How Can I Help My Lake?

Kawartha Lake Stewards Association
2013 Lake Water Quality Report

April 2014

KLSA

Kawartha Lake Stewards Association

Lake Water Quality Report - 2013

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

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You can view Adobe pdf versions of KLSA reports on the KLSA website:

klsa.wordpress.com

Cover photo by Janet Duval

THE ONTARIO TRILLIUM FOUNDATION

LA FONDATION TRILLIUM DE L'ONTARIO

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KLSA Editorial Committee (left to right): Sheila Gordon-Dillane (Chair): Kevin Walters, Tom Cathcart, Simon Conolly, Janet Duval, Kathleen Mackenzie. Absent: Ruth Kuchinad, Anita Locke, Pat Moffat.

Kawartha Lake Stewards Association
Executive Summary - 2013 Report

The Kawartha Lake Stewards Association (KLSA) is a volunteer-driven, non-profit organization of cottagers, year-round residents and local business owners in the Kawartha Lakes region. Established to provide a coordinated approach to lake water monitoring, the Association tests lake water for phosphorus, water clarity and *E.coli* bacteria during the spring, summer and early fall. In recent years, KLSA has expanded its activities into the areas of research and public education, forming valuable partnerships with Trent University, Fleming College and Kawartha Conservation resulting in research studies of aquatic plants and algae, the impact of nutrients on water quality and bacteria in stormwater runoff into the lakes. KLSA has also supported lake management planning initiatives, particularly in the City of Kawartha Lakes. The President of KLSA is Chris Appleton. A list of Directors is provided in Appendix A.

With support from the Ontario Trillium Foundation, KLSA has published two booklets: *Aquatic Plants Guide* (2009) and *The Algae of the Kawartha Lakes* (2012) to inform the public about causes of aquatic plant and algae growth and environmentally responsible management practices. This year's report highlights further actions individuals and organizations can take to protect and enhance water quality. A summary of articles contained in the 2013 *KLSA Annual Water Quality Report* follows.

Promoting Good Practices on Your Lake
Janet Duval, a member of the KLSA Board of Directors from 2006 – 2013, is a strong advocate for protecting the Kawartha Lakes by naturalizing shorelines and other stewardship initiatives. Her article describes resources individuals can obtain and share with their neighbours and examples of programs in Canada and the United States that encourage best practices in stewardship of our lakes and living in harmony with nature. Each of us can make a difference – it may start with a conversation.

Sturgeon Lake Management Plan (SLMP)
Under the leadership of the Kawartha Region Conservation Authority, a management plan has been developed for Sturgeon Lake. Meghan McDonough, a Resources Technician at KRCA, describes the process and results of the SLMP, intended to ensure the long-term sustainability of the Sturgeon Lake ecosystem that provides a high-quality destination for living and working, boating, swimming, fishing, tourism and access to water for household uses. Eight objectives provide the basic structure of the Plan and goals aimed at reducing phosphorus levels are set. Actions to achieve the targets include a site plan control by-law, septic tank inspection programs, protection of public beaches and a lake monitoring program. Shoreline property owners are encouraged to take action to reduce nutrient inputs into the lake and to undertake shoreline naturalization efforts such as planting native shrubs, grasses and flowers.

Gchi-Nibi – Sacred Water
Anishnaabe Elders in the Kawarthas tell stories of their ancestors who travelled throughout the Kawartha Lakes and accepted responsibility for caring for the lands and waters. TRACKS, the Trent Aboriginal Cultural Knowledge and Science Youth Program, offers programs such as workshops and summer camps to combine traditional Indigenous knowledge with science. Robyn Smith, TRACKS Youth Program Coordinator, describes the program that focuses on water (nibi) and building relationships with it. An international gathering, the Sacred Water Circle, takes place at Trent University on May 2-4, 2014.

***E.coli* Bacteria Testing**
In 2013, KLSA volunteers tested 88 sites in 15 lakes for *E.coli* bacteria. Samples were analyzed by SGS Lakefield Research or the Centre for Alternative Wastewater Treatment (CAWT) laboratory at Fleming College in Lindsay. Public beaches are posted as unsafe for swimming when levels reach 100 *E.coli*/100 mL of water. The KLSA believes that counts in the Kawartha Lakes should not exceed 50 *E.coli*/100 mL, given their high recreational use. In general, *E.coli* levels were low throughout the summer of 2013, consistent with other years. Of the 86 sites tested either five or six times, 63 were "very clean" (no readings above 20 *E.coli* per 100mL), 19 were "clean" (one or two readings above 20), and four were "somewhat elevated" (three readings over 20), mostly attributable to waterfowl. Detailed results can be found in Appendix E.

Phosphorus Testing
In 2013, as part of the Ministry of the Environment's Lake Partner Program, volunteers collected water samples four to six times (monthly from May to October) at 37 sites on 15 lakes for phosphorus testing. Samples were analyzed by the Ministry laboratory. Volunteers also measured water clarity, using a Secchi disk. The Ministry's

Provincial Water Quality Objectives consider average phosphorus levels exceeding 20 parts per billion (ppb) to be of concern since at that point algae growth accelerates, adversely affecting enjoyment of the lakes. Overall in the summer of 2013, average phosphorus levels were similar to those of previous years, although they were somewhat higher than usual in some lakes, especially in August. Detailed results of the 2013 Lake Partner Program are provided in Appendix F, along with a table of 2013 rainfall data in Appendix G.

2012 Kawartha Lakes Sewage Treatment Plants Report
Each year, KLSA Vice-Chair Kevin Walters monitors and reports on output from local sewage treatment plants. Data is only available for 2012. Phosphorus is a key indicator, and a primary cause of plant and algae growth in our lakes. The report includes results for Minden, Bobcaygeon, Coboconk, Fenelon Falls, Lindsay, Kings Bay, Omemee and Port Perry. The total volume of phosphorus discharged from the four aquatic plants in 2012 was 265 kg, down from 392 kg in 2011. There is still room for improvement, particularly in Bobcaygeon, Fenelon Falls and Port Perry, to meet our goal of 99% phosphorus removal. Continued monitoring of all STPs is vital.

Septic System Maintenance and Septic Tank Inspection Programs
KLSA Vice-President Kevin Walters and Board member Mike Dolbey contributed a series of articles on maintaining septic systems and inspection requirements. Kevin explains how septic systems work and addresses several misconceptions about the need for frequent pumpouts, leakage from septic beds and the use of bacterial supplements. In a separate article, Kevin discusses the issue of whether leaking septic systems pollute the lakes and whether inspection programs would make a difference. Noting that fourteen years of testing for *E.coli* have shown that levels are very low and are usually explained by other causes such as ducks and geese, he concludes that a risk analysis should be undertaken before new inspection programs are undertaken and that inspection should focus on areas most likely to have problems. Mike Dolbey's two articles outline the current Ontario Building Code requirements for Septic System Maintenance Inspection Programs and the results of a study of municipal reinspection conducted by the University of Guelph's Ontario Rural Wastewater Centre.

KLSA Membership and Upcoming Public Meetings
KLSA is introducing a new system of paid membership. The membership fee is $20 per year ($10 for full-time students). This will entitle members to vote at the AGM and to have a copy of the annual report mailed to them. KLSA holds two general meetings per year in the spring and fall. The fall meeting includes the Association's Annual General Meeting. In 2014, the spring meeting will be held at the Bobcaygeon Community Centre on Saturday, May 10 at 10 a.m. This meeting will include presentations expanding on the articles in this report. The fall meeting will be on Saturday, October 4 at 10 a.m. at Lakehurst Community Hall.

Thank You
The Kawartha Lake Stewards Association could not achieve its goals without the extraordinary support of the many volunteers who participate in our monitoring programs and the individuals, cottage associations, ratepayer associations, municipalities and businesses that provide financial support. We are also very grateful to the Trent-Severn Waterway for its annual grant and to the Ontario Trillium Foundation for funding our aquatic plants and algae projects. Thank you also to Dr. Paul Frost, Dr. Eric Sager and their colleagues at Trent University and Fleming College for their scientific advice and ongoing support of our work, staff at the Ministry of the Environment Lake Partner Program and staff at SGS Lakefield Research and the Centre for Alternative Wastewater Treatment at Fleming College who assist with the water testing program. Thank you also to George Gillespie of McColl Turner LLP for reviewing our financial records. We are also very grateful to Simon Conolly, publisher of the *Lakefield Herald*, for his assistance with the publication of this report. Please join the KLSA and also consider making a donation to support our work. For further details, visit our website: http://klsa.wordpress.com.

Chair's Message

Chris Appleton, Chair, Kawartha Lake Stewards Association

As the incoming Chair of KLSA, I must first thank our retiring Chair, Mike Stedman, who is stepping down after four years in that capacity. Mike has made a tremendous contribution to KLSA over the years, and we are thankful that he has agreed to stay on the Board of Directors as Treasurer in 2014. We continue to benefit from his guidance.

Spring flood
In 2013 we started the season with the biggest spring floods in recent memory. Records were set, and property damage was, in some cases, severe. The wide open dams and enormous rapids were a sight to behold. Considering events in Toronto and Calgary later in the year, 2013 could go down as the year of the flood.

Events like spring flooding remind us of how vulnerable we are to the forces of nature. In spite of the best efforts of the Trent-Severn Waterway (TSW) to predict and manage spring water flows over their 160+ dams, Mother Nature conspired to throw warm and heavy spring rains on a melting snowpack sitting on frozen ground, resulting in a runoff beyond all predictions. We commend the TSW, and all associated governmental and other agencies, for their dedicated efforts in managing through the crisis, and in helping those in need.

Lake planning
The Kawartha Region Conservation Authority (KRCA) has finalized a draft plan for Sturgeon Lake, which we anticipate will receive all necessary approvals this year. There is a more detailed article on lake planning from KRCA in this Report. Studies continue on other lakes, including Balsam, Cameron and Pigeon. Stewardship "best management practices" are recommended and reinforced in these lake plans, and the Sturgeon Lake Plan should now progress to implementation. KLSA remains fully engaged with KRCA on lake planning, with KLSA Director Doug Erlandson stepping in as Chair of the Community Advisory Panel for the Balsam Lake Plan. We are very grateful for the support that the City of Kawartha Lakes continues to provide to KRCA for lake planning.

The Trent-Severn Waterway
The TSW continues to face challenges, beyond managing water levels. There are financial, operational and infrastructure issues that need to be addressed, in a climate of austerity and cutbacks. Reduced operating hours and increased fees can only hurt the tourism business. The Kawartha community faces a great challenge if the TSW is not properly staffed and managed. KLSA will continue to remain involved in the continuing discussions amongst the many politicians and stakeholders.

Water testing
KLSA will continue water testing in 2014. We have established a good record on the lakes through our studies, and will continue to collaborate with educational and other partners on water quality projects. 2013 test results are included in detail in this Report.

Stewardship
KLSA intends to pursue and promote stewardship projects in 2014 by collaborating with partners and implementing best management practices. Shoreline naturalization is a good example. KLSA has accumulated project funds that we intend to leverage with matching grants from other institutions and agencies. The chance for a successful grant application is increased by the amount KLSA contributes, so member donations help considerably.

In past years, some individual donations to KLSA were made payable to the Stony Lake Heritage Foundation, which issued a charitable donation receipt, but this has been discontinued.

Membership
KLSA is implementing a new membership structure for individuals. The annual fee will be $20 per person, $10 for students. Members will be entitled to vote at the Annual General Meeting and will receive a copy of the annual report.

Municipal/provincial election year
2014 is a municipal election year. It may also be a provincial election year. KLSA will encourage a public discussion of issues related to the environment and the future management of the Kawartha watershed.

Appreciation
Thank you to the members of the Board of Directors, committee members and our scientific advisors, water testers, speakers at our public meetings and contributors to this report for volunteering their time and expertise. We are also grateful to the government agencies, businesses and individual donors who have supported our work. Special thanks also to George Gillespie, McColl Turner LLP for his help with our financial reports and Simon Conolly, publisher of The Lakefield Herald, for his assistance with the publication of this Report.

KLSA 2014 Spring and Fall Meetings

KLSA's spring meeting will be held on **Saturday, May 10, 2014 at 10 a.m.** at the Bobcaygeon Community Centre. The spring meeting will include presentations expanding on the content of our 2013 annual Water Quality Report.

KLSA's fall meeting, which includes the Annual General Meeting, is scheduled for **Saturday, October 4, 2014 at 10 a.m.** at Lakehurst Community Hall. The AGM will include the election of the Board of Directors.

We hope to see you at these meetings! Bring your questions and comments! Bring your neighbours!

Become a KLSA member. For further information, visit klsa.wordpress.com. Find us on Facebook. What's new on your lake? Share your findings and find out what others are doing.

The KLSA Board: Back Row Kevin Walters, Mike Dolbey, Doug Erlandson, Tom Cathcart, Mike Stedman, Sheila Gordon-Dillane. Front Row Jeff Chalmers, Chris Appleton (Chair), Ann Ambler, Heathyr Francis, Lynn Woodcroft. Absent Kathleen Mackenzie.

Promoting Good Practices on Your Lake

Janet Duval, former KLSA Director

When you live on a lake, the things that you or your neighbour do can affect everyone. Perhaps the fellow on one side of you fertilizes his lawn regularly. You cringe, thinking of all that phosphorus leaching into the lake and feeding the weeds. The woman on the other side has a concrete retaining wall along her shoreline, another environmental no-no. New owners down the way cut down their trees, then graded and sodded the land to the water's edge. What's a good environmentalist to do?

Talk to your neighbour

"Start with a conversation," says Mike Gibbs of Lakeland Alliance. If you're on good terms with your neighbour, wait for the right moment, perhaps when you're sharing a drink on the dock. Drop a nugget of information about good environmental practice, be non-judgmental, and let it percolate for a while. "We all start somewhere with environmental awareness," says Gibbs. "Bluster and self-righteousness won't work. Your neighbours may not realize they're doing anything wrong. Do your homework, and be ready to answer their questions." A day or two later, you might drop off one of many easily obtained publications for them to read. Examples:

- *Sustainable Lakeshore Living and Shoreline Naturalization* klsa.wordpress.com/what-can-you-do/sustainable-shore/
- *A Shoreline Owner's Guide to Healthy Waterfronts* produced by the Federation of Ontario Cottagers' Associations (FOCA). Download from lakelandalliance.net or the FOCA web site foca.on.ca. The FOCA website offers many other fact sheets and videos.
- *Aquatic Plants Guide: Aquatic plants in the Kawartha Lakes - their growth, importance and management* Find it at klsa.wordpress.com on left side of the home page
- *Restoring Healthy Shorelines* from Peterborough Green-Up. Get it at lakelandalliance.net
- Kawartha Conservation offers plenty of good advice and publications at kawarthaconservation. com. Look under Programs: Stewardship on their menu
- The Blue Canoe program (see below) offers much helpful information including shoreline protection, lawn care, scoop the poop, car and driveway care, and rainwater collection at www. kawarthaconservation.com/bluecanoe

Some of these publications may be available in print form at KLSA's public meetings, held twice a year.

It gets trickier if you don't really know your neighbour, or if your relationship is a bit testy. You don't know whether their environmentally unfriendly practices stem from ignorance or intention, and the last thing you want is to create enmity. "I see a lot of urban style lawns running down to the lake," says Chris Appleton, KLSA Chair and a cottager on Sturgeon Lake. He's the recent winner of Kawartha Conservation's Individual Conservationist Award. "It's a matter of education and aesthetics. People like their lawns. They don't connect the dots between relaxing with a drink on green, fertilized grass and watching algae grow in the lake."

Dave Pridham of Kawartha Conservation agrees. "Some people bring urban lawn and garden ideas to the cottage. It can take a while to convince them to accept more naturalized landscaping. Even your own family can be a tough sell." He believes improvements in lake environments are inevitable, but cultural change will take time. "We have to work within the lake community and learn to be patient."

One thing he'd like to see is garden tours of naturalized shorelines. "At Kawartha Conservation, we try to encourage the innovators," he says. "Often they're respected individuals in the community. When others see what they're doing, they may follow."

Appleton, too, recommends leading by example. "People will see that naturalizing the shoreline, even with a row of daisies, helps stop runoff and has the added advantage of keeping away Canada geese."

If you belong to a cottage association

- The newsletter is a great place to start. Can you feed the editor a short article about good landscape management or shoreline practices? Or tiny tidbits to be published in every issue? A good newsletter will constantly educate its readers on issues that affect everyone.
- If you're not a writer, print off copies of any of the publications above and ask that they be distributed along with the newsletter or at meetings. Your executive could keep a stash of them to give out every time someone new joins your association.
- Talk about good shoreline practices at meetings, or invite a local expert to do so. Kawartha Conservation, for example, offers speakers and advice: just ask.
- Host an Open House for the Environment. It shouldn't be hard to bring in a speaker, displays and plenty of free handouts. Hold it on the property of an "early adopter" who uses many good environmental practices.

Take it up another level

We're beginning to see a number of initiatives that promote good management of entire lakes or watersheds.

BLUE CANOE PROGRAM

You're lucky if you live on Balsam, Cameron, Pigeon or Sturgeon Lake. The **Blue Canoe** team is ready to drop by for a personal visit, a "dock talk" or a presentation at your association meeting, bringing personalized tips and advice to help improve and protect your lake and your properties. Funded equally by the City of Kawartha Lakes and the Royal Bank's Blue Water Project, they hope to reach thousands of landowners in the western Kawartha lakes. Call 705-328-2271 ext. 223 for an appointment, or write bluecanoe@kawarthaconservation.com.

Blue Canoe, reprinted with permission

A Blue Canoe team is ready to come to your dock.

Lakeland Alliance, a collaborative initiative based in Peterborough, is piloting the **Love Your Lake** program promoting shoreline naturalization. In 2013 they surveyed waterfronts on all 1165 Chandos Lake properties near Apsley, input the findings to a database hosted by the Canadian Wildlife Federation, and will provide a customized report to every property owner on how they might naturalize their shore and be good stewards of the lake in general.

Love your Lake

The Chandos Lake project was funded by a Trillium grant, but it's Mike Gibbs' hope that the methodology could be made available to any lake association and expanded nationally. "It could run on a shoestring budget, with the surveying done by university students. Property owners could get a mailed or emailed notice the following spring when their individual report is ready for downloading from a web site." So for a small investment, lake associations might get a big payoff.

Meanwhile, Gibbs may be available for visits to specific lakes to give general stewardship advice, subject to funding and travel time. Your lake association should line up several interested owners who are ready for site visits on a mutually agreeable day.

One very effective program we know of is the **Restore the Shore Challenge** run by Muskoka's Lake Vernon Association. They award a *Restore the Shore* plaque to members who naturalize as little as one square metre of shoreline, a first step to good environmental practices. "The goal is education," says executive member Mar McBrien. Lake Vernon cottagers who hope to earn the award can sign up online or at the annual meeting, then learn about good shoreline practices at a workshop run by Muskoka Conservancy. "That works well" says McBrien. "We piggyback onto their expertise. They have funding to give the workshop; we do the footwork afterwards." Some owners simply commit to leave their shore in its already-natural state, once they learn the merits of doing so.

McBrien takes a picture of each property before cottagers get to work, then returns for an informal assessment when they're done. It's almost guaranteed that everyone who works to naturalize their shore will be honoured at the next annual meeting, complete with a Before and After slide show. "People are so proud to get the award," she says. "Some of them mount the plaque right by their shore for others to see: it's waterproof. We like this method of gentle, positive reinforcement rather than a strict, hardline approach. Anyone can plant a square metre!" And some do much more. Right away, they're learning to identify native plants versus ornamentals, remove invasives, and restore their shoreline to a natural state. A local nursery owner who believes strongly in the program offers a big discount for appropriate plants. The only cost to the lake association is the plaques. "You have to think about how prestigious you want this award to be," says McBrien. "If it's too hard to get it, people won't even try." So there's no detailed checklist for what property owners must do, just a commitment to get started on good shoreline practices.

For more information go to www.lake-vernon.ca/restore-the-shore.html

The Lake of the Woods District Property Owners Association has been running a **Lakesmart** project for three years now, very similar to the Blue Canoe program. Two student ambassadors visit hundreds of properties each summer delivering healthy shoreline information kits to help residents be as environmentally conscious as possible. The Association calls it "one of the most successful outreach programs in recent history." It has generated new members for the association and is "vital to our goal of sustaining the association and preserving the watershed."

The state of Maine has a more complex **LakeSmart** program run by its Department of Environmental Protection. State officials award a certificate and sign to property owners who score 67% or more for good practices in five areas:

- Road, Driveway and Parking Areas
- Structures and Septic System
- Lawn, Recreation Areas and Footpaths
- Shorefront and Beach
- Undeveloped Land.

According to its web site, the state is currently working with 33 lake associations that are willing to make a three-year commitment to encouraging LakeSmart practices. "We want lakes to reach the self-sustaining point of 15% of shoreline properties being LakeSmart. Social marketing theory states that if 15% of a community is engaged in a new behavior, that behavior has the momentum to spread on its own; so lake-friendly practices will spread."

Lake Management Plans

People who care about their lakes are coming together to push for good environmental practices and land use policies. Some are developing Lake Management Plans (LMPs) endorsed by all stakeholders. It's a difficult process that can take years. "Anything that involves land use policy typically has to go to through the municipal process," says Chris Appleton, who is involved with the Sturgeon Lake Management Plan. "I've learned how patient you have to be."

LMPs have no authority over private property, but they can make recommendations as to best practices

such as shoreline naturalization. There may even be a recommendation that governments consider a ban on phosphorus in fertilizer. "I think in ten years we may see that," says Appleton. "It's already happening in some jurisdictions."

Conservation authorities often take the lead in LMPs, but it is municipalities that implement most land use regulations such as site planning, septic inspections or shoreline controls. New developments bring in new taxes. It can be a tough sell asking elected officials for more environmental controls on those developments. "Politicians need to hear from us," says Appleton. "Public pressure on councils will eventually bring in responsible practices."

KLSA Chair Chris Appleton

A better future?

Our lakes were once pristine gems, inhabited by people who lived lightly on the land and in harmony with the natural world upon which they depended. Can we get back to that? "The personal is the political." Each of us can make a difference. It may start with a conversation.

Another Meaning for 'TSW'?

Kevin Walters, B.A.Sc., P.Eng.
Vice-Chair, KLSA

Many people are unaware of the name changes that occurred in southern Ontario, or rather Upper Canada, in the very late 1700s with the arrival of Governor Simcoe, that staunch British monarchist Governor of Upper Canada.

In order to make Upper Canada more British in response to the growing democratic and republican threat to the south, and to make the region more appealing to British immigrants, Simcoe changed long-standing non-English southern Ontario names into English ones. Most of these original names were, linguistically, native or French, or Franco-native. The most notable example of the change was the elimination of the name 'Toronto' from the maps. 'Toronto' is Iroquois for 'where trees stand in the water'. It had applied to the town where the current city stands; to the large lake (now Simcoe) to the north of it; and to the river flowing out of that lake into what is now Georgian Bay. Even that bay may have been called Toronto Bay, or the name may have applied only to the innermost part of it, more recently renamed Severn Sound.

Accordingly, the Severn River was formerly the Toronto River, and Lake Simcoe was formerly Lake Toronto (also known by the French translation 'Lac La Clie'). See "The Toronto Lakes" in KLSA's *2012 Lake Water Quality Report*. Only the town, which he had renamed York, eventually returned to the former name of Toronto.

At the other end of the Trent-Severn Waterway (TSW) we have the Trent River, which was formerly the Saggettewedgewam River, Ojibwa/Chippewa, apparently, for 'river hard to travel'. If these names had not been changed, we might still have the TSW, but it would stand for the Toronto-Saggettewedgewam Waterway.

Sturgeon Lake Management Plan

A Guide to Ensuring Long-Term Sustainability of the Lake

Meghan McDonough, Resources Technician, Kawartha Conservation

Sturgeon Lake is a central hub-lake of the Trent-Severn Waterway and is highly valued for providing significant economic, social and ecological benefits to those who live, work and recreate in the Kawartha Lakes region. The *Sturgeon Lake Management Plan* (SLMP) is a community-driven endeavour, stemming from a common resolve to maintain this healthy lake environment in light of pressures that threaten its long-term sustainability.

In response to lake pressures, Kawartha Conservation, funded primarily by the City of Kawartha Lakes (CKL), and by working with volunteers and partners, developed a lake management plan to sustain the health and natural features of Sturgeon Lake. The SLMP focuses on the entire ecosystem of the lake, including nutrient inputs from major tributaries, urban areas and shoreline communities, aquatic habitats and the rural lands within the watershed that drain to Sturgeon Lake.

The intent of the SLMP is to: *"Ensure the long-term sustainability of a Sturgeon Lake ecosystem that provides a high-quality destination for living and working, boating, swimming, fishing, tourism, and access to water for household uses."* The SLMP will achieve this by addressing land use pressures and other community based concerns through protecting and improving water quality, promoting sustainable land management practices, and using science-based findings to guide the City of Kawartha Lakes Official Plan policies to protect the lake and its watershed.

A series of objectives act as the base structure for the Plan. These were formed by considering all of the lake studies and lake stakeholder-based issues surrounding the lake, summarized as follows.

1. Minimize pollution entering the lake from human sources.
2. Enhance swimming opportunities at public beaches.
3. Maintain the biodiversity of the lake ecosystem.
4. Maintain recreational access along populated waterfront areas.
5. Enhance and maintain the natural integrity of the shoreline.
6. Maintain healthy and productive sport fish populations.
7. Ensure the permit application process for works projects is transparent and efficient.
8. Improve our understanding of how the lake will respond to emerging pressures.

Specific targets were developed for agricultural, urban and shoreline areas, with management activities designed to address the pressures to the watershed, and these are outlined in detail in the SLMP. The draft plan has been posted at the website below:
http://www.kawarthaconservation.com/cklplans/newseventsreports.html

In addition, certain recommendations are proposed that will strengthen municipal plan policies as they pertain to development activities for shoreline areas:

- Strengthening protection for shorelines and natural heritage features and linkages through enhancements to the CKL Official Plan
- Development of a tree conservation by-law with the intent of protecting larger wooded areas near shorelines
- The CKL is in the process of developing a Secondary Plan for shorelines.

Targets

The SLMP includes a number of short- and long-term targets:

- Within a 5-year period, achieve a target of 50% of lakeside residences having greater than 25% of their shoreline naturalized to a minimum of 3 metres (10 feet) from the water's edge.
- Within a 5-year period, achieve a target of increasing streamside vegetation in the core Sturgeon Lake planning area by 1% (21 acres) of the current deficit each year. This will be accomplished by a

combination of planting (50%) and natural regeneration (50%), primarily along stream corridors in targeted locations.
- Over the long term, achieve a 35% reduction in existing phosphorus loading from local agricultural sources.
- Over the long term, achieve a 56% reduction in existing phosphorus loading from local urban sources.

Examples of actions

To achieve the targets identified in the plan, an extensive list of recommended actions has been developed for implementation at all levels from residents to municipalities, including:

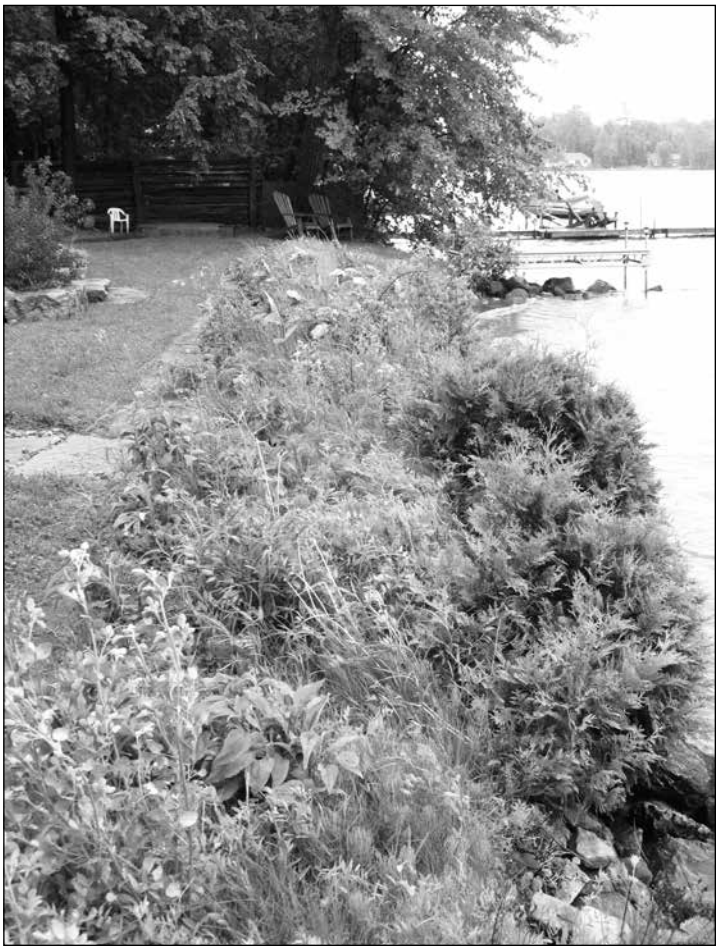
- Develop a site plan control by-law for shoreline areas to protect and enhance natural vegetation and significant habitat, establish buffer zones, and improve water quality.
- Increase community enjoyment of public beaches and waterfronts by deterring geese, conducting regular maintenance, and increasing public access.
- Implement a coordinated lake monitoring program that regularly tracks key indicators of watershed health, including nutrients, forest cover, fish communities and oxygen levels.
- Implement a septic inspection program to identify and facilitate the repair, upgrade, or replacement of faulty septic systems in heavily developed shoreline areas.
- Create opportunities for input to plan implementation and updates, and regularly assess target audience needs, values, concerns, interests, barriers and knowledge gaps.

Everyone in the watershed shares a responsibility for the current state of the lake, so everyone is needed to participate in management efforts. A broad spectrum of partners, businesses and residents is required in the implementation process in the watershed.

Shoreline owners should all be asking, "What can I do on my property to help my lake?" You can do a quick inventory of your property and ask yourself:

- Does the lawn really need to be fertilized? Consider reducing or eliminating fertilizer use entirely. This will help to reduce nutrient inputs into the lake that contribute to excess algae growth.
- Is the shoreline area naturalized, with the ability to capture and filter as much runoff as possible? It doesn't have to be treed and view obstructing, but a wide 'no mow' zone with some deep rooted, sturdy perennial flowers or grasses (preferably of a native species) and a few shrubs or pruned cedar is ultimately more pleasing and lake friendly than a mowed lawn. An added benefit will be that it keeps the geese away.
- Is the septic system working well? Here's a good website, with links to further information: www.kawarthaconservation.com/septicsystems/index.html

Shoreline owners are on the front line when it comes to protecting water quality and aquatic habitats, and collectively have a big impact on their lake. Making subtle changes to implement a more natural style of landscaping does not have to be expensive, will be pleasing and attractive, and - when adopted by many across the landscape - will have great results.



Kawartha Conservation

A property where the owner stopped cutting the grass along the shoreline. Naturalization has been enhanced by several trees that have established themselves over the last five years, and with the planting of perennial plants. The total cost was less than $200.00.

Gchi-Nibi – Sacred Water

Robyn Smith, TRACKS Youth Program Coordinator

Many of us who enjoy waterfront living are grateful for the gifts the lake gives us: the sound of its waves, the freshness of the breeze, the beautiful views of sunset, sunrise, rain falling on the ever-changing colours of the water. We give thanks that we are able to fish, swim, canoe, play on the shore with children and grandchildren, splash about in its shallow waters. Some of us even pipe this water into our homes for washing dishes and clothes or other practical tasks.

Anishinaabe Elders of this region speak of a time not too long ago when the Indigenous people of this region and settlers too could drink straight from the waterways of the Kawarthas. They tell stories of fishing freely, of moving along the shore to follow the seasons. The Indigenous people who travelled among the lakes lived in relationship with all of Creation and accepted the responsibility of caring for the land and waters.

This act of relationship building is one of the tenets of TRACKS, the TRent Aboriginal Cultural Knowledge and Science Youth Program run through Trent University's Indigenous Environmental Studies department. We run a series of workshops, outreach activities, and summer camp programming with the intention of weaving traditional Indigenous knowledge and science. By exposing people to different worldviews and incorporating the best from both, we believe that science and cultural knowledge are not at odds; rather, they complement each other so we can have a broader perspective.

One of our most popular programs is our Gchi-Nibi Sacred Water workshop, where we discuss our relationship

TRACKS youth discover the marvels of water filtration.

to water. While we learn about water's scientific properties and consider the gifts water (nibi) brings to us, we also take time to discuss the reciprocity of this relationship and how we can give back to the water. Many of us give back by respecting and advocating for the water, avoiding flushing chemicals into our waterways (cleaning products, pesticides, medication), and joining community organizations to become lake stewards. All of us can work to build relationships with nibi.

For the Mississauga Anishinaabe and other nations who lived here, this relationship was dramatically altered with the advent of settlement and colonization - and much of the private land we own and enjoy was appropriated illegally by the original settlers. While none of us is directly responsible for what has happened in the past, we all carry the responsibility to do our part to move forward in solidarity with the Indigenous peoples of this area. Part of this work is to rebuild these relationships - with Creation, with the water, with the Indigenous people who continue to live on and with this land. Another part of this work is to understand our history here, to learn from the people who were here first, and to support them in their work for the land and water.

As a first step, we could explore the history of our homes. Who lived here first? What was their relationship to the water? What are the original names given to this area, and do we know any of the stories that move with it? At TRACKS, we explore these important truths so that Indigenous youth can access programming that allows them to learn and share in cultural teachings, and non-Indigenous youth can learn about building relationships and working in solidarity.

TRACKS program participants gather in the tipi at Trent University.

The songs and teachings from our Gchi-Nibi workshop come from the wise and wonderful Dorothy Taylor from Curve Lake, who learned these teachings from her Elders. She speaks of the role of women in caring for the water and how to build a relationship with nibi through song and prayer. If you are interested in Dorothy's work for the water and would like to get involved, I encourage you to learn about the Sacred Water Circle (www.sacredwater.ca) and consider attending their international Gathering, May 2-4 at Trent University.

If you'd like more information on the TRACKS Youth Program or know of young people who might be interested in volunteering or attending camp, please contact us at trackscamp@gmail.com or find us on Facebook. We will be running open camp weeks at Trent from July 21-25 (ages 8-11) and July 28-August 1 (ages 12-15). Cost is $175 per camp session.

E.coli Bacteria Testing

Kathleen Mackenzie, KLSA Vice-Chair

Two summers ago, I stood in line at the Lakefield Home Hardware store while a woman in front of me complained bitterly about the closing of the Lakefield Beach due to high bacterial counts. She was especially upset because it was extremely hot, their air conditioning had broken down, they had young children, etc. Then she stated that the Kawartha Lakes needed to be cleaned up – people were letting all sorts of bacteria into the lakes! At that point, I had to say something. I stated confidently that a number of people I knew had been testing for bacteria on the Kawartha Lakes for twelve years, and had found them to be very clean. There was the occasional high count, but so far these seemed to be related mainly to high populations of birds, not careless humans. I hope she felt better; I know I felt good about being able to put a single beach closure into perspective.

So, thank you, volunteers, for amassing enough data that we now know how clean our lakes really are. Thanks for your time driving your boats around the lakes over the past 13 years, and then shuttling samples to the lab on scorching hot summer days. If there are more of you out there who might be interested in water testing in your area of interest, please contact us; the contracts with our laboratories make such testing very affordable.

There were somewhat fewer sites tested in 2013 than in previous years. Some lakes that have a long history of testing are now cutting back on their sites. Our volunteers tested 88 sites on 15 Kawartha Lakes, up to six times throughout the summer. The samples from 60 sites were analyzed by SGS Lakefield, and 28 were analyzed by the Centre for Alternative Wastewater Treatment at Fleming College in Lindsay.

To see complete results, please refer to Appendix E.

A normal clean year

As in the past 12 years, almost all sites showed excellent water quality for recreational use, with only occasional counts over 20 *E.coli*/100 mL. Of the 86 sites that were tested five or six times, results can be summarized as follows:

Site Rating	Number of Sites	Comments
'Very clean'; all readings less than 20 *E.coli*/100 mL	63	These low counts indicate excellent recreational water quality, and reflect good management practices by lake users.
'Clean'; one or two readings over 20 *E.coli*/100 mL	19	
'Somewhat elevated'; three readings over 20 *E.coli*/100 mL	4	The most likely source of bacteria for these sites is waterfowl.

Phosphorus Testing

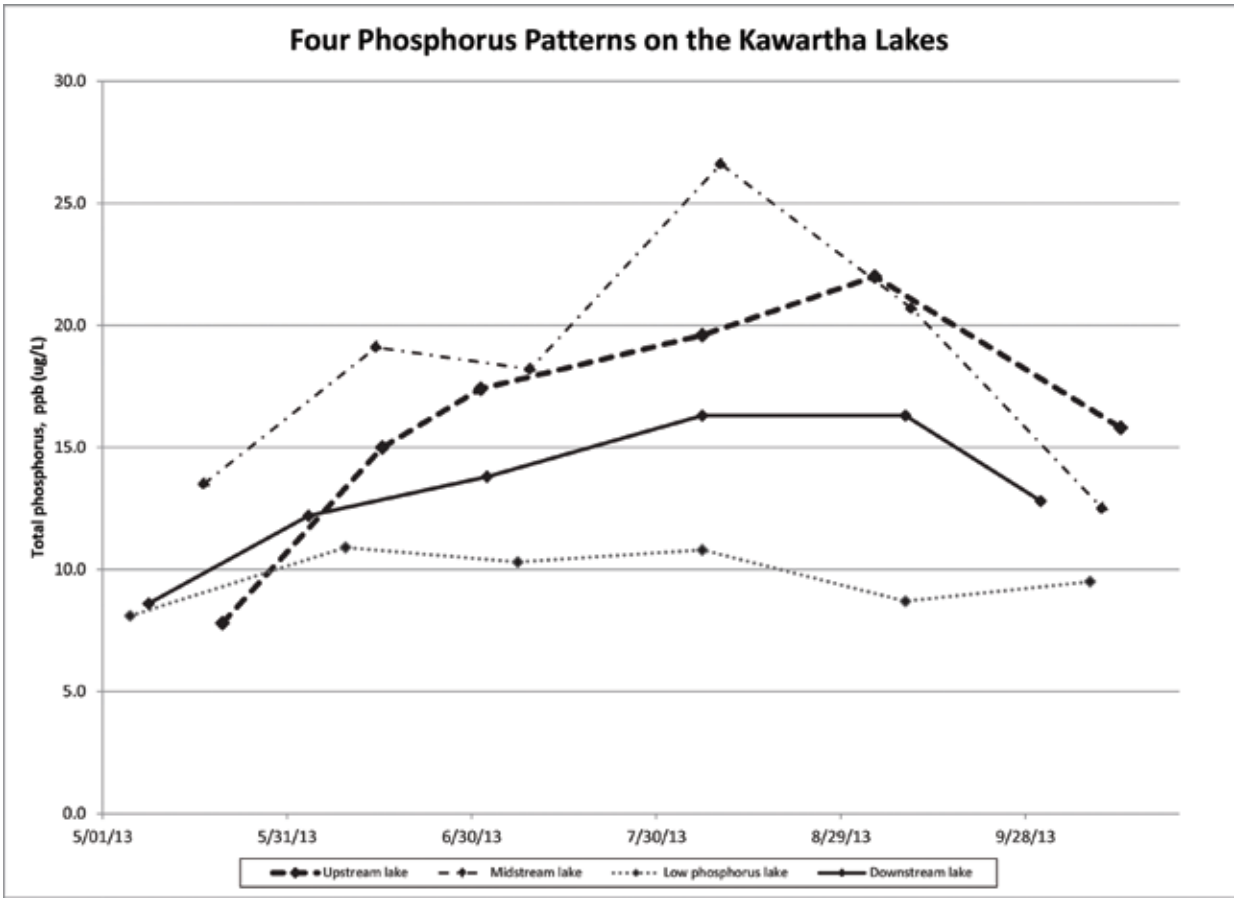
Kathleen Mackenzie, KLSA Vice-Chair

In 2013, KLSA volunteers measured phosphorus levels at 37 sites on 15 Kawartha Lakes up to six times during the ice-out season . We were pleased that Cameron Lake added one more testing site.

If you are interested in testing, please contact KLSA. Equipment and instructions are supplied by the Ontario Ministry of the Environment's Lake Partner Program at no cost. We are especially interested in adding testers in north Chemong Lake, south Pigeon Lake and Buckhorn Lake.

To see complete data, please refer to Appendix F.

Four phosphorus patterns found on the Kawartha Lakes
As in previous years, the Kawartha Lakes can be divided into four groups according to their phosphorus levels during the ice-out season (see graph below).



The four types of lakes, classified according to phosphorus levels, are:
1. Low phosphorus lakes (Balsam, Big Bald, Cameron, Sandy and Upper Stoney Lake): Phosphorus levels were stable from May to September, hovering around 10 ppb. Two of these lakes receive low-phosphorus water directly from the north, where human population is sparse. Big Bald and Sandy Lakes receive their water from the immediate watershed consisting of mostly limestone plain, which releases phosphorus very slowly.

2. Upstream lakes (Sturgeon and Pigeon Lake): Like the low phosphorus lakes, phosphorus levels started out at about 10 ppb. Levels then rose to about 20 ppb in early August, and decreased to about 15 ppb by September. These lakes are influenced by sewage treatment plants, and stormwater runoff from Lindsay, Fenelon Falls, Bobcaygeon and agricultural areas.

3. *Midstream lakes (Chemong, Lower Buckhorn and Lovesick Lake):* These lakes started out in the spring at a low phosphorus level of 10 ppb. However, phosphorus levels then climbed, this year more than usual, to about 25 ppb. Phosphorus levels fell by September. It seems that, as the water flows downstream, it gains phosphorus, likely from lake sediments.

4. *Downstream lakes (Stony, Clear, White and Katchewanooka):* Most of the water in these lakes comes from Lovesick, but is diluted with water from low phosphorus Upper Stoney Lake.

It is interesting to have such a variety in phosphorus characters among such closely related lakes. These lake groups have been consistent since we started testing 12 years ago.

Shelley Durham, City of Kawartha Lakes

The Lindsay water pollution control plant aeration pond. Here, aeration is used to promote the biological oxidation of wastewaters. The black pots are bubblers.

2012 Kawartha Lakes Sewage Treatment Plants Report

Kevin Walters, B.A.Sc., P.Eng.
Vice-Chair, KLSA

As we have indicated before, our plant data is always behind one year, as the reports for the previous year are not available to us before going to press. Most of these reports are now online on the City of Kawartha Lakes web site: http://www.city.kawarthalakes.on.ca/residents/water-and-wastewater/reports/annual-wastewater-reports

This year we have expanded the report to include two 'indirect' sewage treatment plants (STPs), Minden and Port Perry, which are outside of the City of Kawartha Lakes. By indirect, I mean those plants that are not discharging directly to our Kawartha Lakes, and have at least one body of water in between to attenuate the effects of the effluent discharge.

Minden
Minden's plant discharges to the Gull River just above Gull Lake, which is two lakes away from our most upstream Kawartha lake, Shadow Lake. In 2012 this plant performed quite well with a phosphorus (P) removal rate of **98.0%,** not quite meeting our target of 99%, and resulting in a loading of **12.8 kg** P for the year.

E.coli discharges were appropriately low at 2.72 colony forming units (cfu). No spills or other problems were reported for this plant.

Bobcaygeon
This town has two side-by-side sewage treatment plants. In the past, one of the plants was problematic, with operational problems and high phosphorus discharges. Last year, both plants operated well and we saw a big improvement, with discharges to Pigeon Lake being far below the generous amount allowed by the Certificate of Approval (C of A). C of As are established when a plant needs Ministry of Environment approval to construct, modify or expand, and if no approvals for such changes are needed for some time, then a C of A can become quite old with less rigorous standards. In 2012, the output for the year was **43.2 kg**, a large improvement over the previous year's 66 kg. This is substantially below the 1.3 kg *per day* that the plant is permitted to discharge. We have to assume that the recent total elimination of phosphorus from all domestic detergents and cleaning products has assisted in this reduction. Removal rate for the year was an improved **97.9%,** which is getting closer to our desired target of 99%.

E.coli discharges were also very low, at only 2.54 cfu per 100 ml on an annual basis. No bypasses, overflows or spillage to the lakes were reported. Odour from the plant continues to be a problem from time to time, and a pilot program was underway to evaluate a method of odour control.

Coboconk
This lagoon system continues to function well, with discharges to the Gull River just above town occurring in May and October only. Average phosphorus discharges were under 0.03 mg/L. Removal rate was **99.43%,** exceeding our target of 99%. The total annual discharge of phosphorus was only approximately **1.2 kg**, another big improvement over last year (5.8 kg).

E.coli discharges were up from last year at 5.5 cfu on average. Given the time of year for the discharges, this is not particularly a concern. No spills, bypasses or overflows were reported. Odour complaints were received on a couple of occasions, but odour was not as severe as in the past.

Fenelon Falls
This year we caught a recurring error in the Fenelon Falls plant report. What they have been stating in their reports as their annual average phosphorus removal rate, has, in fact, been the monthly maximum level. We had thought that these 99%+ rates were surprisingly high. Accordingly, for this year, the stated 99.3% removal rate was in fact only **97.8%,** below our target of 99%, and comparable to Bobcaygeon. Last year's rate was actually 96.8%, not the 98.8% they reported (which we reiterated in our 2012 *Report*), so this year is an improvement. We expect that all future reports will avoid this error.

Discharge rates were between 0.03 and 0.12 mg/L every month (average 0.05 mg/L). The C of A allows 10 times that at 0.5 mg/L. This removal rate occurs in spite of ongoing problems with tertiary filter operations, which appear to have been resolved by July. Still, total phosphorus discharge for the year from this plant was 19.4 kg, less than half of Bobcaygeon's.

Cross-connections (storm sewer connections into sanitary sewer systems and vice versa) still appear to be a serious problem here. During high rainfall and/or snowmelt events, this year, as in the past, some raw sewage from the sanitary sewer system flushed straight into the lake, bypassing the treatment plant completely when a pumping station on Colbourne Street was overwhelmed by the flow. The bypass lasted three days in October/November, which resulted in 3216 m^3 of untreated sewage being discharged, or about 1% of the total amount of sewage generated for the year.

Phosphorus levels were recorded, and the net effect of this spill was to add approximately 8.1 kg of phosphorus to the lakes, for a total of **27.5 kg**, diminishing the effective treatment of Fenelon's sewage to **96.8%.** It is clear that this ongoing inflow issue must be explored and resolved by the City.

E.coli levels in the effluent were again around 2 cfu.

Lindsay
This plant, the largest on the lakes, continues to work well, showing improved effluent quality over each of the last two years. Phosphorus discharges averaged 0.043 mg/L, whereas the C of A allows five times this at 0.2 mg/L. Removal rate averaged **98.23%**, up one percent from last year. Total annual phosphorus discharge amounted to **193 kg**, down substantially from last year's 288 kg. Even more good news is that there were no spills or bypasses in 2012, and no complaints were received.

Average *E.coli* in the discharges was 2.4 cfu per 100 ml, also down substantially from last year.

Kings Bay
This plant is functioning better than last year, and the effluent targets continue to be met. Phosphorus discharge to the underground disposal bed averaged 0.32 mg/L, down from last year, out of an allowable 1.0 mg/L. The annual daily loading for 2012 was 0.013 kg per day, less than one tenth of the allowable discharge volume of 0.17 kg per day.

Actual loading to the lake likely remains nil since the discharge is to the ground, as with a septic tile bed. Monitoring wells located 15 m down gradient from the bed had P levels averaging 0.0255 mg/L for the first half of the year, and an order of magnitude higher for the samples taken later in the year. The latter samples contained sediment from well cleaning operations and were not considered representative of normal conditions. The early season results amount to an overall 99.9% P removal rate at that point, and that more than meets our target. Last year was almost as good at 99.4%. Since these trenches average 150 m from the lake or the Nonquon River, this suggests that, at least for the time being, we still have effectively **100%** removal. No bypasses were reported this year.

Omemee
Again this year, this lagoon facility did not require any emergency discharges to the Pigeon River, and all effluent was spray-irrigated onto nearby fields. Phosphorus was reduced to 0.51 mg/L of an allowable 1.0 mg/L, reflecting an 88.1% removal rate to the point of spray irrigation, ten percent higher than last year. However, removal is likely almost **100%** with respect to our lakes.

E.coli levels averaged a rather high 309 cfu. However this was to land, not to our waterways.

Port Perry
This plant consists of lagoons that discharge seasonally to the Nonquon River northwest of Port Perry, which in turn empties into Lake Scugog at Seagrave, where the Kings Bay facility is located. The Port Perry facility discharges phosphorus at a rate comparable to the much larger one in Lindsay. Phosphorus was reduced to a monthly average of 0.19 mg/L for a total loading of **148.9 kg**, which is almost as high as Lindsay. This reflects a removal rate of only **96.7**%, the poorest performance of all the area sewage plants. There were no reported spills or bypasses this year however.

The Port Perry lagoons are expected to be replaced by a new mechanical sewage treatment plant to allow for the expansion of Port Perry. In the design criteria for this new plant, it has been proposed to use the 2009 to 2011 three year average of 170 kg P per year. Loadings for these years were as follows:

2009 - 229.3 kg/year

2010 - 143.7 kg/year

2011 - 137.6 kg/year

If the new plant is designed as proposed, we would hope that actual phosphorus discharge amounts will be much less, reflecting a 99+% removal rate.

Summary
The total volume of phosphorus discharged to the mainstream Kawartha Lakes from the four aquatic discharge plants in 2012 was 265 kg, down nearly 33% from 392 kg in 2011, which was down from 416 kg in the previous year.

If we include the tributary Port Perry plant but exclude Minden, we have total phosphorus loading rates to the lakes of 414 kg in 2012, 520 kg in 2011, and 560 kg in 2010. So, while we have seen tremendous declines in STP phosphorus discharges over the past few decades, we have, in addition, seen a further substantially reduced amount over the past few years.

Ontario Building Code Requirements for Septic System Maintenance Inspection Programs

Michael Dolbey, KLSA Director

The latest revision of the Ontario Building Code (OBC), Ontario Regulation 332/12, includes provisions for septic system maintenance inspection programs in Division C, Section 1.10. Discretionary and mandatory programs are discussed. Discretionary programs may be established in areas of concern by the principal authority that has jurisdiction in the area, which may be a municipality, a conservation authority or a public health unit. Mandatory programs must be established in two types of areas defined by the OBC. Areas to be established for source water protection as required by the Clean Water Act, 2006 are loosely defined as "areas within a vulnerable area that are located in a source protection area and that are identified …. as areas where activity …. is or would be a significant drinking water threat".

More specific is the requirement to establish a mandatory inspection program for the Lake Simcoe shoreline and watershed. As of January 1, 2011, all septic systems within 100 metres of the shoreline (with a few excepted areas) must be inspected within five years and every five years thereafter. Starting on January 1, 2016 the program must be expanded with few exceptions to include all septic systems within 100 metres of any river, stream, lake or pond in the Lake Simcoe watershed. All types of septic systems with a capacity less than 10,000 litres/day (typical for homes, cottages and small businesses: larger systems are regulated by other legislation) must be inspected. These include outhouses, composting and other types of waterless toilets, greywater pits, cesspools, tank/leaching bed systems and pumped holding tank systems. The OBC can be found by searching for "*O. Reg. 332/12*" on the E laws website, www.e-laws.gov.on.ca/navigation?file=home

The OBC comes under the jurisdiction of the Ontario Ministry of Municipal Affairs and Housing (MMAH). In March 2011 MMAH issued *On-site Sewage System Maintenance Inspections*, a guide for establishing and carrying out such programs. This six page document provides an excellent summary of the process and is worthwhile reading for anyone interested in the subject. It can be found at www.oowa.org/maintenence-inspection/pdf/Maintenance-Inspection.pdf

Septic System Maintenance - A Really Tough Job?

Kevin Walters, BASc, P.Eng.
KLSA Vice-Chair

We've all heard a lot lately about the importance of maintaining your septic system. We're led to believe that if it's not maintained properly, it will pollute the lake.

But what is one to do?

Personally, I do almost nothing at all to maintain my septic system, for the simple reason that there is really almost nothing to do in the way of maintenance.

Septic systems are passive sewage disposal systems that essentially compost our sewage and distribute the liquid under the ground, where it is absorbed and filtered by the soil. Let's look at its origins.

Septic systems were invented, or rather evolved, in the 19th century after the invention of the toilet, as a means of disposing of the resulting sewage underground, so that pathogens, recently discovered, would not enter drinking water sources. They are very low-tech, and were intended to do nothing more than that. The original disposal area was a cesspool, or what we now call a leaching pit (however, the latter is not allowed to accept toilet waste today). Cesspools were prone to plugging and overflowing, so another system had to be developed. The tile field had already been invented as a means of draining water from under farm fields, and it was recognized that the tile field would also work in reverse – that is, draining water *into* fields, under the surface. The only problem with raw sewage however was the solid material within it, material that would plug up a tile bed quickly. So a settling tank, essentially a sealed cesspool, was retained at the front end to let the solids settle out, or float to the surface. The then solid-free liquid would drain out into the bed.

We still use this system today, essentially unchanged, simply because this rudimentary concept works, and works well. In addition to what it was intended to do, we find that the solids in the tank break down biologically over time, and the liquid draining into the field also breaks down biologically.

Popular misconceptions

Here are some popular misconceptions, along with explanations that some no doubt will consider to be heresy:

✘ Pump out your tank frequently.

Pumping out your tank frequently does not prevent pollution of your lake. If it is never pumped out, eventually it can fill up with those solids, resulting in the solids being forced out into the tile bed. Hence, pumping out a tank regularly prevents your tile field or filter bed from clogging up, which would result in sewage rising up to the ground surface over your bed and necessitating a costly repair. Ultimately, if this problem is not addressed, you will end up polluting the lake, but in reality, who would tolerate this developing condition in the interim?

How often sludge removal is required depends on the size of the tank, the number of people using the system, how frequently, and over what period of time.

Established guidelines indicate that for a 1,000-gallon (typical size) tank serving a standard dwelling occupied by three people, the tank should be pumped out every three to four years. The underlying assumption here is that the property is occupied 12 months of the year. But what if this dwelling is a cottage, and is only used for a maximum of two months per year? That means that the sludge builds up much more slowly and has more time to break down in between occupancy periods. Accordingly, the three to four year pump-out frequency for a two-month cottage becomes 18 to 24 years due to the usage period alone; and can be extended for even longer given that the sludge has more time to break down. Fifty years in such cases may be quite adequate. One tank I owned had been installed at a cottage somewhere around the late 1950s. It was used regularly up

until the early 1980s, when the cottage was closed up and unused for 15 to 20 years. Seasonal use resumed in the late 1990s when I acquired it. This tank was steel, without access ports. When it was cut open for inspection and pumping around 2005, it was found to contain only about three inches of sludge in the bottom. Most of this had likely been deposited in the immediately preceding years. All the sludge that had previously accumulated had broken down during that lengthy hiatus. Clearly, it had never been pumped out previously, as there was no means of access.

This means an infrequently used septic system can go for longer periods between pump-outs than even the 'period of use' factor would indicate. How much longer I can't say. (But if you haven't used your cottage in a decade, there's probably very little sludge left.) While it's best to stick to the 'period of use' timeframe, don't worry if you miss it by a bit. Sludge builds up quite slowly.

Of course, this is largely dependent upon what you put into it. If you put quantities of food waste down the drain (don't use a garbage disposal unit on a septic system, use a compost bin instead), or lots of grease, then sludge and greasy scum will build up faster. Undigested food waste and grease both take a much longer time to break down. Lots of grease or old cooking oil to dispose of? This is excellent fuel and can be poured over an outdoor fire.

What should be done in terms of regular maintenance is to check, or have someone check, the depth of sludge in your tank periodically to determine if and when a pump-out is required. Regulations require that it be pumped out when the sediment reaches 1/3 of the volume. This ensures that there is sufficient retention time to settle out the solids from the liquid.

Refer to the following table. It's taken from an Ohio Department of Health website. I have rounded the years to the nearest whole or half year and recognized seasonal use. I don't know what science was used to determine the time periods shown in this table; however, they seem reasonable.

Tank Size	**Number of Household Residents**							
Litres/US Gallons	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2850/750	9	4	2.5	2	1	1	0.5	0.5
3800/1000	12.5	6	4	3	2	1.5	1	1
4750/1250	16	7.5	5	3.5	2.5	2	1.5	1.5
5675/1500	19	9	6	4	3	2.5	2	2
6625/1750	22	11	7	5	4	3	2.5	2.5
7575/2000	25	12	8	6	5	4	3	3
9450/2500	32	16	10	7.5	6	5	4	4
	Approx. Pump Out Frequency - in years of use							

As well, if you have a recently installed system, there is usually an accessible effluent filter between the tank and the tile bed. This helps prevent solids from moving into the tile bed. It should be checked regularly for accumulated material. It can be an early warning detector of an infilling tank.

Another thing you can do is not put things in the tank that don't break down quickly. Toilet paper is fine, but don't put in Kleenex, sanitary napkins, paper towels or wipes. Oddly, if you are in a pinch and find yourself without toilet paper, cheap paper table napkins can be flushed instead. They are made in much the same way as toilet paper, and fall apart in water.

✘ Leaking septic systems are a problem.

Just about everyone is certain there are leaking septic systems around their lake. That neighbour with the weed bed out front – that must be due to their septic system leaking. I have bad news folks. Everyone's septic system is leaking, even yours. That's because that's what they are designed to do. Leak. Leak out everything that comes into them. All of it, except for the sludge part. The system is supposed to leak via the tiles/pipes

into the leaching or filter bed, where it is evenly distributed through the soil. Sometimes old tanks, primarily the old steel ones, leak through pin holes in the tank. This is not a design intent and it may lead to some localized groundwater pollution. Or maybe not. It depends on how porous the soils are under it. In any case, it is not very likely that such leaks will reach surface waters such as your lake. But if you have such a tank, err on the side of safety and replace it with a water-tight concrete one.

✘ It all reaches the lake anyway.

The water that you've pulled in either from the ground or the lake and put through your septic tank does all eventually reach the lake, but not most of the stuff you dirtied that water with. Salts, nitrates and certain other chemicals like some pharmaceuticals tend not to be held back in the tank or the soil, but the solid particles, the bacteria, and usually most of the phosphorus, are. The average water filtration plant producing municipal drinking water uses just a few feet of well-selected sands to filter that water. Your septic bed has at least 50 feet of solid soil between it and your lake. That's a large filtration capacity. If you have lots of vegetation between your bed and the lake, particularly trees, they will further absorb nutrients like phosphorus (P).

Malfunctioning septic systems aren't ones that have found some subterranean passageway to the lake, but rather they have plugged tiles resulting in surface sewage ponding. Squishy, smelly ground is the primary symptom, with potential for the effluent to reach the lake in wet weather via surface runoff. One ends up with what could be termed a 'sewage lagoon' in the yard.

What about old tile beds – don't they become saturated with phosphorus? It seems that while there are some that might, the years of sewage effluent discharged in one spot apparently acidifies the immediate soil. The more acidified the soil, the better it becomes at holding phosphorus. So these old tile beds actually hold more phosphorus over time.

Furthermore, most soils hold phosphorus very well. The notable exception is calcareous (alkaline) sand. It is typically found along the Great Lakes shorelines where sand beaches and dunes are found in limestone-bedrock regions. Even so, it is likely that, over time, such soils will also become acidified under septic beds and will increasingly retain phosphorus. My own review of the phosphorus levels in Ontario's lakes with large numbers of septic systems shows no evidence of phosphorus migration in terms of observable deteriorating water quality. Whenever enriched lake conditions are found, there are always other identifiable sources. Furthermore, numerous studies have shown that approximately half of all the phosphorus entering septic tanks resides in that sludge in your tank. Removal of that sludge takes 50% of your phosphorus away from your lake, provided the sludge hauler disposes of it properly. In some areas that is an issue unto itself.

Therefore, it is highly likely that most, and in some cases even all of the phosphorus entering your tank will never reach the lake.

✘ Use phosphate-free soaps, detergents, shampoos and cleaners.

Don't waste your time. I challenge you to find any products labelled as such. They are hard to find simply because they are now *all* phosphate-free, even dishwasher detergents. Recent government regulations have prohibited phosphates in domestic cleaning products, so you no longer have to seek them out. As a result, your septic system receives far less phosphorus today than it used to. Most of that comes from our bodies, excreted via urine. Remember, pee = P, so don't pee in the lake if you can avoid it.

✘ Chlorine bleach will kill your septic system.

Chlorine bleach attaches to and attacks organic matter. Bleach used to remove fabric stains will first attack an organic food stain, as intended. If left too long, it will attack the fabric itself, if it is an organic fibre like wool or cotton. The amount of bleach one is likely to use in laundry and general cleaning is miniscule in comparison to all that organic mass in your septic tank. This bleach will get used up almost immediately in the tank, resulting in little, if any, harm to the bacteria population at large. This assumes of course that you don't pour a whole jug of bleach down your sink to unclog a blocked drain.

✘ Your septic bed needs sun and grass growing on it to promote evapotranspiration.

This may assist with the reduction of liquid and promote the uptake of nutrients at the bed, but certainly, septic system design does not take this into account. Septic systems are designed to distribute the water

underground where it continues to move downward and laterally. Upward movement is not relied upon. Since significant evapotranspiration only occurs during warm, dry summer weather, and that is only a small portion of the year. Your septic system works (or should work) year-round, even in wet weather. Nonetheless, the Building Code still requires that you not inhibit the potential for evapotranspiration.

✘ **You should add bacterial supplements to your tank to keep it working.**

Bacteria are very plentiful in this world and we go to great lengths to try to reduce them in places where we don't want them, but we achieve only limited success. It's hard to imagine any septic tank that receives its normal load as not being exceedingly 'septic'. I doubt that such additives are really necessary, and many firmly assert that they're not. On the other hand, I can't see them doing any harm either, and they may actually help by speeding up that sludge breakdown. Whether one is actually adding bacteria to the tank rather than say just a package of sawdust, and whether those bacteria actually like living in a septic tank, or are even the right type to assist in sludge breakdown, all remain a mystery to this author.

✘ **A composting toilet is better than having a flush toilet on a septic system.**

I don't see how. After all, they're *both* composting systems: one uses water, the other doesn't. If you are really short of water (usually not a problem at lakeshore properties), or don't have room for a septic system, a dry-composting toilet makes perfect sense. Otherwise, I don't think so.

Now for a couple of true ones.....

✓ **Keep vehicles, snowmobiles and structures off your bed.**

This one is *largely* true. The weight of vehicles can break your tiles or piping. At the very least, they can compact the soils so that they cannot pass or absorb effluent as effectively. Snowmobiles on the bed are a lesser concern. They can compact snow, reducing its insulating value and increasing the chance of your bed freezing up in winter. This is not much of a concern, however, if that bed is not used in winter. Structural weight can similarly compact soils, so anything large and heavy should be avoided on the septic bed. Something like a bird bath, on the other hand, should be no problem.

✓ **Trees and shrubs can plug your tiles with roots.**

Yes, true, unfortunately. This is a tough one for tree huggers, and can involve a degree of maintenance. Fortunately, trees don't grow nearly as fast as that green stuff that lawns are made of, and keep you a full-time slave until the snow flies. Try to keep woody vegetation away from your bed, and limit any plant growth to shallow-rooted annual type plants and grasses. If you do find tree roots encroaching on your bed, cut them off around the perimeter. The roots in the tiles or pipes will die and break down over time, but certainly not overnight. They're made of wood after all.

On the other hand, trees surrounding your bed are a good thing. The roots will take up considerable water during the summer season, and with it, the nutrients. Just make sure that you don't have water- seeking, intrusive trees such as willows. As a general rule, it is probably best to keep the 'drip line' (the limit of the branches) of all deciduous trees away from the bed.

So there you have it. Maintain your septic system simply by being careful of what you put into it, don't park your car on the bed, don't let trees grow on or too close to it, check the sludge depth in the tank periodically, and pump it out (only) when needed. That's almost like doing nothing at all.

Lakeshore Septic System Inspections: A Considered and Cautious Approach

Kevin Walters, B.A.Sc, P. Eng.
KLSA Vice-Chair

Once again we are hearing a call for septic system inspections along our lakeshores, as many people increasingly believe that water quality issues they are experiencing must be the result of 'leaking' or poorly maintained systems. (See "Septic System Maintenance", p. 22.) These concerns come from two interest groups: those most concerned with public health issues and specifically leakage of pathogens (as implied by the presence of *E. coli* bacteria), and those most concerned about algae and aquatic plant growth (weeds at your dock), which is stimulated by nutrients. Often the conversation combines both these concerns under the label of 'pollution'.

This complex issue requires informed discussion because the only solution currently being studied by many municipal governments is septic system inspections. These programs can be costly when regulation, administration, policing and public education are included.

The body of evidence KLSA has seen over the years strongly implies that septic systems generally do not cause water quality problems in our lakes and rivers. While there may be a few systems contributing 'pollution' to our lakes, the impact on a lake would be quite small, given the small size of a household septic system.

For example, Kawartha Conservation (KC) has estimated that 4% of the phosphorus entering Sturgeon Lake is from lakeshore septic systems. That is a high estimate, in our opinion, which assumes that about 25% of the phosphorus that goes into each system reaches the lake. However, assuming that this was true, and that correcting a system could stop phosphorus entering the lake, and, if, say, 5% of the lakeshore systems were defective and contributing to pollution, our net reduction in phosphorus with these systems corrected would be only 0.2%.

Example of a successful inspection program

However, there have been areas where septic inspections have led to a reduction in *E.coli* in dense cottage communities, such as the east shore of Nottawasaga Bay, where hundreds of cottages on septic systems occupy the back-shore area behind the beaches. (The even denser south end, Wasaga Beach, is now all connected to a sewage treatment plant.) This area was first developed in the 1920s or so, in the days of outdoor privies and hand-pump wells. Consequently, lots were not sized with septic systems in mind, and many lots are tiny, sometimes a mere 25 feet by 50 feet, or even less. The soil in the area is calcareous beach sand – the type that doesn't hold phosphorus very well – and many small creeks wind between the lots, the result of a high water table emerging from the old shore-bluff in behind. High *E.coli* counts were found in many of these streams. Septic system improvements imposed through the inspections resulted in major reductions in *E. coli* in the streams, and presumably along the beach areas where the streams discharge. However, owing to the vastness of Nottawasaga Bay and significant water movement, detecting *E. coli* in the bay water is difficult, except very close to shore in very shallow water. Phosphorus was not a particular concern here owing to the very low background nutrient level of Nottawasaga Bay.

This inspection program is administered by Tiny Township, and is undertaken on a continuous and recurring basis. Property owners are given a timeline for bringing deficient septic systems up to standard. All septic systems in the area have now been inspected once, with repeat inspections scheduled over the next six years. Currently, the municipality is into the third year of round two. Time will tell if there are any real deficiencies found in the second round, and if continuing this project is worthwhile.

Should the Kawartha Lakes waterfront community adopt a similar program?

To answer that question we look to our 14-year KLSA history of monitoring the water quality of our Kawartha Lakes. KLSA was formed at the time of the *E. coli* crisis in Walkerton. We wanted to see what the *E. coli* levels were in the Kawartha Lakes, which, we recognized, had significant farmland immediately surrounding the lakes, as well as countless septic systems and many municipal wastewater plants. KLSA commenced *E. coli* testing of the waters in numerous locations where the potential for contamination appeared to exist. Testing

included the waters near developed areas and stream mouths, and these areas continue to be tested to this day. No significant areas of contamination were revealed, save for several of those stream mouths and certain other typically shallow areas. KLSA's previous reports document the search to find the source of the *E. coli* in these areas. Septic contamination remained our prime suspect. Ultimately, what we found was that the *E. coli* in many of these areas could be explained by the presence of waterfowl, as there was a strong correlation between measured *E. coli* levels and the known presence of waterfowl. Also, we found that streams, draining either agricultural land or undeveloped wilderness areas containing wetlands, had relatively high *E. coli* levels. Waterfowl may have again been the source of the latter 'contamination'.

Still later, we learned that lake sediments typically contained *E. coli*, and these could be stirred up into the water column by boaters, swimmers or wave action. As it turned out, we were left with no areas exhibiting habitually high *E. coli* levels that did not fall under one of the foregoing explanations. While this was very encouraging in some respects, it was also somewhat disappointing in that had we been able to pinpoint areas of probable septic contamination, we would have become strong advocates for septic inspection in these areas. Our expectations would have been raised that improving septic systems would reduce *E. coli* levels and produce an overall better water quality.

With nothing to show for all of our years of efforts in this regard – except to be able to say, with some satisfaction, that our evidence suggests that we have no sewage-related *E. coli* problems in our lakes – we switched to testing for the well known, but non health-threatening contaminant, phosphorus.

That we found in abundance. In our ongoing search for the sources of phosphorus and the means to curtail its discharge into our lakes, we are again confronting the septic system question. However, we have found that, typically, septic systems seem to retain phosphorus quite well, with about 50% of it being retained in the tank, and much of that which is discharged into the tile bed being retained in the soil. Furthermore, this retention seems to increase over time as the soil becomes acidified by the effluent. The one notable exception may be septic systems located within coarse calcareous sand, such as we often find along the shores of the Great Lakes, as in the Tiny Township case (see "Septic System Maintenance", p.22), which allows more rapid drainage of effluent, and where the calcareousness inhibits soil acidification.

Further review of our lake testing data for phosphorus shows us that in those lakes that are removed from the main water flow path on or below Sturgeon Lake, i.e., Shadow, Balsam, Cameron, the Bald Lakes, Sandy Lake and Upper Stoney Lake, phosphorus levels are low to very low, suggesting that if there are systems contributing septic effluent to the lakes, they are not having a significant impact on water quality.

Recommendations

A septic inspection program may nonetheless have some merit in certain areas. But before we actually commence an inspection program, we should undertake a risk analysis. In other words, look for areas where problems are more likely, such as areas with dense development on very small or shallow lots, or suspected very old systems, which are more likely to be substandard. We would look also for areas where we have very little soil, or that calcareous sand, and areas where the health department may be able point to as having frequent problem systems. As well, the small-lot criterion could apply to island properties where the island, either by size, topography or shape, allows little space for a proper septic system.

Once such areas are identified, we could then initiate a more specific and concentrated *E. coli* testing program in the water immediately offshore, to see if higher than normal *E. coli* levels are present. This is similar to the testing of streams in the Tiny Township beaches area that often showed high *E. coli* levels. If no higher *E.coli* levels are found, the program should stop there, as no *E. coli* essentially means no leaks. If higher *E.coli* levels are found, and, even if they may be explained by the presence of waterfowl or streams, then an inspection program may still be advisable to confirm the source. Where single-property problematic islands are identified, they could go directly to an inspection, *as E. coli* in the lake from a single system would likely be hard to detect.

This considered and cautious approach would limit inspections to areas where we are most likely to find deficient systems, and avoid the time and expense of inspecting all systems. Our resources might better be spent controlling *E. coli* and phosphorus from our more significant and known sources.

The ORWC Review of Existing Reinspection Programs in Ontario

Michael Dolbey, KLSA Director

In 2001, the Ontario Government's Ministry of Municipal Affairs and Housing (MMAH) developed guidelines for municipalities who wished to establish discretionary septic system reinspection programs but they provided no specific rules for how it should be done. A number of municipalities established such programs, and in 2006 the University of Guelph's Ontario Rural Wastewater Centre (ORWC) was commissioned by MMAH to review these programs and provide recommendations for best practices. This report[1] surveyed sixteen municipalities to examine the range of existing reinspection programs across the province. It reviewed the results and made recommendations for future programs. Of interest is that most of the municipalities that had established programs were concentrated in areas with significant numbers of waterfront and seasonal properties.

The ORWC report analysed the results of the septic system reinspection programs of the 16 municipalities. These programs looked for serious malfunctions such as septage breakout (sewage reaching the surface of the soil), and other factors that may not pose an immediate risk but could lead to later problems, such as the presence of steel tanks that are no longer allowed, structures or trees on the leaching bed or the proximity of the septic system to wells and water bodies. The number of systems found to have actual septage breakout was not recorded. Fewer than 5% required total system replacement, fewer than 6% required new septic tanks and about 4% required new leaching beds.

1 Development of Potential Technical Standards for Reinspection of Onsite Sewage Systems and Data Collection Guidelines to Develop Risk Models for Potential Reinspection Programs www.orwc.uoguelph.ca/Research/documents/reinspection_final_report_with_appendices.pdf

A Round of Applause for Blue-Green Algae Please

Kevin Walters, B.A.Sc., P.Eng.
KLSA Vice-Chair

If you watched the *Wonders of Life* series on TVO this winter, you will likely have gained a new respect for blue-green algae, or cyanobacteria as they are also known, and so-called in this series.

While we see these organisms as problematic, being somewhat toxic and also releasing their toxins to the lake water when they die and decay, we should look at these organisms in a different light.

It seems that 2.5 billion years ago, cyanobacteria ingeniously developed the way to utilize sunlight to split the water molecule into hydrogen and oxygen, utilizing the hydrogen to make food (sugar) and releasing the oxygen to the atmosphere as waste. No organism has figured this method out on its own since. The ability to produce chlorophyll to split apart water has been passed along to every living plant species that has since evolved, and they have all evolved from these blue-green algae. This has resulted in a planet covered in green chlorophyll-containing plants, and of course, oxygen-breathing, plant-eating animals like ourselves.

Without blue-green algae/cyanobacteria, we simply wouldn't be here. Not much else would be here either.

Appendix A:

KLSA Mission Statement, Board of Directors and Volunteer Testers

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. The Kawartha Lake Stewards Association ensures that water quality test results, prepared according to professionally validated protocols with summary analysis, are made available to all interested parties. The Kawartha Lake Stewards Association 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.

2013-2014 Board of Directors

Chris Appleton, President/Chair
Sturgeon Lake

Kathleen Mackenzie, Vice-Chair
Stony Lake

Kevin Walters, Vice-Chair
Shadow, Lovesick and Sandy Lakes

Mike Stedman, Treasurer
Lakefield

Ann Ambler, Secretary
Lovesick Lake

Sheila Gordon-Dillane, Recording Secretary
Pigeon Lake

Tom Cathcart, Director
Peterborough

Jeffrey Chalmers, Director
Clear Lake

Mike Dolbey, Director
Katchewanooka Lake

Janet Duval, Director*
Lower Buckhorn Lake

Doug Erlandson, Director
Balsam Lake

Heathyr Francis, Director
Big Bald Lake

Lynn Woodcroft, Director**
Buckhorn

*until October 5, 2013
**elected October 5, 2013

Scientific Advisors

Dr. Paul Frost, David Schindler Professor of Aquatic Science, Trent University, Peterborough

Dr. Eric Sager, Coordinator of the Ecological Restoration Program at Fleming College and Adjunct Professor at Trent University, Peterborough

Volunteer Testers, 2013

Balsam Lake – funding provided by *Balsam Lake Association, North Bay Association, Driftwood Village, Killarney Bay Association:* Ross Bird, Catherine Couchman, Douglas and Peggy Erlandson, Leslie Joynt, Barbara Peel, Diane Smith, Jeff Taylor, Bob Tuckett, Gary and Maryanne Watson, Steve and Laura Watt

Big Bald Lake - *Big Bald Lake Association*: Heathyr Francis, Colin Hoag

Big Cedar Lake - *Big Cedar Lake Stewardship Association:* Rudi Harner

Cameron Lake - Gord McCann, Ruth Pillsworth

Clear Lake – *Birchcliff Property Owners Association*: Jeff Chalmers
Clear Lake - *Kawartha Park Cottagers' Association*: Vivian Walsworth

Katchewanooka Lake – *Lake Edge Cottages*: Peter Fischer, Mike Dolbey

Lovesick Lake – *Lovesick Lake Association*: Ron Brown, John Ambler

Lower Buckhorn Lake – *Lower Buckhorn Lake Owners' Association*: Brian Brady, Paul Pause, Mark and Diane Potter, Harry Shulman, Dave Thompson

Pigeon Lake – *Concession 17 Pigeon Lake Cottagers Association*: Jim Dillane, Sheila Gordon-Dillane
Pigeon Lake – *North Pigeon Lake Ratepayers' Association*: Tom McCarron, Francis Currer
Pigeon Lake – *Victoria Place*: Ralph Erskine

Sandy Lake – *Sandy Lake Cottagers Association*: Mike and Diane Boysen

Shadow Lake and Silver Lake - Phil Taylor, Eveline Eilert

Stony Lake – *Association of Stony Lake Cottagers*: Ralph and Barb Reed, Kathleen Mackenzie, Bob Woosnam, Gail Szego, Rob Little

Sturgeon Lake – funding provided by *Bayview Estates Association, Blythe Shores, East Beehive Association, Hawkers Creek, Kawartha Protect Our Shores, Kenhill Beach, Snug Harbour, Stinson's Bay Road Associations:* Chris Appleton, Bruce Hadfield, Rod Martin, Paul Reeds, Dave Young

Upper Stoney Lake - *Upper Stoney Lake Association*: Karl, Kathy, Ken and Kori Macarthur, and their Golden Retriever Kooper

White Lake – *White Lake Association*: Wayne Horner

Appendix B: Financial Partners

Thank You to Our 2013 Supporters

Federal Government Contributions

Trent-Severn Waterway (Parks Canada)

Municipal Government Contributions

City of Kawartha Lakes
Township of Douro-Dummer
Municipality of Trent Lakes
Township of Selwyn

Community Association Donations

Balsam Lake Association
Big Cedar Lake Road Committee
Big Cedar Lake Stewardship Association
Birchcliff Property Owners Association
Buckhorn Lake Estates Rate Payers Association
Buckhorn Sands Property Owners Association
East Beehive Community Association
Harvey Lakeland Cottage Owners Association
Jack Lake Association
Killarney Bay ~ Cedar Point Cottage Association
Sandy Lake Cottagers Association
Shadow Lake Association
Stony Lake Heritage Foundation
Sturgeon Point Association
White Lake Association

Private Business Donations

Camp Kawartha
Clearview Cottage Resort
Egan Houseboat Rentals
Pinewood Cottages and Trailer Park Ltd.
Rosedale Marina

Individual Donations

Mary Auld
Robin Blake
Mike Dolbey
Janet Duval
Janet Haslett-Theall
David Heaman
Allan J. Heritage
Edward (Ted) and Mary Hill
Robert Hogg
Barry and Carol Hooper
Ralph Ingleton
Jim Keyser
Ken King
Robert and Penny Little
Tracy Logan
Gerald and Barbara McGregor
Peter Miller
Chris Norman
Lou and Judy Probst
Arnie Pundsack
Claudio Rosada
Kay (Kathleen) Ross
Linda Spiewak
Jelle and Karen Visser
Patricia Watson
Jeff Webb
Maria Windover
Two anonymous donors

Many thanks to all of our generous donors

Appendix C: KLSA Treasurer's Report

Mike Stedman, KLSA Treasurer

Attached are financial statements showing Revenue, Expenditures and Net Assets for the Kawartha Lake Stewards Association for the years 2013 and 2012. The financial statements have been reviewed by McColl Turner LLP Chartered Accountants in Peterborough, Ontario. A copy of their Review Engagement Report is included. Our thanks to George Gillespie for his continuing support of KLSA.

The Statements show that KLSA had a gain of $3,500 in 2013. The 2013 budget had forecasted a gain of about $4,100, so we are essentially on budget for the year.

The Statements show that KLSA had Net Assets of $21,250 at year-end 2013. The Board considers that $10,000 is available for project funding. New projects are being considered, but no commitments have been made at this date.

KLSA thanks the Stony Lake Heritage Foundation for its past support in accepting donations on behalf of KLSA and providing charitable receipts. Unfortunately this arrangement has been discontinued.

KLSA will be implementing a membership fee structure in 2014.

Tom Cathcart

Look what floated in: a bumper milfoil harvest.

Financial Statements of

KAWARTHA LAKES STEWARDS ASSOCIATION

December 31, 2013

Note To The Financial Statements
December 31, 2013

BASIS OF PRESENTATION

The accompanying financial statements relate to the incorporated association registered by Letters Patent as Kawartha Lakes Stewards Association. The Association conducts co-ordinated, 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 Lakes Stewards Association qualifies as a non-profit organization under section 149(1)(l) of the Income Tax Act, and, as such, is not responsible to pay any income tax. The distribution of any of its assets or profits to, or for the personal benefit, of its members, directors or affiliates is prohibited.

McCOLL TURNER LLP
CHARTERED ACCOUNTANTS

362 Queen Street
Peterborough, ON
K9H 3J6

P: 705.743.5020
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REVIEW ENGAGEMENT REPORT

To Mr. Chris Appleton, Treasurer

KAWARTHA LAKES STEWARDS ASSOCIATION

We have reviewed the statement of financial position of Kawartha Lakes Stewards Association as at December 31, 2013 and the statement of operations for the year then ended. Our review was made in accordance with generally accepted standards for review engagements and accordingly consisted primarily of enquiry, analytical procedures and discussion related to information supplied to us by the organization.

A review does not constitute an audit and consequently we do not express an audit opinion on these financial statements.

Based on our review, nothing has come to our attention that causes us to believe that these financial statements are not, in all material respects, in accordance with Canadian accounting standards for not-for-profit organizations.

McColl Turner LLP

Licensed Public Accountants

Peterborough, Ontario
March 10, 2014

KAWARTHA LAKES STEWARDS ASSOCIATION

Statement of Financial Position - December 31, 2013

	(Unaudited) 2013	2012
ASSETS		
Current Assets		
Cash	$ 16,189	12,696
Guaranteed Investment Certificate	5,078	5,000
	21,267	17,696
NET ASSETS	21,267	17,696
	$ 21,267	$ 17,696

Statement of Operations
Year ended December 31, 2013

	(Unaudited) 2013	2012
REVENUE		
Parks Canada, Trent-Severn Waterway	$ 3,000	$ 3,000
Municipal grants	5,765	5,876
Associations	1,445	1,910
Private contributions	2,323	3,165
Water testing fees	5,075	5,795
Interest	78	-
	17,686	19,746
EXPENDITURES		
Water testing fees	5,344	5,817
Algae project / Aquatic plant project	-	7,835
Miskwaa Zibii River Study	-	10,000
Annual report costs	6,148	4,770
Insurance	1,656	1,637
Telephone, copies and other administrative costs	922	1,257
Bank charges	45	200
	14,115	31,516
EXCESS OF REVENUE OVER EXPENDITURES (EXPENDITURES OVER REVENUE) FOR THE YEAR	3,571	(11,770)
NET ASSETS - beginning of year	17,696	29,466
NET ASSETS - end of year	$ 21,267	$ 17,696

McCOLL TURNER LLP
CHARTERED ACCOUNTANTS

Appendix D: Privacy Policy

Jeffrey Chalmers, KLSA Privacy Officer

As a result of Federal Privacy Legislation changes, all businesses and associations that collect personal information from their customers and members must develop and post a Privacy Policy. The following is the policy that your Board has developed to protect you and your personal information held by the Kawartha Lake Stewards Association (KLSA).

To our Membership: Your privacy is important to us. This policy tells you what information we gather about you, how we would use it, to whom we may disclose it, how you can opt out of the collection, use or disclosure of your personal information, and how to get access to the information we may have about you.

Collecting Information: We collect information about our members and volunteers such as name, address, relevant telephone numbers, email address and preferred method of communication. We obtain this information through the attendance form at our workshops and AGM, and by information provided by the many volunteers assisting in our lake water quality testing programs. We may keep the information in written form and/or electronically. Keeping your email address information at our email site allows us to send you information in an efficient and low cost manner. By providing this information to us, you enable us to serve you better.

Using Information: We use the information collected to provide you with information about the association activities and related lake water issues of interest to residents of the Kawartha Lakes. We will retain your personal information only for as long as required by law or as necessary for the purposes for which it is collected. Your personal information will not be used for other purposes without your consent.

Disclosing Information: We will not disclose any personal information collected about you to anybody else, unless required to do so by law. We will comply with all laws, which require us to supply the information to government agencies and others. We will not otherwise sell, transfer or trade any mailing list, which includes your information.

Keeping Information Secure: We will keep written information in a secure place.

Access to Information: If you wish to review the personal information we keep about you please contact the association c/o "Privacy Officer" at the address set out below. At your request, subject to applicable law, we will delete your personal information from our records. The Privacy Officer is not intended to be an elected position. It is an appointment to one of the elected directors of the board providing they are in good standing and have the support of the Chair and other directors.

Obtaining Your Consent: By providing personal information to us, you are consenting to us using it for the purposes set out above and disclosing it to the parties described above. If you do not want us to use any personal information about you, or wish to limit the use or disclosure of such personal information by us, please contact the Privacy Officer at the address set out below by mail.

Contacting us: We may be contacted by email at kawarthalakestewards@yahoo.ca or by regular mail to:

KLSA
24 Charles Court
Lakefield, ON K0L 2H0

Appendix E: Rationale for *E.coli* Testing and 2013 Lake-by-Lake Results

Kathleen Mackenzie, KLSA Vice-Chair

Choosing sites

The goals of this testing were threefold:

- To see how safe the water was for swimming at these sites
- To provide baseline data for ongoing monitoring in future years
- To discover sources of elevated bacterial counts

Almost all sites were chosen because it was thought that they would have the highest *E.coli* counts in the lake; that is, we were "looking for trouble". Therefore, please realize that the readings shown here do not represent the average bacterial levels on our lakes; rather, they would represent some of the highest bacterial levels on our lakes. Test sites included:

- Areas of high use (resorts, live-aboard docking areas, etc.)
- Areas of low circulation (quiet, protected bays)
- Areas near inflows (from culverts, streams, wetlands)
- Areas of concentrated populations of wildlife (near wetlands, areas popular with waterfowl)

Please note:

- KLSA does not test drinking water. Only surface waters are tested. All untreated surface waters are considered unsafe for drinking.
- KLSA results are valid only for the times and locations tested, and are no guarantee that a lake will be safe to swim in at all times and in all locations.
- Only sites consistent with provincial sampling protocol have been reported.

How and why did we test for *E.coli*?

The protocol for *E.coli* testing is found in the Ontario Ministry of Health's "Beach Management Guidance Document", Section 2.1 "Data Collection and Methodology for Recreational Water Sampling" which can be found at www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/guidance/guide_beach.pdf

E.coli was the bacteria of choice because:

- The presence of *E.coli* usually indicates fecal contamination from warm-blooded animals such as birds or mammals, including humans. The presence of *E.coli* indicates the possible presence of other disease-causing organisms found in fecal material, such as those causing gastrointestinal and outer ear infections.

- *E.coli* is present in fecal material in very high numbers. Healthy humans excrete about 100 million *E.coli* per ¼ teaspoon of fecal matter! Therefore, it is easier to 'find' than most other less plentiful bacteria.

- *E.coli* itself can be dangerous. Although most strains of *E.coli* are harmless, some strains cause serious disease, as occurred in the Walkerton tragedy, or occasionally in ground beef 'scares'. The basic analysis done by the laboratories cannot distinguish the difference between the harmless and the deadly, so we always treat *E.coli* as if we were dealing with a harmful strain.

To put the results in perspective:

- 100 *E.coli*/100 mL is the level at which public beaches are posted unsafe for swimming in Ontario;
- KLSA considers counts over 50 *E.coli*/100 mL as somewhat high for the Kawartha Lakes, and cause for re-testing;
- counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha Lakes.

Balsam Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	12-Aug-13	3-Sep-13
00	8	11	16	3	3	8
01	3	5	<3	3	<3	<3
02	-	<3	3	8	<3	8
03	3	<3	<3	<3	<3	3
04	5	25	8	3	5	<3
05	<3	5	11	<3	3	5
06	5	<3	3	3	<3	--
07	<3	3	8	8	3	<3
08	8	3	3	<3	<3	8
12A	<3	<3	13	<3	<3	22
12B	5	3	19	<3	<3	13
12C	3	<3	<3	<3	<3	5

As in previous years, counts were low on Balsam Lake.

Big Bald Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	1-Aug-13	5-Aug-13	14-Aug-13	3-Sep-13
1	5	9	18	2	13	3
2	4	2	42	0	1	0
3	3	2	25	4	1	7
8	2	0	3	0	0	4
9	0	4	7	1	1	1
10	3	4	38	12	2	2

Similar to previous years, counts were consistently low on Big Bald Lake. Counts were slightly higher on August 1, possibly due to heavy rains the night before as seen in Appendix G.

Big Cedar Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	1-Aug-13	5-Aug-13	14-Aug-13	3-Sep-13
640	1	2	1	0	1	2

Counts were consistently low at this location on Big Cedar Lake.

To put the results in perspective:

- 100 *E.coli*/100 mL is the level at which public beaches are posted unsafe for swimming in Ontario;
- KLSA considers counts over 50 *E.coli*/100 mL as somewhat high for the Kawartha Lakes, and cause for re-testing;
- counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha Lakes.

Cameron Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	12-Aug-13
1	3	3	<3	3	<3
2	11	5	--	5	8

Counts are low in this second year of testing on Cameron Lake.

Clear Lake: Birchcliff Property Owners

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	8-Jul-13	25-Jul-13	7-Aug-13	29-Aug-13	9-Sep-13	19-Sep-13
BB	**62**	0	1	1	0	0
1	0	1	0	1	3	0
2	0	0	0	2	1	0
3	1	0	3	39	0	0
4	1	1	4	9	0	0
5	2	0	0	13	0	1
6	0	0	2	9	0	5
7	25	0	0	2	0	1
8	0	1	**62**	36	8	10

Site BB is at the mouth of a stream which greatly increases in volume after a rain. On July 7, the day before the high reading of 62, there was a heavy rainstorm, over 20 mm. Elevated counts after a heavy rain have been observed before at this site.

Site 8 is near a shoal where birds congregate, and occasional elevated counts have been seen here before. It is interesting, though, that on September 9, the tester noticed a large number of birds near Site 8, but this didn't cause high counts. In the past, we have seen that the direction of the wind can determine exactly where the bacteria go; perhaps on September 9 Site 8 was upwind from the birds.

Clear Lake: Kawartha Park

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	15-Jul-13	17-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	12-Aug-13	5-Sep-13
A	1	3	--	--	0	0	0	0
B	0	**160**	6,8,11,11,19	0,0,0,2,10	0,1,0	0	0	0
C	0	0	--	--	--	2	7	0
D	0	0	--	--	--	0	1	0
P	1	1	--	--	2	0	2	2
W	0	0	--	--	0	0	4	0

The Site B/July15 reading of 160 was of considerable concern to the Kawartha Park Cottagers' Association. They intend to carry out further research if a similar count should reoccur.

To put the results in perspective:

- 100 *E.coli*/100 mL is the level at which public beaches are posted unsafe for swimming in Ontario;
- KLSA considers counts over 50 *E.coli*/100 mL as somewhat high for the Kawartha Lakes, and cause for re-testing;
- counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha Lakes.

Katchewanooka Lake: Sites 2, 5, 6

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	3-Jul-13	9-Jul-13	24-Jul-13	29-Jul-13	7-Aug-13	3-Sep-13
2	**251**	42	**77**	19	24	6
5	3	--	7	5	26	21
6	15	--	0	4	1	0

High counts for Site 2 have not been seen in previous years. However, this year, the resort at this location was closed. Since there was little human activity there, many seagulls congregated on a shoal. A site just upstream from Site 2 showed low counts, so it would seem that the seagulls may well have been the cause of the high counts at Site 2.

Katchewanooka Lake: Site 7

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	13-Aug-13	3-Sep-13	6-Sep-13
7	5	10	10	3	1	**100**	0,2,0

There was no obvious reason for the unusually high count on September 3. Counts were otherwise very low.

Lovesick Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-12	22-Jul-12	30-Jul-12	7-Aug-12	13-Aug-12	4-Sep-12
16	0	9	4	2	1	0
18	0	5	0	0	0	0
19	2	0	0	1	0	7

All counts were very low at these 3 locations on Lovesick Lake.

Lower Buckhorn Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	4-Jul-13	15-Jul-13	22-Jul-13	30-Jul-13	6-Aug-13	19-Aug-13
1	**75**	4	23	3	2, 16	3
2	0	--	7	2	--	39
5	0	--	35	27	0	0
8	0	--	0	24	0	16
9	2	--	0	0	0	3
11	7	--	10	11	2	1
15	--	--	--	--	--	0

Site 1/July 4 is in a back bay with low circulation. Algae and aquatic plants had become very thick, which would also reduce circulation.

To put the results in perspective:

- 100 *E.coli*/100 mL is the level at which public beaches are posted unsafe for swimming in Ontario;
- KLSA considers counts over 50 *E.coli*/100 mL as somewhat high for the Kawartha Lakes, and cause for re-testing;
- counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha Lakes.

Pigeon Lake: Concession 17 Pigeon Lake Cottagers Assoc.						
2013 *E.coli* Lake Water Testing *E.coli*/100 mL						
Site	**1-Jul-13**	**22-Jul-13**	**29-Jul-13**	**6-Aug-13**	**12-Aug-13**	**3-Sep-13**
A	0	1	1	1	0	1
B	1	0	1	1	2	1
3	0	0	0	5	0	1

As in the past, counts were very low at the Concession 17 sites.

Pigeon Lake: North Pigeon Lake Ratepayers' Assoc.						
2013 *E.coli* Lake Water Testing *E.coli*/100 mL						
Site	**4-Jul-13**	**22-Jul-13**	**2-Aug-13**	**5-Aug-13**	**12-Aug-13**	**2-Sep-13**
1A	26	**74**	0,7,20	**50,59**	20	**620**
5	43	**62**	--	3	8	4
6	17	1	--	2	6	5
8	1	1	--	1	0	1
13	4	3	--	5	6	2

The elevated counts at Sites 1A and 5 were probably due to the presence of numerous ducks. Also, the water was very warm. Neither location is used for swimming.

Pigeon Lake: Victoria Place						
2013 *E.coli* Lake Water Testing *E.coli*/100 mL						
Site	**2-Jul-13**	**22-Jul-13**	**29-Jul-13**	**6-Aug-13**	**12-Aug-13**	**3-Sep-13**
1	8	11	3	<3	3	<3
2	3	3	<3	3	<3	<3
3	5	3	5	<3	<3	<3
4	5	5	<3	5	5	<3
5	<3	5	<3	5	8	5

All counts were very low this year in Victoria Place.

Sandy Lake: Fire Route 48					
2013 *E.coli* Lake Water Testing *E.coli*/100 mL					
Site	**8-Jul-13**	**19-Jul-13**	**1-Aug-13**	**12-Aug-13**	**3-Sep-13**
1	0	2	0	1	2
2	0	0	0	1	1
3	--	--	--	--	9
4	--	--	--	--	0

Counts were uniformly very low on these Sandy Lake sites.

To put the results in perspective:

- 100 *E.coli*/100 mL is the level at which public beaches are posted unsafe for swimming in Ontario;
- KLSA considers counts over 50 *E.coli*/100 mL as somewhat high for the Kawartha Lakes, and cause for re-testing;
- counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha Lakes.

Shadow Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	12-Aug-13	3-Sep-13
SH01	<3	3	<3	<3	3	<3
SH02	3	3	3	3	11	19

As in the past 2 years, readings were very low on these Shadow Lake sites.

Silver Lake

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	12-Aug-13	3-Sep-13
SI01	3	<3	<3	<3	<3	<3

As in the past 2 years, readings were very low on this Silver Lake site.

Stony Lake: Association of Stony Lake Cottagers

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	7-Aug-13	12-Aug-13	13-Aug-13	3-Sep-13
E	3	0	4	--	37	12	--	4
F	2	0	2	--	0	1	--	3
I	2	7	2	--	4	15	--	6
J	5	0	1	1	--	--	3	5
K	1	1	12	5	--	--	0	10
L	1	5	4	--	1	1	--	0
P	2	0	0	--	17	0	--	1
28	0	17	0	--	5	7	--	6

Counts were uniformly low on these 8 Stony Lake sites.

Sturgeon Lake: North Shore Combined Group

2013 *E.coli* Lake Water Testing
E.coli/100 mL

Site	2-Jul-13	22-Jul-13	29-Jul-13	6-Aug-13	12-Aug-13	3-Sep-13	5-Sep-13
NS2A	5	3	33	28	5	**123**	--
NS3	11	16	13	19	13	**510**	**79,62,87**
NS4	5	<3	13	3	5	5	--
CP6	--	19	8	5	5	13	--
WS1	3	11	16	3	22	25	--
SS	8	--	--	--	--	--	--
SS3	<3	46	--	<3	<3	--	--

Counts were generally low on Sturgeon Lake. There were many ducks near NS2A on September 3, which may have caused the high reading. There was no obvious reason for the high counts at NS3 on September 3 and 5. Both these sites have had occasional elevated readings in past years.

To put the results in perspective:

- 100 *E.coli*/100 mL is the level at which public beaches are posted unsafe for swimming in Ontario;
- KLSA considers counts over 50 *E.coli*/100 mL as somewhat high for the Kawartha Lakes, and cause for re-testing;
- counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha Lakes.

Upper Stoney Lake: Upper Stoney Lake Assoc.						
2013 *E.coli* Lake Water Testing *E.coli*/100 mL						
Site	**2-Jul-13**	**22-Jul-13**	**29-Jul-13**	**6-Aug-13**	**12-Aug-13**	**1-Sep-13**
6	6	9	4	6	2	10
20	**52**	0	5	0	0	1
21	1	2	0	0	0	0
52	14	13	3	8	9	17
65	0	0	1	1	0	0
70	0	1	0	1	0	1
78A	0	0	0	0	0	0

The elevated reading at Site 20/July 2 was in a shallow bay, There were many birds nearby, but that was normal for this site. There was no other obvious cause.

Jay Duval

On the lake snow is glist'ning

Appendix F: 2013 Phosphorus and Secchi Data

Kathleen Mackenzie, KLSA Vice-Chair

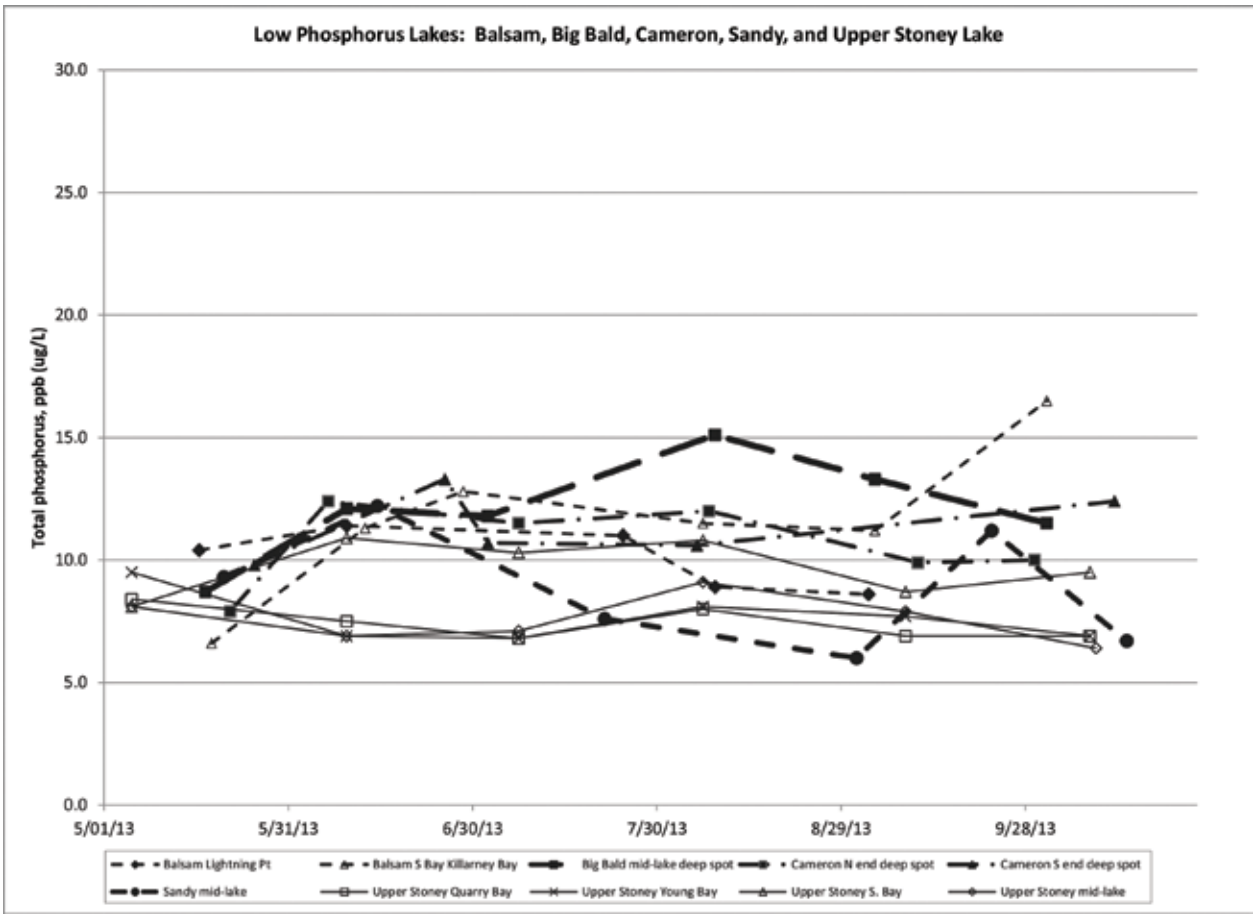
The Province of Ontario encourages shoreline residents to test their lakes for phosphorus through the Ministry of Environment's Lake Partner Program. Hundreds of Ontario lakes have been tracking phosphorus levels over the years because phosphorus is thought to be the major fertilizer for algae and aquatic plants. Higher levels of phosphorus result in a turbid lake and eventually thicker, enriched sediments that are more likely to grow aquatic plants. The Ontario Ministry of the Environment's Interim Provincial Water Quality Objective for Total Phosphorus is as follows:

> *Current scientific evidence is insufficient to develop a firm Objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines which should be supplemented by site-specific studies:*
>
> - *To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 ug/L;*
>
> - *A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 ug/L or less.*

Natural sources of lake phosphorus include rock, soil and decaying vegetation. Human sources include sewage treatment plants, septic systems, fertilizers, and urban and agricultural runoff.

Phosphorus levels are constantly changing in the Kawartha Lakes. They change in each lake from month to month; and on any one date, phosphorus levels differ as you travel from lake to lake. And the general pattern varies somewhat from year to year. Tracking these phosphorus levels helps us to understand the chemistry of our lakes.

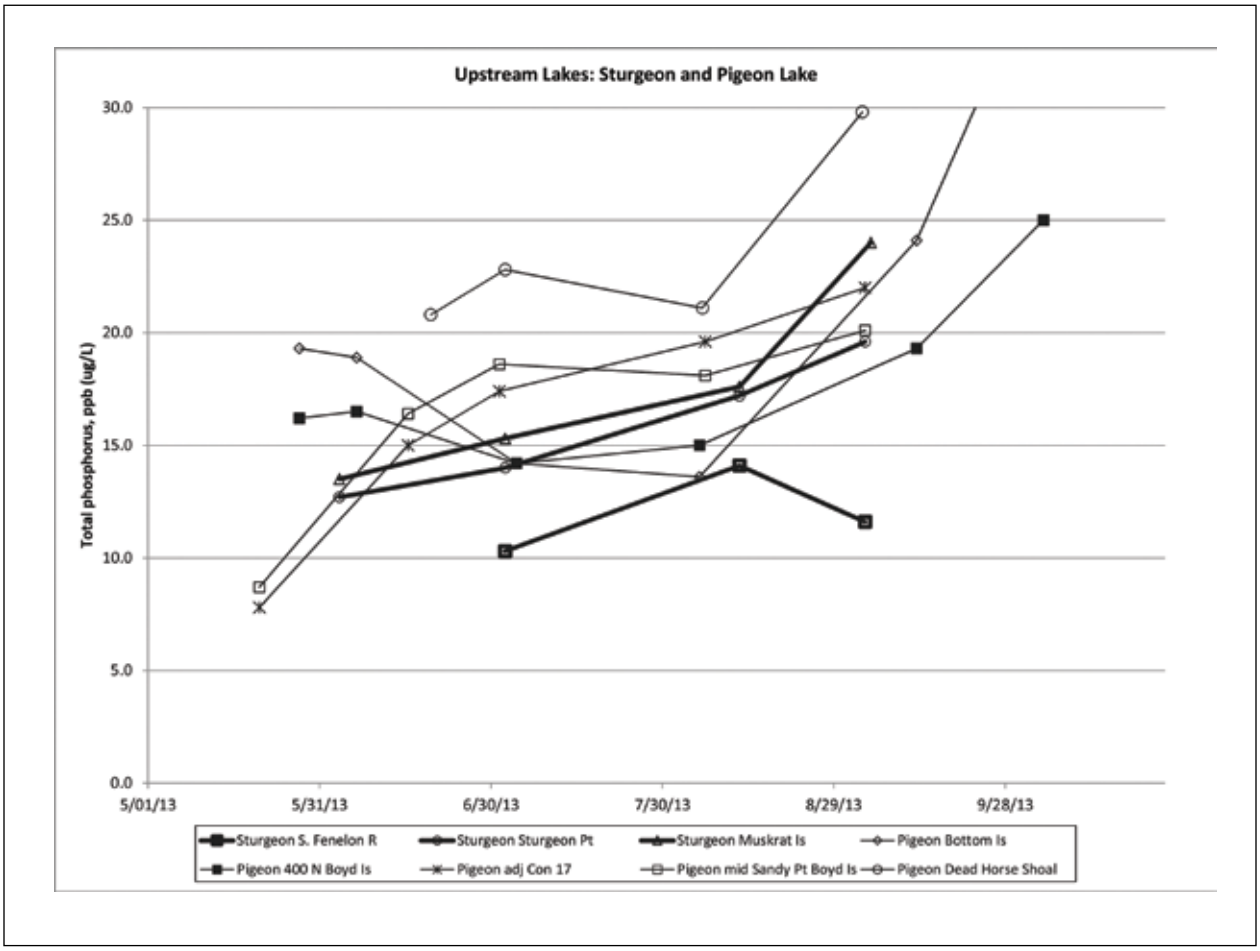
Low Phosphorus Lakes: Less influenced by human activity



In these lakes, the phosphorus curve is 'flat'; that is, it does not change much during the summer, staying

between 10 and 15 ppb. This is typical of our more northern lakes, which are less affected by agriculture and urban influences. Balsam Lake and Cameron Lake receive most of their water directly from the Gull River and Burnt River, respectively. These rivers flow down from the north with low phosphorus water.

Upstream Lakes: Phosphorus rises over the summer



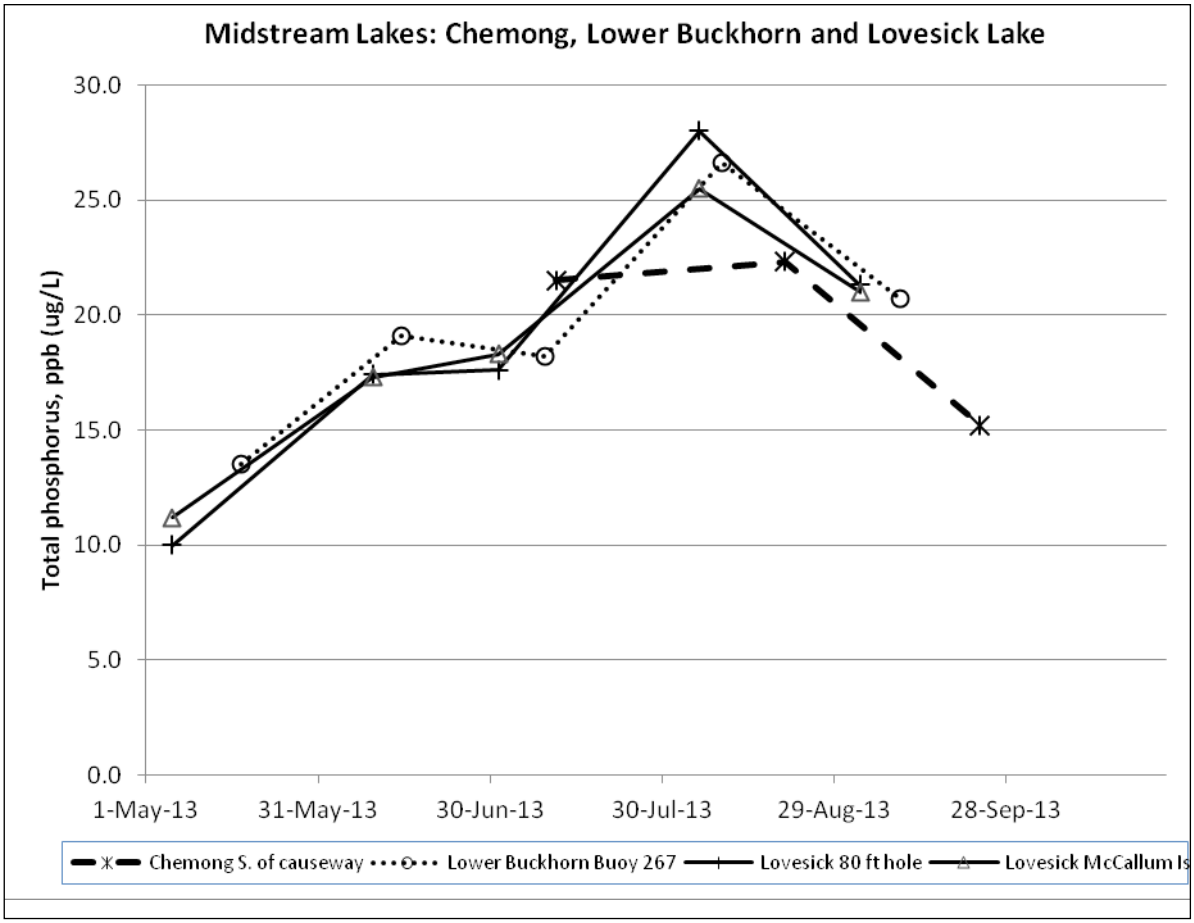
When the Fenelon River flows from Cameron Lake into Sturgeon Lake, it has a phosphorus level much the same as in Cameron Lake (below 15 ug/L). However, as the water then flows through Sturgeon Lake and Pigeon Lake, phosphorus levels climb to between 15 ug/L and 25 ug/L in mid-summer. Sturgeon Lake, then, is the place where the Kawartha Lakes transform from low-nutrient lakes to higher-nutrient lakes.

The reasons for this rise in phosphorus? Until someone decides to write a thesis on this, we at KLSA will continue to surmise. We think that this phosphorus may be coming from the bottom of the lake, that is, the sediments. Over the past decades, the sediments may have become enriched with phosphorus from the sewage treatment plants at Fenelon Falls and Lindsay, from agricultural runoff, and from urban runoff.

However, this rise in phosphorus may be partly a reflection of a more southerly watershed. North of the Kawartha Lakes the land is predominantly Canadian Shield (little soil, frequent insoluble granite), yielding low-phosphorus water. South of the Kawartha Lakes is predominantly a limestone watershed (limestone-rich soil with resulting harder water). As the Kawartha Lakes flow further south, they would be expected to pick up

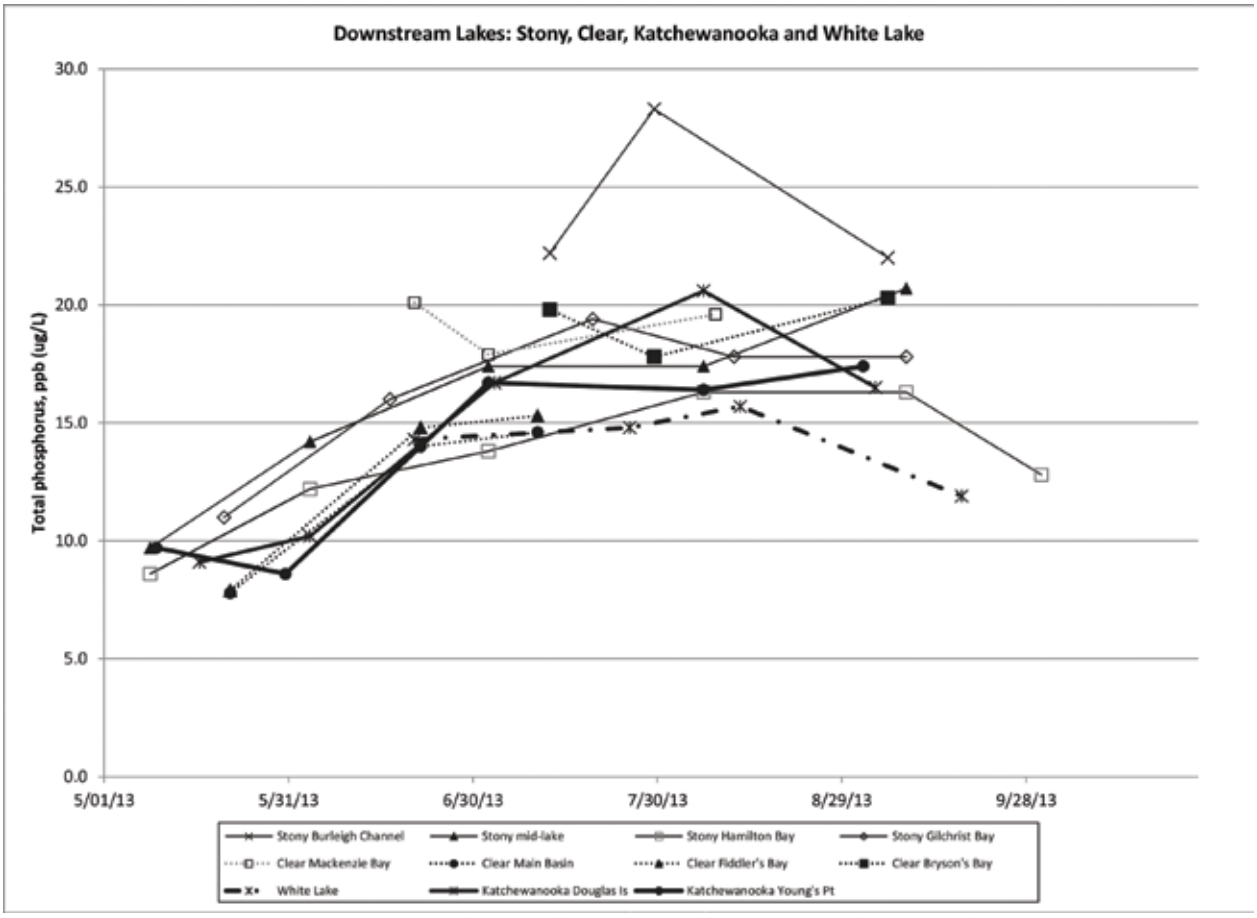
more phosphorus from runoff and groundwater.

Midstream Lakes: Another rise in phosphorus



The Midstream Lakes graph shows a phosphorus level much higher than usually found in early August, though returning to a similar level (about 20 ppb) in early September. There are no large inflows of high-phosphorus water to Lovesick or Lower Buckhorn Lake, so it seems likely that it is the chemistry of the lake that is causing this. We suspect that it is due to a combination of direct phosphorus release from the sediments as well as the release of nutrients from the sediments via the cycle of growth and death of plants and algae. Whatever the relative cause, the level of phosphorus in mid-summer was well above 20 ppb; the level at which nuisance algae often start to grow (see beginning of Appendix F).

Downstream Lakes



As seen in previous years:

- Water flowing into Stony Lake at the Burleigh Channel has a phosphorus level similar to Lovesick Lake, which is directly upstream.
- Phosphorus levels then dip about 5 ppb at the other Stony Lake sites apparently because of dilution by water from Upper Stoney Lake (see 'Low Phosphorus Lakes').
- Water flows directly from Gilchrist Bay to White Lake, but White Lake has somewhat lower phosphorus levels.

Conclusion

Phosphorus levels showed the same patterns in 2013 as in previous years:

- In early May, all lakes have a low phosphorus level of about 10 ppb.
- Most lakes show a rise in phosphorus from 10 ppb in early May to 20 or 25 ppb in early August, then a decrease to about 15 or 20 ppb in early September.
- August phosphorus levels rise as water flows downstream. There is a drop, however, at Stony Lake likely due to dilution with low phosphorus water from Upper Stoney Lake.
- A few lakes have stable low phosphorus levels, less than 15 ppb, throughout the summer.

2013 Total phosphorus measurements

Data in **bold** were considered erroneous, and were not used to calculate the average total phosphorus (TP).

LAKE_NAME	Site Description	Date	TP1 ug/L	TP2 ug/L	Ave TP, ug/L
BALSAM LAKE	N Bay Rocky Pt.	30-Jun-13	9.20	9.60	9.40
BALSAM LAKE	N Bay Rocky Pt.	01-Aug-13	10.60	10.20	10.40
BALSAM LAKE	N Bay Rocky Pt.	01-Sep-13	9.60	8.80	9.20
BALSAM LAKE	NE end-Lightning Pt	16-May-13	10.40	10.40	10.40
BALSAM LAKE	NE end-Lightning Pt	09-Jun-13	9.80	13.00	11.40
BALSAM LAKE	NE end-Lightning Pt	24-Jul-13	11.60	10.40	11.00
BALSAM LAKE	NE end-Lightning Pt	08-Aug-13	9.20	8.60	8.90
BALSAM LAKE	NE end-Lightning Pt	02-Sep-13	8.00	9.20	8.60
BALSAM LAKE	NE end-Lightning Pt	02-Oct-13	8.60	8.20	8.40
BALSAM LAKE	South B-Killarney B	18-May-13	6.80	6.40	6.60
BALSAM LAKE	South B-Killarney B	12-Jun-13	11.00	11.60	11.30
BALSAM LAKE	South B-Killarney B	28-Jun-13	13.80	11.80	12.80
BALSAM LAKE	South B-Killarney B	06-Aug-13	11.80	11.20	11.50
BALSAM LAKE	South B-Killarney B	03-Sep-13	11.20	11.20	11.20
BALSAM LAKE	South B-Killarney B	01-Oct-13	17.00	16.00	16.50
BALSAM LAKE	W Bay2, deep spot	15-Jun-13	8.80	9.80	9.30
BALSAM LAKE	W Bay2, deep spot	02-Jul-13	10.80	13.20	12.00
BALSAM LAKE	W Bay2, deep spot	04-Sep-13	9.60	9.60	9.60
BALSAM LAKE	E of Grand Is	12-Aug-13	10.60	9.80	10.20
BIG BALD LAKE	Mid Lake, deep spot	17-May-13	9.20	8.20	8.70
BIG BALD LAKE	Mid Lake, deep spot	09-Jun-13	12.40	11.80	12.10
BIG BALD LAKE	Mid Lake, deep spot	02-Jul-13	11.80	11.80	11.80
BIG BALD LAKE	Mid Lake, deep spot	08-Aug-13	14.20	16.00	15.10
BIG BALD LAKE	Mid Lake, deep spot	03-Sep-13	13.20	13.40	13.30
BIG BALD LAKE	Mid Lake, deep spot	01-Oct-13	11.60	11.40	11.50
BIG CEDAR LAKE	Mid Lake, deep spot	18-May-13	6.60	6.00	6.30
CAMERON LAKE	N end, deep spot	21-May-13	7.60	8.20	7.90
CAMERON LAKE	N end, deep spot	06-Jun-13	11.60	13.20	12.40
CAMERON LAKE	N end, deep spot	07-Jul-13	10.80	12.20	11.50
CAMERON LAKE	N end, deep spot	07-Aug-13	13.60	10.40	12.00
CAMERON LAKE	N end, deep spot	10-Sep-13	9.60	10.20	9.90
CAMERON LAKE	N end, deep spot	29-Sep-13	9.60	10.40	10.00
CAMERON LAKE	S end, deep spot	25-May-13	10.00	9.60	9.80
CAMERON LAKE	S end, deep spot	25-Jun-13	13.40	13.20	13.30
CAMERON LAKE	S end, deep spot	02-Jul-13	10.00	11.40	10.70
CAMERON LAKE	S end, deep spot	05-Aug-13	10.60	10.60	10.60
CAMERON LAKE	S end, deep spot	12-Oct-13	11.40	13.40	12.40
CHEMONG LAKE	S. of Causeway	07-May-13	11.20	9.60	10.40
CHEMONG LAKE	S. of Causeway	11-Jul-13	19.20	23.80	21.50
CHEMONG LAKE	S. of Causeway	20-Aug-13	27.60	17.00	22.30
CHEMONG LAKE	S. of Causeway	23-Sep-13	14.60	15.80	15.20
CLEAR LAKE	MacKenzie Bay	20-Jun-13	20.20	20.00	20.10
CLEAR LAKE	MacKenzie Bay	02-Jul-13	17.20	18.60	17.90
CLEAR LAKE	MacKenzie Bay	08-Aug-13	19.60	19.60	19.60
CLEAR LAKE	Main Basin-deep spot	21-May-13	7.60	8.00	7.80

CLEAR LAKE	Main Basin-deep spot	21-Jun-13	14.40	13.60	14.00
CLEAR LAKE	Main Basin-deep spot	10-Jul-13	14.00	15.20	14.60
CLEAR LAKE	Main Basin-deep spot	19-Sep-13	19.60	17.00	18.30
CLEAR LAKE	Fiddlers Bay	21-May-13	7.80	8.00	7.90
CLEAR LAKE	Fiddlers Bay	21-Jun-13	14.80	14.80	14.80
CLEAR LAKE	Fiddlers Bay	10-Jul-13	15.20	15.40	15.30
CLEAR LAKE	Fiddlers Bay	19-Sep-13	17.20	17.00	17.10
CLEAR LAKE	Brysons Bay	12-Jul-13	20.00	19.60	19.80
CLEAR LAKE	Brysons Bay	29-Jul-13	18.20	17.40	17.80
CLEAR LAKE	Brysons Bay	05-Sep-13	19.80	20.80	20.30
KATCHEWANOOKA LAKE	S/E Douglas Island	16-May-13	8.40	9.80	9.10
KATCHEWANOOKA LAKE	S/E Douglas Island	03-Jun-13	10.20	10.20	10.20
KATCHEWANOOKA LAKE	S/E Douglas Island	03-Jul-13	16.20	17.20	16.70
KATCHEWANOOKA LAKE	S/E Douglas Island	06-Aug-13	20.60	20.60	20.60
KATCHEWANOOKA LAKE	S/E Douglas Island	03-Sep-13	16.60	16.40	16.50
KATCHEWANOOKA LAKE	S/E Douglas Island	08-Oct-13	17.60	18.80	18.20
KATCHEWANOOKA LAKE	Young Pt near locks	09-May-13	9.20	10.20	9.70
KATCHEWANOOKA LAKE	Young Pt near locks	30-May-13	8.20	9.00	8.60
KATCHEWANOOKA LAKE	Young Pt near locks	02-Jul-13	16.80	16.60	16.70
KATCHEWANOOKA LAKE	Young Pt near locks	06-Aug-13	16.60	16.20	16.40
KATCHEWANOOKA LAKE	Young Pt near locks	01-Sep-13	17.20	17.60	17.40
KATCHEWANOOKA LAKE	Young Pt near locks	03-Sep-13	17.20	16.00	16.60
LOVESICK LAKE	80' hole at N. end	05-May-13	9.20	10.80	10.00
LOVESICK LAKE	80' hole at N. end	09-Jun-13	16.00	18.80	17.40
LOVESICK LAKE	80' hole at N. end	01-Jul-13	17.80	17.40	17.60
LOVESICK LAKE	80' hole at N. end	05-Aug-13	30.00	26.00	28.00
LOVESICK LAKE	80' hole at N. end	02-Sep-13	20.80	21.80	21.30
LOVESICK LAKE	80' hole at N. end	10-Oct-13	12.60	13.40	13.00
LOVESICK LAKE	McCallum Island	05-May-13	74.00	11.20	42.60
LOVESICK LAKE	McCallum Island	09-Jun-13	17.60	17.00	17.30
LOVESICK LAKE	McCallum Island	01-Jul-13	17.60	19.00	18.30
LOVESICK LAKE	McCallum Island	05-Aug-13	26.00	25.00	25.50
LOVESICK LAKE	McCallum Island	02-Sep-13	21.60	20.40	21.00
LOVESICK LAKE	McCallum Island	10-Oct-13	13.40	13.40	13.40
LOWER BUCKHORN LAKE	Heron Island	18-May-13	12.60	13.00	12.80
LOWER BUCKHORN LAKE	Heron Island	15-Jun-13	18.20	18.60	18.40
LOWER BUCKHORN LAKE	Heron Island	06-Aug-13	39.40	39.60	39.50
LOWER BUCKHORN LAKE	Heron Island	10-Oct-13	12.20	12.60	12.40
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	17-May-13	15.40	11.60	13.50
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	14-Jun-13	18.60	19.60	19.10
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	09-Jul-13	18.40	18.00	18.20
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	09-Aug-13	27.80	25.40	26.60
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	09-Sep-13	21.80	19.60	20.70
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	10-Oct-13	11.60	13.40	12.50
LOWER BUCKHORN LAKE	Deer Bay-centre	18-May-13	9.60	9.40	9.50
LOWER BUCKHORN LAKE	Deer Bay-centre	15-Jun-13	20.80	19.20	20.00
LOWER BUCKHORN LAKE	Deer Bay-centre	06-Aug-13	27.20	29.40	28.30
LOWER BUCKHORN LAKE	Deer Bay-centre	10-Oct-13	13.20	13.20	13.20
PIGEON LAKE	Middle-Sandy Pt Boyd Is	20-May-13	8.60	8.80	8.70
PIGEON LAKE	Middle-Sandy Pt Boyd Is	15-Jun-13	16.80	16.00	16.40

PIGEON LAKE	Middle-Sandy Pt Boyd Is	01-Jul-13	18.60	**98.00**	18.60
PIGEON LAKE	Middle-Sandy Pt Boyd Is	06-Aug-13	18.00	18.20	18.10
PIGEON LAKE	Middle-Sandy Pt Boyd Is	03-Sep-13	20.60	19.60	20.10
PIGEON LAKE	Middle-Sandy Pt Boyd Is	13-Oct-13	17.40	15.80	16.60
PIGEON LAKE	N-400m N of Boyd Is.	27-May-13	18.00	14.40	16.20
PIGEON LAKE	N-400m N of Boyd Is.	06-Jun-13	15.40	17.60	16.50
PIGEON LAKE	N-400m N of Boyd Is.	04-Jul-13	**32.20**	14.20	14.20
PIGEON LAKE	N-400m N of Boyd Is.	05-Aug-13	15.00	15.00	15.00
PIGEON LAKE	N-400m N of Boyd Is.	12-Sep-13	22.60	16.00	19.30
PIGEON LAKE	N-400m N of Boyd Is.	04-Oct-13	24.00	26.00	25.00
PIGEON LAKE	N end-Adjacent Con17	20-May-13	8.00	7.60	7.80
PIGEON LAKE	N end-Adjacent Con17	15-Jun-13	14.60	15.40	15.00
PIGEON LAKE	N end-Adjacent Con17	01-Jul-13	17.80	17.00	17.40
PIGEON LAKE	N end-Adjacent Con17	06-Aug-13	19.20	20.00	19.60
PIGEON LAKE	N end-Adjacent Con17	03-Sep-13	22.20	21.80	22.00
PIGEON LAKE	N end-Adjacent Con17	13-Oct-13	16.00	15.60	15.80
PIGEON LAKE	C340-DeadHorseShoal	19-Jun-13	20.60	21.00	20.80
PIGEON LAKE	C340-DeadHorseShoal	02-Jul-13	24.40	21.20	22.80
PIGEON LAKE	C340-DeadHorseShoal	03-Aug-13	**54.00**	29.80	29.80
PIGEON LAKE	C340-DeadHorseShoal	06-Aug-13	21.80	20.40	21.10
PIGEON LAKE	N300yds off Bottom I	27-May-13	19.40	19.20	19.30
PIGEON LAKE	N300yds off Bottom I	06-Jun-13	22.40	15.40	18.90
PIGEON LAKE	N300yds off Bottom I	04-Jul-13	14.40	14.00	14.20
PIGEON LAKE	N300yds off Bottom I	05-Aug-13	12.80	14.40	13.60
PIGEON LAKE	N300yds off Bottom I	12-Sep-13	**32.60**	15.60	15.60
PIGEON LAKE	N300yds off Bottom I	04-Oct-13	27.20	**46.60**	27.20
SANDY LAKE	Mid Lake, deep spot	20-May-13	7.00	11.60	9.30
SANDY LAKE	Mid Lake, deep spot	14-Jun-13	9.60	14.80	12.20
SANDY LAKE	Mid Lake, deep spot	21-Jul-13	7.60	7.60	7.60
SANDY LAKE	Mid Lake, deep spot	31-Aug-13	5.80	6.20	6.00
SANDY LAKE	Mid Lake, deep spot	22-Sep-13	13.60	8.80	11.20
SANDY LAKE	Mid Lake, deep spot	14-Oct-13	7.80	5.60	6.70
STONY LAKE	Burleigh locks chan.	12-Jul-13	22.00	22.40	22.20
STONY LAKE	Burleigh locks chan.	29-Jul-13	28.20	28.40	28.30
STONY LAKE	Burleigh locks chan.	05-Sep-13	23.00	21.00	22.00
STONY LAKE	Gilchrist Bay	20-May-13	12.40	9.60	11.00
STONY LAKE	Gilchrist Bay	16-Jun-13	15.80	16.20	16.00
STONY LAKE	Gilchrist Bay	19-Jul-13	20.40	18.40	19.40
STONY LAKE	Gilchrist Bay	11-Aug-13	17.00	18.60	17.80
STONY LAKE	Gilchrist Bay	08-Sep-13	17.40	18.20	17.80
STONY LAKE	Mouse Is.	08-May-13	10.00	9.40	9.70
STONY LAKE	Mouse Is.	03-Jun-13	13.80	14.60	14.20
STONY LAKE	Mouse Is.	02-Jul-13	18.40	16.40	17.40
STONY LAKE	Mouse Is.	06-Aug-13	17.40	17.40	17.40
STONY LAKE	Mouse Is.	08-Sep-13	22.60	18.80	20.70
STONY LAKE	Hamilton Bay	08-May-13	8.60	8.60	8.60
STONY LAKE	Hamilton Bay	03-Jun-13	12.40	12.00	12.20
STONY LAKE	Hamilton Bay	02-Jul-13	13.80	13.80	13.80
STONY LAKE	Hamilton Bay	06-Aug-13	16.00	16.60	16.30
STONY LAKE	Hamilton Bay	08-Sep-13	16.20	16.40	16.30

STONY LAKE	Hamilton Bay	30-Sep-13	12.80	12.80	12.80
STONY LAKE	Hamilton Bay	30-Sep-13	13.60	13.80	13.70
STURGEON LAKE	Muskrat I-Buoy C388	03-Jun-13	12.00	11.80	11.90
STURGEON LAKE	Muskrat I-Buoy C388	03-Jun-13	13.80	13.20	13.50
STURGEON LAKE	Muskrat I-Buoy C388	02-Jul-13	16.20	14.40	15.30
STURGEON LAKE	Muskrat I-Buoy C388	12-Aug-13	18.40	16.80	17.60
STURGEON LAKE	Muskrat I-Buoy C388	04-Sep-13	23.40	24.60	24.00
STURGEON LAKE	Sturgeon Point Buoy	03-Jun-13	13.00	12.40	12.70
STURGEON LAKE	Sturgeon Point Buoy	02-Jul-13	14.80	13.20	14.00
STURGEON LAKE	Sturgeon Point Buoy	12-Aug-13	16.80	17.60	17.20
STURGEON LAKE	Sturgeon Point Buoy	03-Sep-13	19.00	20.20	19.60
STURGEON LAKE	Fenelon R. mouth	02-Jul-13	10.20	10.40	10.30
STURGEON LAKE	Fenelon R. mouth	12-Aug-13	15.00	13.20	14.10
STURGEON LAKE	Fenelon R. mouth	03-Sep-13	11.40	11.80	11.60
UPPER STONEY LAKE	Quarry Bay	05-May-13	7.80	9.00	8.40
UPPER STONEY LAKE	Quarry Bay	09-Jun-13	7.60	7.40	7.50
UPPER STONEY LAKE	Quarry Bay	07-Jul-13	6.80	6.80	6.80
UPPER STONEY LAKE	Quarry Bay	06-Aug-13	8.00	8.00	8.00
UPPER STONEY LAKE	Quarry Bay	08-Sep-13	7.00	6.80	6.90
UPPER STONEY LAKE	Quarry Bay	08-Oct-13	7.00	6.80	6.90
UPPER STONEY LAKE	Young Bay	05-May-13	9.60	9.40	9.50
UPPER STONEY LAKE	Young Bay	09-Jun-13	6.80	7.00	6.90
UPPER STONEY LAKE	Young Bay	07-Jul-13	7.40	6.20	6.80
UPPER STONEY LAKE	Young Bay	06-Aug-13	8.00	8.20	8.10
UPPER STONEY LAKE	Young Bay	08-Sep-13	7.40	8.00	7.70
UPPER STONEY LAKE	Young Bay	08-Oct-13	7.00	6.80	6.90
UPPER STONEY LAKE	S Bay, deep spot	05-May-13	8.00	8.20	8.10
UPPER STONEY LAKE	S Bay, deep spot	09-Jun-13	10.60	11.20	10.90
UPPER STONEY LAKE	S Bay, deep spot	07-Jul-13	10.40	10.20	10.30
UPPER STONEY LAKE	S Bay, deep spot	06-Aug-13	11.20	10.40	10.80
UPPER STONEY LAKE	S Bay, deep spot	08-Sep-13	8.40	9.00	8.70
UPPER STONEY LAKE	S Bay, deep spot	08-Oct-13	9.60	9.40	9.50
UPPER STONEY LAKE	Crowes Landing	05-May-13	8.20	8.60	8.40
UPPER STONEY LAKE	Crowes Landing	09-Jun-13	6.40	6.40	6.40
UPPER STONEY LAKE	Crowes Landing	07-Jul-13	6.60	10.20	8.40
UPPER STONEY LAKE	Crowes Landing	06-Aug-13	8.80	9.60	9.20
UPPER STONEY LAKE	Crowes Landing	08-Sep-13	7.40	7.00	7.20
UPPER STONEY LAKE	Crowes Landing	08-Oct-13	6.60	7.00	6.80
UPPER STONEY LAKE	Mid Lake, deep spot	05-May-13	8.20	8.00	8.10
UPPER STONEY LAKE	Mid Lake, deep spot	09-Jun-13	6.80	7.00	6.90
UPPER STONEY LAKE	Mid Lake, deep spot	07-Jul-13	7.20	7.00	7.10
UPPER STONEY LAKE	Mid Lake, deep spot	06-Aug-13	9.00	9.20	9.10
UPPER STONEY LAKE	Mid Lake, deep spot	08-Sep-13	8.00	7.80	7.90
UPPER STONEY LAKE	Mid Lake, deep spot	09-Oct-13	6.40	6.40	6.40
WHITE LAKE (DUMMER)	S end, deep spot	20-Jun-13	12.20	16.40	14.30
WHITE LAKE (DUMMER)	S end, deep spot	25-Jul-13	15.20	14.40	14.80
WHITE LAKE (DUMMER)	S end, deep spot	12-Aug-13	14.80	16.60	15.70
WHITE LAKE (DUMMER)	S end, deep spot	17-Sep-13	12.20	11.60	11.90
WHITE LAKE (DUMMER)	S end, deep spot	08-Oct-13	10.20	10.60	10.40

2013 Secchi Depth Measurements

KLSA volunteers measured water clarity using the Secchi disk method. A larger Secchi measurement indicates clearer water. As a general rule, lakes with higher phosphorus levels will have reduced clarity, and therefore lower Secchi measurements. We can see this relationship in the Kawartha Lakes: the average Secchi reading in early August of six sites on two low-phosphorus lakes, Upper Stoney Lake and Balsam Lake, was 5.2 m. In contrast, the average Secchi reading in early August of four sites on three higher-phosphorus lakes, Chemong, Lower Buckhorn and Lovesick Lake, was 2.5 m.

However, just to complicate matters, other factors can affect Secchi disk readings in our lakes. In hard-water lakes like Sandy, Big Bald, and Chemong (as well as Scugog) calcium carbonate will precipitate in the water column when the lake water warms, creating somewhat cloudy or murky conditions, persisting until that precipitate settles to the bottom (creating marl) or the water cools again in the fall. Also, organic staining of lake water from streams fed by wetlands can darken the water, creating tea-like conditions and reducing the penetration of light. Such conditions are found more commonly in the spring or during wet weather when large amounts of runoff enter the lakes. Some lakes, however, particularly Cameron and Little Bald Lakes, remain tea-coloured year-round due to the large amounts of wetlands in their watershed.

LAKE NAME	Site Description	Date	Secchi (m)
BALSAM LAKE	N Bay Rocky Pt.	30-Jun-13	5.00
BALSAM LAKE	N Bay Rocky Pt.	12-Jul-13	5.50
BALSAM LAKE	N Bay Rocky Pt.	01-Aug-13	5.75
BALSAM LAKE	N Bay Rocky Pt.	15-Aug-13	6.00
BALSAM LAKE	N Bay Rocky Pt.	01-Sep-13	6.50
BALSAM LAKE	N Bay Rocky Pt.	14-Sep-13	6.25
BALSAM LAKE	NE end-Lightning Pt	24-Jul-13	4.30
BALSAM LAKE	South B-Killarney B	18-May-13	3.55
BALSAM LAKE	South B-Killarney B	12-Jun-13	3.15
BALSAM LAKE	South B-Killarney B	28-Jun-13	3.75
BALSAM LAKE	South B-Killarney B	06-Aug-13	3.73
BALSAM LAKE	South B-Killarney B	03-Sep-13	3.81
BALSAM LAKE	South B-Killarney B	01-Oct-13	4.85
BIG BALD LAKE	Mid Lake, deep spot	17-May-13	5.50
BIG BALD LAKE	Mid Lake, deep spot	05-Jun-13	3.00
BIG BALD LAKE	Mid Lake, deep spot	02-Jul-13	4.50
BIG BALD LAKE	Mid Lake, deep spot	08-Aug-13	3.00
BIG BALD LAKE	Mid Lake, deep spot	03-Sep-13	3.30
BIG BALD LAKE	Mid Lake, deep spot	02-Oct-13	3.90
BIG CEDAR LAKE	Mid Lake, deep spot	18-May-13	4.90
BIG CEDAR LAKE	Mid Lake, deep spot	05-Jun-13	5.00
BIG CEDAR LAKE	Mid Lake, deep spot	16-Jun-13	4.70
BIG CEDAR LAKE	Mid Lake, deep spot	21-Jun-13	5.80
BIG CEDAR LAKE	Mid Lake, deep spot	29-Jun-13	5.00
BIG CEDAR LAKE	Mid Lake, deep spot	12-Jul-13	6.20
BIG CEDAR LAKE	Mid Lake, deep spot	21-Jul-13	5.50
BIG CEDAR LAKE	Mid Lake, deep spot	31-Jul-13	5.80
BIG CEDAR LAKE	Mid Lake, deep spot	18-Aug-13	6.50
BIG CEDAR LAKE	Mid Lake, deep spot	28-Aug-13	6.70
BIG CEDAR LAKE	Mid Lake, deep spot	09-Sep-13	6.10
CAMERON LAKE	N end, deep spot	01-May-13	3.60
CAMERON LAKE	N end, deep spot	06-Jun-13	3.20
CAMERON LAKE	N end, deep spot	07-Jul-13	3.60
CAMERON LAKE	N end, deep spot	22-Jul-13	3.60

CAMERON LAKE	N end, deep spot	09-Aug-13	3.20
CAMERON LAKE	N end, deep spot	10-Sep-13	3.30
CAMERON LAKE	N end, deep spot	29-Sep-13	4.10
CAMERON LAKE	S end, deep spot	25-May-13	3.25
CAMERON LAKE	S end, deep spot	23-Jun-13	3.50
CAMERON LAKE	S end, deep spot	02-Jul-13	3.20
CAMERON LAKE	S end, deep spot	05-Aug-13	3.20
CAMERON LAKE	S end, deep spot	12-Oct-13	3.20
CHEMONG LAKE	S. of Causeway	07-May-13	4.00
CHEMONG LAKE	S. of Causeway	11-Jul-13	2.00
CHEMONG LAKE	S. of Causeway	20-Aug-13	2.00
CHEMONG LAKE	S. of Causeway	23-Sep-13	2.60
CLEAR LAKE	Main Basin-deep spot	21-May-13	4.01
CLEAR LAKE	Main Basin-deep spot	21-Jun-13	3.65
CLEAR LAKE	Main Basin-deep spot	10-Jul-13	2.93
CLEAR LAKE	Main Basin-deep spot	19-Sep-13	3.61
CLEAR LAKE	Fiddlers Bay	21-May-13	4.01
CLEAR LAKE	Fiddlers Bay	21-Jun-13	3.36
CLEAR LAKE	Fiddlers Bay	10-Jul-13	2.85
CLEAR LAKE	Fiddlers Bay	19-Sep-13	3.61
KATCHEWANOOKA LAKE	S/E Douglas Island	15-May-13	4.70
KATCHEWANOOKA LAKE	S/E Douglas Island	03-Jun-13	5.60
KATCHEWANOOKA LAKE	S/E Douglas Island	16-Jun-13	4.05
KATCHEWANOOKA LAKE	S/E Douglas Island	03-Jul-13	4.20
KATCHEWANOOKA LAKE	S/E Douglas Island	15-Jul-13	3.00
KATCHEWANOOKA LAKE	S/E Douglas Island	07-Aug-13	3.65
KATCHEWANOOKA LAKE	S/E Douglas Island	21-Aug-13	5.05
KATCHEWANOOKA LAKE	S/E Douglas Island	03-Sep-13	4.00
KATCHEWANOOKA LAKE	S/E Douglas Island	18-Sep-13	5.50
KATCHEWANOOKA LAKE	S/E Douglas Island	08-Oct-13	5.65
KATCHEWANOOKA LAKE	S/E Douglas Island	23-Oct-13	4.90
KATCHEWANOOKA LAKE	Young Pt near locks	09-May-13	3.10
KATCHEWANOOKA LAKE	Young Pt near locks	21-May-13	5.00
KATCHEWANOOKA LAKE	Young Pt near locks	30-May-13	5.50
KATCHEWANOOKA LAKE	Young Pt near locks	19-Jun-13	4.50
KATCHEWANOOKA LAKE	Young Pt near locks	02-Jul-13	3.60
KATCHEWANOOKA LAKE	Young Pt near locks	17-Jul-13	3.80
KATCHEWANOOKA LAKE	Young Pt near locks	06-Aug-13	4.20
KATCHEWANOOKA LAKE	Young Pt near locks	17-Aug-13	5.20
KATCHEWANOOKA LAKE	Young Pt near locks	03-Sep-13	4.40
KATCHEWANOOKA LAKE	Young Pt near locks	22-Sep-13	5.50
KATCHEWANOOKA LAKE	Young Pt near locks	01-Oct-13	6.10
KATCHEWANOOKA LAKE	Young Pt near locks	14-Oct-13	6.10
LOVESICK LAKE	80' hole at N. end	05-May-13	4.00
LOVESICK LAKE	80' hole at N. end	09-Jun-13	4.00
LOVESICK LAKE	80' hole at N. end	01-Jul-13	4.00
LOVESICK LAKE	80' hole at N. end	05-Aug-13	3.00
LOVESICK LAKE	80' hole at N. end	02-Sep-13	3.25
LOVESICK LAKE	80' hole at N. end	10-Oct-13	5.00
LOVESICK LAKE	McCallum Island	05-May-13	4.00
LOVESICK LAKE	McCallum Island	09-Jun-13	4.50
LOVESICK LAKE	McCallum Island	01-Jul-13	4.00

LOVESICK LAKE	McCallum Island	05-Aug-13	3.00
LOVESICK LAKE	McCallum Island	02-Sep-13	3.00
LOVESICK LAKE	McCallum Island	10-Oct-13	5.00
LOWER BUCKHORN LAKE	Heron Island	18-May-13	3.50
LOWER BUCKHORN LAKE	Heron Island	01-Jun-13	3.60
LOWER BUCKHORN LAKE	Heron Island	05-Aug-13	2.30
LOWER BUCKHORN LAKE	Heron Island	10-Oct-13	5.00
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	17-May-13	4.15
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	31-May-13	2.64
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	14-Jun-13	2.68
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	04-Jul-13	3.19
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	10-Jul-13	3.01
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	25-Jul-13	2.55
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	09-Aug-13	1.89
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	10-Aug-13	7.33
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	27-Aug-13	2.34
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	10-Sep-13	3.31
LOWER BUCKHORN LAKE	Deer Bay W-Buoy C267	24-Sep-13	4.11
LOWER BUCKHORN LAKE	Deer Bay-centre	18-May-13	4.20
LOWER BUCKHORN LAKE	Deer Bay-centre	01-Jun-13	3.60
LOWER BUCKHORN LAKE	Deer Bay-centre	05-Aug-13	2.30
LOWER BUCKHORN LAKE	Deer Bay-centre	10-Oct-13	4.80
PIGEON LAKE	Middle-Sandy Pt Boyd I	20-May-13	2.80
PIGEON LAKE	Middle-Sandy Pt Boyd I	15-Jun-13	2.70
PIGEON LAKE	Middle-Sandy Pt Boyd I	01-Jul-13	2.70
PIGEON LAKE	Middle-Sandy Pt Boyd I	06-Aug-13	2.60
PIGEON LAKE	Middle-Sandy Pt Boyd I	03-Sep-13	2.10
PIGEON LAKE	Middle-Sandy Pt Boyd I	13-Oct-13	3.10
PIGEON LAKE	N-400m N of Boyd Is.	02-Oct-13	1.25
PIGEON LAKE	N end-Adjacent Con17	20-May-13	2.80
PIGEON LAKE	N end-Adjacent Con17	15-Jun-13	2.60
PIGEON LAKE	N end-Adjacent Con17	01-Jul-13	2.80
PIGEON LAKE	N end-Adjacent Con17	06-Aug-13	2.50
PIGEON LAKE	N end-Adjacent Con17	03-Sep-13	2.20
PIGEON LAKE	N end-Adjacent Con17	13-Oct-13	3.00
PIGEON LAKE	C340-DeadHorseShoal	19-Jun-13	3.30
PIGEON LAKE	C340-DeadHorseShoal	02-Jul-13	2.60
PIGEON LAKE	C340-DeadHorseShoal	06-Aug-13	2.90
PIGEON LAKE	C340-DeadHorseShoal	03-Sep-13	2.40
PIGEON LAKE	N300yds off Bottom I	02-Oct-13	1.50
SANDY LAKE	Mid Lake, deep spot	20-May-13	4.40
SANDY LAKE	Mid Lake, deep spot	15-Jun-13	5.20
SANDY LAKE	Mid Lake, deep spot	21-Jul-13	3.50
SANDY LAKE	Mid Lake, deep spot	31-Aug-13	4.70
SANDY LAKE	Mid Lake, deep spot	22-Sep-13	5.10
SANDY LAKE	Mid Lake, deep spot	14-Oct-13	5.20
STONY LAKE	Mouse Is.	08-May-13	3.00
STONY LAKE	Mouse Is.	03-Jun-13	3.20
STONY LAKE	Mouse Is.	02-Jul-13	3.00
STONY LAKE	Mouse Is.	06-Aug-13	3.40
STONY LAKE	Mouse Is.	08-Sep-13	3.10
STONY LAKE	Mouse Is.	30-Sep-13	3.50

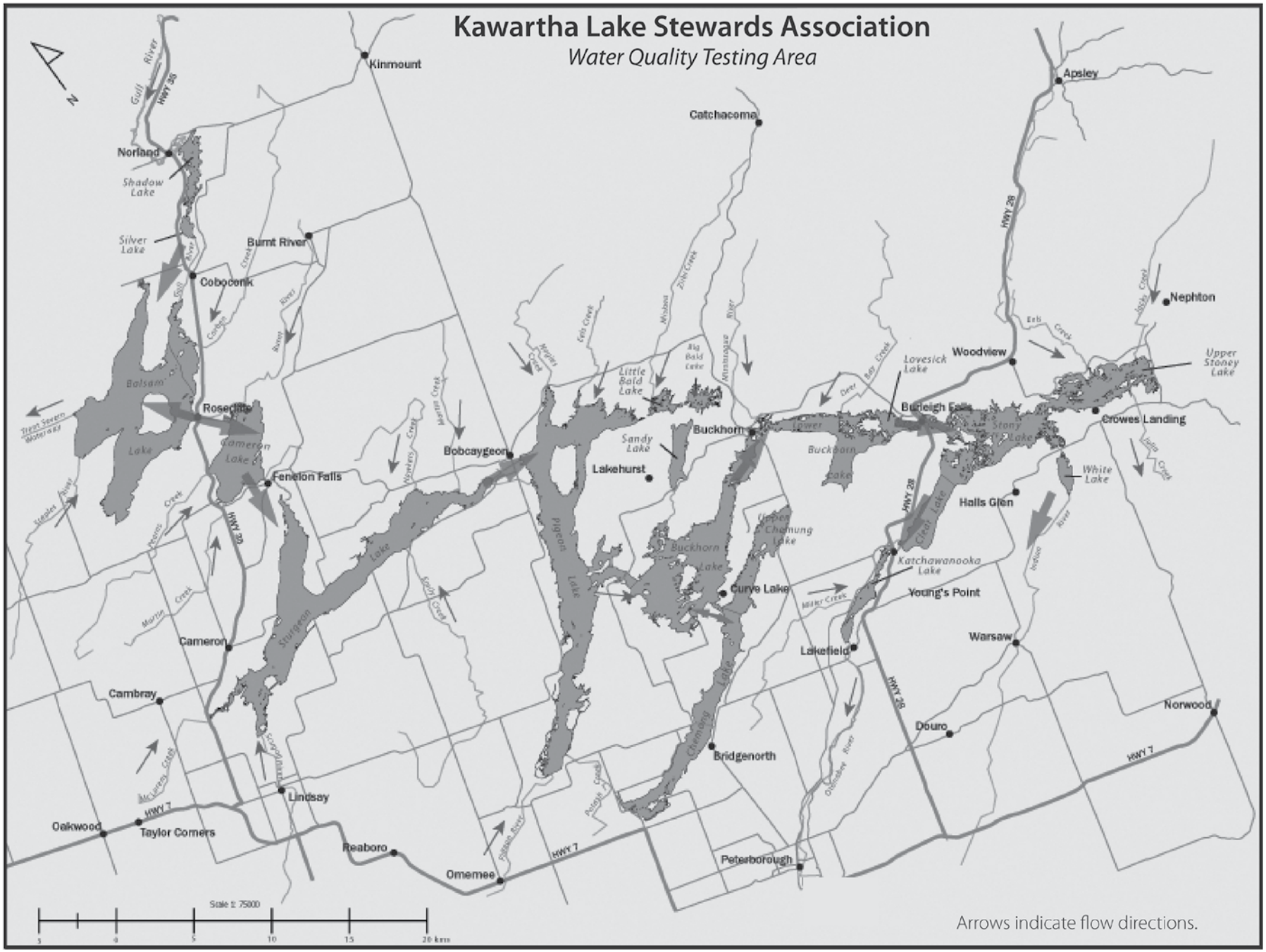
STONY LAKE	Hamilton Bay	08-May-13	3.10
STONY LAKE	Hamilton Bay	03-Jun-13	3.40
STONY LAKE	Hamilton Bay	02-Jul-13	3.00
STONY LAKE	Hamilton Bay	06-Aug-13	3.30
STONY LAKE	Hamilton Bay	08-Sep-13	4.10
STONY LAKE	Hamilton Bay	30-Sep-13	3.60
STURGEON LAKE	Muskrat I-Buoy C388	04-Jun-13	2.60
STURGEON LAKE	Muskrat I-Buoy C388	02-Jul-13	2.75
STURGEON LAKE	Muskrat I-Buoy C388	06-Aug-13	3.60
STURGEON LAKE	Muskrat I-Buoy C388	04-Sep-13	3.00
STURGEON LAKE	Sturgeon Point Buoy	04-Jun-13	2.00
STURGEON LAKE	Sturgeon Point Buoy	03-Jul-13	2.80
STURGEON LAKE	Sturgeon Point Buoy	06-Aug-13	2.70
STURGEON LAKE	Sturgeon Point Buoy	03-Sep-13	1.90
STURGEON LAKE	Fenelon R. mouth	04-Jun-13	2.60
STURGEON LAKE	Fenelon R. mouth	03-Jul-13	2.90
STURGEON LAKE	Fenelon R. mouth	06-Aug-13	2.60
STURGEON LAKE	Fenelon R. mouth	03-Sep-13	2.90
UPPER STONEY LAKE	Quarry Bay	05-May-13	4.00
UPPER STONEY LAKE	Quarry Bay	09-Jun-13	6.70
UPPER STONEY LAKE	Quarry Bay	07-Jul-13	5.50
UPPER STONEY LAKE	Quarry Bay	06-Aug-13	5.70
UPPER STONEY LAKE	Quarry Bay	10-Aug-13	6.90
UPPER STONEY LAKE	Quarry Bay	09-Sep-13	5.60
UPPER STONEY LAKE	Young Bay	05-May-13	3.70
UPPER STONEY LAKE	Young Bay	09-Jun-13	6.90
UPPER STONEY LAKE	Young Bay	07-Jul-13	5.00
UPPER STONEY LAKE	Young Bay	06-Aug-13	5.90
UPPER STONEY LAKE	Young Bay	10-Aug-13	6.60
UPPER STONEY LAKE	Young Bay	09-Sep-13	6.00
UPPER STONEY LAKE	Crowes Landing	05-May-13	3.10
UPPER STONEY LAKE	Crowes Landing	09-Jun-13	6.00
UPPER STONEY LAKE	Crowes Landing	07-Jul-13	5.10
UPPER STONEY LAKE	Crowes Landing	06-Aug-13	4.90
UPPER STONEY LAKE	Crowes Landing	10-Aug-13	5.80
UPPER STONEY LAKE	Crowes Landing	09-Sep-13	6.60
UPPER STONEY LAKE	Mid Lake, deep spot	05-May-13	4.00
UPPER STONEY LAKE	Mid Lake, deep spot	09-Jun-13	6.00
UPPER STONEY LAKE	Mid Lake, deep spot	07-Jul-13	5.10
UPPER STONEY LAKE	Mid Lake, deep spot	06-Aug-13	5.00
UPPER STONEY LAKE	Mid Lake, deep spot	10-Aug-13	7.00
UPPER STONEY LAKE	Mid Lake, deep spot	09-Sep-13	6.10
WHITE LAKE (DUMMER)	S end, deep spot	21-Jun-13	4.20
WHITE LAKE (DUMMER)	S end, deep spot	25-Jul-13	4.20
WHITE LAKE (DUMMER)	S end, deep spot	12-Aug-13	4.20
WHITE LAKE (DUMMER)	S end, deep spot	17-Sep-13	4.10
WHITE LAKE (DUMMER)	S end, deep spot	08-Oct-13	4.90

Appendix G: Rainfall in the Kawarthas 2013

This chart shows rainfall at four sites in the Kawarthas during the summer of 2013. Gauge locations are Stony Lake (SL), southwest Sturgeon Lake (SWS), northeast Sturgeon Lake (NES), and Trent University (TU).

Date	SL	SWS	NES	TU
2-May	0	0.8	12.2	0
3-May	0	0	0	0
4-May	0	0	0	0
5-May	0	0	0	0
6-May	0	0	0	0
7-May	0	0	0	0
8-May	0	0	0	0
9-May	0	0	0	0
10-May	0	1	0.7	0
11-May	0	0	0	23.2
12-May	0	0	0	0
13-May	0	0	0	3.5
14-May	0	0	0	0
15-May	0	0	0	0
16-May	0	0	0	0.3
17-May	0	0	0	0
18-May	0	0	0	0
19-May	0	0	0	0
20-May	0	0	0	0
21-May	0	0	0	2.9
22-May	0	0	25.5	44.2
23-May	0	0	0	1.8
24-May	0	55.4	0	0.4
25-May	0	0	20.3	0
26-May	0	0	0	0
27-May	0	0	0	0
28-May	0	0.9	0	0
29-May	0	0	0	3.1
30-May	0	0	0	7.7
31-May	0	0	0	0
Total	0	58.1	58.7	87.1
Average	**0**	**14.525**	**11.74**	**2.903**
1-Jun	0	12	13.2	0
2-Jun	17.9	0	0	12.2
3-Jun	11.4	0	0	10.2
4-Jun	0	20.3	15.5	0
5-Jun	0	0	0	0
6-Jun	0	0	0	0
7-Jun	7.5	12.2	0	9.1
8-Jun	0	0	0	0
9-Jun	0	0	0	0
10-Jun	0	0	0	0
11-Jun	20.1	0	12.2	26.4
12-Jun	0	0	0	1.4
13-Jun	0	0	0	0
14-Jun	1	0	0	6.3
15-Jun	0	0	0	0
16-Jun	0	0	0	0
17-Jun	20.9	0	0	22.5
18-Jun	0	0	0	0.8
19-Jun	0	36.4	51	0
20-Jun	0	0	0	0
21-Jun	0	0	0	0
22-Jun	0	0	0	0
23-Jun	0	0	0	2.3
24-Jun	0	0	0	0
25-Jun	0	0	6.6	0
26-Jun	1.6	2.6	0	4.8
27-Jun	0	0	0	0
28-Jun	0	0	0	0
29-Jun	18.2	6	0.7	0
30-Jun	0	0	0	0
Total	98.6	89.5	99.2	96
Average	**12.325**	**14.917**	**16.533**	**3.2**
1-Jul	0	0	0	0
2-Jul	0	0	0	0
3-Jul	0	0	0	0
4-Jul	0	0	0	
5-Jul	0	0	0	0
6-Jul	2.2	0	0	0
7-Jul	0	0	0	0
8-Jul	23.8	0	0	20.3
9-Jul	0	36.9	0	0
10-Jul	0	0	16.4	0
11-Jul	0	7.8	0	0
12-Jul	11	0	0	0
13-Jul	0	0	0	0
14-Jul	0	0	0	0
15-Jul	0	0	0	0
16-Jul	0	0	0	0
17-Jul	0	0	12.2	0
18-Jul	3.3	0	0	0
19-Jul	0	0	0	0
20-Jul	4.8	0	0	2.9
21-Jul	0	0	0	5.2
22-Jul	0	0	0	0
23-Jul	0	11.5	16.2	0

24-Jul	13.4	0	0	1
25-Jul	0	0	0	0
26-Jul	0	0	0	0
27-Jul	0	0	0	0
28-Jul	0	0	0	0.4
29-Jul	0	0	0	0
30-Jul	16.4	0	0	3.1
31-Jul	0	25.4	7.3	0
Total	74.9	81.6	52.1	32.9
Average	**10.7**	**13.6**	**10.42**	**1.097**
1-Aug	0	0	0	
2-Aug	48.4	48	52.5	30.9
3-Aug	0	0	0	10.4
4-Aug	24.6	0	0	0
5-Aug	0	0	0	0
6-Aug	0	0	0	0
7-Aug	0	4.6	9.8	0
8-Aug	6	0	0	38.1
9-Aug	0	33.9	41.8	0
10-Aug	0	0	0	0
11-Aug	0	0	0	0
12-Aug	0	0	0	0
13-Aug	4.7	0	0	0
14-Aug	0	6.4	4.8	0
15-Aug	0	0	0	0
16-Aug	0	0	0	0
17-Aug	0	0	0	0
18-Aug	0	0	0	0
19-Aug	0	0	0	0
20-Aug	0	0	0	0
21-Aug	0	0	0	0
22-Aug	0	0	0	0
23-Aug	7.7	0	0	1.8
24-Aug	0	0	0	0
25-Aug	0	0	0	0
26-Aug	0	0	0	11.9
27-Aug	17.4	0	0	10.7
28-Aug	0	32.8	0	0
29-Aug	4.9	0	28.8	0
30-Aug	0	0	0	0
31-Aug	0	0	1.1	8.2
Total	113.7	125.7	138.8	112
Average	**16.243**	**17.957**	**23.133**	**3.862**
1-Sep	4	0	0	0
2-Sep	0	15	4.6	0
3-Sep	0	0	0	18.9
4-Sep	0	13.6	0	0
5-Sep	0	0	0	0
6-Sep	0	0	0	0
7-Sep	0	0	0	0
8-Sep	0	0	0	1.4
9-Sep	0	0	0	0
10-Sep	0	0	0	0
11-Sep	29.8	12	0	11.9
12-Sep	0	0	15.7	0
13-Sep	1.2	0	0	3.6
14-Sep	0	0	0	0
15-Sep	0	0	0	0
16-Sep	0	0	0	1.4
17-Sep	0	0	0	0
18-Sep	0	0	0	0
19-Sep	0	0	0	0
20-Sep	0	0	0	0
21-Sep	0	0	0	8.9
22-Sep	48.3	0	0	27.2
23-Sep	0	0	0	0
24-Sep	0	50	53.4	0
25-Sep	0	0	0	0
26-Sep	0	0	0	0
27-Sep	0	0	0	0
28-Sep	0	0	0	0
29-Sep	0	0	0	0
30-Sep	0	0	0	0.3
Total	83.3	90.6	73.7	73.6
Average	**20.825**	**22.65**	**18.425**	**2.726**
1-Oct	0	0	0	0
2-Oct	0	0.5	2.2	0
3-Oct	0	0	0	0.3
4-Oct	0	0	0	0
5-Oct	0	0	0	8.4
6-Oct	0	0	0	0
7-Oct	0	0	0	7.1
8-Oct	0	0	0	7.9
9-Oct	0	31.2	41.1	0
10-Oct	0	0	0	0
11-Oct	0	0	0	0
12-Oct	0	0	0	0
13-Oct	0	0	0	0


Kawartha Lake Stewards Association
Water Quality Testing Area
Kinmount
Norland
Shadow Lake
Silver Lake
Burnt River
Coboconk
Gull River
Balsam Lake
Cameron Lake
Rosedale
Fenelon Falls
Bobcaygeon
Lakehurst
Sandy Lake
Little Bald Lake
Buckhorn
Buckhorn Lake
Upper Chemung Lake
Pigeon Lake
Sturgeon Lake
Curve Lake
Catchacoma
Apsley
Woodview
Lovesick Lake
Burleigh Falls
Stony Lake
Upper Stoney Lake
Nephton
Crowes Landing
White Lake
Halls Glen
Katchawanooka Lake
Young's Point
Warsaw
Lakefield
Bridgenorth
Douro
Norwood
Peterborough
Omemee
Reaboro
Lindsay
Cambray
Cameron
Oakwood
Taylor Corners
HWY 35
HWY 28
HWY 7
Arrows indicate flow directions.

Join the Kawartha Lake Stewards Association (KLSA)

The KLSA is a non-profit, completely volunteer organization of cottagers and year-round residents formed to monitor the water quality of the Kawartha Lakes. The organization was formed in 2001 and over the years has conducted water testing and sponsored a number of scientific studies focused on improving and sustaining the health of the Kawartha Lakes. We work co-operatively with the Trent-Severn Waterway, area municipalities, Conservation Authorities, Trent University, Fleming College and other partners.

The work of the KLSA is documented in a series of annual Lake Water Quality Reports as well as the 2009 Aquatic Plants Guide, The Milfoil Weevil (2011) and the 2012 The Algae of the Kawartha Lakes, all of which are specific to the Kawartha Lakes. The organization is well-recognized and was the winner of the Kawartha Conservation 2012 Community Conservationist Award, the Cottage Life 2008 Green Cottager Award and the Federation of Ontario Cottagers' Association's 2002 Jerry Strickland Award.

Historically, KLSA has funded its work with donations from individuals, businesses and local groups, and with grants from local governments and organizations such as the Trent-Severn Waterway and The Ontario Trillium Foundation. In the current fiscal climate, there is a concern that some of these grants will be more difficult to secure.

In addition to funding concerns, forthcoming legislation regarding not-for-profit organizations requires that the KLSA develop a more structured membership policy. As a result, the KLSA Board of Directors has decided to transition to a paid membership effective this year, 2014. Membership will be limited to two categories – Individual and Student. The cost is $20 per year; $10 per year for full-time students. Members will be entitled to vote at the KLSA Annual General Meeting and will be eligible to have a printed copy of the annual Lake Water Quality Report mailed to their home in the Spring of the following year. For example, if you join the KLSA in 2014 and indicate that you would like a printed copy of the report, you will receive the Annual Report via mail when it is published in April 2015.

If you benefited from this report, and if you want to keep our future work in the public eye, please join the KLSA and consider making an additional donation. Run by volunteers, KLSA provides excellent value for every dollar it receives, and gratefully acknowledges every donor.

You can join the KLSA by visiting our website at www.klsa.wordpress.com and completing the membership form. Payment can be made via PayPal or major credit card.

OR

You can complete the form on the back of this page and mail it with a cheque to:

Kawartha Lake Stewards Association – Membership
c/o 142 West Bay Boulevard
Kirkfield, Ontario, K0M 2B0

KLSA Membership

Individual Membership - $20. Student Membership - $10.
Complete the form below for each membership.
Please direct questions regarding KLSA Membership to joinklsa@gmail.com.

Name: _____ Address: _____ City: _____ Postal Code: _____ Email: _____ My Lake: _____ My Association: _____ _____ ð Individual $20 ð Student $10 Additional donation to support the work of KLSA: $_____ Total enclosed: $_____ I wish to receive a mailed copy of the next KLSA Annual Water Quality Report. ð Yes ð No Note: KLSA is not able to issue charitable tax receipts for personal donations.	Name: _____ Address: _____ City: _____ Postal Code: _____ Email: _____ My Lake: _____ My Association: _____ _____ ð Individual $20 ð Student $10 Additional donation to support the work of KLSA: $_____ Total enclosed: $_____ I wish to receive a mailed copy of the next KLSA Annual Water Quality Report. ð Yes ð No Note: KLSA is not able to issue charitable tax receipts for personal donations.

Donation from an Association or Business Organization Name: _____ _____ Donation Amount: $_____ Contact Name and Address: _____ _____ Business receipt required? ð Yes ð No	**Donation from an Association or Business** Organization Name: _____ _____ Donation Amount: $_____ Contact Name and Address: _____ _____ Business receipt required? ð Yes ð No

Please make your cheque payable to Kawartha Lake Stewards Association and mail it with the above form to:
Kawartha Lake Stewards Association – Membership
c/o 142 West Bay Boulevard
Kirkfield, Ontario, K0M 2B0