, several of whom are KLSA members. To fulfill the goal of fostering interest and promoting stewardship of water quality throughout Ontario, we are always looking for ways to provide more value to the dedicated and enthusiastic volunteers in the LPP.

We realize that it is often difficult for volunteers to decipher and contextualize the data that the MECP lab produces and posts online for public use. This can limit the benefits volunteers receive for being a part of the program and could reduce the impact they feel they are having through their stewardship efforts.

In the past the LPP has produced some Lake Data Reports. These reports unfortunately took a very long time to create, and the format was limited in the information provided. In 2023 we decided to revamp these reports to include more data visualization, trend analysis and information about individual parameters, and now they can be made in a matter of minutes with up-to-date data, rather than taking a day or more, as the old reports did.

The new and improved lake data reports

The new reports are available upon request to any volunteer who has sampled continuously for at least five years. The new reports are more interactive and informative than they were in the past. On page 20 is an example of the new report's features. This is a map of Balsam Lake. In the report this map is interactive and displays all sampling sites within the LPP that contain sufficient data, as well as a pop-up tab that details the past six-year averages for each site location as well as entire lake averages. This is much improved from the past reports, where the maps were just static screenshots.

Throughout the report, there are multiple figures

Teaching an Old Dog New Tricks: The Lake Partner Program Continues to Grow, Even in its 28th Year!

Figure 1: A map showing Balsam Lake that is included in the new Lake Data Reports.

that visualize the water quality data from the samples volunteers have collected. Each figure has a section below that highlights the key takeaways for each graph and provides additional context.

The graph seen in Figure 2 is taken from the Lake Data Report for Balsam Lake. For each parameter measured in the program (i.e., total phosphorus, calcium, chloride, and water clarity) a time-series graph (a plot of data values across time) is made to visualize the data as well as a chart showing how the levels of total phosphorus vary across different lakes in Ontario (which can be seen below). The key information that is derived from this data visualization seen above is the trend of total phosphorus over the 20-year span and an analysis of the significance of this trend.

For Balsam Lake, the total phosphorus levels decreased by approximately 3.0 µg/L, or from 12.5 µg/L in 2002 to 9.5 µg/L in 2022. In the report we also run a statistical analysis to determine what the probability is that this trend arose by chance. If this p-value is below 0.05, then there is a high likelihood that this trend did not occur by chance. The Balsam Lake's p-value for Figure 2 was 0.0003, meaning there is strong evidence this trend did not occur by chance.

Teaching an Old Dog New Tricks: The Lake Partner Program Continues to Grow, Even in its 28th Year!

What does Balsam Lake's annual total phosphorus concentration look like over time?

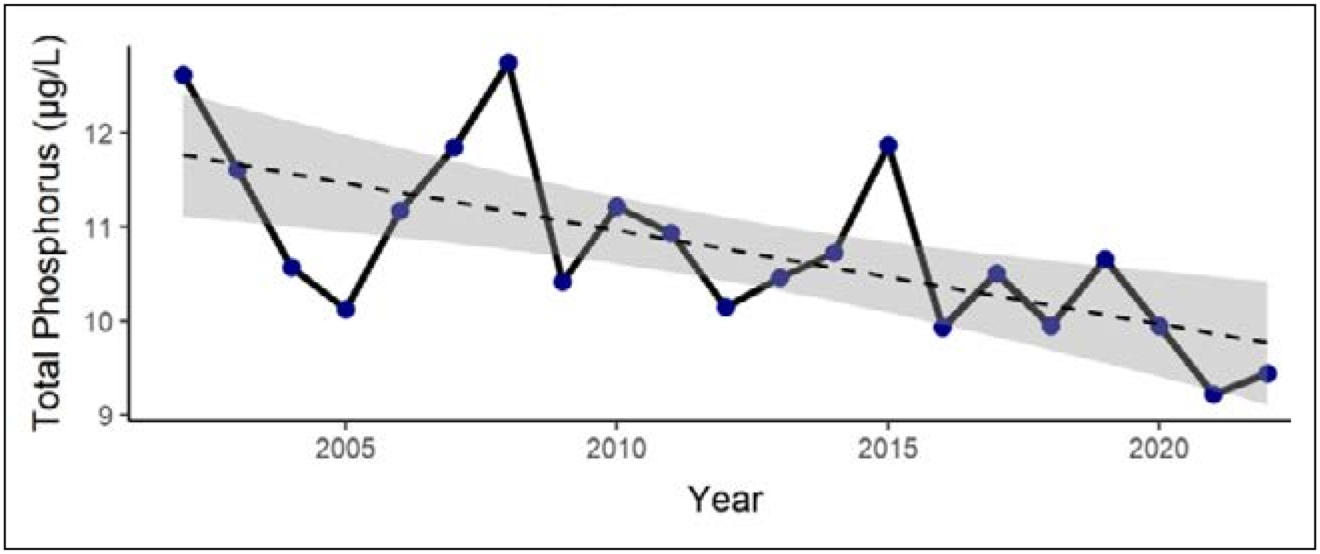


Figure 2: Annual graphs of Balsam Lake's total phosphorus from 2002-2022, taken from Lake Data Report for Balsam Lake

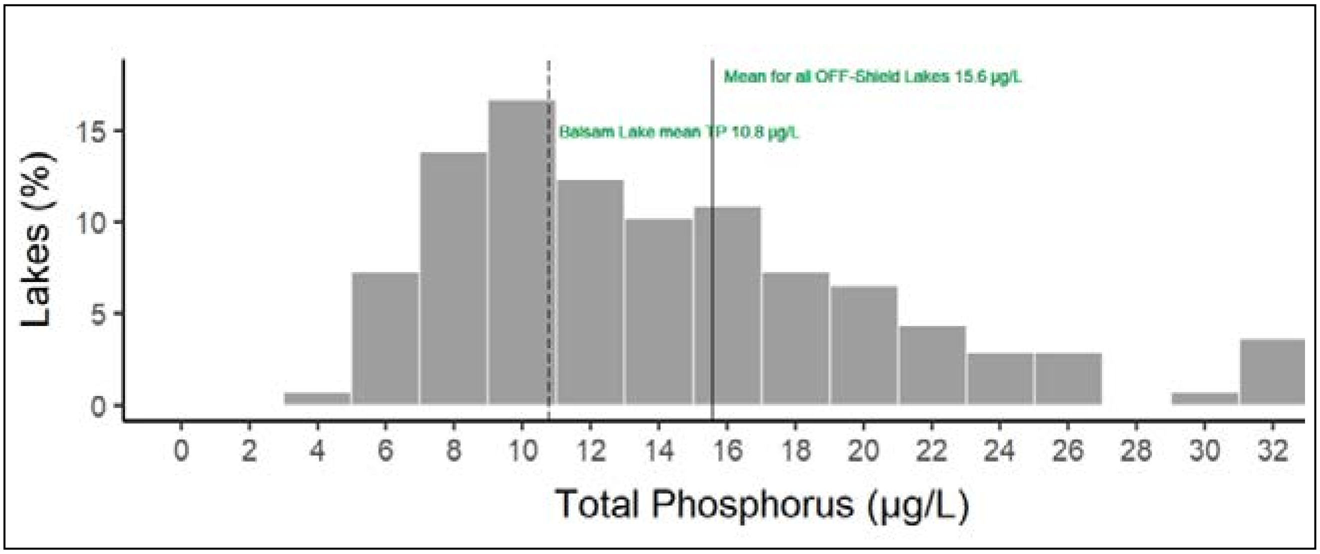


Figure 3: Histogram taken from Balsam Lake's data report.

What we hope volunteers get from the new data reports!

We developed these new lake data reports with the hope that they can help volunteers better understand the data produced from the samples they collect and, subsequently, the lakes they steward. We hope these reports act as a gateway for stewards in the KLSA and beyond to begin to better understand their individual lakes and to grow the scope of what being a lake steward means.

For more about the LPP, including a video about sampling techniques, consult FOCA's webpage:

https://foca.on.ca/lake-partner-program/

Discovering the Beauty Beneath the Surface of our Lakes

Patty MacDonald, Environmental Director
Kawartha Park Cottage Association

Since starry stonewort (SSW) was identified on Stony Lake in 2018 a lot of time and energy has gone into creating public awareness of this little-known invasive species. People on Stony Lake participated in the KLSA SSW Monitoring Project, watched webinars presented by the Starry Stonewort Collaborative, created maps and signage to identify infested areas, and raised their concerns with environmental organizations such as the Invading Species Awareness Program (ISAP) and the Invasive Species Centre. Presentations were also made to local governments and MPPs so they would be aware of the potential impacts of not just SSW but all invasive species. In the summer of 2023 we decided that it was now time to shift our focus. We began to look for ways to educate our lake community about the important role aquatic plants play in maintaining a healthy lake ecosystem. The Association of Stony Lake Cottagers (ASLC), the Kawartha Park Cottagers' Association (KPCA), and St. Peter's Church on the Rock worked together to create simple, inexpensive activities that were fun, engaging and informative.

The first activity we promoted was a series of small group information sessions held in my bay. For the past three years I volunteered to visit people's cottages if they suspected they had SSW on their shoreline. I would take a rake toss sample and then help the cottagers identify the aquatic plants in the sample. Usually, SSW was not present so I would bring a small sample so they could see it, and touch it. I'd then explain the key characteristics used to identify SSW: a clear monofilament at the base connected to star shaped bulbils, branches arranged in whorls with five to eight per whorl, and a smooth texture. We would also discuss the differences between our native charophytes (muskgrass and nitella) and SSW. Over my three summers doing this I was surprised how few aquatic plants even lifelong cottagers actually recognized.

In the summer of 2023, we decided to use people's curiosity about SSW to encourage them to take a good look at all the life beneath the surface. My cottage is adjacent to the area we call *"The Lost Channel,"* a gorgeous wetland teeming with aquatic life and one of the first areas on Stony Lake identified as containing SSW. Instead of waiting for people to ask me to come and take a look at a plant they were concerned about, I invited small groups of people to "*Meet Me In My Bay*."

Children laying on the dock at Juniper Island looking at the plants in the water. *Photo by Patty MacDonald*

To begin our aquatic plant adventure, we started by taking samples of the SSW growing at my dock. This gave people an opportunity to take a good look at the structure of the plant and see how it looks growing under the surface. Many were surprised to find that what appeared to be a very shallow area, was in fact, two to four feet deep but filled with densely tangled SSW. This led to a good discussion about the preventative measures I've been using for the last three years to minimize spreading SSW. I explained how I raise my motor and use the same path when approaching the dock in order to prevent fragmentation of the SSW. I also explained that as an island cottager with limited docking options, I carefully hand remove SSW in the area where my boat is docked and compost the material well back from my shoreline. Again, trying to minimize fragmentation of the SSW. This naturally led to a discussion about the importance of knowing where SSW has been identified on Stony Lake and avoiding the areas if at all possible.

While still on the dock we also took a look at any other aquatic plants that had been mixed in with our SSW samples. I demonstrated how to use iNaturalist to record the plants and to help identify them. I encouraged our participants to join the KLSA Aquatic Plant Contest in order to practice their identification skills and have some fun looking beneath the surface. I also introduced them to the

Discovering the Beauty Beneath the Surface of our Lakes

KLSA's Aquatic Plant Checklist of 30 common species found in the Kawartha Lakes, many right in my bay and the Lost Channel! At this point, it seemed like a good time to get in our canoes and kayaks and take a tour of my bay and the Lost Channel. As we paddled, we looked at the amazing plant life beneath and took a few samples so we could have a better look and try to identify them. We also discussed the importance of maintaining the amazing biodiversity we were seeing, and the role aquatic plants play.

Over five weeks we had approximately 25 visitors "*Meet Me In My Bay*." Some participants used it as a fun family outing while others came on their own. At the end of our visit, all participants were given reference materials provided by the ISAP, a copy of the KLSA Annual Lake Water Quality Report, and a map of SSW locations on Stony Lake. We're hoping they also went home with a new appreciation of our aquatic plants and the importance of protecting them.

Our second set of aquatic plant activities came about because we were given funding we weren't expecting. In mid-July, the Association of Stony Lake Cottagers (ASLC) informed me that the proceeds from the annual Ladies Luncheon had been ear-marked to support education and awareness around starry stonewort. We decided our target group would be our youngest cottagers. We would focus on creating a new generation of Stony Lakers that have a better understanding of the role aquatic plants play in maintaining a healthy lake ecosystem. In turn, they would encourage their parents and grandparents to appreciate a natural waterfront, learn more about the incredible plants in our lakes, and better understand why it's so important to protect them.

Children looking at the map of starry stonewort locations on Stony Lake and trying to find their cottages. ***Photo by Patty MacDonald***

Since it was already mid-July we had to move quickly. We decided to piggyback on children's programs already established and well attended on Stony Lake. Abbie Formoso (ASLC Environmental Director), Morley Birdsell-Farrow (ASLA Programs), Mary Parker and Martha Hunt helped to plan aquatic plant activities at Camp Juniper; a popular paddle, swim and craft camp held on Juniper Island. To begin our activities with the children, we talked about our love of the lake and our need to protect it. We also talked about things that can have a negative impact on the lake such as invasive species and climate change. We then discussed SSW as an example of an invasive species. While looking at samples we talked about how to identify it and how it is different from our native charophytes. The children were then encouraged to touch and take a closer look at the samples. Using the map created by the ASLC which shows the 40 or so known locations of SSW on Stony, the children tried to find their own cottage and where they were in relation to SSW.

The children then worked in small groups with Camp Leaders and Leaders in Training. They looked at a variety of aquatic plant resources we created and did rake toss sampling from various locations. To identify the plants in their samples, they compared them to aquatic plant samples floating in labeled tubs. Once they found a match, they placed their plants in that tub. The groups met for a final discussion about the important role each plant plays in providing food and habitat for fish, turtles, etc. and that it is our job to protect the biodiversity of our lake. Each participant took home materials provided by ISAP to share with their families.

To reach a few more children, we approached St. Peter's Church on-the-Rock (a lovely small church on an island) which holds services each Sunday of the summer and has a Sunday school. We were generously offered one Sunday school session to share our aquatic plant activities with the children.

Discovering the Beauty Beneath the Surface of our Lakes

Two ladies in a canoe and kayak. Nicole Rush (left) and Leah Walton (right). ***Photo by Patty MacDonald***

By the end of August close to 100 participants had taken part in our aquatic plant activities. We also distributed nearly 200 sets of invasive species materials (magnets, reference guides, Clean, Drain & Dry cards) we had received from ISAP. In addition to our activities, we created displays for three local marinas and three lake associations. The feedback that we received from our lake community was very positive. Parents and grandparents were particularly pleased regarding the interest, knowledge and enthusiasm their children shared about the experiences we offered.

Planning for 2024 is already underway. We plan to build on the work we did last summer, and better coordinate and communicate what we can do collectively and as individuals to contribute to a sustainable future, and protect the natural environment we sometimes take for granted. With our commitment and active involvement, the future of our lakes and natural areas will be protected for generations to come.

Group of Swans. *Photo by: Terena S. (Katchewanooka)*

Gold Sunset. *Photo by: Thorsten Koseck. (Big Bald Lake)*

Garden Visitor - frog. *Photo by: Pam Dickey. (Big Bald Lake, Pluards Landing)*

Turtles. *Photo by: Helen Batten. (Stony Lake, St. Peter's on-the-Rock)*

The Journey from Interested to Committed: Joining the Fight Against Aquatic Invasive Species

Vickie Hartog, Secretary/Communications Manager,
Loon Call Lake Cottagers' Association

When my friends see me, they ask if I am working. I retired over five years ago, but I have taken contracts each year since then. It's a common tale of the working retired; as I like to say, I have failed at retirement.

In 2023, as I was contemplating whether I would seek another contract after cottage season, the Loon Call Lake Cottagers' Association received an email from the Big Cedar Lake Stewardship Association (BCLSA). Diane Trauzzi, Secretary of BCLSA, was seeking support for their application to the Department of Fisheries and Oceans Canada (DFO) for a grant from the Aquatic Invasive Species Prevention Fund. It was a worthy cause our association could support so as the Secretary/Communications Manager for the Loon Call Lake Cottagers' Association, I drafted a letter of support for our President to sign.

Not long after the letter of support was sent, another request came in. It went something like this…Could anyone help with the proposal, and if won, we are looking for a project manager. It will be a paid position. Hmmm, is this the contract I am looking for? After a few days of contemplation I decided that I would throw my hat into the ring. I was officially interested! I really didn't know much about invasive species, but I did know about Project Management, having spent over 40 years in the field. I sent an email to Diane to let her know that while I don't consider myself a great proposal writer, I am a project manager. If their application was successful, I would like to be considered for the position of project manager. No more than three minutes passed before my phone rang. It was Diane. Would I like to come review the proposal with her, learn about the project, and decide if it was for me?

After a few hours with Diane, I was committed! The project was meaningful, aggressive and a significant undertaking. We worked together for the next week to complete the application, and when Diane submitted it on August 31st, we were satisfied that the proposal was worthy.

The application was for a multi-dimensional, three-year undertaking, including:

- Increasing awareness of Aquatic Invasive Species (AIS), their impact and how they spread,
- Creating baseline invasive species counts and performing yearly assessments in North Kawartha lakes,
- Facilitating Clean-Drain-Dry practices by installing six cleaning units staffed with students to encourage their use,
- Spreading Clean-Drain-Dry messaging within North Kawartha via increased signage and attending community events with roving cleaning units, and
- Ensuring people are aware of the Invasive Species Act and that Clean-Drain is the law (Dry is not required in the Act but is considered best practice.)

Diane received tremendous support from across the region. Support ranged from training people in the Clean-Drain-Dry practice, spreading the message of the program, assistance identifying invasives in the lakes, volunteering to attend local events to spread the word, and providing nominal funding to assist in the effort. North Kawartha Township generously committed to install, maintain and manage the cleaning units and the student staff.

Diane and I worked through the fall so we would be ready to hit the ground running if we received the funds. We worked with the Ontario Ministry of Natural Resources and Forestry (OMNRF) to prepare for the necessary permits and approvals and the Ontario Federation of Anglers and Hunters (OFAH) Invasive Species Awareness Program (ISAP), to line them up to support us by gathering educational material and planning training for lake stewards; and preparing our communications plans and the overall project plan.

On December 15th we received word that the application met the requirements of the program but the DFO fund was not sufficient for all of the qualifying applications. We would not be receiving the funding, but that's not stopping us.

We had anticipated this possibility and had a Plan B. While we will not be purchasing the cleaning units we will be spreading the word about AIS and the Clean-Drain-Dry message. And, we will be engaging with the community.

We have formed a new organization, Preventing Lake Invasives in North Kawartha (PLiiNK). PLiiNK will:

The Journey from Interested to Committed: Joining the Fight Against Aquatic Invasive Species

- Establish a Working Group to bring expertise and enthusiasm to the project
- Hold an awareness session in April for the supporters of the initiative to get their continued support
- With OFAH, provide training on Clean-Drain-Dry practices
- Attend AGMs and community events to spread information about invasive species and the Clean-Drain-Dry message
- Create and publish posters to increase community knowledge of invasive species
- Facilitate the identification of invasive species in local lakes (this has turned out to be more difficult than we originally anticipated, but we will do what we can)
- Increase community knowledge of the Clean-Drain-Dry practice
- Find funding sources for increased signage
- Communicate, communicate, communicate at PLiiNK.ca - Prevent Lake Invasives in North Kawartha – where the community can follow our progress of normalizing the Clean-Drain-Dry practice

Now, when I meet my friends and they ask if I am working, I tell them, "Well, yes, I am. You have a cottage. Did you know about the spread and impact of AIS? Did you know it is the law to clean and drain your boat when you leave a waterway? Did you know it doesn't take much for an invasive species to spread from lake to lake and impact the native species? Do you want to help spread the message? " I am hoping to get them interested, and then committed.

Let's get the entire community committed to reducing the spread of AIS and who knows, maybe next time we will receive some of those funds.

If you are interested in the Attorney General's 2022 report on the Invasive Species fund, you can find it at the link below. It provides a summary of the federal and provincial responsibilities regarding invasive species, the shortcomings in regulating and detecting invasive species and the impact on the environment. It also found that roles and responsibilities were not clear. And finally, that partners lack funding to sufficiently combat invasive species.

PLiiNK.ca
CLEAN - DRAIN - DRY
Caring for Our Lakes

We found during our preparatory work that while individuals were enthusiastic there were simply not enough resources

https://www.auditor.on.ca/en/content/annualreports/arreports/en22/ENV_ProvMgmtInvasiveSpecies_en22.pdf

You can reach us at info@pliink.ca. We would love to hear from you about your commitment to Preventing the Spread of Aquatic Invasive Species. And, reach out if you would like to join the PLiiNK team.

The Journey from Interested to Committed: Joining the Fight Against Aquatic Invasive Species

We would like to thank the following groups for their support of the application and for their ongoing support of the initiative:

- Kawartha Nishnawbe First Nation
- North Kawartha Township
- Ontario Federation of Anglers and Hunters (OFAH) Invading Species Awareness Program (ISAP)
- Ontario Ministry of Natural Resources and Forestry (OMNRF)
- Invasive Species Centre
- Ontario Waterways, Parks Canada Agency
- Lovesick Lake Association
- Kawartha Highlands Signature Site Provincial Park
- North Kawartha Lakes Association (NORKLA)

North Kawartha Cottagers' Associations:

- Anstruther Lake
- Chandos Lake
- Eels Lake
- Loon Call Lake
- Upper Stoney Lake
- Wolf Lake

Cottagers and other Associations surrounding or in North Kawartha Township:

- Environment Council for Clear, Ston(e)y and White Lakes
- Kawartha Lake Stewards Association
- Economic Development Cooperative of North Kawartha
- Kawartha Park Cottager's Association
- Juniper Point Cottage Owners' Association

Orange Sunset. *Photo by: Thorsten Koseck. (Big Bald Lake)*

Swan Swimming. *Photo by: Deborah Kustor. (Katchewanooka Lake)*

Girl on Dock. *Photo by: Thomas Craig. (Sturgeon Lake)*

Mystery Snail Management and Removal Program

Robert McGowan, *ISAP Program Specialist*

Aquatic Invasive Species (AIS) are a threat to Ontario's landscapes, negatively impacting the environment, recreation, our economy, and society, including human health. Specifically, Chinese mystery snails (CMS) and banded mystery snails (BMS) negatively impact Ontarians' enjoyment of our waterways: their shells wash up and foul shorelines; they negatively impact desirable sport fishes, such as Largemouth Bass. They have also been linked to die-offs of waterfowl through the transmission of intestinal parasites, such as flukes; and they outcompete native benthic or bottom dwelling species, such as our native clams.

In 2021, the Invading Species Awareness Program (ISAP) spearheaded the Mystery Snail Management and Removal Program in partnership with the Coalition of Haliburton Property Owners' Associations (CHA) to address the threat of these invasive snails. The scope of the program is to minimize the impacts of mystery snails on our ecological communities and society through volunteer engagement in training, surveillance (early detection), and removal events. Through this program, we are building strong partnerships and providing volunteers with the knowledge required to respond to existing and newly detected CMS/BMS populations.

Beyond the training and tools provided to volunteers when they join the program, we also offer on-the-ground support to coordinate mystery snail removal events within their communities. ISAP works closely with these communities to remove mystery snails from their aquatic ecosystems, while avoiding native snail species, such as the Pointed Campeloma. By removing these invaders, we are collectively aiding in the long-term benefits to biodiversity, as well as to the quality of recreational activities, and reducing costs resulting from mystery snails' impacts on property and infrastructure, such as fouling water intake pipes.

In 2023, the program saw more than 200 volunteers participate with more than 25 km of shoreline monitored and 248,783 invasive snails removed from the landscape. Since 2021, over 930,000 mystery snails have been removed from Ontario waterways.

While we continue to work on the ground to combat invasive species, we recognize that regulatory tools are essential to preventing invasive species from arriving and establishing. As such, the Ontario

Banded Mystery Snail

Federation of Anglers and Hunters and its ISAP are pleased to see the Ontario government respond to the growing risk of AIS by continuing to flesh out the *Invasive Species Act, 2015.*

Regulatory Changes to the Invasive Species Act, 2015

Since the royal assent of the *Invasive Species Act, 2015,* the Ontario Provincial government has been taking serious action to control the spread of AIS. In 2022, they announced changes that would regulate the boater pathway.

The rules are as follows:

"A person shall not transport watercraft overland, unless:

- Drain plugs and other devices used to control drainage of water from the watercraft and watercraft equipment have been opened or removed.
- Reasonable measures have been taken to remove any aquatic plants, animals or algae from the watercraft, watercraft equipment, and any vehicle or trailer used to transport the watercraft or watercraft equipment overland.
- Prior to reaching a launch site for a body of water, the watercraft, watercraft equipment and any vehicle or trailer used to transport the watercraft or watercraft equipment must not have an aquatic plant, animal or algae attached to it.
- No person shall place a watercraft, watercraft equipment, or any vehicle or trailer used to transport a watercraft into any body of water if the watercraft, watercraft equipment, vehicle

Mystery Snail Management and Removal Program

or trailer has an aquatic plant, animal or algae attached."

What does this mean?

To summarize, boaters are now required to take reasonable precautions to ensure, before reaching a launch site or placing a watercraft in any waterbody in Ontario, that it is free of all aquatic plants (weeds), animals, and algae. This includes boats, boating equipment, vehicles, or trailers and removing or opening drain plugs to allow water to drain from the boat or boat equipment before transporting them overland. Effectively, these new regulations make it a legal requirement for boaters to perform the first two steps of "Clean, Drain, Dry". These regulations exist to ensure that watercraft users of all kinds, whether recreational or professional, do not inadvertently transport invasive organisms between waterways.

The **Clean, Drain, Dry** message goes like this:

CLEAN the boat and all related equipment before leaving the waterbody and ensure it is clean before entering a new one. Look for any mud, vegetation, mussels, or other suspicious debris stuck in or on the vessel and its equipment.

DRAIN all standing water by pulling the transom plug, draining the live-well, lowering the motor, and draining all other water-containing devices on the vessel. Draining helps to eliminate small organisms, such as spiny waterfleas and zebra mussel larvae from the vessel.

DRY or disinfect. To eliminate unseen organisms, you can dry the vessel for at least 5 days in sunlight or clean it from top to bottom with hot water over 50°C or pressurized water of at least 2500 psi.

If you would like more information about the new *Invasive Species Act regulations*, you can visit: https://www.invadingspecies.com/invasive-species-act /

Report!

Remember, if you think you've seen an invasive species, report it! Take a photo, mark your location, and call the Invading Species Hotline at 1-800-563-7711 or report online at www.EDDMapS.org

If you would like more information on the Mystery Snail Management and Removal Program, you can contact Robert McGowan, ISAP Program Specialist, by emailing robert_mcgowan@ofah.org.

Chinese Mystery Snail

Beavers – A Sign of a Healthy Ecosystem

Geoffrey Carpentier, *Environmental Consultant and Advisor to the Scugog Lake Stewards*

From time to time I like to reread interesting pieces I encountered in the past. As such, I was looking at some older newspaper clippings I had saved and came across one that seemed innocuous at first, but later proved to be a bit of a hot pepper! It was quite complimentary about beavers and their impact when it stated: they are climate superheroes; beaver ponds saturate soil and plants, making them more resistant to fire; beaver ponds allow water to soak in and slow down flooding; beaver ponds are safe places for wildlife to take refuge during fires; plants around beaver ponds are more resilient and rebound more quickly; and beaver ponds store water above and below the ground, even during drought.

That doesn't sound too awful, but some of the comments that followed this post were angry and accusatory. I was quite surprised at the vehemence of some of them. Reading these one can presume that most of the respondents had a bad encounter with these large rodents, and had lost trees and habitat to them over the years. That doesn't mean that beavers are perfect – they're not. Witness a re-introduction into southern Argentina a few years ago, where the natural checks on the beaver's populations don't exist and the beaver's impact can therefore be devastating. In that case, they destroyed much of the local forest preserve in Tierra del Fuego National Park. Flash forward to a recent announcement from Great Britain, where the Eurasian Beavers will be re-introduced to a park in London. Will the outcome be as devastating? Time will tell, but again the natural predators don't exist in London so I suspect this may be another failed attempt.

What about here in Canada? Well, I won't say our beavers are always in balance with nature, and I won't say they're not. We simply have a lot of them – trapping and natural predators seem to keep them under some form of control, and have for eons. Many of the claims in the original post, cited above, are true. As wetlands disappear and we destroy habitats, these beaver-created wetlands can be critical habitat for aquatic amphibians, insects, mammals and birds. As a reservoir for water, they can show both immediate benefits and long-term ones as they recharge the aquifers below them. Fire is a constant threat it seems, so these ponds may in fact be lifesaving harborages for many animals.

Beaver, *The Tip, Pelee National Park 2016*

We tend, when viewing nature, to think of it in isolation – we plant a tree and all is good. But we forget that underground all trees are linked by mycelia – small fungi that are essential to a forest's health. We cut down weeds, because who needs weeds anyway? But we forget that these plants are flowering plants and a weed is, after all, just a plant we think is in the wrong place. Insects, birds and small mammals need these plants to survive. Our pollinators need these 'weeds' so we can have food on our tables. The bottom line - nature doesn't think in straight lines - everything is interconnected. Beavers flood land which kills some trees, but these dead trees become food for insects which feed woodpeckers and more. These ponds encourage cattail growth, which is known to be a water-borne contaminant trap. In fact the government has tested and utilized cattails in the past to remove persistent chlorinated hydrocarbons out of the water column.

We need to better understand how complex nature actually is. Right now we are battling climate change, but even now we don't get it – nature is not linear – every action affects another and itself is affected. Aldo Leopold said it well when he said "The last word in ignorance is the man who says of an animal or plant, 'What good is it?' If the biota, in the course of [eons], has built something we do not understand, then who but a fool would discard seemingly useless parts? "

Now let's talk more about the beaver's history and biology to complete the story.

The beaver has been a foundational component of our traditional trade systems since the early explorers came to Canada in the 17th and 18th centuries, when fur trappers wandered the north in search of pelts. White-tailed deer and raccoon were the primary exports, with beavers a close third. In 1787, 139,509 beaver skins were exported from Canada, compared

Beavers – A Sign of a Healthy Ecosystem

Beaver Lodge, *Nonquon River, Scugog Township 2012*

to 68,142 martens, 26,330 otters, 16,951 minks, 8,913 foxes, 17,109 bears, 102,656 deer, 140,346 raccoons, 9,816 elks, 9,687 wolves and 125 seals according to McGill University. The average take of beavers during this era was about 200,000/year until the early 1900s when they became so rare we had to protect them. At that time only about 100,000 beavers were left in all of North America - most of them in Canada. By 1950, they had recovered such that almost 3 million pelts were taken between 1950-60!

Today the estimated North American population is between 6-12 million. Its importance of course is recognized in part by the fact it appears on our 5-cent coin. Ranging across Canada and much of North America, it understandably is not common in urban areas, but I recently saw them at the tip of Point Pelee National Park in Essex County and in Toronto's Tommy Thompson Park, so they can be quite opportunistic and resilient.

The beaver is a large rodent, whose teeth grow throughout its lifetime. Constant gnawing is essential to its survival or its teeth will grow right through its jaws (called malocclusion) and death is imminent. Its diet ensures it can manage tooth growth, because it literally gnaws its way to the dinner table! It is a semi-aquatic mammal, and has a broad tail that is used to warn of danger. It has webbing only on the hind feet for swimming and it has an odd feature on the notched hind toe, which is used as a comb to maintain the pelt's waterproofing ability.

The den is either built as the typical lodge - an iconic structure recognized by many, or it will construct a bank den when the borders of the water body are too steep or deep. As we all know, the beaver builds and maintains elaborate dams to maintain the water level throughout the year, so the entryways to the lodges are always submerged and below the level where the water freezes in winter. Broken dams are quickly repaired, usually at night, with all the family members (except small young ones) helping to close the breach. Lodges are elaborate structures that can be up to 12 m (40 ft) across and 3 m (10 ft) tall. Each lodge contains compartments to allow for care of the young, resting places and even a latrine!

Food is comprised primarily of the soft bark of trees and shrubs and other seasonal plants as available. Beavers are famous for sometimes tackling very large trees, so to dispel a myth – beavers cannot predict which way a tree will fall, and many have been killed chopping down trees that then fell on them.

Breeding starts when the beaver is about 21 months old and occurs in the winter, with the kits (young beaver) being born in April, May or June, when three to four (and up to eight) young are born. Quite large, they weigh 0.25-0.75 kg (0.5-1.5 lbs), are about 30.5-38 cm (12-15 in) long and sport a tail of about 9 cm (3.5 in). By the time it is a year old, it will weigh in at about 9-12 kg (20-27 lbs) at which time it may remain in the lodge when the next litter is born, but when the following litter comes, it is driven off to fend for itself.

So what was the big draw in the first place to create such a high demand for beaver pelts? Indigenous peoples trapped them for food, clothing and trade, but the westerners wanted hats – ah vanity is such a part of our history! Whether you love them or hate them, they are excellent guardians of the environment and indicate the health of an ecosystem.

Geoff Carpentier is a published author, expedition guide and environmental consultant. Visit Geoff on-line on LinkedIn, Facebook and Instagram.

Update on the Stoney Lake Fish Tracking Project

Graham Raby, Biology Department
Trent University

What secrets do the fish in Ston(e)y Lake have to tell us? That's what we're trying to find out with the Stoney Lake Fish Tracking project. We are using acoustic telemetry transmitters implanted into fish to track their movements, generating detailed data on the lives of individual fish 365 days a year. Ultimately, the work will help us to better understand the habitat needs of important fishes in Stoney Lake: walleye, muskellunge, smallmouth bass, black crappie, and yellow perch. Healthy fisheries are important to support First Nations treaty rights, economically important recreational fisheries, and they serve as good indicators of a healthy ecosystem.

The project began in 2022; so I was due to give an update here. Since spring 2022 we've had 60 acoustic receiver stations deployed on the lake bottom throughout Stony, Upper Stoney, and the northern part of Clear Lake. Those stations are 'listening' for transmissions from the 215 fish we have now tagged. 2023 was a big year. Our team of Trent students (led by Trent PhD student Amber Fedus) and Fisheries and Oceans Canada researchers (led by Dr. Jake Brownscombe) spent several weeks on the water catching and tagging fish (153 in total, across five species). We are looking forward to start sharing a glimpse of the results (i.e., what the fish are up to) as this year progresses (follow my blog for occasional updates: www.rabylab.com/stoneylake).

We received generous in-kind and financial support from community members in 2023. Viamede Resort (Ben Samann) let us use their space for meetings and provided us a parking slip for our new research vessel (RV Ingleton). Several wonderful folks around the lake let us use their properties or helped us catch fish. Bill and Gail Szego and Ralph and Carol Ingleton made (and continue to make) crucial donations that make the project possible. Ralph left us in the summer; pushing for Trent researchers and students to do research on the Stoney Lake ecosystem will be one of his many lasting impacts. He gave me a lot of energy to push ahead on the research we're doing, which is helping to train the next generation of aquatic biologists. I miss my conversations with him.

While you can expect to start seeing some 'results' from our work soon, we're not yet done with field work, so you may see us out on the lake this year. We've mostly struck out on catching muskies so far, so we're going to give that another good shot this year with the help of the lake community and volunteer anglers from Muskies Canada. The Muskies Canada folks have also been generous in financially supporting the project (so we can purchase transmitters). We expect to continue tracking fish for a couple more years, with many of the fish we've already tagged (in 2023) still being out there, transmitting their signals.

If you or someone you know find a transmitter in a fish (i.e., after harvesting the animal, which itself is safe to eat), please get in touch with me. I'd love to get the tag back so it can be re-used in another animal (thanks to those of you who have already returned tags to me). If you know anyone who spends a lot of time fishing on Stoney and doesn't read this report, please let them know about the tags. If it's a walleye, there's an external tag on the animal with my phone number. I can also be reached by e-mail: grahamraby@trentu.ca for tag returns or for any questions or concerns about the project. We also welcome donations to help support Trent students doing the field work and data analyses. If you're interested in donating, please get in touch by e-mail.

Muskie Surgery, *Photo by: Raby Lab.*

Conserving Wetlands in the Kawarthas for the Future

Dani Couture, Communications Manager
Kawartha Land Trust

Kawartha Land Trust, the region's charitable land trust, shares some conservation updates from 2023.

As I write this article, it's one of our favourite days on the calendar — World Wetlands Day (February 2), a day to reflect upon the importance of wetlands in our region and worldwide.

We know that wetlands — from ponds, marshes and vernal pools, to swamps, bogs and fens — are essential ecosystems that filter water, store carbon, and blunt the impact of storms. They are vital for the survival of the countless plant and animal species that rely upon them. According to Ontario Nature, wetlands "provide habitat for over 20% of Ontario's species at risk," including Northern Map Turtle, Least Bittern, and Western Chorus Frog to name a few.

However, to spend time in or near the wetlands of the Kawarthas is to also know that they are places of great beauty. From dense stands of cattails swaying in a light breeze and pops of colour from spring-blooming flowers like Marsh Marigold to the iridescent feathers of a Green Heron or the shimmer of dragonfly wings, as they fly past you, there is much to see.

You might spot gelatinous salamander egg masses in a vernal pool, see the shiny black shells of Midland Painted Turtles crowded together as they bask on a log at your favourite marsh, or, perhaps, you might catch a glimpse of a Great Blue Heron hunting the shallows for its next meal.

Creek that feeds into a Black Ash swamp at Kawartha Land Trust's new Forbes Lane Property, established in 2023. *Photo by: Megan Greenwood*

Springtime is one of my favourite times to visit Kawartha Land Trust's (KLT) public access trails to enjoy the swift change from serene winter to raucous spring. At one section of KLT's Stony Lake Trails, the sounds of frogs calling from the marsh in early spring are so loud it almost drowns out bird-song.

In 2023, KLT was able to protect more of the vibrant wetlands of the Kawarthas, including those at our newly protected O'Leary Family Wetland and Forbes Lane properties.

O'Leary Family Wetland

KLT's O'Leary Family Wetland is a 25-acre swamp located in the City of Kawartha Lakes. The entirety of the property is located within the Emily Creek No. 2 Provincially Significant Wetland (PSW).

KLT staff who have visited this abundant wetland have noted how peaceful it is. The property is home to Silver Maples, Eastern White Cedars, Red Osier Dogwoods, Speckled Alders, and a large stand of Endangered Black Ash trees.

The swamp provides important breeding habitat for amphibians whose numbers are dropping world-

One of the factors that makes the protection of the O'Leary Family Wetland so special is that the property is contiguous with KLT's Emily Creek Wetland (est. 2010), which maintains landscape connectivity in the Emily Creek Area. *Photo by: Sam Clapperton/KLT* wide due, in part, to habitat loss. Cavity trees and snags provide places for nesting, denning, and resting for bats and overwintering birds.

Even in winter, the swamp is alive with calls from Black-capped Chickadees, Blue Jays and woodpeckers. The tracks of small mammals zig-zag across the property.

Forbes Lane Property

Another conservation success that we were able to share last year was the protection of our 73-acre Forbes Lane Property, located in Douro-Dummer Township. In addition to the plentiful forests on this new nature reserve, KLT's Forbes Lane Property is home to almost 15 acres of conifer swamp.

Endangered Black Ash Trees can be found throughout the swamps on the property and vernal pools create predator-free breeding habitat for species like Blue-spotted Salamander and at-risk Western Chorus Frog.

Both KLT's O'Leary Family Wetland and Forbes Lane Property were protected through the support of volunteers, donors, and Environment and Climate Change Canada's (ECCC) Nature Smart Climate Solutions Fund (NSCSF).

Partners in Conservation

In 2023, KLT was able to increase its impact in the Kawarthas through the expansion of our growing Partners in Conservation (PIC) program. The program focuses on listening to the needs of local landowners and finding ways to work together to create a more sustainable landscape.

Throughout the year, we were able to work on a number of projects with our PIC members on their lands, including tallgrass and tree plantings, species surveys, and the installation of a variety of volunteer-made nesting structures that support bird and bat habitats.

Protecting and stewarding more of the Kawarthas' natural and working lands contributes to the overall water health of our region. There are many ways we can work together to achieve positive conservation outcomes.

Through KLT's Partners in Conservation program, we can work collaboratively on projects to reconnect broken channels, adjust perched culverts to restore fish access, and improve vegetation in riparian areas to help regulate water temperature. The creation of new nature reserves can ensure the permanent protection of wetlands and natural shorelines along our lakes and rivers.

If you'd like to learn more about how you can support KLT's conservation work in the region, visit our website at kawarthalandtrust.org. If you own more than 30 acres of land and are interested in participating in our Partners in Conservation program, reach out to us at partnersinconservation@kawarthalandtrust.org or call Rachel Barrington at 705-743-5599.

A Wood Duck box that was built by KLT volunteer Rob Gouinlock was installed on a PIC member's wetland property in Kawartha Lakes to enhance habitat for this beautiful duck. *Photo by: Rachel Barrington/KLT*

This project was undertaken with the financial support of:
Ce projet a été réalisé avec l'appui financier de :
Environment and Climate Change Canada / Environnement et Changement climatique Canada

KLSA Secures EcoAction Funding to Boost Shoreline Health

Kimberly Ong, *KLSA Director*

Exciting news is rippling through the Kawartha lakes! Thanks to a grant from Environment and Climate Change Canada (ECCC), KLSA has received funding to administer two fantastic programs to empower landowners to restore shorelines and foster a deeper understanding of lakeside ecosystems. The EcoAction grant provides financial support to non-profit organizations to take on local action-based projects that produce measurable, positive effects on the environment and build the capacity of communities to sustain these activities. We at the KLSA will use this grant to continue the Natural Edge program and launch the Love Your Lake Program on Stony, Upper Stoney, and Clear Lakes.

The Natural Edge Program

With continued support from Watersheds Canada, the Natural Edge Program is a shoreline restoration initiative designed to empower landowners to enhance the ecological integrity of their waterfronts. KLSA works with landowners one-on-one to evaluate their shoreland and develop a planting plan with native plants, shrubs, and trees. We help purchase plants and planting materials and find volunteers to help enact the planting plan, transforming shorelines. We have completed 20 sites to date, and with this funding, we can ramp up our efforts to complete 30 more sites by 2025!

Landowners have joined the program for a wide range of reasons: to defend against erosion, to keep geese off the property, to provide better habitat for shoreline species, to protect our waters, to beautify the land, and even to reduce the need to mow. The Natural Edge program is available to all waterfront property owners in the Kawartha Lakes region who want to re-naturalize their shorelines. The cost to each owner is typically $250 to help offset the plant costs. The plants take about three years to establish and fill the shoreline fully.

Native plants help stop erosion on shorelines

As part of the Natural Edge program, we bring all the materials - soil, mulch, tools, plants and volunteers

If you want to transform your shoreline into a naturally beautiful, cost-effective, eco-friendly 'natural edge,' we'd love to hear from you! Please contact kim.ong@klsa.info.

The Love Your Lake Program

This year, KLSA is implementing a new Love Your Lake program. This is a shoreline evaluation program developed by the Canadian Wildlife Federation and Watersheds Canada. This summer, two enthusiastic students will be boating around Stony, Upper Stoney, and Clear Lakes (with the help of local volunteer boaters), cataloging key indicators of ecological health. These observations will serve as the foundation for personalized reports sent (free!) to all lakefront property owners, sharing insights and tips to

KLSA Secures EcoAction Funding to Boost Shoreline Health

keep our slice of shoreline paradise thriving. The Love Your Lake program will provide landowners with actionable recommendations to optimize shoreline management practices and foster ecosystem resilience.

Community Engagement and Empowerment

Central to these programs is community engagement. These programs are special because they are about all of us – neighbours, friends, and lake lovers coming together and making a difference. Whether planting native plants, being mindful of lakeside activities, or volunteering, every action adds to a healthier lake ecosystem for everyone.

We are looking for volunteers to help with:

- Planting shorelines (3-4 hours per shoreline)
- Boating around with our two students (4-8 hours)
- Spreading the word!

Thank you to the over thirty volunteers who have helped support these programs so far. We are lucky to have had so many volunteers from the local community and schools. These programs would not be possible without support from ECCC, Watersheds Canada, the Canadian Wildlife Federation, the Environment Council for Clear, Ston(e)y and White Lakes, the Lovesick Lake Association, and the Kawartha Land Trust.

For more information on getting involved with the Natural Edge or Love Your Lake programs, please contact kim.ong@klsa.info.

Planting volunteers are ready to help landowners restore their shorelines

Many hands make the work easier to naturalize your shorelines

Osprey. *Photo by: Terena S (Katchewanooka Lake)*

KLSA Community Science and Ontario Tech Student Research: A Productive Collaboration

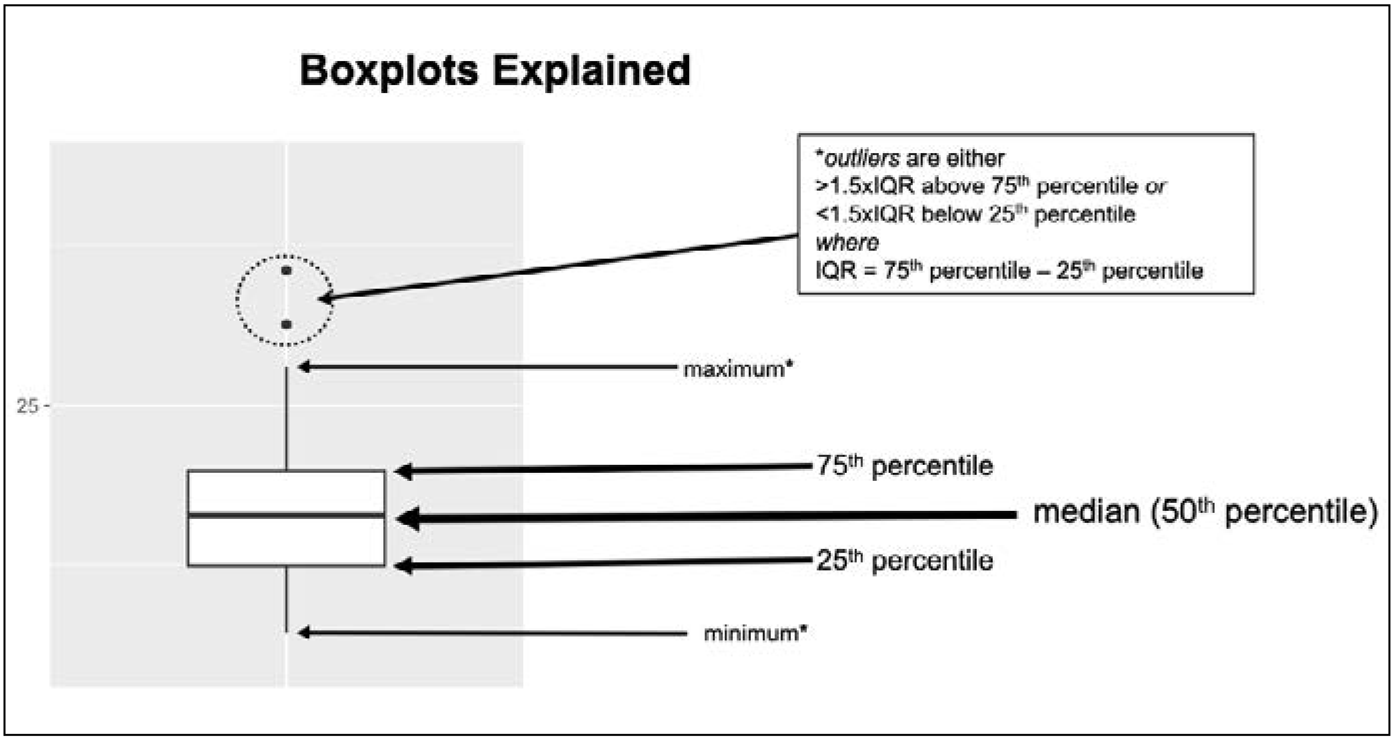
Bob Bailey, KLSA Vice-Chair and Professor of Science, *Ontario Tech*
Omar Alfzalzada, Angela Karmizad, Vibin Magesh, Hira Shammas, Students BSc, Biological Science, *Ontario Tech*

For many years, KLSA has supported and collaborated with students and faculty members at Trent, Queen's, Ontario Tech, Fleming, and beyond in research projects on the Kawartha Lakes. We have also undertaken our own community science projects, such as the *E. coli* water sampling program, and reported our findings and presented the data in our Annual Lake Water Quality Report. This year, I've taken the collaboration a step further. Four students in their final year of study on their BSc Biological Science degrees have been working with me on their honours thesis projects. An honours thesis is like a mini-master's thesis. The student works on the project from September to April, getting credit for two of the ten courses in their senior year. They collect or assemble data from the lab or field, analyse it, write it up, and eventually produce a scientific poster and a thesis. This year my students looked at the data KLSA volunteers and others have collected over the past 20 years. By the time you read this, they'll be finished (it's February as we write this), so we'll just provide a summary of their projects and some interesting findings below, and look forward to chatting with you about the "final story" after April. You'll be able to see the scientific poster they created at the KLSA Spring Meeting and on the KLSA website as well.

In each of the summaries below, we use what is known as a boxplot to describe the variation among observations in a given group. The graphic below shows you how to decipher all the information in a boxplot. I find it the best way to see important patterns in a complicated dataset!

Changes in Phosphorus Concentrations in the Kawartha Lakes (Vibin Magesh)

There has been a long and fruitful partnership between KLSA and the Lake Partners Program (Federation of Ontario Cottagers" Associations and Ontario Ministry of Environment, Conservation & Parks). Since 2001, community scientists across Ontario have taken water samples that have been analysed by MECP for phosphorus (P). Vibin Magesh looked at variation in P over time and among four regions, including the Kawartha Lakes (Figure 1). It's interesting to see that variation in lake phosphorus both within and among time periods was most like lakes in northwestern Ontario rather than the nearby Dorset Lakes (Figure 2). Vibin also drilled down into a few of the lakes to compare changes over time among



KLSA Community Science and Ontario Tech Student Research: A Productive Collaboration

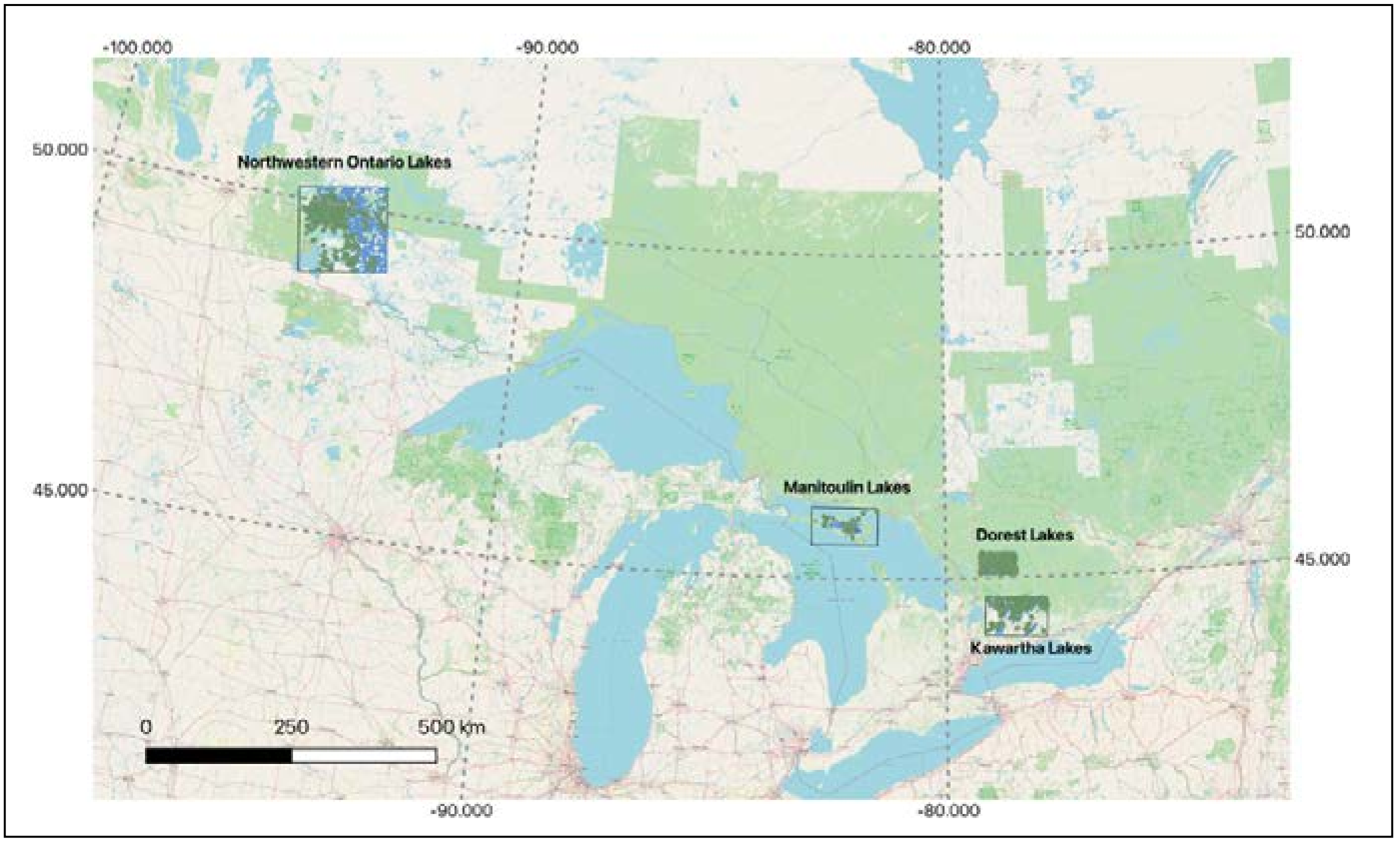


Figure 1: Lake Regions across Ontario compared in Vibin Magesh's Honours Thesis research.

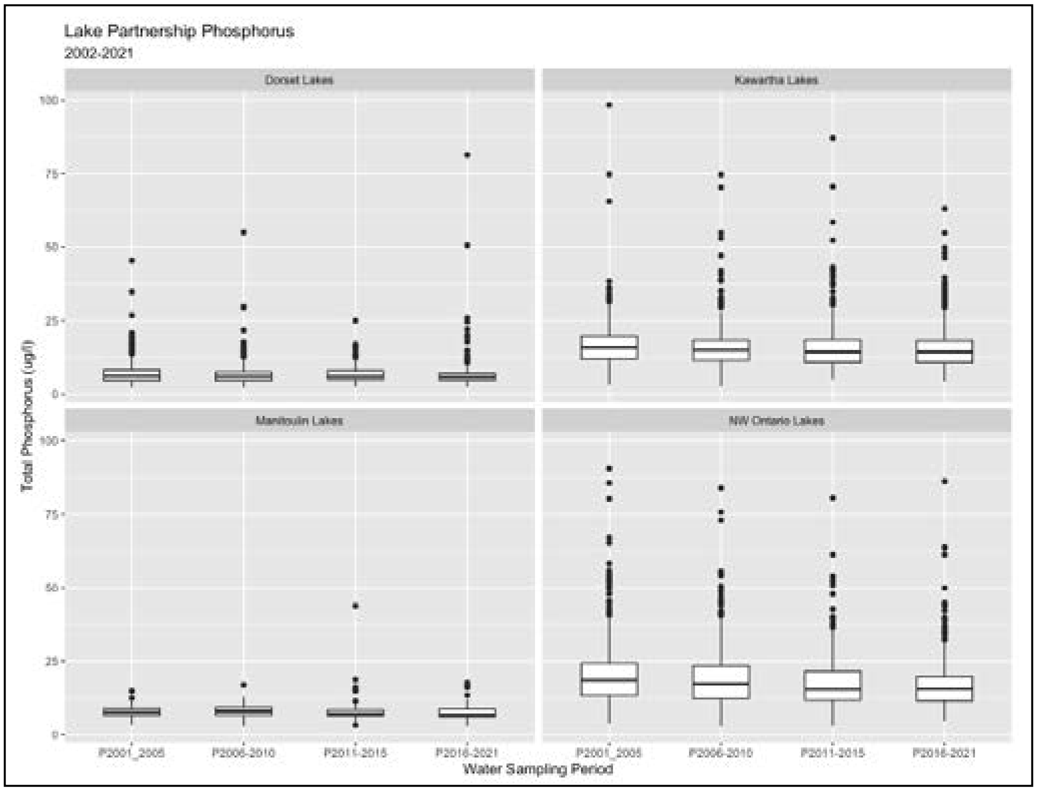


Figure 2: Phosphorus variation over time in four Ontario Lake Regions.

Kawartha Lakes. As an example, there seems to be much more variability in Pigeon Lake phosphorus in the first half of the 2010s relative to other half decades (Figure 3).

Changes in Dissolved Oxygen in the Kawartha Lakes (Angela Karimzad)

Thanks to Dr. Paul Frost at Trent University, Angela Karmizad had access to both KLSA's recent (2020-2023) oxygen profiles from several of our lakes as well as profiles that Paul's lab did in 2009-2010. She looked at changes in oxygen over that decade in both shallow (<4m) and deep (>4m) water since oxygen tends to get depleted in the deeper water with increased productivity or warming water from climate change. Figure 4 shows the result for Balsam Lake deep water, where median oxygen was similar in the past (2009-2010) compared to recent (2020-2023) measurements, although we see more variability in the past. This might just be due to a difference in sampling design. Angela is sorting that out now for all the lakes she's looking at.

***E. coli* in the Kawartha Lakes** (Omar Alfzalzada and Hira Shammas)

KLSA community scientists have been collecting water samples for *E. coli* analysis for more than 20

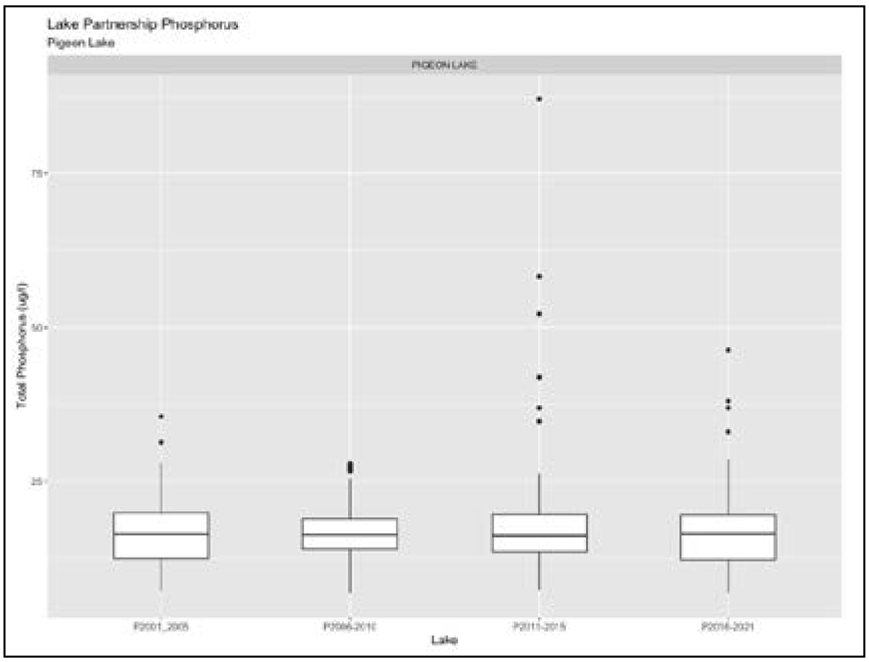


Figure 3: **Phosphorus variation in Pigeon Lake within and among half decade periods.**

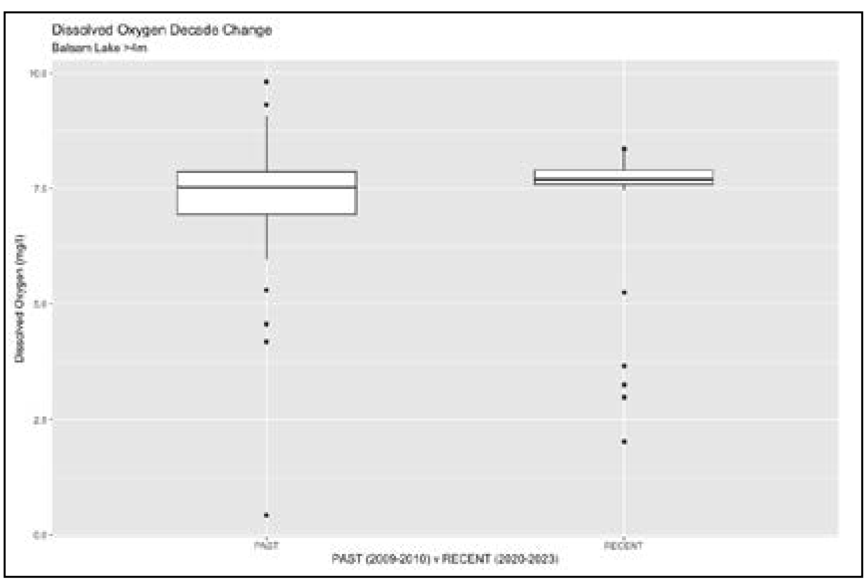


Figure 4: **Changes in dissolved oxygen in Balsam Lake deep (>4m) water.**

KLSA Community Science and Ontario Tech Student Research: A Productive Collaboration

years. Omar Alfzalzada looked at the last decade of data to see if any directional trends over time were evident. He also downloaded Environment & Climate Change Canada weather data over that same decade and characterized each year using precipitation and temperature data to see if they could help explain variation in *E. coli*. He's still working on the data, but there are certainly some interesting patterns across all lakes and in specific lakes (Figure 5). Hira Shammas is focused on KLSA's 2023 *E. coli* dataset. She contacted all our community scientists who took the samples and asked them about their sampling sites, what the bottom was like, and what their sense of waterfowl and aquatic plant abundance was. She's still working on her data analysis and interpretation, but she too is finding some interesting variations (Figure 5).

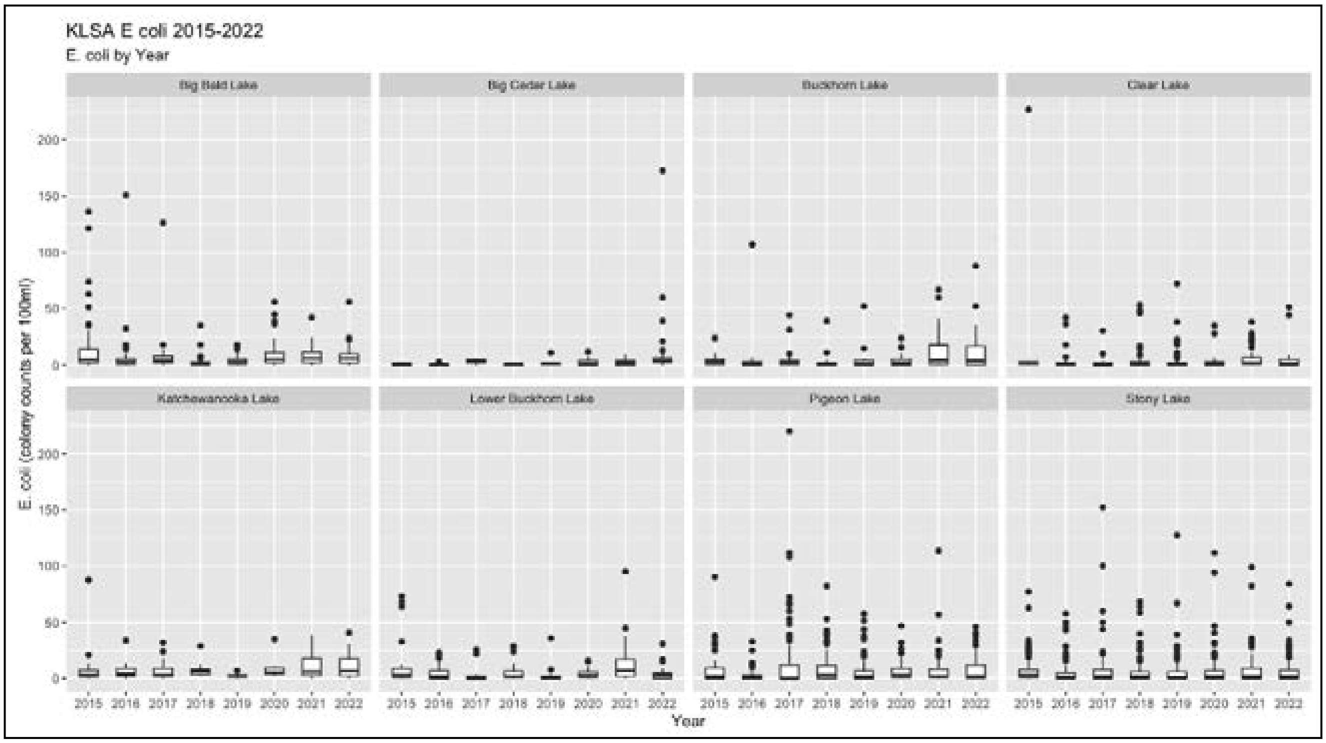


Figure 5: E. coli variation among and within Kawartha Lakes from 2015 to 2023.

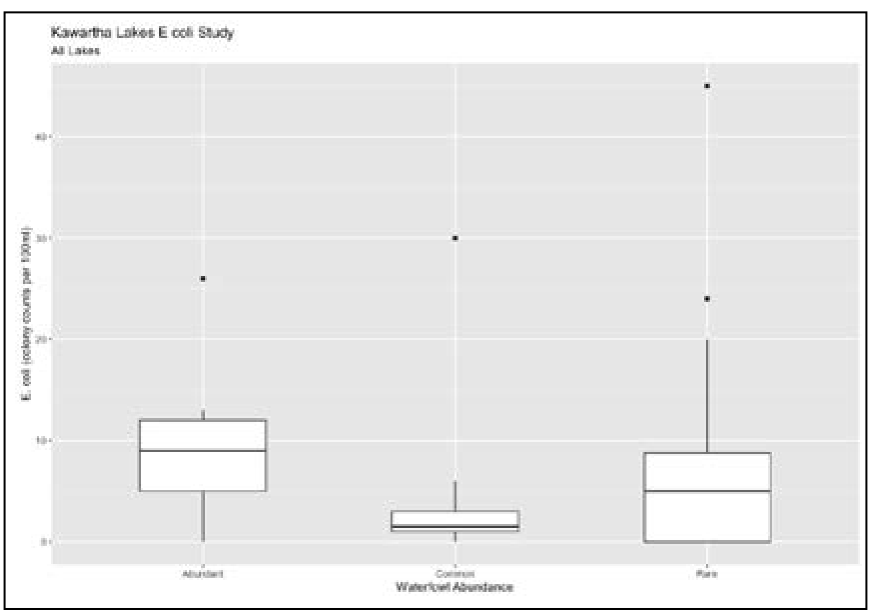


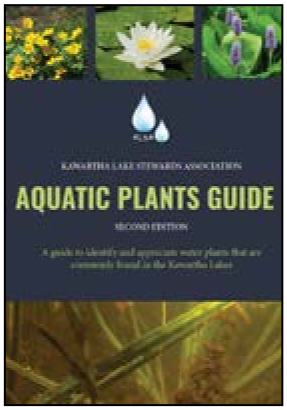
Figure 6: E. coli in relation to waterfowl abundance at the sampling site as reported by the community scientist (2023 samples).

What's New with KLSA?

In 2023, the KLSA published the Aquatic Plants Guide, Second Edition. You can view the publication for free at: https://klsa.wordpress.com/wp-content/uploads/2023/11/klsa-aquatic-plant-guide-2023_web.pdf

We also secured a new website that will be up and running soon!

Plus, you are cordially invited to our annual Spring Meeting happening May 25, 2024 from 10am-12 noon at the Buckhorn Community Centre. You won't want to miss the terrific guest speakers we have lined up for you.



Bookmark our NEW website:

www.klsa.ca

Annual Spring Meeting
May 25, 2024, 10AM - 12 noon

Buckhorn Community Centre

Heron - neck extended in water. *Photo by: Terena S. (Katchewanooka Lake)*

Snapping Turtle. *Photo by: Anne & Steve Wildfong (Clear Lake)*

2022 Kawartha Lakes Sewage Treatment Plants Report

Mike Dolbey Ph.D., P.Eng.,
KLSA Volunteer

Each year, KLSA monitors the performance of Sewage Treatment Plants (STPs) that discharge effluent either directly to the Kawartha Lakes or their watershed, or to waterbodies that flow into the Kawartha Lakes. The purpose of STPs is to protect public health by minimizing the discharge of pathogens and to protect the environment by minimizing the discharge of phosphorus (P) to our lakes. Of primary interest to KLSA is the quantity of phosphorus that is discharged by these plants to our lakes because phosphorus is known to be the most likely nutrient to cause increases in the growth of aquatic plants and algae.

Lake management studies have shown that the amount of phosphorus now discharged from STPs is only a small percentage of the phosphorus entering our lakes from all sources. This was not always the case. Prior to the 1970s, STPs discharged between 50 and 100 times more phosphorus than modern STPs. However, unlike most other phosphorus sources that are widely distributed, STPs are localized sources that can be controlled, and considerable public dollars are spent to build and operate these plants to protect our health and the environment. Municipalities fund STPs by charging the users of the systems an annual levy but they also receive grants from the federal and provincial governments, i.e., all taxpayers, that partly offset the cost of capital projects to repair, upgrade and increase the capacity of STPs.

KLSA monitors the performance of STPs to determine if they are being operated to their fullest potential. Ideally KLSA would like all STPs that discharge directly to our lakes to achieve a 99% phosphorus removal rate. This means that only one part in 100 of the phosphorus entering the plant leaves in the effluent. A drop of removal rate to 95% means five parts in 100 leave the plant, which is five times more phosphorus released compared to 99% removal rate. What might seem like a small change in removal rate can have a very large consequence!

As we have indicated in past years, our STP data is always one year behind, because the reports for the previous year are not available to us before going to press. This year all the reports were available online on the websites of their respective municipalities. Due to changes in the City of Kawartha Lakes website, key tables in their online reports were not included but they were provided upon request.

Again, this year we have included three STPs, Minden, Nonquon (Port Perry) and King's Bay, which do not discharge directly into the Kawartha Lakes. These plants are upstream of our Kawartha Lakes and have at least one body of water in between to attenuate the effects of their effluent discharge.

Minden

Minden's STP discharges to the Gull River just above Gull Lake, which is two lakes away from our most upstream Kawartha lake, Shadow Lake. The average annual removal rate in 2022 was 95.44% without accounting for bypasses. Three bypasses of the tertiary sand filters occurred due to weather events in February, June and August. An estimated 3930 m^3 of partially treated sewage entered the river. Based on samples taken during these events it is estimated that the additional P load to the river was 1.66 kg. This increased the total annual P load to **32.6 kg**, almost double last year's 18.8 kg. The Minden STP's effective removal rate was **95.20%** compared to 97.46% last year. No other spills, bypasses or overflows were reported, and no complaints related to the plant's operation were received during the year.

Average *E. coli* discharges were generally low during the year. The geometric mean of samples during the year ranged from 2 to 57 cfu/100 mL with an average value of 9.8 cfu/100mL, well within the plant's Certificate of Approval level of 200 cfu/100mL.

Coboconk

This lagoon system continued to function well in 2022, with planned discharges to the Gull River just above town occurring in April, May and December. The average phosphorus content of all effluent discharges was less than 0.03 mg/L. With lagoon systems such as Coboconk's, the volume of effluent released from the lagoons each year may be considerably more or less than the volume of raw input to the lagoons during the year. This may be due to operational considerations and variable amounts of precipitation and evaporation. Hence, determining the phosphorus removal rate is problematic. Considering all inputs and outputs over the past twelve years, the overall phosphorus removal rate was **greater than 97.0%** during that period and the 2022 total annual discharge of phosphorus was estimated to be **2.7 kg.**

The maximum geometric mean of *E. coli* in the discharges in spring and fall were 36 and 2 cfu/100mL respectively. No spills or bypasses occurred during 2022, and there was only one complaint about odour received during the year.

Fenelon Falls

In 2022 the Fenelon Falls Waste Water Treatment Plant (WWTP) had a challenging year. In January both the return-activated sludge (RAS) pump and waste-activated sludge (WAS) pump failed, and replacement pumps could not be acquired until May. This reduced the effectiveness of the secondary treatment stage consisting of anaerobic and aerobic digestion that produces the activated sludge. The RAS pump returns a small amount of the produced activated sludge to the incoming effluent which acts as a 'starter' akin to that used in making sourdough bread. The WAS pump removes the excess activated sludge to a settling tank for disposal. Attempts to use external temporary pumps were hindered by cold winter weather. As a result, TP levels in the final effluent were higher than usual for the early part of the year. In addition to this problem, on three occasions high flow caused by weather events resulted in a partial bypass of the treatment plant's tertiary sand filters. During one of these events in June there was also a raw sewage overflow at the Colborne St. SPS. The three bypass events, in March, June and December, resulted in approximately 0.9 kg of phosphorus entering the lakes. The raw sewage overflow in June resulted in an additional 1.2 kg of phosphorus entering the lakes. The annual average removal rate of the plant was 92.5%, well down from last year's 97.4% and the overflow and bypasses reduced the overall removal efficiency to **92.3%**. This resulted in a P discharge to Sturgeon Lake of **84.4 kg** for the year compared to 55.5 kg last year. In the previous year, 2021, the reported monthly influent TP concentrations were typically 2.8 times higher than those in the past four years. In 2022, TP concentrations returned to normal levels.

In 2022 *E. coli* levels in the effluent from the Fenelon Falls WWTP were generally low with an annual average geometric mean of 4.5 and a maximum of 7 cfu/100mL. No complaints about plant operations were received in 2022.

Lindsay

The Lindsay WWTP is the largest on the lakes. The City of Kawartha Lakes (CKL) owns the Lindsay plant and operated it until the end of July 2015 when its operation was contracted to the Ontario Clean Water Agency (OCWA) which operates all the other sewage treatment plants owned by CKL. As reported in previous years, the Lindsay plant measures influent and effluent volumes separately with surprisingly different results in past years. In 2022 the total effluent volume was only 6% less than influent volume, the lowest ratio since OCWA began operating the plant.

In 2022 the Lindsay WWTP operated while undergoing upgrades to construct a new aeration basin and blower building. The new coarse and fine air diffusion aeration basin came online on September 30, 2022. During construction, from February 2 to 24, the treatment plant was shut down to allow for integration of a new electrical blower (aerator) building. During the shutdown, all raw influent was stored in lagoons on-site for later treatment. After restart, there were several aerator failures that resulted in high Total Ammonia Nitrogen (TAN) levels for most of the summer. However, these problems did not affect the removal of Total Phosphorus (TP). No bypasses or abnormal discharges from the plant were reported. It is estimated that the 2022 annual average phosphorus removal rate was **97.1%**, up from last year's 95.2%. This resulted in a P discharge to Sturgeon Lake of **318.6 kg**, less than half last year's 754.7 kg.

The annual average geometric mean of *E. coli* in the discharge was 9.8 cfu/100mL with a maximum of 31 cfu/100mL in June. In 2022, two complaints about odour from the STP's lagoons were received during the period when the STP was shut down and raw sewage was being stored for later treatment.

Bobcaygeon

The significant improvement in the performance of the Bobcaygeon WWTP in 2019 continued in 2022. It appears that the 2019 repairs to sanitary sewers to reduce infiltration have substantially reduced inflows during wet weather easing the load on the plant. In 2022 the plant appeared to operate well with no reported bypasses, overflows, spills or abnormal events. The average phosphorus removal rate for the Bobcaygeon WWTP in 2022 was calculated to be **97.2%**, up from last year's 96.3%. The reported annual phosphorus load to the lake was **61.3 kg**, similar to last year's 64.2 kg. As discussed previously, only one influent sample is tested for Total Phosphorus each month and monthly results vary considerably. Hence calculated removal rates are influenced by this variability.

The annual average geometric mean density of *E. coli* in the discharge was 8.3 cfu/100mL with a maximum of 41.2 cfu/100mL in March. There were no complaints received during 2022.

Omemee

This facility consists of two large settling lagoons. Until 2014 all the effluent was spray-irrigated onto nearby fields during the summer months. A subsurface effluent disposal system was commissioned at the site in March, 2014 with the intention that it would dispose of all the effluent. However, there were problems with the capacity of the subsurface system that required both the spray irrigation and subsurface disposal systems be used for a few years. After a study of the problem, changes were implemented in 2022. For the past two years all the effluent has been directed to the subsurface disposal system and none has been sprayed.

The average effluent phosphorus concentration in 2022 was 0.40 mg/L, similar to last year's 0.39 mg/L and below the allowable 1.0 mg/L. Lagoon systems can have considerable volume buffering capacity with the volume of raw influent and treated effluent varying considerably from year to year. In 2022 the effluent discharged was about 145% of the influent volume. Based on the numbers provided, phosphorus removal was estimated to be **~72%** with ~99.8 kg being distributed to the subsurface system. However, because the effluent is disposed of far from Pigeon Lake, removal is probably **100%** with respect to our lakes. This is confirmed by measurements in 17 downstream monitoring wells that are sampled four times a year. All wells have very low TP levels and there has been no significant change since 2019 when the subsurface disposal system was commissioned.

The annual average geometric mean density of *E. coli* in the effluent was a rather high 856 cfu/100mL this year, but it was disposed of in the subsurface system. This lagoon facility did not require any emergency discharges to the Pigeon River in 2022 and there were no bypasses, overflows, spills or abnormal discharge events reported. One complaint was received about possible leakage of the sewage lagoon onto an adjacent property. It was still under investigation when the 2022 performance report was published.

King's Bay

The King's Bay STP serves a golf course community situated on a peninsula between Lake Scugog and the Nonquon River. Houses down the centre of the peninsula are surrounded by the golf course. Treated effluent from the STP at the apex of the peninsula is discharged into two large disposal beds under the golf course on each side of the peninsula. One up-gradient and three down-gradient wells are located around each disposal bed to monitor groundwater for phosphorus migration.

The King's Bay STP treats sewage using two Rotating Biological Contactor (RBC) units. RBC2 failed in July 2021 and was not replaced until September 2022. Total Suspended Solids (TSS) in the effluent continued to be higher than desired, but not above the licence limit, and process parameters were adjusted in an attempt to rectify the situation. Effluent TP concentration of discharge to the underground disposal beds averaged 0.25 mg/L, lower than the 0.36 mg/L in 2021, out of an allowable 1.0 mg/L. The annual daily loading for 2022 was 0.010 kg per day, about 6% of the allowable discharge of 0.17 kg per day. The annual average phosphorus removal rate within the plant was 99.4% this year. No spills or abnormal discharges occurred in 2022. There was one minor bypass when approximately 50 m^3 of effluent was partially treated before being discharging to the subsurface disposal system. There were no community complaints in 2022.

Monitoring wells located both up- and down-gradient from the disposal sites have had sporadic high TP readings in past years. In 2016 the TP measurement procedure was changed to collecting a field filtered grab sample from each well twice a year. TP levels in the two up-gradient wells have remained low over the past four years. However, a number of down-gradient wells have had variably high readings for a few years but with no consistent pattern to the high readings. In 2022, one well in the east down-gradient rank had an intermittent high reading. The purpose of the monitoring wells is to detect phosphorus migration towards the lake or the Nonquon River. Since these wells are on average 100 m from the lake or the Nonquon River, it is probable that, at least for the time being, there is still effectively **100%** removal with respect to the lake.

Port Perry

Port Perry is served by the Nonquon Waste Pollution Control Plant (WPCP) which discharges treated effluent into the Nonquon River northwest of Port Perry, which, in turn, empties into Lake Scugog at Seagrave, where the King's Bay facility is located. A new modern plant designed to treat wastewater at an average daily flow rate of 5900 m3/d was commissioned in 2017. The system performed well in 2022.

In 2022, phosphorus was reduced to an annual average of 0.052 mg/L for a total loading of **56.2 kg**, slightly higher than last year's 49.8 kg. This reflects a removal rate of **98.6%**, close to our target of 99%. Monthly *E. coli* levels this year were between 1 and 10 cfu/100mL. There were no reported bypasses, spills or abnormal discharges, and no complaints were received during 2022.

The total weight of phosphorus discharged to the mainstream Kawartha Lakes from the Lindsay, Fenelon Falls and Bobcaygeon WWTPs in 2022 was 464 kg, about half last year's 874 kg. If we include all the plants that we now monitor, we had total phosphorus loading to the lakes of 556 kg in 2022 compared to 946 kg in 2021. If all plants had achieved the 99% removal rate that we would like, the total phosphorus discharge for the year would have been about 191 kg or about 34% of the 2022 total.

Summary

KLSA Annual Review of Area Sewage Treatment Plant Performance

Plant Location - Discharges to & Type	Year	Phosphorus Removal Rate % (1)	Total Annual TP Load Out kg (2)	Annual TP Load if 99% kg (3)	E. coli (average) (cfu/100mL)	Bypasses, Spills, Comments
Minden - Gull River	2015	96.4%	17.9	4.9	68.0	None reported
Extended aeration activated sludge	2016	89.7%	44.9	4.4	81.0	Bypass resulted in ~22 kg extra P load
process with tertiary treatment	2017	92.3%	32.9	5.4	297.0	Bypass resulted in ~8.7 kg extra P load
	2018	96.2%	16.6	4.4	82	Bypass resulted in ~0.4 kg extra P load
	2019	95.3%	23.8	5.1	268	Bypass resulted in ~4.2 kg extra P load
	2020	98.1%	11.1	6.0	11.4	Bypass resulted in ~0.2 kg extra P load
	2021	97.5%	18.8	7.4	4.3	Bypass resulted in ~0.4 kg extra P load
	2022	95.2%	32.6	6.8	9.8	Bypass resulted in ~1.7 kg extra P load
Coboconk - Gull River Mill Pond	2015	>98.0%	< 2.2	1.1	2.5	None reported
Dual lagoons	2016	>97.6%	4.2	1.2	3.4	None reported
semiannual discharge to river	2017	>97.3%	5.1	1.1	2.7	None reported
	2018	>97.0%	4.0	1.2	1.6	Overflow of $50 m^3$ - no P load to Gull R
	2019	>96.9%	5.0	1.1	12.2	None reported
	2020	>96.9%	2.8	1.0	1.6	None reported
	2021	>97.9%	2.7	1.1	6.7	None reported
	2022	>97.0%	2.7	1.1	6.8	None reported
Fenelon Falls - Sturgeon Lake	2015	96.3%	26.3	7.2	2.0	None reported
Extended aeration activated sludge	2016	94.6%	38.8	7.2	3.3	Bypass resulted in ~ 10.4 kg extra P load
process with tertiary treatment	2017	94.6%	49.1	9.1	2.3	Bypass resulted in ~ 1.6 kg extra P load
	2018	95.8%	34.0	8.0	2.2	Bypass resulted in ~ 1.5 kg extra P load
	2019	95.7%	33.7	7.7	9.0	None reported
	2020	93.9%	39.6	6.4	2.5	Bypass resulted in ~ 3.5 kg extra P load
	2021	97.5%	55.5	20.0	7.5	Bypass resulted in ~ 3.0 kg extra P load
	2022	92.3%	84.4	10.9	4.2	Bypass & Overflow ~2.1 kg extra P load
Lindsay - Sturgeon Lake	2015	>98.2%	<239.4	131.7	2.5	None reported
Flow equalization lagoons;	2016	>98.6%	<176.8	134.3	3.5	None reported
extended aeration activated sludge	2017	97.5%	311.7	125.9	11.0	Overflow resulted in ~0.5 kg extra P load
process with Actiflo tertiary treatment	2018	97.4%	301.1	115.4	14.0	Overflow resulted in ~0.1 kg extra P load
	2019	97.2%	364.7	132.8	11.2	None reported
	2020	97.7%	307.4	131.2	4.0	None reported
	2021	95.2%	754.7	158.4	259.2	None reported
	2022	97.1%	318.6	111.3	9.8	None reported
Bobcaygeon - Pigeon Lake	2015	98.0%	51.8	26.9	21.0	None reported
Extended aeration activated sludge	2016	95.8%	125.6	30.0	31.0	Spill of 1 Litre reported
process with tertiary treatment	2017	94.7%	114.7	19.7	53.7	None reported
	2018	93.0%	171.3	24.4	98.8	None reported
	2019	96.7%	65.5	19.8	4.9	None reported
	2020	97.8%	37.9	16.9	2.8	Spill of 1 m^3 reported
	2021	96.3%	64.2	17.5	6.8	None reported
	2022	97.2%	61.3	22.1	8.3	None reported
Omemee - Fields/Underground	2015	100.0%	0	0.0	143.0	None reported
Dual lagoons with spray irrigation;	2016	100.0%	0	0.0	496.0	None reported
pumped into underground disposal	2017	100.0%	0	0.0	150	None reported
beds beginning 2015	2018	100.0%	0	0.0	172	None reported
	2019	100.0%	0	0.0	132	None reported
	2020	100.0%	0	0.0	190	None reported
	2021	100.0%	0	0.0	3496	None reported
	2022	100.0%	0	0.0	856	None reported
King's Bay - Underground	2015	100.0%	0	1.1	-	Spill resulted in ~1.14 kg release to lake
Pumped into underground disposal	2016	100.0%	0	0.0	-	None reported
beds.	2017	100.0%	0	0.0	-	None reported
	2018	100.0%	0	0.0	-	None reported
	2019	100.0%	0	0.0	-	None reported
	2020	100.0%	0	0.0	-	None reported
	2021	100.0%	0	0.0	-	None reported
	2022	100.0%	0	0.0	-	None reported
Port Perry - Lake Scugog	2015	98.2%	69.7	37.8	-	None reported
Extended aeration activated sludge	2016	97.8%	75.3	33.6		None reported
process with tertiary treatment;	2017	98.8%	52.3	45.3	2	None reported
effluent discharge to Nonquon River.	2018	99.0%	44.5	44.4	2	None reported
	2019	98.7%	52.0	40.9	1	None reported
	2020	97.9%	86.3	41.0	2	None reported
	2021	98.8%	49.8	39.9	21.5	None reported
	2022	98.6%	56.2	39.1	3.3	None reported

(1) 'Phosphorus Removal Rate %' is the percentage of the phosphorus in the plant influent that is removed before effluent is discharged.
(2) 'Total Annual TP Load Out kg' is the total weight of phosphorus, in kilograms, that is discharged from the plant during the year.
(3) 'Annual TP Load if 99% kg' is the total weight of phosphorus, in kilograms, that would be discharged from the plant during the year if the plant achieved a 99 % Phosphorus Removal Rate.

60 Years of Observations from a Water Enthusiast

A Sense of Place – over a long time

Terry Rees

If you've spent 60 years experiencing the same landscape, the same patch of glorious Canadian freshwater - you can witness the evolution of the watershed; the transition in the upland forest, the changes to the shoreline structure, plants and the animals that use them; various changes to the water levels – some dictated by one agency or another from time to time; some a function of changing climate, and significantly, changes to the landscape from human activities. All these changes can have a profound – and cumulative - effect on the system's ability to provide abundant clean water; for human consumption, to grow our food, to power our industries, and to serve our communities.

I've spent parts of every year of my life on Lake Kasshabog. It's located just off the end of Upper Stoney Lake. Though it is not part of the contiguous Kawartha Lakes and is landlocked from the Trent-Severn Waterway, it shares numerous similarities with many other beautiful lakes in our region.

I've always said that as a waterfront resident (or visitor, or enthusiast), we have a responsibility to conduct ourselves in a manner so that the fantastic watery resources we share and enjoy so deeply are able to continue to thrive.

If you are a watershed manager, a municipal planner, an engineer responsible for water infrastructure of any kind – you know that the past is becoming a poor example to follow for success in the future. But understanding the trends, appreciating where we've been and paying attention to where we're headed is essential to making decisions with better economic, ecological, and sustainable outcomes.

Over the twenty years that I have spent leading FOCA (www.foca.on.ca) and following the great work of the KLSA, I have seen significant change. FOCA's audience of 250,000 families collectively own and steward 15,000 kilometres and 50,000 hectares of ecologically important real estate along Ontario's lakes and rivers. They also have a front row seat to the changes afoot in our freshwaters.

Our seasons are shifting. If you are a winter sports enthusiast, or if you need to manage for stormwater flows and flooding hazards you will know that in our lifetime, winter has become shorter and rainier. We

now regularly experience flood and drought in the same year. When trying to plan for adequate water supplies for drinking, irrigation, recreation, or industry, it matters when and how the water shows up. 2024 is starting out drier than normal after the winter that wasn't.

Stormier conditions and a warmer atmosphere are also warming our freshwaters.

According to research by Dr. John Smol (Queen's University) and Dr. Sapna Sharma (York University) and others, warming northern lakes globally - including our precious inland and Great Lakes – is resulting in many chemical and physical changes to our natural water systems, including increases to salinity levels, and higher incidence of algae blooms of all types, including toxic cyanobacteria.

We know that these blooms can hamper the ability to provide safe drinking water, can impact human and animal health, reduce recreational opportunities, and decrease property values.

Warmer water leads to higher evaporation rates, lower water levels, and lower dissolved oxygen levels in water – which can impact important biological processes and iconic keystone species, like Canada's globally rare lake trout.

These cumulative changes are happening at a rate that challenges our ability to adapt. But this is our challenge: as water lovers and water managers, we need to recognize that the baselines are shifting; we need to build (or rebuild) our communities to be more resilient to future fluctuations; to lower our footprint overall; we need to scope and deliver infrastructure to consider higher highs and lower lows, and to take advantage of nature's incredible ability to store and clean our water. As owners and stewards of shorelands, we have an obligation to keep our small parts of the ecosystem intact.

Our fresh waters are tremendously resilient even in the face of historical neglect or even abuse. But we have the opportunity, now, to build on our tremendous attachment and reliance on freshwater to overcome complacency, and to embrace a future that, while different, is still water-rich and able to sustain us. This is a whole society challenge and opportunity, and one where we need to build on the lessons from the past to build a healthy watery future for Canada.

The Kawartha Lake Stewards Association is helping to lead the way with their dedicated and thoughtful approach to helping us to better understand, appreciate and ultimately protect our lakes!

Terry Rees is the outgoing Executive Director of the Federation of Ontario Cottagers' Associations, with four decades of ongoing commitment to Canada's natural resources management in the private and not-for-profit sectors.

Terry is a member of the Water Canada Advisory Board, and a Water Canada Awards judge.

Mink on dock. *Photo by: Helen Batten (Stony Lake, Saint Peter's on-the-Rock)*

Turtle Trio. *Photo by: Martha Hunt (Stony Lake, Lost Channel)*

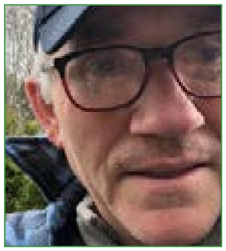
Morning Sunrise. *Photo by: Pam Dickey (Big Bald Lake, Pluards Landing))*

Swan Preening. *Photo by: Deborah Kustor (Katchewanooka Lake)*

Appendix A - Board of Directors

2023 – 2024 Board of Directors

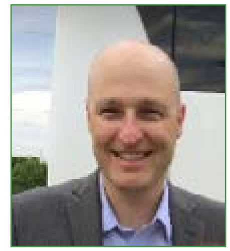
Ed Leerdam
Chair/Treasurer
Nogies Creek



Robert Bailey
Vice-Chair
Lower Buckhorn Lake

Sheila Gordon-Dillane
Secretary
Pigeon Lake

Carol Cole
Director
***Stony* Lake**



Darryl Kotton
Director
Buckhorn Lake

Jacqui Milne
Director
Nogies Creek

Kimberly Ong
Director
Stony Lake

Brett Tregunno
Director
Omemee

Roland Van Oostveen
Director
Selwyn

KLSA 2023 Annual Lake Water Quality Report

This report was prepared for the members of the KLSA, its funders, academics and researchers, other non-profit associations and individuals engaged in similar water quality testing in Ontario. The accuracy of the information and the conclusions in this report are subject to risks and uncertainties including but not limited to errors in sampling methodology, testing, reporting and statistics. KLSA does not guarantee the reliability or completeness of the data published in this report. Nothing in this report should be taken as an assurance that any part of any particular body of water has any particular water quality characteristics or is (or is not) safe for swimming or drinking. There can be no assurance that conditions that prevailed at the time and place that any given testing result was obtained will continue into the future or that trends suggested in this report will continue.

KLSA Privacy Policy

The complete KLSA Privacy Policy is on the KLSA website: www.klsa.ca.

KLSA collects information about our members and volunteers such as name, address, telephone number, email address and preferred method of communication. Information may be kept in written form or electronically. It is used to provide information about KLSA activities and related lake water issues of interest to residents of the Kawartha Lakes. Information will not be disclosed to anyone else unless required to do so by law and will be deleted when it is no longer required. Mailing lists will not be sold, transferred or traded. Information will be kept in a secure place. Further details can be obtained by contacting the KLSA Privacy Officer, Carol Cole, by email at klsa@klsa.info or by regular mail at 264 Bass Lake Road, Trent Lakes ON K0M 1A0.

Thank You to our 2023 Supporters

FOUNDATIONS AND MUNICIPALITIES

Gold ($5,000+)

Silver ($1,000 - $4,999)
Municipality of Trent Lakes
Township of Douro-Dummer

Bronze (less than $1,000)
Municipality of Selwyn

ASSOCIATIONS/BUSINESSES/INDIVIDUALS

Gold ($200+)

Anonymous
Balsam Lake Association
Sheila Gordon-Dillane and Jim Dillane
Michael and Susan Dolbey
Janet and Paul Duval
Elaine Gold
Janet Hasslett-Theall and Larry Theall
Jim Keyser
Darryl Kotton (through the Benevity Community Impact Fund)
Tom and Patti McAllister
Ted Oakes
Paris Marine
Peterborough Pollinators
Pinewood Cottages and Trailer Park
Rosedale Marina
Cathy and Jeff Webb

Silver ($100 - $199)

Chris Appleton and Nancy Austin
Big Bald Lake Cottagers Association
Birchcliff Property Owners Association
Peter Chappell
FR 44 Cottagers Association
Gill Fisher and Bob Woosnam
Diane Gage-Lang
Penny and Bob Little
Kathleen and Blair Mackenzie
Audrey and Tom McCarron
Cliff Moon
Rosemary and Claudio Rosada
Edith and Joe Wood

Bronze (less than $100)

Anonymous
Big Cedar Lake Association
Buckhorn Sands Property Owners Association
East Beehive Community Association
Yvonne Flavelle
Guy Hanchet
Ed Leerdam
Carol and David MacLellan
Violet and Daniel McMurdy
North Kawartha Lakes Association
Sandy Lake Cottagers Association
Heather and Hans Stelzer

Appendix C - Treasurer's Report and Financial Statements

KLSA Treasurer's Report as of December 31, 2023

Ed Leerdam, *KLSA Treasurer*

This Treasurer's Report refers to the 2023 calendar year and the H & R Block Statement of Financial Position summarizing revenue, expenditures and assets for 2022 and 2023 fiscal years. Our thanks to Mr. Chad Irvine of H & R Block for preparing these financial statements.

2023 Revenue of $20,713 increased by 19.62% over 2022's revenue of $17,316, a difference of $3,397. The increase is mainly attributed to aligning our advertising receipts to be within the same year the advertisement appears in our annual Lake Water Quality Report.

Contributions and donations are up 4.61% at $255 year-over-year. Donations from businesses were down a bit at -$50 (-4.35%) while donations from individuals were up a bit at $115 (3.07%), and donations from associations were up significantly at $190 (29.69%).

<u>Continuing</u> sources of income were:

• Water Testing Fees	$4,938[1]
• Municipal Grants	$2,250
• Individual Donations	$3,855
• Private Business Donations	$1,100
• Association Donations	$ 830
• Advertising in the KLSA Annual LWQR	$6,050[1]

2023 expenses of $29,281 increased by 117.64%, or $15,827, over 2022 expenses. This is attributed to two major undertakings in 2023: a) our new Aquatic Plants Guide, at a cost of $10,185 to produce and publish, and b) the shoreland naturalization of six properties at a cost of $6,751[2].

<u>Recurring</u> operating expenses included:

• E. Coli Lab Test Fees	$4,344
• Liability Insurance	$1,980
• KLSA Annual Lake Water Quality Report	$4,862
• Public Meetings	$ 204
• Office	$ 410
• Memberships	$ 141
• Professional Fees	$ 339
• Bank Charges	$ 65

We closed 2023 with a cash position of $271, and $20,000 reserves in GICs.

[1] $420 from 2022 tests received in 2023.

[2] the KLSA Shoreland Restoration project continues in 2023, 2024 and 2025 under an EcoAction grant won by KLSA. (Funding to be received in 2024-2025)

Appendix C - Treasurer's Report and Financial Statements

Notice to Reader

I have compiled the Statement of Financial Position of Kawartha Lake Stewards Association as at December 31, 2023 and the Statement of Operations and Changes in Net Assets for the year then ended from information provided by management.

I have not audited, reviewed or otherwise attempted to verify the accuracy or completeness of such information. Accordingly, readers are cautioned that these statements may not be appropriate for their uses.

Chad R. Irvine

Bobcaygeon, ON

Jan 24, 2024

Kawartha Lake Stewards Association
Statement of Financial Position
As At December 31, 2023

	2023	2022
Assets		
Cash	20271	28839
Prepaid Expenses		
	20271	28839
Liabilities		
Accounts Payable and Accrued	367	339
Net Assets	19904	28500
	20271	28839

Prepared Without Audit- See Notice to Reader

Appendix C - Treasurer's Report and Financial Statements

Kawartha Lake Stewards Association
Statement of Operations and Changes in Net Assets
Year Ended December 31, 2023

	2023	2022
Revenues		
Contributions and Donation		
Private	3855	3740
Businesses	1100	1150
Associations	830	640
Water Testing Fees	4938	4711
Advertising	6050	3050
User Fees	1500	1750
Interest Earned	190	
Municipal Grants	2250	2275
	20713	17316
Expenditures		
Annual Report Costs	4862	4406
Water Testing Fees	4344	4699
Meeting Costs	204	125
Professional Fees	339	339
Memberships	141	125
Insurance	1980	1948
Special Projects	16936	1390
Office and Administration	410	355
Bank Charges	65	67
	29281	13454
Excess of Revenues over Expenditures	-8568	3862
Net Assets, Beginning of Year	28839	24638
Net Assets, End of Year	20271	28500

Prepared Without Audit- See Notice to Reader

Kawartha Lake Stewards Association

Notes to Financial Statements

Unaudited- See Notice to Reader

December 31, 2023

1. Basis of Presentation

The accompanying financial statements relate to the Incorporated Association registered by Letters Patent as the Kawartha Lake Stewards Association. The Association conducts coordinated consistent water quality testing programs (including bacteria and phosphorus) of lake water on lakes within the Trent Canal System watershed. The association derives its revenue from those groups and individuals who are concerned about maintaining the quality of water within the watershed.

Kawartha Lake Stewards Association qualifies as a non-profit organization under section 149(1) of the Income Tax Act, and, as such, is not responsible to pay income tax. The distribution of any of its assets or profits to, or for the personal benefit, of its members or affiliates is prohibited.

Appendix D - Thank You to our 2023 Volunteers

Without our volunteers, whether serving on our Board, leading a program, scooping water or aquatic plants out of our lakes, planting native plants along shorelines, or attaching a temperature monitor to their docks, KLSA would not exist and would not be able to do the work and collect the data that is so important in knowing how good (or not) the waters are in our lakes and what's in them. We are very grateful to all our volunteers who help us in all these ways and more.

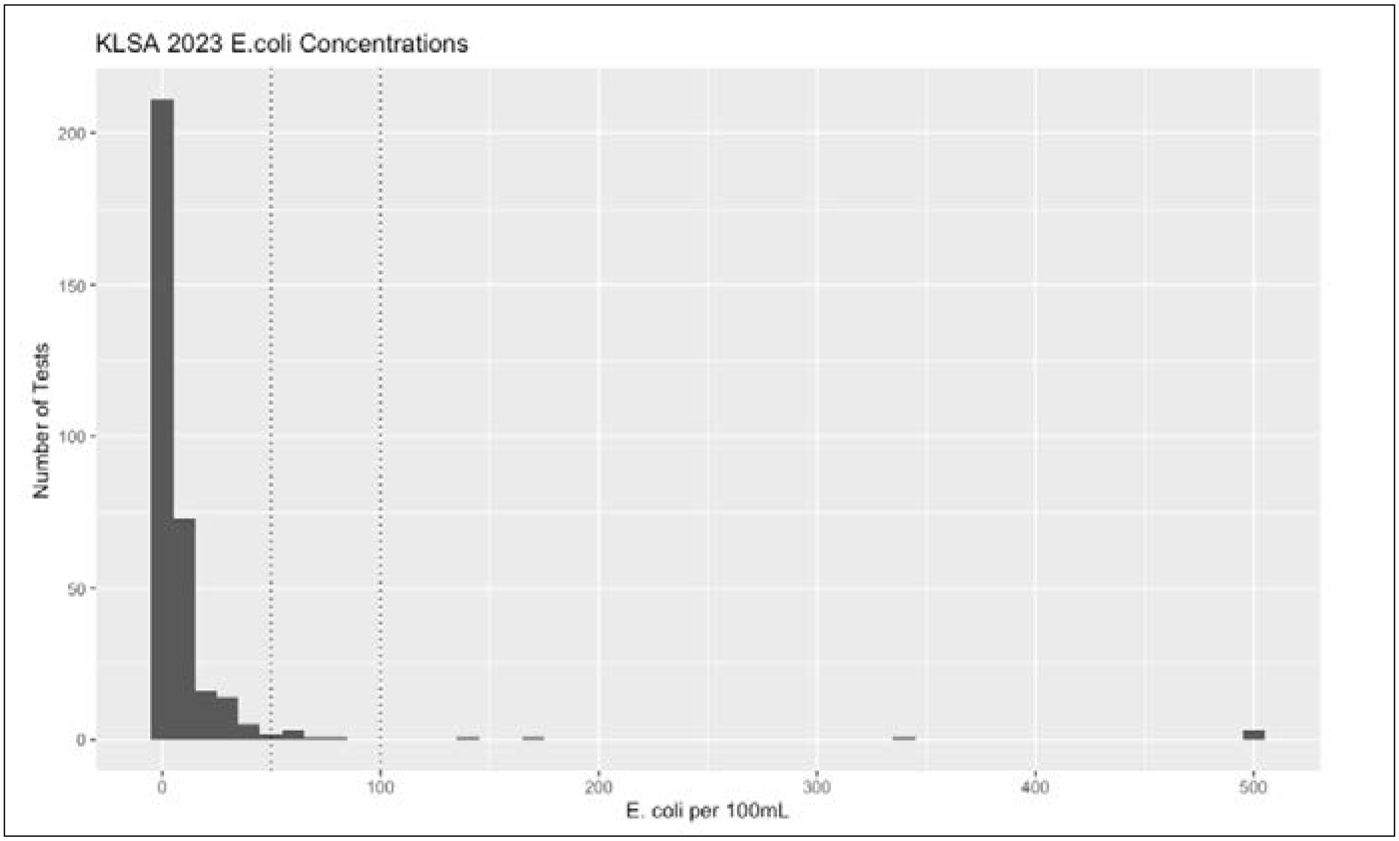
(We strive to ensure no-one is missed when we acknowledge our volunteers. If you see we have missed you or we've made a mistake, please let us know.)

Chris Appleton
Bob Bailey
Dian Bogie
Rick Bogie
Amanda Brazeau
George Brown
Jeff Chalmers
Carol Cole
Lawrence Cook
Krista Coppaway
Rich Corbin
Mark Crane
Lillian Crane
Arden Curran
Mike Dolbey
Warren Dunlop
Douglas Erlandson
Theresa Francis
Julie Fulford
Jessie Gordon
Sheila Gordon-Dillane
L'Anne Greene
Ian Grist
Jill Hamilton
Guy Hanchet
Tyler Harrington
Guy Hatchett
Marco Heitz
Bill Herman
Ginette Hicks
Bruce Hooey
Mitchell Horn
Jeannine Ignatz
Sherri Ireland
Shanna James
Wendy Kennedy
Pat Kennedy Harp
Janet Kline
Darryl Kotton
Chloe Lajoie
Alex Lane
Cindy Lee
Ed Leerdam
Cindy Maason
Patty MacDonald
Kathleen Mackenzie
Dean Michel
Jacqui Milne
Roslyn Moore
Brian Moore
Carmen Morris
Bill Napier
Diane Northey
Lisa Oelke
Kim Ong
Mike Perry
Christine Pigeon
Line Pinard
Mark Potter
Lenore Reid
Dave Sansom
Sarah Scarborough
Jen Schimmens
Alyssa Sharrard
Kathy Simpson
Ashley Smith
Catherine Stikkelbroeck
Diane Trauzzi
Ralph Trauzzi
Brett Tregunno
Roland van Oostveen
Brenda Wall
Lois Wallace
Grace Widuch
Steve Wildfong
Phelisha Williams
Beth Woodcock
Wendy Zelsman

Appendix E - *E. coli* Testing 2023 Results

Bob Bailey, *KLSA Vice-Chair*

KLSA's *E.coli* water sampling program was active in 2023, with 68 sites in 14 lakes sampled up to five times each through the summer. Results were typical of the last several years, with only five of the hundreds of tests being above the provincial standard for public beaches of 200 *E.coli* per 100mL (see below).



In Ontario, a public beach is 'posted' when the level of *E. coli* in the water exceeds 200 *E. coli* colonies per 100mL. This means that the water is unsafe for recreational use. KLSA considers counts over 50 cfu/100mL as somewhat high for the Kawartha Lakes. Counts of 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha Lakes. The presence of *E. coli* usually indicates fecal contamination from warm-blooded animals such as birds or mammals, including humans. Although *E. coli* can be dangerous, most strains of *E. coli* are harmless. The usual analysis done cannot distinguish the difference between the harmless and the deadly.

Results of *E.coli* analyses are expressed as *E. coli* cfu/100 mL. When sample water is plated on growth medium in the laboratory, each live bacterium will multiply to form a visible colony which is then counted 24 hours after the start of incubation of the sample. If there are so many live bacteria that the colonies on the growth medium merge, the sample is said to be 'overgrown', or **#NDOGEC** in the data table below.

Appendix E - *E. coli* Testing 2023 Results

Balsam Lake							
Site	**04-Jul**	**17-Jul**	**08-Aug**	**20-Aug**	**21-Aug**	**04-Sep**	**05-Sep**
A	**56**	35	14		9		4
B	2	7	1		34		0
C	3	6	26	7		1	
G	0		0		27		1

Bass Lake							
Site	**04-Jul**	**17-Jul**	**08-Aug**	**20-Aug**	**21-Aug**	**04-Sep**	**05-Sep**
A	0	0	1		0		0

Big Bald Lake							
Site	**04-Jul**	**17-Jul**	**10-Aug**	**20-Aug**	**21-Aug**	**04-Sep**	**05-Sep**
A	8	12	6		8		0
B	2	14	14		8		1
C	1	1	0		1		0
D	1	16	14		1		7
E	4	4	1		4		4

Appendix E - *E. coli* Testing 2023 Results

Big Cedar Lake							
Site	04-Jul	17-Jul	08-Aug	20-Aug	21-Aug	04-Sep	05-Sep
A	0	26	13		5		5
B	0	2	2		0		1
C	1	6	5		1		30
D	2	0	1		8		0
E	3	1	1		2		0
F	0	1	4		2		0

Buckhorn Lake								
Site	04-Jul	17-Jul	19-Jul	27-Jul	8-Aug	21-Aug	29-Aug	05-Sep
A	1	1			3		0	17
B	4	2			11		0	17
C	3		**138**	13 and 19	0	13		1

Site C: **27-Jul -** Re-test after high reading.

Cameron Lake		
Site	20-Aug	05-Sep
A	12	30
B	8	26

Appendix E - *E. coli* Testing 2023 Results

Clear Lake

Site	04-Jul	7-Jul	16-Jul	18-Jul	07-Aug	14-Aug	20-Aug	22-Aug	04-Sep	06-Sep
A	5			0		**82**		4		41
B	0			0		0		0		1
C	7			1		43		4		11
D		2	6		0		3		0	
E		3	2		7		2		0	
F		2	0		0		0		2	
G		1	3		0		1		1	
H		0	0		1		0		5	
I		6	1		1		1		0	

Site A: **22-Aug -** Re-test after high reading.

Katchewanooka Lake

Site	21-Jun	04-Jul	17-Jul	8-Aug	10-Aug	12-Aug	21-Aug	24-Aug	29-Aug	05-Sep
A		30	11			0	9			9
B		36	35	8			**172**	**340**	50	31
C		1	9		10		7			14

Site B: **24 and 29-Aug -** Re-test after high reading.

Lovesick Lake

Site	04-Jul	17-Jul	9-Aug	21-Aug	05-Sep
A	6	2	3	3	2
B	14	4	8	3	7
C	4	1	7	2	0

Appendix E - *E. coli* Testing 2023 Results

Lower Buckhorn Lake								
Site	**04-Jul**	**7-Jul**	**16-Jul**	**17-Jul**	**09-Aug**	**21-Aug**	**04-Sep**	**05-Sep**
A	7			7	18	**62**	18	
B	1			1	3	3	0	
C	13			5	1	0	23	
D	1			20	1	0	1	
E	1			5	0	1		0
F	**#NDOGEC**	19	3		6	0		1

Site F: **04-Jul** Overgrown (very high) *E coli*.

Pigeon Lake											
Site	**03-Jul**	**4-Jul**	**9-Jul**	**10-Jul**	**17-Jul**	**31-Jul**	**8-Aug**	**20-Aug**	**21-Aug**	**04-Sep**	**05-Sep**
A	35				6	8		11		10	
B	0				2	0		4		7	
C	15				**66**	10		41		2	
D	**60**				46	16		21		15	
E	0				3	12		0		0	
F			1		2		13		0		0
G			2		4		1		0		2
H			3		9		0		4		1
J		21			2		0		0		2
K		**#NDOGEC**		7,1,7	1		1		2		1
L		**#NDOGEC**		13,5,5	2		0		4		0
M		4			6		8		1		4
N		1			27		12		3		2

Site K: **4-Jul** Overgrown (very high) *Ecoli*, **10-Jul** Re-test after high reading.
Site L: **4-Jul** Overgrown (very high) *Ecoli*, **10-Jul** Re-test after high reading.

Appendix E - *E. coli* Testing 2023 Results

Sandy Lake					
Site	04-Jul	17-Jul	7-Aug	21-Aug	05-Sep
A	0	3	1	4	1

Stony Lake						
Site	04-Jul	7-Jul	19-Jul	03-Aug	21-Aug	11-Sep
A	7		45	9	7	20
B	3		5	7	2	0
C			3		2	1
D			4		0	0
E		0		3		
F		18		3		
G		9	24			
H		0	0	12	8	0

Sturgeon Lake				
Site	20-Aug	23-Aug	4-Sep	05-Sep
A	5			0
B	7			11
C		1	2	

Appendix F – Phosphorus, Secchi Depth, Chloride and Calcium 2022 Results

Bob Bailey, *KLSA Vice-Chair*

The Lake Partner Program (LPP) is a collaboration of the Ontario Ministry of the Environment, Conservation & Parks (MECP) with the Federation of Ontario Cottagers' Associations (FOCA). The data presented here are from Kawartha Lakes that were sampled by volunteers in our community in 2022:

Lake – name of the lake
Site ID – site code; sometimes there's more than one site sampled in a lake
Site Description – a brief description of the site
Date – date when the water sample was collected and other observations made
P (µg/L) – concentration of **Phosphorus** in the water, an important nutrient for plants and algae and sometimes too high from human activity
Ca mg/L – concentration of **Calcium** in the water, an important nutrient for all organisms, especially molluscs
Cl mg/L – concentration of **Chloride**, sometimes occurs at damaging levels due to human activity like road salting
Secchi Depth (m) – how clear the water is, measured by lowering a disk until you can't see it, so the deeper the Secchi depth the clearer the water. Suspended material and algal blooms can reduce the clarity and thus the Secchi depth.

This dataset was downloaded from the LPP website (foca.on.ca/lake-partner-program) where data from the past 20 years from samples of lakes across Ontario can be examined or downloaded, as well as background on all the measurements made by LPP volunteers and analyses of their water samples. If you don't see your lake below, you can contact the LPP program from their website and find out about becoming an LPP volunteer lake scientist.

Lake	Site ID	Site Description	Date	P (µg/L)	Ca mg/L	Cl mg/L	Secchi Depth (m)
BALSAM LAKE	2	N Bay Rocky Pt.	14May22	5.2	21.6	7.4	6.5
BALSAM LAKE	2	N Bay Rocky Pt.	23Jun22	10	23.6	7.7	5.3
BALSAM LAKE	2	N Bay Rocky Pt.	25Jul22	10.4	20.7		5
BALSAM LAKE	2	N Bay Rocky Pt.	15Aug22	8.9	21	7.9	5.5
BALSAM LAKE	2	N Bay Rocky Pt.	10Sep22			7.9	
BALSAM LAKE	2	N Bay Rocky Pt.	15Sep22	9.6	18	7.7	5.7
BALSAM LAKE	2	N Bay Rocky Pt.	09Oct22	8.5	19.1		6.5
BALSAM LAKE	5	NE end-Lightning Pt	09Jan22			6.7	
BALSAM LAKE	5	NE end-Lightning Pt	08Feb22			7.1	
BALSAM LAKE	5	NE end-Lightning Pt	10May22			6.3	
BALSAM LAKE	5	NE end-Lightning Pt	26May22	20.7	11.7	8.1	2.2
BALSAM LAKE	5	NE end-Lightning Pt	21Jun22	9.8	10.6	7.6	2.8
BALSAM LAKE	5	NE end-Lightning Pt	02Aug22	11.1	8.6		3.6
BALSAM LAKE	5	NE end-Lightning Pt	01Sep22	10.4	7.7		4.2
BALSAM LAKE	5	NE end-Lightning Pt	15Sep22	9.1	7.7	6.7	5.5
BALSAM LAKE	5	NE end-Lightning Pt	05Oct22	10.5	7		6.8
BALSAM LAKE	8	W Bay2, deep spot	09Jan22			7.8	
BALSAM LAKE	8	W Bay2, deep spot	08Feb22			7.5	
BALSAM LAKE	8	W Bay2, deep spot	10Mar22			7.8	
BALSAM LAKE	8	W Bay2, deep spot	13Jun22	8	22.1	7.5	4.8
BALSAM LAKE	8	W Bay2, deep spot	13Jun22	8	22.1	7.5	4.8
BALSAM LAKE	8	W Bay2, deep spot	07Jul22	10.7	21.7	7.7	4.1
BALSAM LAKE	8	W Bay2, deep spot	07Jul22	10.7	21.7	7.7	4.1
BALSAM LAKE	8	W Bay2, deep spot	02Aug22	10.7	21.3		3.6
BALSAM LAKE	8	W Bay2, deep spot	02Aug22	10.7	21.3		3.6
BALSAM LAKE	8	W Bay2, deep spot	16Aug22				4
BALSAM LAKE	8	W Bay2, deep spot	16Aug22				4
BALSAM LAKE	8	W Bay2, deep spot	01Sep22	10.5	20		4
BALSAM LAKE	8	W Bay2, deep spot	01Sep22	10.5	20		4
BALSAM LAKE	8	W Bay2, deep spot	16Sep22				3.8
BALSAM LAKE	8	W Bay2, deep spot	03Oct22	9.6	18.4		
BALSAM LAKE	8	W Bay2, deep spot	04Oct22				3.2
BALSAM LAKE	9	E of Grand Is	06Feb22			7.5	

Appendix F – Phosphorus, Secchi Depth, Chloride and Calcium 2022 Results

Lake	Site ID	Site Description	Date	P (µg/L)	Ca mg/L	Cl mg/L	Secchi Depth (m)
BALSAM LAKE	9	E of Grand Is	02Jun22	7.6	20		4.5
BALSAM LAKE	9	E of Grand Is	01Jul22				3.7
BALSAM LAKE	9	E of Grand Is	14Jul22				4.5
BALSAM LAKE	9	E of Grand Is	14Aug22				4.7
BALSAM LAKE	9	E of Grand Is	17Sep22				4.1
BALSAM LAKE	9	E of Grand Is	05Oct22				5
BALSAM LAKE	9	E of Grand Is	21Oct22				5.1
BALSAM LAKE	9	E of Grand Is	05Nov22				5.1
BIG BALD LAKE	1	Mid Lake, deep spot	28Aug22	12.2	37.8	22.3	1.9
BIG BALD LAKE	1	Mid Lake, deep spot	30Sep22	10.7	34.5	21.9	3.1
BIG BALD LAKE	1	Mid Lake, deep spot	24Oct22	9.7	36.6	22.1	5.2
BIG CEDAR LAKE	1	Mid Lake, deep spot	23May22	5.9	26.2		5.1
BIG CEDAR LAKE	1	Mid Lake, deep spot	03Jun22				4.8
BIG CEDAR LAKE	1	Mid Lake, deep spot	19Jun22				4.3
BIG CEDAR LAKE	1	Mid Lake, deep spot	02Aug22				3.4
BIG CEDAR LAKE	1	Mid Lake, deep spot	08Aug22				5.5
BIG CEDAR LAKE	1	Mid Lake, deep spot	15Aug22				5.2
BUCKHORN LAKE (U)	1	Narrows-redbuoy C310	10Feb22			13.8	
BUCKHORN LAKE (U)	1	Narrows-redbuoy C310	08Apr22			14.1	
BUCKHORN LAKE (U)	1	Narrows-redbuoy C310	09Jun22			14.2	
BUCKHORN LAKE (U)	1	Narrows-redbuoy C310	04Aug22	18.5	33.8		2.6
BUCKHORN LAKE (U)	1	Narrows-redbuoy C310	06Sep22	16.9	32.3		2.5
BUCKHORN LAKE (U)	1	Narrows-redbuoy C310	02Oct22	11.2	31.9		4
BUCKHORN LAKE (U)	9	Young's Cove, Deep Spot	25May22	11.2	39.1	16.8	
BUCKHORN LAKE (U)	9	Young's Cove, Deep Spot	30Jun22	16.7	35.1	14.7	
BUCKHORN LAKE (U)	9	Young's Cove, Deep Spot	28Jul22	34.4	33.8	14.3	
BUCKHORN LAKE (U)	9	Young's Cove, Deep Spot	26Aug22	16.6	31.9	14.1	
BUCKHORN LAKE (U)	9	Young's Cove, Deep Spot	29Sep22	10.4	30.8	13.6	
BUCKHORN LAKE (U)	9	Young's Cove, Deep Spot	23Oct22	9.2	31.6	13.6	
BUCKHORN LAKE (U)	10	NE of Fox Is	18May22	12.8	38.4	17.1	
BUCKHORN LAKE (U)	10	NE of Fox Is	23May22				4
BUCKHORN LAKE (U)	10	NE of Fox Is	30Jun22	15.9	33.5	14.6	3.7
BUCKHORN LAKE (U)	10	NE of Fox Is	30Jul22	31	33.5	13.6	3.2
BUCKHORN LAKE (U)	10	NE of Fox Is	27Aug22	17.6	32.2	13.9	3.5
BUCKHORN LAKE (U)	10	NE of Fox Is	10Oct22	19.2	29.4	13.7	
BUCKHORN LAKE (U)	10	NE of Fox Is	11Oct22				3.8
CAMERON LAKE	6	S end, deep spot	10Jul22	11.6	21.8		
CAMERON LAKE	6	S end, deep spot	07Oct22			8	
CHEMONG LAKE	9	S. of Causeway	25May22	9.9	48.3	30.8	
CHEMONG LAKE	9	S. of Causeway	22Jun22	22.1	48.1	31.4	
CHEMONG LAKE	9	S. of Causeway	20Jul22	18	43.8	31	
CHEMONG LAKE	9	S. of Causeway	24Aug22	17.8	38.4	31.3	
CHEMONG LAKE	9	S. of Causeway	19Sep22	13.6	38.1	32.2	
CHEMONG LAKE	11	N of Big Island	06Mar22			24.8	
CHEMONG LAKE	11	N of Big Island	08Apr22			26.7	
CHEMONG LAKE	11	N of Big Island	03Jun22	10.2	55.5		
CHEMONG LAKE	11	N of Big Island	07Jun22			26.3	
CHEMONG LAKE	11	N of Big Island	06Jul22	13.2	49		
CHEMONG LAKE	11	N of Big Island	04Aug22	14.1	43.7		
CHEMONG LAKE	11	N of Big Island	11Sep22	9.3	41.8		
CHEMONG LAKE	11	N of Big Island	09Nov22			28	
CLEAR LAKE	2	Main Basin-deep spot	09Jul22			13.4	
CLEAR LAKE	2	Main Basin-deep spot	10Aug22	14.8	29.9		3
CLEAR LAKE	2	Main Basin-deep spot	07Sep22	20.5	30.3		3.2
CLEAR LAKE	2	Main Basin-deep spot	08Oct22			13	
CLEAR LAKE	3	Fiddlers Bay	09Jul22			13.5	
CLEAR LAKE	3	Fiddlers Bay	10Aug22	13.8	31.1		3.7
CLEAR LAKE	3	Fiddlers Bay	07Sep22	20.7	30.2		3.2
CLEAR LAKE	3	Fiddlers Bay	08Oct22			13	
CLEAR LAKE	1	Stn1-W of Mickle Is.	25Jun22	13.3	2.8	0.7	5
CLEAR LAKE	1	Stn1-W of Mickle Is.	14Jul22				5.5
CLEAR LAKE	1	Stn1-W of Mickle Is.	01Aug22				7.5
CLEAR LAKE	1	Stn1-W of Mickle Is.	13Aug22				6.5
CLEAR LAKE	1	Stn1-W of Mickle Is.	09Sep22				6.5
CLEAR LAKE	1	Stn1-W of Mickle Is.	24Sep22				5.5
CLEAR LAKE	1	Stn1-W of Mickle Is.	01Oct22				6.2
CLEAR LAKE	1	Mid Lake, Deep Spot	10May22			10.5	
CLEAR LAKE	1	Mid Lake, Deep Spot	25May22	8.7	27.9	10.2	4.8
CLEAR LAKE	1	Mid Lake, Deep Spot	08Jun22			10.6	
CLEAR LAKE	1	Mid Lake, Deep Spot	25Jun22	12.3	28.2	10.7	4.5

Appendix F – Phosphorus, Secchi Depth, Chloride and Calcium 2022 Results

Lake	Site ID	Site Description	Date	P (µg/L)	Ca mg/L	Cl mg/L	Secchi Depth (m)
CLEAR LAKE	1	Mid Lake, Deep Spot	07Jul22	16.1	27.6	11.2	5
CLEAR LAKE	1	Mid Lake, Deep Spot	06Aug22	11	26.9		4.7
CLEAR LAKE	1	Mid Lake, Deep Spot	09Aug22			11	
CLEAR LAKE	1	Mid Lake, Deep Spot	08Sep22	12.3	26.9		4.6
CLEAR LAKE	1	Mid Lake, Deep Spot	05Oct22	20.1	25.2		5
CLEAR LAKE	1	Central Basin	28May22	3.3	3	2.4	
CLEAR LAKE	4	site 4 E end	28May22	3.5	3.2	2.4	
KATCHEWANOOKA LAKE	1	S/E Douglas Island	06Feb22			14.3	
KATCHEWANOOKA LAKE	1	S/E Douglas Island	10Feb22			12.7	
KATCHEWANOOKA LAKE	1	S/E Douglas Island	07Apr22			13.4	
KATCHEWANOOKA LAKE	1	S/E Douglas Island	18May22	9.3	35.6	15.5	7
KATCHEWANOOKA LAKE	1	S/E Douglas Island	02Jun22	8.6	32.6		6.1
KATCHEWANOOKA LAKE	1	S/E Douglas Island	04Jul22	13.3	32.7		4.7
KATCHEWANOOKA LAKE	1	S/E Douglas Island	22Jul22	15.9	31.1	12.9	
KATCHEWANOOKA LAKE	1	S/E Douglas Island	02Aug22				3.5
KATCHEWANOOKA LAKE	1	S/E Douglas Island	31Aug22	18.8	30.4	12.7	4.9
KATCHEWANOOKA LAKE	1	S/E Douglas Island	02Oct22	15.2	29.6		
KATCHEWANOOKA LAKE	1	S/E Douglas Island	03Oct22				6.7
KATCHEWANOOKA LAKE	2	Young Pt near locks	08Feb22			12.9	
KATCHEWANOOKA LAKE	2	Young Pt near locks	10Feb22			12.8	
KATCHEWANOOKA LAKE	2	Young Pt near locks	05Mar22			14.1	
KATCHEWANOOKA LAKE	2	Young Pt near locks	07Apr22			13.4	
KATCHEWANOOKA LAKE	2	Young Pt near locks	03May22	6.7	35.7		7.6
KATCHEWANOOKA LAKE	2	Young Pt near locks	06Jun22	8.7	35.1	14.6	7
KATCHEWANOOKA LAKE	2	Young Pt near locks	09Jun22			13.4	
KATCHEWANOOKA LAKE	2	Young Pt near locks	25Jun22				4.7
KATCHEWANOOKA LAKE	2	Young Pt near locks	04Jul22	14	33.7		6.7
KATCHEWANOOKA LAKE	2	Young Pt near locks	19Jul22				4
KATCHEWANOOKA LAKE	2	Young Pt near locks	02Aug22	16.7	31		3.7
KATCHEWANOOKA LAKE	2	Young Pt near locks	15Aug22				4.5
KATCHEWANOOKA LAKE	2	Young Pt near locks	06Sep22	19.3	30.9		5.4
KATCHEWANOOKA LAKE	2	Young Pt near locks	19Sep22				5.5
KATCHEWANOOKA LAKE	2	Young Pt near locks	02Oct22	18.5	30		4.6
KATCHEWANOOKA LAKE	2	Young Pt near locks	17Oct22				6
KATCHEWANOOKA LAKE	2	Young Pt near locks	30Oct22				7.5

Lake	Site ID	Site Description	Date	P (µg/L)	Ca mg/L	Cl mg/L	Secchi Depth (m)
LOVESICK LAKE	1	80' hole at N. end	09Feb22			13	
LOVESICK LAKE	1	80' hole at N. end	08Apr22			13.6	
LOVESICK LAKE	1	80' hole at N. end	08Jun22	19.3	32.5		
LOVESICK LAKE	1	80' hole at N. end	22Jul22		31	13	
LOVESICK LAKE	1	80' hole at N. end	04Aug22		32.9		
LOVESICK LAKE	1	80' hole at N. end	06Aug22			14.2	
LOVESICK LAKE	1	80' hole at N. end	15Aug22	20	31.1	13.6	
LOVESICK LAKE	1	80' hole at N. end	02Sep22	19.5	29.7		
LOVESICK LAKE	3	McCallum Island	09Feb22			13.2	
LOVESICK LAKE	3	McCallum Island	08Apr22			13.7	
LOVESICK LAKE	3	McCallum Island	08Jun22	23.2	32.3		
LOVESICK LAKE	3	McCallum Island	22Jul22		31.5	13.2	
LOVESICK LAKE	3	McCallum Island	04Aug22		32.7		
LOVESICK LAKE	3	McCallum Island	06Aug22			14.2	
LOVESICK LAKE	3	McCallum Island	15Aug22	21.8	31	13.6	
LOVESICK LAKE	3	McCallum Island	02Sep22	23.3	29.9		
LOWER BUCKHORN LAKE	1	Heron Island	19Jun22	12.5	30.8		5.3
LOWER BUCKHORN LAKE	1	Heron Island	12Jul22	17.5	28.4		3.2
LOWER BUCKHORN LAKE	1	Heron Island	03Aug22				3
LOWER BUCKHORN LAKE	1	Heron Island	04Aug22	19.1	31.7		
LOWER BUCKHORN LAKE	1	Heron Island	16Aug22	18.9	30.4		
LOWER BUCKHORN LAKE	1	Heron Island	17Aug22				2.9
LOWER BUCKHORN LAKE	1	Heron Island	06Sep22	18.3	29.4		3.1
LOWER BUCKHORN LAKE	1	Heron Island	24Sep22	15.6	28.7		3.9
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	28May22	13.1	36.8		
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	29May22				3.3
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	14Jun22	15.3	32.9		6.2
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	20Jul22	24.2	30.2		3.6
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	12Aug22	21.5	30.3		
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	13Aug22				2.3
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	10Sep22	17.9	28.9		3.7
LOWER BUCKHORN LAKE	4	Deer Bay W-Buoy C267	03Oct22	12.4	29.4		5.8
LOWER BUCKHORN LAKE	6	Deer Bay-centre	17Jun22				3.6
LOWER BUCKHORN LAKE	6	Deer Bay-centre	19Jun22	14.4	32		
LOWER BUCKHORN LAKE	6	Deer Bay-centre	12Jul22	18	31.6		3.2

Appendix F – Phosphorus, Secchi Depth, Chloride and Calcium 2022 Results

Lake	Site ID	Site Description	Date	P (µg/L)	Ca mg/L	Cl mg/L	Secchi Depth (m)
LOWER BUCKHORN LAKE	6	Deer Bay-centre	03Aug22				3.1
LOWER BUCKHORN LAKE	6	Deer Bay-centre	04Aug22	16	31.5		
LOWER BUCKHORN LAKE	6	Deer Bay-centre	16Aug22	14.2	30.9		
LOWER BUCKHORN LAKE	6	Deer Bay-centre	17Aug22				3.1
LOWER BUCKHORN LAKE	6	Deer Bay-centre	06Sep22	17.4	30.5		3.4
LOWER BUCKHORN LAKE	6	Deer Bay-centre	24Sep22	14.7	27		3.5
LOWER BUCKHORN LAKE	7	Lower Deer Bay, Mid-deep	01May22				1.8
LOWER BUCKHORN LAKE	7	Lower Deer Bay, Mid-deep	21May22	13.1	24.2		
LOWER BUCKHORN LAKE	7	Lower Deer Bay, Mid-deep	08Jun22	14.6	14.1		1.8
LOWER BUCKHORN LAKE	7	Lower Deer Bay, Mid-deep	08Jul22	15.6	29.2		1.9
LOWER BUCKHORN LAKE	7	Lower Deer Bay, Mid-deep	06Aug22	15.3	30.8		1.8
LOWER BUCKHORN LAKE	7	Lower Deer Bay, Mid-deep	13Sep22	17.1	25.5		1.8
LOWER BUCKHORN LAKE	7	Lower Deer Bay, Mid-deep	06Oct22	10.9	28.7		1.6
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	01May22				2.9
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	21May22	15.7	33.9		
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	08Jun22	16.3	19.9		2.7
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	08Jul22	13.9	25.2		
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	06Aug22	13.6	29.7		2.6
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	08Sep22				2.7
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	13Sep22	16.5	26.6		2.5
LOWER BUCKHORN LAKE	8	Main basin, deep- spot	06Oct22	11.5	27.6		2.5
PIGEON LAKE	1	S end, deep spot	06Mar22			20.1	
PIGEON LAKE	1	S end, deep spot	19May22	21.6		19.6	2.5
PIGEON LAKE	1	S end, deep spot	03Jun22	22			2.5
PIGEON LAKE	1	S end, deep spot	14Jul22	16.1		18.7	2.5
PIGEON LAKE	1	S end, deep spot	24Aug22	20.7		20.3	2.3
PIGEON LAKE	1	S end, deep spot	15Sep22	18.4		19.2	2.3
PIGEON LAKE	1	S end, deep spot	23Oct22	21.2		18	2.2
PIGEON LAKE	3	Middle-SandyPtBoyd I	07Apr22			13.2	
PIGEON LAKE	3	Middle-SandyPtBoyd I	09May22			13.6	
PIGEON LAKE	3	Middle-SandyPtBoyd I	19Jun22	14		14.4	3
PIGEON LAKE	3	Middle-SandyPtBoyd I	04Jul22	15.2			2.5
PIGEON LAKE	3	Middle-SandyPtBoyd I	08Aug22	16.1		13.2	2.8
PIGEON LAKE	3	Middle-SandyPtBoyd I	05Sep22	15.6			2.8
PIGEON LAKE	3	Middle-SandyPtBoyd I	02Oct22	11.9			2.8
PIGEON LAKE	3	Middle-SandyPtBoyd I	11Oct22	13.9			
PIGEON LAKE	3	Middle-SandyPtBoyd I	10Nov22			13.3	
PIGEON LAKE	12	N-400m N of Boyd Is.	09Feb22			13.4	
PIGEON LAKE	12	N-400m N of Boyd Is.	24May22	7.2		15.1	
PIGEON LAKE	12	N-400m N of Boyd Is.	25May22				4.2
PIGEON LAKE	12	N-400m N of Boyd Is.	28Jun22	14.9		13	4.2
PIGEON LAKE	12	N-400m N of Boyd Is.	25Jul22	16.8		13	3.8
PIGEON LAKE	12	N-400m N of Boyd Is.	02Sep22	20.7			3.6
PIGEON LAKE	12	N-400m N of Boyd Is.	26Sep22	16.7			3.7
PIGEON LAKE	12	N-400m N of Boyd Is.	23Oct22	13.1		11.1	3.5
PIGEON LAKE	13	N end-Adjacent Con17	10Feb22			13.3	
PIGEON LAKE	13	N end-Adjacent Con17	07Apr22			13.1	
PIGEON LAKE	13	N end-Adjacent Con17	09May22			13.6	
PIGEON LAKE	13	N end-Adjacent Con17	19Jun22	13.9		14.5	2.8
PIGEON LAKE	13	N end-Adjacent Con17	04Jul22	15			2.5
PIGEON LAKE	13	N end-Adjacent Con17	08Aug22	15.6		13.2	2.8
PIGEON LAKE	13	N end-Adjacent Con17	05Sep22	14.4			2.8
PIGEON LAKE	13	N end-Adjacent Con17	02Oct22	10.9			3
PIGEON LAKE	15	C340-DeadHorseSho	08Jan22			13.1	
PIGEON LAKE	15	C340-DeadHorseSho	09Feb22			13.3	
PIGEON LAKE	15	C340-DeadHorseSho	07Apr22			13.5	
PIGEON LAKE	15	C340-DeadHorseSho	04Jul22	17.5			3.1
PIGEON LAKE	15	C340-DeadHorseSho	01Aug22	18			3.1
PIGEON LAKE	15	C340-DeadHorseSho	02Sep22	16.8			3.1
PIGEON LAKE	15	C340-DeadHorseSho	29Sep22	11.4		12.7	3.1
PIGEON LAKE	16	N300yds off Bottom I	09Feb22			12.6	
PIGEON LAKE	16	N300yds off Bottom I	25May22	7.8		14.7	4.1
PIGEON LAKE	16	N300yds off Bottom I	28Jun22	16.4		12.8	4.3
PIGEON LAKE	16	N300yds off Bottom I	25Jul22	18.2		12.6	3.8
PIGEON LAKE	16	N300yds off Bottom I	02Sep22	20.8			3.6
PIGEON LAKE	16	N300yds off Bottom I	26Sep22	16.4		12.7	3.8
PIGEON LAKE	16	N300yds off Bottom I	23Oct22	14.8		11.6	3.4
STONY LAKE	4	Burleigh locks chan.	08Mar22			13.6	
STONY LAKE	4	Burleigh locks chan.	09Jun22			13	
STONY LAKE	4	Burleigh locks chan.	11Jul22	9.7	28.2		

Appendix F – Phosphorus, Secchi Depth, Chloride and Calcium 2022 Results

Lake	Site ID	Site Description	Date	P (µg/L)	Ca mg/L	Cl mg/L	Secchi Depth (m)
STONY LAKE	4	Burleigh locks chan.	03Aug22	19.7	30.5		
STONY LAKE	4	Burleigh locks chan.	06Sep22	19.4	29.7		
STONY LAKE	4	Burleigh locks chan.	07Nov22			8.6	
STONY LAKE	7	Mouse Is.	07Mar22			12.5	
STONY LAKE	7	Mouse Is.	09Mar22			12.4	
STONY LAKE	7	Mouse Is.	14May22	9.4	31.2	13.3	4.5
STONY LAKE	7	Mouse Is.	30May22	64.5	33.9	14.3	6.4
STONY LAKE	7	Mouse Is.	03Jul22	11.5	30.6		4.1
STONY LAKE	7	Mouse Is.	30Jul22				3.2
STONY LAKE	7	Mouse Is.	31Jul22	13.8	29.7	12	
STONY LAKE	7	Mouse Is.	03Sep22	17	29.3		4
STONY LAKE	7	Mouse Is.	30Sep22	12.8	28.9	12.2	5.1
STONY LAKE	8	Hamilton Bay	07Mar22			12.8	
STONY LAKE	8	Hamilton Bay	09Mar22			12	
STONY LAKE	8	Hamilton Bay	14May22		31.8	12.9	4.1
STONY LAKE	8	Hamilton Bay	30May22	10.6	33.5	13.6	4.1
STONY LAKE	8	Hamilton Bay	03Jul22	11.5	30.6		4.1
STONY LAKE	8	Hamilton Bay	30Jul22				4.1
STONY LAKE	8	Hamilton Bay	31Jul22	13.7	30.1	12	
STONY LAKE	8	Hamilton Bay	03Sep22	14.4	29.2		4
STONY LAKE	8	Hamilton Bay	30Sep22	11.8	28.4	11.7	4.1
STURGEON LAKE	4	Muskrat I-Buoy C388	14Jun22				3.9
STURGEON LAKE	4	Muskrat I-Buoy C388	11Aug22	17	29.4		2.9
STURGEON LAKE	4	Muskrat I-Buoy C388	17Sep22				2.3
STURGEON LAKE	4	Muskrat I-Buoy C388	20Sep22	20.1	26.5	11.8	
STURGEON LAKE	4	Muskrat I-Buoy C388	08Nov22			13	
STURGEON LAKE	5	Sturgeon Point Buoy	10Mar22			9.3	
STURGEON LAKE	5	Sturgeon Point Buoy	30May22				3.4
STURGEON LAKE	5	Sturgeon Point Buoy	31May22	8.9	28	12.3	
STURGEON LAKE	5	Sturgeon Point Buoy	14Jun22				3.7
STURGEON LAKE	5	Sturgeon Point Buoy	28Jun22	14	28.1	12.4	3.7
STURGEON LAKE	5	Sturgeon Point Buoy	20Jul22				2.3
STURGEON LAKE	5	Sturgeon Point Buoy	09Aug22				2.8
STURGEON LAKE	5	Sturgeon Point Buoy	12Aug22	16	27.5		
STURGEON LAKE	5	Sturgeon Point Buoy	09Sep22	16.1	24.4	10.5	3.1
STURGEON LAKE	5	Sturgeon Point Buoy	03Oct22	12.1	21.8		3.9
STURGEON LAKE	5	Sturgeon Point Buoy	08Dec22			12	
STURGEON LAKE	9	Fenelon R. mouth	10Mar22			8.1	
STURGEON LAKE	9	Fenelon R. mouth	30May22				4.7
STURGEON LAKE	9	Fenelon R. mouth	31May22	9.1	22.6	8.4	
STURGEON LAKE	9	Fenelon R. mouth	14Jun22				3.7
STURGEON LAKE	9	Fenelon R. mouth	28Jun22	11.3	22	8.2	3.5
STURGEON LAKE	9	Fenelon R. mouth	20Jul22				3.7
STURGEON LAKE	9	Fenelon R. mouth	09Aug22				4.4
STURGEON LAKE	9	Fenelon R. mouth	12Aug22	11	21.5		
STURGEON LAKE	9	Fenelon R. mouth	09Sep22	9.8	20.3	8.4	3.9
STURGEON LAKE	9	Fenelon R. mouth	03Oct22	8.3	19.4		4.9
STURGEON LAKE	9	Fenelon R. mouth	08Dec22			8.5	
UPPER STONEY LAKE	1	Quarry Bay	07Mar22			8.7	
UPPER STONEY LAKE	1	Quarry Bay	05May22	5.5	28.5	7.4	
UPPER STONEY LAKE	1	Quarry Bay	09May22				6.1
UPPER STONEY LAKE	1	Quarry Bay	10May22			7.7	
UPPER STONEY LAKE	1	Quarry Bay	08Jun22				5.8
UPPER STONEY LAKE	1	Quarry Bay	11Jun22	7.3	28.7		
UPPER STONEY LAKE	1	Quarry Bay	03Jul22	8.6	27.3		
UPPER STONEY LAKE	1	Quarry Bay	04Jul22				5.6
UPPER STONEY LAKE	1	Quarry Bay	18Jul22	16.6	27.5	8	
UPPER STONEY LAKE	1	Quarry Bay	05Aug22				4.8
UPPER STONEY LAKE	1	Quarry Bay	17Sep22				5.5
UPPER STONEY LAKE	1	Quarry Bay	19Sep22	7.6	24.5		
UPPER STONEY LAKE	1	Quarry Bay	05Oct22	7.2	25.6		6.7
UPPER STONEY LAKE	1	Quarry Bay	06Nov22			8.2	
UPPER STONEY LAKE	3	Young Bay	07Mar22			8.6	
UPPER STONEY LAKE	3	Young Bay	05May22	6.5	28.4	8.1	
UPPER STONEY LAKE	3	Young Bay	09May22				5.1
UPPER STONEY LAKE	3	Young Bay	10May22			7.7	
UPPER STONEY LAKE	3	Young Bay	25May22	7	29.1	8.6	
UPPER STONEY LAKE	3	Young Bay	08Jun22				5.6
UPPER STONEY LAKE	3	Young Bay	03Jul22	8.4	26.7		
UPPER STONEY LAKE	3	Young Bay	04Jul22				5.8

Appendix F – Phosphorus, Secchi Depth, Chloride and Calcium 2022 Results

Lake	Site ID	Site Description	Date	P (µg/L)	Ca mg/L	Cl mg/L	Secchi Depth (m)
UPPER STONEY LAKE	3	Young Bay	18Jul22	7.5	27.3	8	
UPPER STONEY LAKE	3	Young Bay	05Aug22				5
UPPER STONEY LAKE	3	Young Bay	17Sep22				5.7
UPPER STONEY LAKE	3	Young Bay	19Sep22	7.3	25.4	7.5	
UPPER STONEY LAKE	3	Young Bay	05Oct22	6.2	25.4		7
UPPER STONEY LAKE	4	S Bay, deep spot	07Mar22			9.1	
UPPER STONEY LAKE	4	S Bay, deep spot	05May22		28.9	7.8	
UPPER STONEY LAKE	4	S Bay, deep spot	08May22	6.6			
UPPER STONEY LAKE	4	S Bay, deep spot	10May22			8.1	
UPPER STONEY LAKE	4	S Bay, deep spot	11Jun22	9.4	29		
UPPER STONEY LAKE	4	S Bay, deep spot	03Jul22	9.6	26.8		
UPPER STONEY LAKE	4	S Bay, deep spot	18Jul22	18.5	30	13.8	
UPPER STONEY LAKE	4	S Bay, deep spot	19Sep22	10.5	27.8	8.1	
UPPER STONEY LAKE	4	S Bay, deep spot	05Oct22	6.7	26.8		
UPPER STONEY LAKE	4	S Bay, deep spot	06Nov22			8.7	
UPPER STONEY LAKE	5	Crowes Landing	07Mar22			8.7	
UPPER STONEY LAKE	5	Crowes Landing	08May22	6.2	28.5		
UPPER STONEY LAKE	5	Crowes Landing	09May22				5.5
UPPER STONEY LAKE	5	Crowes Landing	10May22			7.7	
UPPER STONEY LAKE	5	Crowes Landing	08Jun22				5.9
UPPER STONEY LAKE	5	Crowes Landing	11Jun22	6.7	29.1		
UPPER STONEY LAKE	5	Crowes Landing	24Jun22	8.2	28	8.1	
UPPER STONEY LAKE	5	Crowes Landing	03Jul22	8.7	27.6		
UPPER STONEY LAKE	5	Crowes Landing	04Jul22				5.4
UPPER STONEY LAKE	5	Crowes Landing	05Aug22			7.6	4.6
UPPER STONEY LAKE	5	Crowes Landing	17Sep22				5.8
UPPER STONEY LAKE	5	Crowes Landing	19Sep22	7.4	26	7.8	
UPPER STONEY LAKE	5	Crowes Landing	05Oct22	5.9	25.4		6.1
UPPER STONEY LAKE	5	Crowes Landing	06Nov22			8.6	
UPPER STONEY LAKE	6	Mid Lake, deep spot	07Mar22			8.1	
UPPER STONEY LAKE	6	Mid Lake, deep spot	08May22	5.3	28.9		
UPPER STONEY LAKE	6	Mid Lake, deep spot	09May22				5.5
UPPER STONEY LAKE	6	Mid Lake, deep spot	10May22			7.6	
UPPER STONEY LAKE	6	Mid Lake, deep spot	08Jun22				5.4
UPPER STONEY LAKE	6	Mid Lake, deep spot	11Jun22	7.8	28.5		
UPPER STONEY LAKE	6	Mid Lake, deep spot	24Jun22	8.3	27.5	8.1	
UPPER STONEY LAKE	6	Mid Lake, deep spot	03Jul22	8.4	27.2		
UPPER STONEY LAKE	6	Mid Lake, deep spot	04Jul22				5.9
UPPER STONEY LAKE	6	Mid Lake, deep spot	05Aug22			7.6	4.9
UPPER STONEY LAKE	6	Mid Lake, deep spot	17Sep22				5.6
UPPER STONEY LAKE	6	Mid Lake, deep spot	19Sep22	6.8	26.2	7.7	
UPPER STONEY LAKE	6	Mid Lake, deep spot	05Oct22	5.7	24.4		6.3
UPPER STONEY LAKE	6	Mid Lake, deep spot	06Nov22			8.5	
WHITE LAKE (DUMMER)	1	S end, deep spot	14May22				4
WHITE LAKE (DUMMER)	1	S end, deep spot	24May22				6
WHITE LAKE (DUMMER)	1	S end, deep spot	14Jun22	15.1	34.7	12.6	5.5
WHITE LAKE (DUMMER)	1	S end, deep spot	09Jul22				4.9
WHITE LAKE (DUMMER)	1	S end, deep spot	22Jul22	12.7	32.3	13.3	3.2
WHITE LAKE (DUMMER)	1	S end, deep spot	05Aug22				4.7
WHITE LAKE (DUMMER)	1	S end, deep spot	14Aug22	12.9	30	13.3	4.2
WHITE LAKE (DUMMER)	1	S end, deep spot	05Sep22				4.9
WHITE LAKE (DUMMER)	1	S end, deep spot	15Sep22	11.1	29.9	13	5
WHITE LAKE (DUMMER)	1	S end, deep spot	03Oct22				5.8
WHITE LAKE (DUMMER)	1	S end, deep spot	22Oct22	14.5	29.3	12.4	5.5

Appendix G: Water Temperature Monitoring 2023 Results (June 1 to August 31)

Site ID	Location	Waterbody Name	Days Above 25C (#)	Maximum Temp. (C)	Average Temp. (C)	Notes
Bal1	Nearshore	Balsam Lake	46	28.3	23.0	
Bal2	Nearshore	Balsam Lake	44	29.7	23.1	
Bal3	Nearshore	Balsam Lake	23	26.3	22.6	
TSW1	Offshore	Balsam Lake	17	27.3	22.7	No data after August 10
Buc1	Nearshore	Buckhorn Lake (U)	50	29.6	23.8	
TSW4	Offshore	Buckhorn Lake (U)	22	27.5	23.4	No data after August 22
Cam1	Nearshore	Cameron Lake	10	26.2	22.5	
Cam2	Nearshore	Cameron Lake	37	27.8	22.8	
Cam3	Nearshore	Cameron Lake				No data – logger malfunction
Cam4	Nearshore	Cameron Lake	34	27.8	22.7	
Cle1	Nearshore	Clear Lake	13	26.8	23.5	No data before July 26
Kat1	Nearshore	Katchewanooka Lake	17	26.3	23.0	No data before June 7 and after June 9
TSW5	Offshore	Katchewanooka Lake	12	25.7	22.9	
Oto1	Nearshore	Otonabee River				No data – logger malfunction
Pig1	Nearshore	Pigeon Lake				No data
Pig2	Nearshore	Pigeon Lake	43	29.5	23.4	
Pig3	Nearshore	Pigeon Lake	8	26.7	21.5	Outlier data – logger malfunction?
Pig4	Nearshore	Pigeon Lake	55	30.5	23.8	.
TSW3	Offshore	Pigeon Lake	18	27.5	22.9	
San1	Creek	Sandy Creek	61	30.9	23.1	Creek site, not on a lake
Scu1	Nearshore	Scugog Lake	50	30.6	23.3	
Scu2	Nearshore	Scugog Lake	37	29.3	23.2	
Scu3	Nearshore	Scugog Lake	51	29.8	23.3	
Stu1	Nearshore	Sturgeon Lake	42	29.3	23.2	
Stu2	Nearshore	Sturgeon Lake				No data – logger malfunction
Stu3	Nearshore	Sturgeon Lake	58	31.4	23.6	
Stu4	Nearshore	Sturgeon Lake	46	29.6	23.8	
Stu5	Nearshore	Sturgeon Lake	33	27.5	22.9	
TSW2	Offshore	Sturgeon Lake	19	27.2	22.7	No data after August 10
*AVERAGE all			35.6	28.5	23.1	
*AVERAGE nearshore only			41.2	29.0	23.2	
*AVERAGE offshore only			17.6	27.0	22.9	

*AVERAGE does not include data shaded in grey.

Support the Kawartha Lake Stewards Association

Please Support the Kawartha Lake Stewards Association

KLSA distributes all its publications, including this one, at no charge. We need your continued support to be able to provide these annual reports to cottage associations, libraries, government agencies, academics, and to people like you. If you have benefited from this report and would like to see this work continue, please consider a donation. Completely run by volunteers, KLSA provides excellent value for every dollar it receives and gratefully acknowledges every donor in our annual report. Please give generously.

Please send an e-transfer to: **klsa@klsa.info**
Please include in the comments your name, your Association or Business name (if donation is from one of these), full address, email address, your lake, if you would like us to mail you our next annual Lake Water Quality Report, and if you would like us NOT to publish your name or business in KLSA publications.

To send a cheque, please fill out this form and mail to:
KLSA Treasurer, 264 Bass Lake Road, Trent Lakes, ON K0M 1A0
To enquire about advertising in this report, please email Ed.Leerdam@klsa.info.

KLSA Donation Form

I am proud to support KLSA's work at the level of:

☐ Gold - $200 and up

☐ Silver - $100 - $199

☐ Bronze - less than $100

Donation Amount $____________

If sending a cheque, please make it payable to: Kawartha Lake Stewards Association.
Please note that KLSA cannot issue charitable donation receipts for personal income tax purposes.

Name: ____

Name of association or business if applicable:

____

Exact name to appear in KLSA publications. A business receipt will be issued.

Address: ____

City: ____ Postal Code: ________________________

Email: ____

My Lake: ____

☐ Please mail the next annual KLSA Lake Water Quality report to me at the above address.

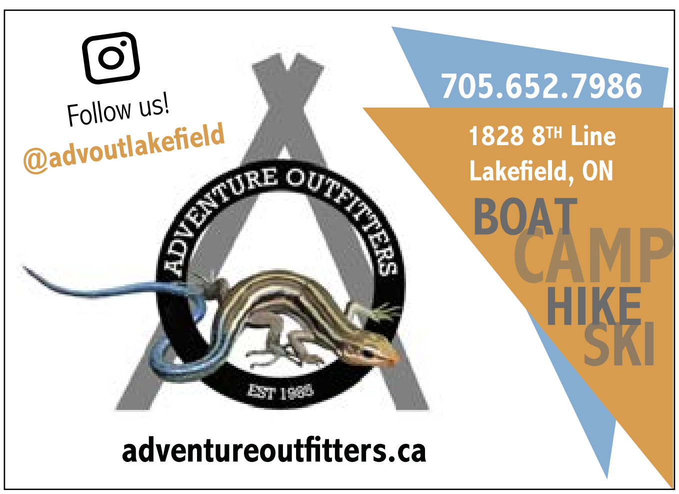
☐ Please do not publish my name or business name in KLSA publications.


CLEARVIEW
COTTAGE RESORT
No Words. Just Memories.
www.clearviewresort.com
705.652.3542
info@clearviewresort.com


ROCKY RIDGE
DRINKING WATER LIMITED
Peterborough's Bottled Water Company
Ian and David Green
(705) 743-1343
www.rockyridgewater.com


R&R Houseboat Rentals and Kawartha Lakes Marina...
Helping create memorable family vacations for over 14 years!
Contact us at:
info@rrhouseboats.com / 705-738-4800
info@kawarthalakesmarina.ca / 705-738-2983

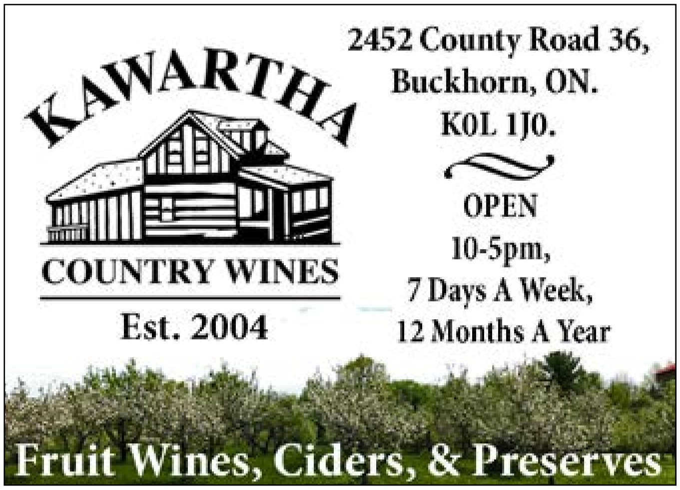

H&R BLOCK
CHAD IRVINE MANAGER
MASTER TAX PROFESSIONAL
116 Main Street, P.O. Box 1275
Bobcaygeon, ON K0M 2A0
Office: 705.738.1216
chad.irvine@hrblock.ca
HRBLOCK.CA


Follow us!
@advoutlakefield
ADVENTURE OUTFITTERS
EST 1985
705.652.7986
1828 8TH Line
Lakefield, ON
BOAT
CAMP
HIKE
SKI
adventureoutfitters.ca


SUBSCRIBE TO THE HERALD
Stay informed with the news that touches your life!
$45*
ONE YEAR
52 issues
*Anywhere in Canada!
We also offer digital printing services for all your needs:
Flyers, Rack Cards, Business Cards, Menus, Posters, Brochures & much more!
Lakefield Herald
74 Bridge Street • 705-652-6594
www.lakefieldherald.com • info@lakefieldherald.com


Home building centre
Roofing & Siding
OPENING SOON
Lakefield Home building centre
178 Water Street, Lakefield
P. (705) 652-0909
E. lee.gynane@homehardware.ca
Home Building Centre -Lakefield
lakefield_hbc
lakefield_hbc


Kawartha Home hardware
24 Queen St. Lakefield, ON
P 705 652 3171 | kawarthahomehardware.ca
facebook.com/LakefieldHomeHardware
twitter.com/hh_kawarthas
@kawarthahomehardware


KAWARTHA
COUNTRY WINES
Est. 2004
2452 County Road 36,
Buckhorn, ON.
K0L 1J0.
OPEN
10-5pm,
7 Days A Week,
12 Months A Year
Fruit Wines, Ciders, & Preserves


EASTMAN PLUMBING
RESIDENTIAL & COMMERCIAL
Licensed Well Technicians
Class 4
Pump Replacement
Well Inspections
Well Upgrades
Well Cleaning
Flow Testing
Treatment
Call now 705.324.4061


THE TASTE OF Cottage Country
EST. 1937
Kawartha
DAIRY
Fresh, by Nature.


Own a Short Term Rental?
Municipality of
Trent Lakes
The Municipality of Trent Lakes will be looking for public review and comment on the draft Licensing By-law starting in Spring 2024. Watch our website and sign up for our monthly newsletter to stay up-to-date.
Scan to join our email list!
or visit www.trentlakes.ca


Serving Cottage Country & The Peterborough Area
ROYAL LEPAGE
RED DIAMOND
AWARD 2022
ROYAL LEPAGE
NATIONAL
TOP 5%
AWARD
2022
Lynn Woodcroft B.Sc.
Sales Representative
www.lynnwoodcroft.com
Direct: 705-768-5588
lynnwoodcroft@royallepage.ca
ROYAL LEPAGE
FRANK Real Estate
INDEPENDENTLY OWNED AND OPERATED, BROKERAGE