Kawartha Lake Stewards Association
Winner of FOCA'S 2002 Jerry Strickland Award

Lake Water Quality 2003 Report

Changing as We Flow

April 2004
kawarthalakestewards@yahoo.ca

This year's cover graphic is a view of the March 2004 flow at Burleigh Falls and helps to convey the title theme of the 2003 report, **"Changing as We Flow"**. Jeff Chalmers, our hard working Treasurer and report production Guru, contributed all the photographs in the report, as well as designing the cover.

Pat Moffat, Jeff Chalmers, Jim Keyser & Kathleen Mackenzie working on the 2003 report.

Please Note: We welcome media coverage of our testing programs and our published reports. Whether you are a cottage association representative, member of the media, teacher, student, agency representative or municipal councilor, please feel free to photocopy and distribute parts of this report. To obtain additional copies of our report or to find out more about KLSA please contact:

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OR any member of the Executive listed in Appendix A

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Message from the Chair

This is the third annual report concerning the Kawartha Lake Stewards Association's (KLSA) water quality testing program. Our program focuses on bacteria *(E.coli)* and phosphorus in lake water, within the watershed of the Kawartha Lakes section of the Trent-Severn Waterway. KLSA is a volunteer driven non-profit organization representing local lake associations of property owners in the Kawartha Lakes area. The association was started because there was no coordinated lake water testing program being done by government agencies and the testing being done on some lakes by volunteers was inconsistent lake to lake. Appendix A contains KLSA'S Mission Statement.

Highlights of 2003

KLSA had continued success in 2003. Items of note include:

- KLSA volunteers tested 119 sites (compared with 148 sites last year) for *E.coli* on twelve lakes. Phosphorus samples were taken at 27 sites, an increase from 15 in 2002. Appendix A lists the executives and other volunteers active in our 2003 program;
- Lake Scugog decided to carry on their own water quality testing program as part of a broad lake based environmental program. Contact Barbara Karthein at bkarthein@yahoo.ca for a copy of their excellent "Lake Scugog Base Environmental Information" report;
- We did not test in Chemong Lake this year through lack of volunteers but testing will resume in 2004;
- We welcome representatives from several cottage associations on Sturgeon Lake to our testing program this year;
- We welcome several new volunteers for 2003 and 2004 including those from the Curve Lake First Nation, Pigeon, Upper Buckhorn, and Sturgeon Lakes;
- Pat Moffat organized a "Weed Research" pilot study on Lovesick lake, –which is reported on in this report. We hope to expand this research into other lakes in 2004;
- We exhibited and spoke at two events:
  -The "Lakeland Conference" in Buckhorn and
  -A meeting sponsored by the Kawartha Protect Our Water (KAPOW) organization to fight the expansion of the Lindsay dump-and possible pollution coming into Sturgeon Lake;
- We furthered our relationship with ORCA and plan to have a joint project on "Benthic Bugs" in 2004;

- Our funding activities continue to be successful. About 40% of our funds come from participating associations. The other 60% came from local municipalities, businesses and the Trent-Severn Waterway. We hope our donors find this report interesting and valuable, and we look forward to their continuing support. Appendix B lists our donors and sponsors;
- As indicated in the Treasurer's report in Appendix C, we have an ongoing surplus to cover report production and 2004's spring/early summer activities. Most of our expenses (75%) are for analysis and reporting of *E.coli* by SGS Lakefield Research.
- Two very successful volunteer meetings/training sessions were held this year.
- All Board members from 2002/2003 were re-elected as the new Board for 2003/2004.

Roles for members of the Board for 2003/2004 are as follows:

Jim Keyser - Chair
Jeff Chalmers - Secretary/Treasurer
Pat Moffat - Vice-Chair: Fund Raising/Media Relations
Kathleen Mackenzie - Vice Chair: Water Testing Program
Mark Potter - Director: Lake Expansion Program
Ron Elliot - Director: Lake Expansion Program/Fund Raising

We thank Marlene Steele, who stepped down as recording secretary, for all her work and support and welcome Ann Ambler of Lovesick lake as our new recording secretary.

Thank you

To our volunteers, donors, speakers, SGS Lakefield Research staff and to those such as the staff at the Lake Partner Program of MOE, Peterborough County-City Health Unit, Buckhorn Community Centre, Burleigh Falls Native Community Centre, Sir Sandford Fleming College Cartography Department and City of Peterborough Land Information Services Division, Trent University Geography Department and the Oliver Ecological Centre who helped us in so many ways, I want to extend my sincere thanks. Extra thanks to George Gillespie, of McColl Turner Chartered accountants, for reviewing our financial records and to Tom Cathcart of the Peterborough County-City Health Unit for assisting us during the year. Thanks also to Bev Clark for his advice during the year and contributing to the weeds section of this report.

To find out more about KLSA, or to discuss any aspect of this report, please contact me or any other member of the Board.

Jim Keyser, Chair

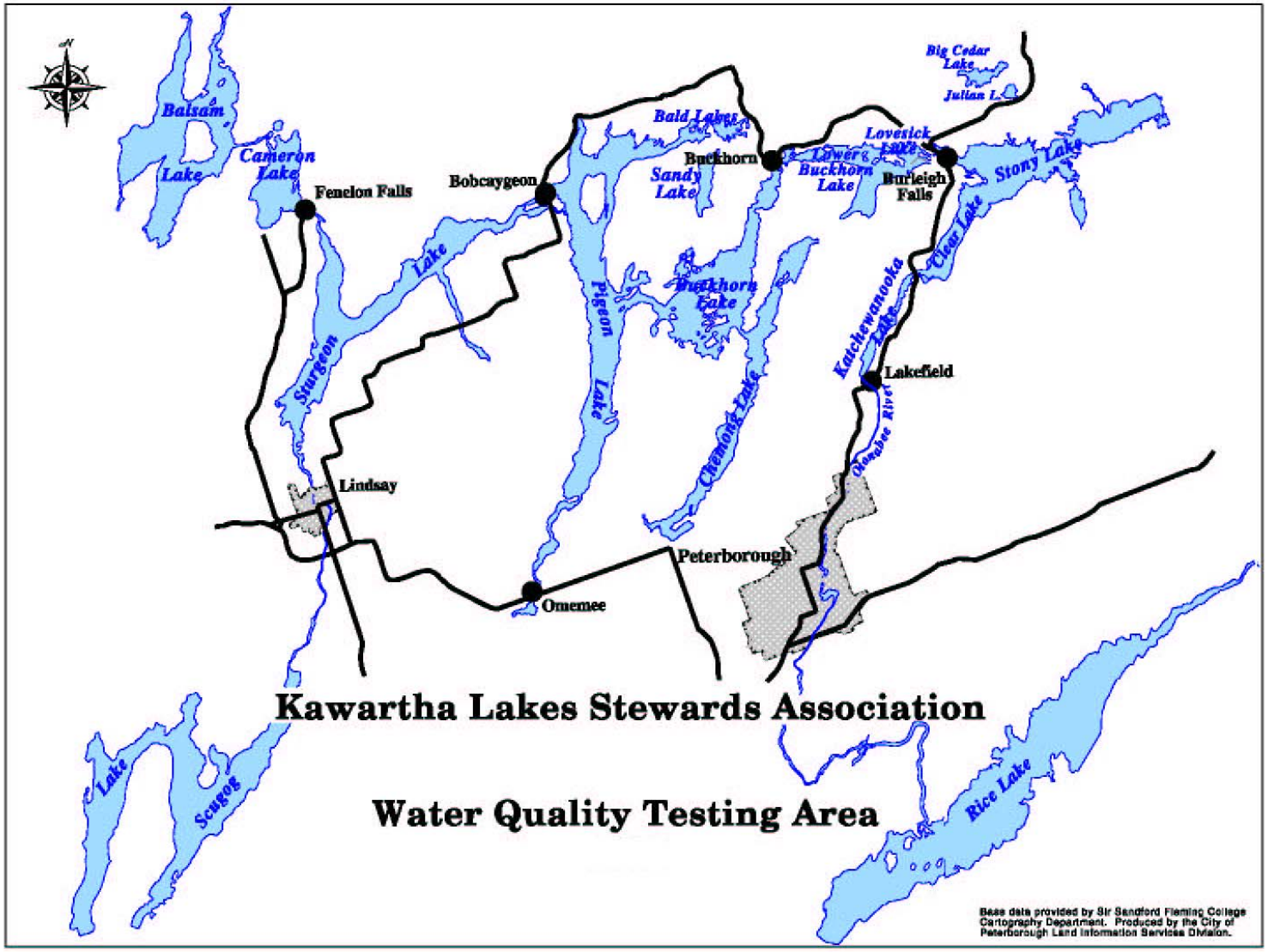
Introduction

KLSA's watershed of concern begins in Balsam Lake and flows southeast through several connected lakes into Lake Ontario. Changing as it flows, the water is fed by streams from the Precambrian granite shield to the north, and by streams from the younger limestone formation to the south. Since many of the Kawartha lakes lie on the interface between these two geological formations, their vegetation and wildlife are unusually varied. This makes the Trent-Severn Waterway, originally built for the logging industry, a magnet for boaters, fishermen, and campers from near and far.

Today thousands of seasonal cottagers pay taxes to local municipalities, and many are converting their cottages to year-round retirement homes. As pressures on the environment mount, cottagers and residents are becoming more concerned about protecting water quality in the Kawarthas. There are development pressures, and large agricultural operations that can impinge upon the lakes with manure and other fertilizers. There are thousands of pleasure boats that legally dump greywater into the lakes, and a great many aging and possibly leaking septic systems at cottages. There are surburban-type homes with fertilized lawns running down to the shoreline. These lawns not only provide nutrients for the water weeds, but Canada Geese love to feed on them. Unnaturally large numbers of Canada geese, which KLSA has often found associated with high *E.coli* readings, are thriving on our lakes.

A major part of KLSA's work is sharing what we learn from our phosphorus and bacteria testing with the public, to help people understand the connections between human activities and the health of the lakes. Publishing this annual report is part of that effort. Each spring and fall KLSA holds workshops on our program and water quality issues in general. Most KLSA volunteers represent local lake associations, and report on our work at local meetings and in newsletters. Thus, thousands of cottagers and year-round residents learn how to help decrease human inputs of phosphorus to our lakes, as well as possible sources of bacterial contamination. To many people, the most urgent water quality issue today is the surge in aquatic weed growth over the past few years; by August thick weeds can make swimming and boating difficult in some parts of the lakes. Lovesick Lake began an on-going weed survey in 2003, and KLSA hopes that other lakes will join the program this year.

Map of the Kawartha Lakes 2003 Testing Area



Summary of Results

2003 was the third year of bacteria and phosphorus water testing by the Kawartha Lake Stewards Association (KLSA). We are continuing to add to our baseline data and are also seeing some patterns emerging in our testing area. This area includes most lakes of the Trent-Severn Waterway (TSW) flowing south from Balsam Lake to Katchewanooka as well as some feeder lakes such as Big Bald and Julian. As in previous years, overall *E.coli* counts were low, suggesting that swimming is generally safe. Phosphorus, however, is a continuing concern: all of our lakes that are within the flow of the TSW have summer phosphorus readings near or above the 20 ppb level that the Ministry of the Environment (MOE) warns may lead to nuisance algal blooms.

Bacteria: Only two of the 119 sites that KLSA volunteers tested in '03 are unswimmable. That is, they had recurring counts above 100 *E.coli* per 100 milliliters of lake water, which is the MOE's cut-off for "safe swimming." Fortunately, neither site, one in Pigeon Lake and one in Katchewanooka, is a swimming area. Both sites will be further investigated this year. KLSA found three other sites worth watching, in Lower Buckhorn, Pigeon, and Upper Stoney, as each had several readings between 20 and 50 *E.coli*/100 ml.

Overall, the Kawartha lakes have very low *E.coli* counts. Only 18 readings out of 525 in '03 were over 50 *E.coli*/100 ml, the maximum level KLSA considers acceptable. Almost all high counts returned to normal a week later. High counts were often found at inflows, suggesting wildlife or human activity upstream.

Reviewing three years of bacteria data, we can make a few conclusions:

- Bacteria counts tend to rise after significant rainfall.
- Long weekends (with increased human activity) do not seem to correlate with higher bacteria counts.
- *E.coli* levels do not rise as the summer advances.

Phosphorus: After three years of testing and discussions, KLSA is developing a better watershed-wide understanding of phosphorus. "Changing as we flow," phosphorus rises as the water flows downstream from Balsam Lake, decreases somewhat in Stony and Clear, and rises again in Katchewanooka. Streams entering the system from the Canadian Shield – at Balsam and also Upper Stony, halfway down the system – are low in phosphorus, while streams entering off the southern limestone

are higher. More phosphorus is added by decaying vegetation in deep water, sewage treatment plants, and shoreline runoff, which may be high in phosphorus due to fertilizers and neglected septic systems.

In all but one of our lakes, phosphorus levels were somewhat higher in '03 than in '02. (And '02 levels in turn were slightly higher than '01 levels.) On average, our lakes begin the spring with a relatively low phosphorus level of about 12 ppb, thanks to the annual spring flushing. Phosphorus rises into the mid-twenties by August, then decreases to about 19 ppb in October. It is too early to tell whether what we are seeing represents a trend or merely natural variation. Yet we should continue lake-friendly practices: using phosphate-free detergents, keeping a natural shoreline, protecting wetlands, and ensuring that local Official Plans and Policies protect shorelines.

Aquatic weeds: In '03 Lovesick Lake volunteers initiated a pilot study to observe weed growth in their lake, as heavy weeds have been a problem for the past several summers. The major nuisance weed was tape grass, which grew in "dense" patches by early August and floated in mats by mid-August. The one invasive weed species in the Kawarthas, Eurasian water milfoil, was not widespread in Lovesick. KLSA encourages other volunteers to use this study as a model for their own lakes. The long-term aims are to record the species and growth patterns of water weeds, to correlate weed growth with phosphorus levels, winter conditions, and other factors, and to learn how to control nuisance weeds in a lake-friendly manner.

Volunteers at KLSA Workshop

Bacteria Testing

What We Did

KLSA started the year with an orientation workshop in May to review sampling technique and to hand out sampling bottles. KLSA volunteers collected lake water samples from 119 sites on 12 Kawartha lakes. Sites were tested 6 times during the summer, from the July 1st weekend until Labour Day. Samples were taken to SGS Lakefield Research, usually within a few hours, and tested the same day. Occasionally they were refrigerated overnight before being taken to the lab. Each group tested between 3 and 13 sites, and the same sites were tested on all six dates.

Most of the sites were the same as in 2002. It was felt that most sites should remain the same to give long-term baseline data. However, some sites were changed as volunteers became more aware of where potential hot spots could be. New sites were given different labels.

Almost all sites were chosen because it was thought that they would have the highest 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 of our lakes; rather, they would likely 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, shallow bays)
- Areas near inflows (from culverts, streams, wetlands)
- Areas of concentrated populations of wildlife (near wetlands, areas popular with waterfowl)

The goals of this testing, now in its third year, were twofold:

- To see how safe the water was for swimming at these sites, and
- To provide baseline data for ongoing monitoring in future years.

Please note:

- ***KLSA did not test drinking water. Only surface waters were 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 places.***

Who Participated?

Dozens of KLSA volunteers (see Appendix A) from different parts of the following lakes were involved in the *E.coli* water sampling program: Big Bald Lake, Buckhorn Lake, Clear Lake, Julian Lake, Katchewanooka Lake, Lovesick Lake, Lower Buckhorn Lake, Pigeon Lake, Sandy Lake, Stony Lake, Sturgeon Lake, and Upper Stoney Lake. Most volunteers represented local associations of cottagers and residents.

Why did We Test for *E.coli*?

E.coli was the bacteria of choice because:

- The presence of *E.coli* indicates fecal contamination from warm-blooded animals, such as birds or mammals, including humans. It is not found, for instance, on rotting vegetation. Presence of *E.coli* indicates the possible presence of other disease causing organisms found in fecal material, such as those causing gastro-intestinal and outer ear infections;
- It is present in fecal material in very high numbers. Healthy humans excrete about 100 million *E.coli* per $\frac{1}{4}$ teaspoon of fecal matter! Therefore it's 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, such as in the Walkerton tragedy, or occasionally in ground beef 'scares'. The basic analysis done by SGS Lakefield Research can not distinguish the difference between the harmless and the deadly, so we always treat *E.coli* as if we were dealing with a harmful strain.

Interpreting the Results: What is a 'High' *E.coli* Count?

When is an *E.coli* count considered to be of concern? These are the KLSA guidelines:

1. *Of serious concern:* over 100 *E.coli*/100 ml. The Ontario Ministry of the Environment's 'safe swimming limit' is 100 *E.coli*/100 ml. This is the level at which public beaches are posted as unsafe for swimming. Any KLSA counts over 100 are retested as soon as possible and nearby residents are informed. We want to make them aware of the problem for their own swimming safety, and to seek their cooperation in trying to determine where the bacteria are coming from.
2. *Of some concern:* The KLSA believes our lakes should be cleaner than public beaches, and believes that *E.coli* counts on Kawartha lakes should not exceed 50 *E.coli*/100 ml. Volunteers are notified within three days if a reading is over 50 *E.coli*/100 ml, and are asked to retest. If counts remain high after retesting, or if counts over 50 are found more than once over the summer, our policy is to inform adjacent landowners of the results.

3. *Unusual:* 20 – 50 *E.coli*/100 ml. It is normal for a location to have a reading between 20 and 50 once or twice over the summer. However, 3 or more counts in this range are unusual and reason for investigation.
4. *Normal:* less than 20 *E.coli*/100 ml. Readings under 20 can be considered normal for surface water, indicating low levels of pollution.

What We Found

For Lake-by-Lake results with commentary, please see Appendix D.

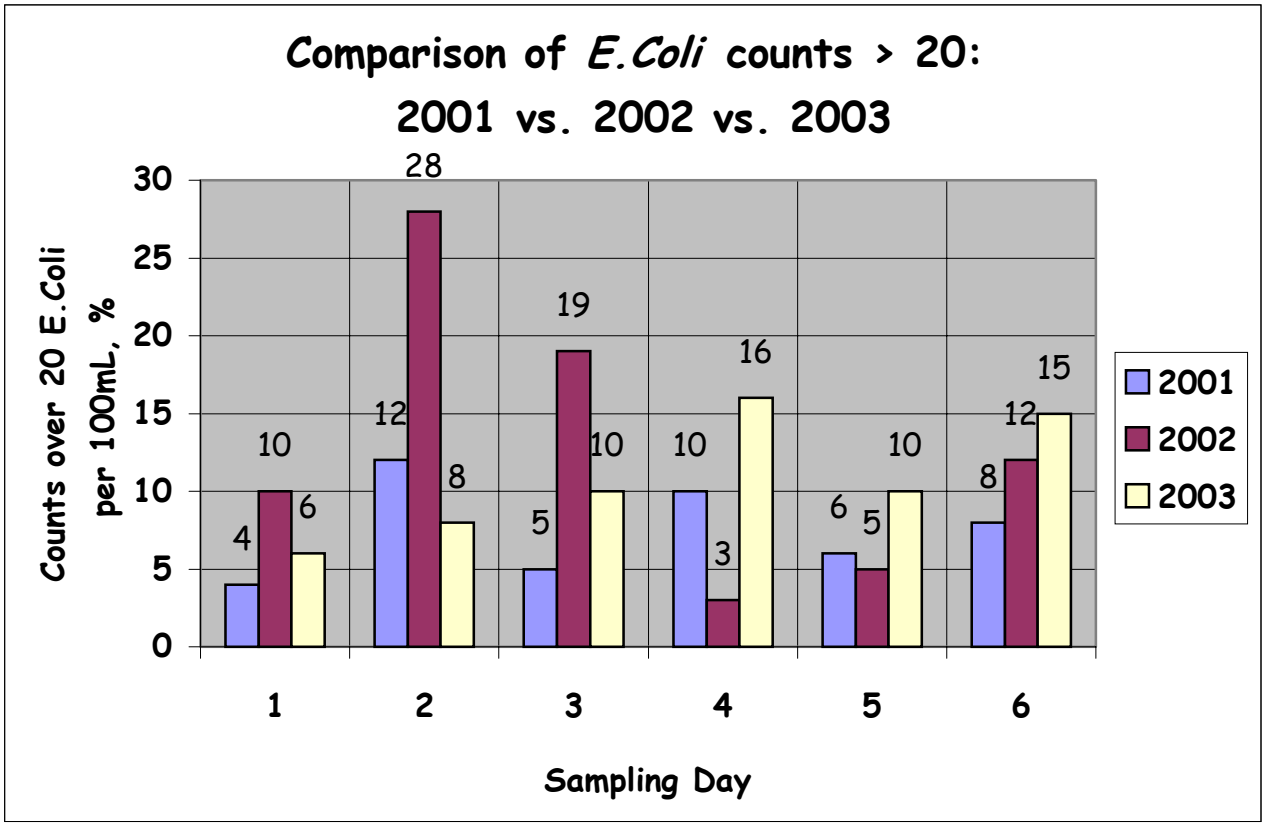
Generally, *E.coli* counts on all the lakes tested were very low throughout the summer, indicating excellent recreational water quality. There were only 2 sites that KLSA would not recommend for swimming due to their high frequency of elevated *E.coli* counts. Fortunately, these were not, in fact, swimming areas. Of the 119 sites tested, 106 were tested regularly (3 or more times), and it is these 106 sites that are discussed below:

- *73 sites :Very Clean.* At 73 out of 106 sites, counts never rose above 20 *E.coli*/100 ml. KLSA considers these sites 'very clean' for surface water.
- *25 sites: Clean.* At 25 out of 106 sites, counts rose above 20 *E.coli*/100 ml once or twice. These occasional elevated counts, or 'spikes', are not deemed of concern, and KLSA considers these sites 'clean'.
- *3 sites: Slightly Elevated.* At 3 sites (Clear Lake West Shore/Site 3, Lower Buckhorn Lake/Site 12, and Stony Lake/Site E), there were 3 counts over 20 during the summer (and at least one of these counts was over 50). This is unusual and bears watching. None of the counts was over 100, and none of these locations had high counts in 2001 and 2002, so it remains to be seen if these will become chronic problem spots.
- *3 sites: Needing Observation*. 3 sites (Lower Buckhorn/Site 3, North Pigeon/Site 6, and Upper Stoney/Site 52) had 4 or 5 readings over 20 during the summer, but almost all readings were under 50 and none exceeded 100. These sites had readings that were somewhat high for a Kawartha Lake but not cause for alarm. These sites should be tested more thoroughly (2 or 3 samples per date rather than 1) in 2004.
- *2 sites: Unswimmable*. Two sites, Pigeon Lake/Site 7 and Katchewanooka Lake/Site 5, had recurring counts over 100. KLSA would regard these sites as unswimmable.
    - Pigeon Lake/Site 7 had similar chronically high counts in 2002. Fortunately, this is not a swimming area. A large number of Canada Geese are attracted to this shoreline, which may be causing the problem. The

owners are aware of the issue, and would like to do something about it. At the end of the summer, a first attempt was made, with the advice of Peterborough County-City Health Unit, to localize the source of the E.coli. Next year, Site 7 will be investigated further with the aid of the Health Unit.

- Katchewanooka/Site 5 has been a clean site in 2001 and 2002. This site is at the mouth of a stream that flows through a culvert 10 metres upstream. Preliminary measurements showed that counts directly downstream of the culvert were higher than counts directly upstream of the culvert. Does the culvert harbour bacteria somehow? Might there be sources of bacteria upstream? These are questions that should be addressed in 2004.

E.coli Results over 3 Years



The chart above indicates how many sites were above 20 on testing dates over 3 years. We can use the chart to consider the causes of high *E.coli* counts across the

Kawarthas. For example, do long weekends, with their intense human activity, result in high counts? Do counts rise over the summer with a rise in water temperature?:

- Counts tend to rise after significant rainfalls. See Appendix F for rainfall at three locations in the Kawarthas over the summer. Within 48 hours before the July 22/02 (day 2) testing there were 30 to 60 mm of rain. Within 72 hours before the July 29/02 (day 3) testing date there was 18 to 37 mm of rain. Within 72 hours before the Aug 5/03 (day 4) date there was a very heavy rainfall, about 40 mm. Rainfall may have caused the somewhat higher readings on these dates. All other testing dates over 3 years had less than 12 mm (0.5 in) of rain 72 hours previous to sampling. This runoff effect is well known; Peterborough's public beaches are automatically closed for at least 24 hours after any rainstorm over 25 mm.
- Over the 3 years, long weekends do not seem to correlate with a significant rise in counts. (Jul 2 (day 1), Aug 6 (day 4) and Sept 2 (day 6) are all immediately after a long weekend.)
- There does not seem to be a gradual rise in *E.coli* counts over the summer.

Possible Reasons for Elevated *E.coli* Counts

The possible sources of elevated counts at particular sites are discussed on a case-by-case basis in Appendix D, Lake-by-Lake Results. Generally, the sources of elevated counts appeared to be the following:

1. *Inflows (7 sites)*. Many inflows came from wetland areas. Counts were more likely to be high after rain events.
2. *Unknown cause (5 sites).*
3. *Geese/waterfowl (4 sites).* Large numbers of geese on shorelines seem to cause high counts, especially after a rainfall.
4. *Intense human activity (3 sites).* When a large number of people are using an area, counts can rise. This was also observed at one site in 2002. Is this due to humans swimming, or possible greywater discharge from boats? Although *E.coli* comes from warm blooded animals, it can be harboured for a period of time in sediments. Does disturbing sediment by swimming or heavy boat traffic increase *E.coli* counts?
5. *Construction (1 site).* In 2002, there was also one site where construction might have been responsible for elevated counts.

Conclusion

Despite being heavily used by people and animals, the Kawartha lakes in general have very low *E.coli* counts. Even though KLSA volunteers tested in areas where they thought they would find the highest counts on their lake, very few high counts appeared. Only 18 readings out of 525 were over 50 *E.coli*/100 ml. (50 *E.coli*/100 ml is the maximum KLSA believes to be acceptable on our lakes.) Almost all high counts were temporary, and had returned to normal when tested a week later. It seems that the occasional (once or twice a summer) elevated count (between 20 and 100 *E.coli*/100 ml) is normal for our lakes. Often, these counts were found at inflows, probably indicating wildlife or human activity upstream.

Three of these 'phantom' high counts, however, were over 100, which seems to indicate an unusual level of pollution. We need to remain vigilant to ensure these rare high counts do not become more frequent.

KLSA did find 2 sites that we would describe as unswimmable (frequent counts over 100 *E.coli*/100 ml). Neither, fortunately, was a swimming area. One site, which now has a 3-year history of high counts, is being investigated with the help of the Peterborough Health Unit. The other site, which does not have a history of high counts, will be tested more frequently next year.

What can we do to keep counts down?

- We can keep our shorelines natural. A heavily vegetated (not grassed) shoreline ensures that Canada Geese do not come up onto the shore from the water. A vegetated shoreline also decreases runoff into the lake, which may contain bacteria from wildlife and pet droppings.
- We can ensure our septic systems are working well.
- If we have a stream on our property, we can ensure that its shores are well vegetated to decrease erosion, particularly after a rainfall.
- We can minimize areas of short grass in our watershed. At night, geese like to be on land where they can see predators approaching. No grass, no geese!

Phosphorus and Water Clarity Testing

Why Test for Phosphorus and Clarity?

High phosphorus levels result in a loss of water *clarity*, in the same way that an untended aquarium becomes green and murky. Phosphorus runs off into lakes from fertilizers, erosion and septic system seepage. The immediate effect is an increase in algal growth, turning the lake murky. Algae absorb phosphorus, then die and sink to the bottom of the lake. These bottom sediments provide a rich 'soil' for aquatic plant growth and continually 'belch' phosphorus back into the lake. Thus phosphorus, once it seeps into a lake, tends to remain there.

The Ministry of the Environment's Provincial Water Quality Objectives (www.ene.gov.on.ca/envision/gp/#groundwater , Report #3303) state:

- Phosphorus concentrations should not exceed an average of 20 ppb (parts per billion, or micrograms per litre) during the ice-free period. At levels higher than 20 ppb, algal growth accelerates, potentially creating unsightly and often foul-smelling algal 'blooms'.
- Ice-free averages of less than 10 ppb give 'a high level of protection against aesthetic deterioration'.

Phosphorus levels and water clarity, then, are used to track lake deterioration.

Measuring Phosphorus

KLSA took water samples for phosphorus analysis at 27 sites, an increase from 15 in 2002. Balsam and Sturgeon Lakes were added in 2003, and additional sites were tested at several lakes. These additional sites meant that we were able to test different sections of a lake. In previous years, only the deepest and/or most central point was tested. Sampling was taken around the first of each month, from May to October. In contrast to sampling for bacteria, which is done at elbow depth, phosphorus samples are taken from deeper water, with a collection bottle lowered down to the required depth.

All testing was done through the Ontario Ministry of the Environment's Lake Partner Program. The Lake Partner Program supplies bottles and mailing containers. Samples are tested for phosphorus at an MOE laboratory at no cost to cottagers other than volunteer time. Ontario cottagers are fortunate to have this excellent program. This is especially true since 2002, when water samples started being sent to a different

laboratory, the Ontario Ministry of the Environment's research laboratory in Dorset, Ontario. This laboratory is the best in Ontario for testing surface water samples for phosphorus.

Because the Lake Partner Program started using a different laboratory last year, our phosphorus measurements are almost *ten times more precise* than they were before 2002! As of 2002, a measurement of 6.0 ppb means that the measurement has a 95% probability of being between 5.4 and 6.6 ppb. This greater precision means that we will be able to detect much smaller changes in phosphorus levels month-to-month and year-to-year. This change in precision is why 2001 results were reported as 8, l2, 14, 22 ppb, etc., while 2002 and 2003 results are reported as 8.6, 11.5, 23.7 ppb, etc.

Phosphorus and Secchi Results

To see phosphorus and Secchi data for locations on all lakes, please see Appendix E.

Comparison of Phosphorus Results: 2002 vs 2003

Following the Flow: Deepest Lake Locations
June-to-September Average Phosphorus* Levels in 2002 and 2003

Lake	Location	2002 TP, ppb	2003 TP, ppb
Pigeon	N End Back Channel	16.2	Not tested
Buckhorn	Centre	16.9	22.4
Lower Buckhorn	Heron Is.	17.6	19.1
Lovesick	80 ft. hole	21.1	20.3
Stony	N Mouse Is.	14.6	15.1
Clear	Centre	14.6	15.5
Katchewanooka	SE Douglas Is.	18.4	21.8
Average		17.0	19.0

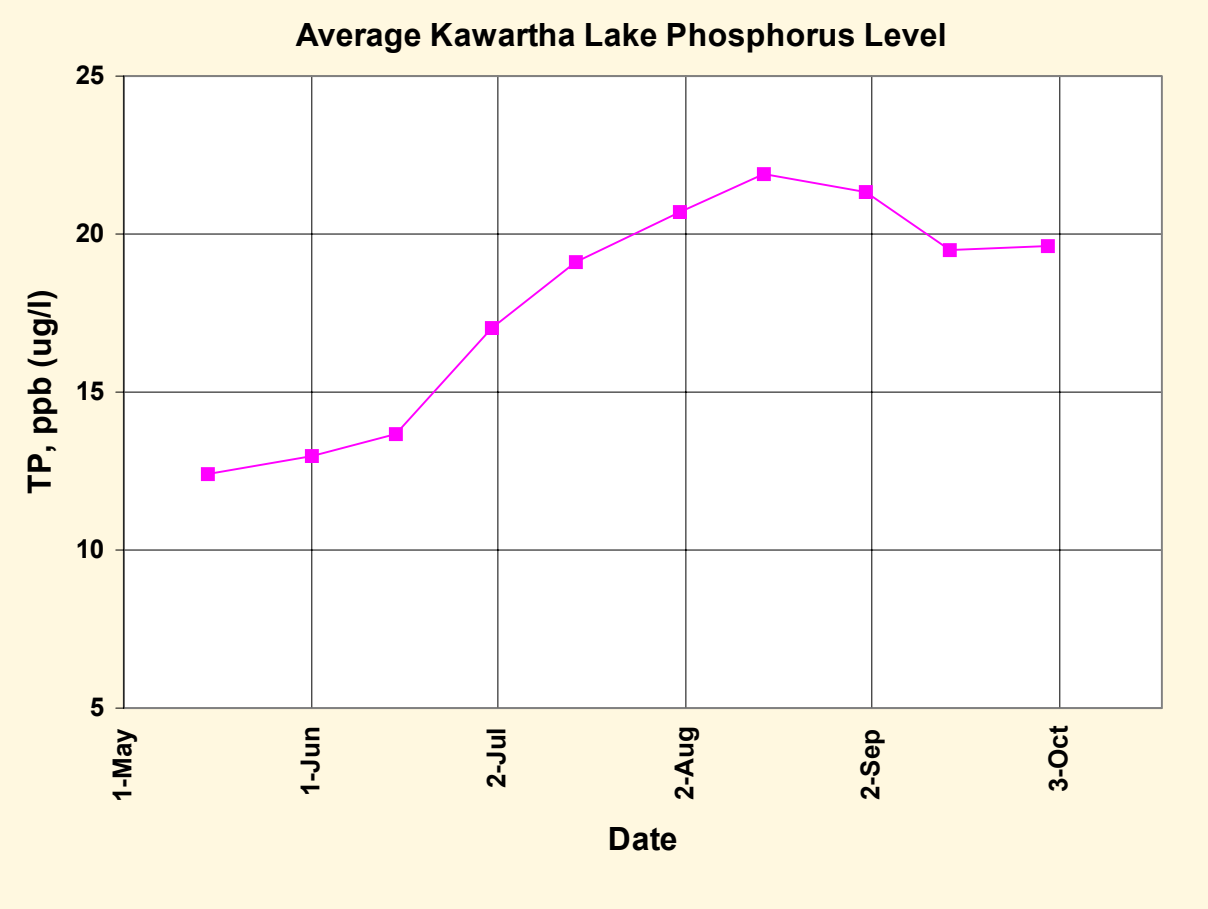
*Four-month averages were used here because KLSA was missing several May and October readings. However, these would be very close to whole-season averages, as spring levels are generally lower and October levels higher than average.

Keeping in mind that a seasonal-average phosphorus level of 20 ppb indicates potential for algal blooms, it appears that many of our lakes are approaching the 'danger zone' of algal overgrowth. Also, algal blooms tend to happen more frequently

later in the summer, and that is when our phosphorus levels are highest. If phosphorus levels were to rise, there would likely be an increased incidence of nuisance algal growth, particularly in late summer.

The chart above indicates that 2003 phosphorus readings were, on all but Lovesick Lake, somewhat higher than in 2002. This may be an indication of poor shoreline management (fertilizer and septic system runoff, erosion of soil) in 2003, or it may simply be a natural year-to-year variation. In 10 years or so, KLSA will have the benefit of good baseline data -- and hindsight -- to be able to better discern unusual years and gradual trends. However, this is an excellent beginning!

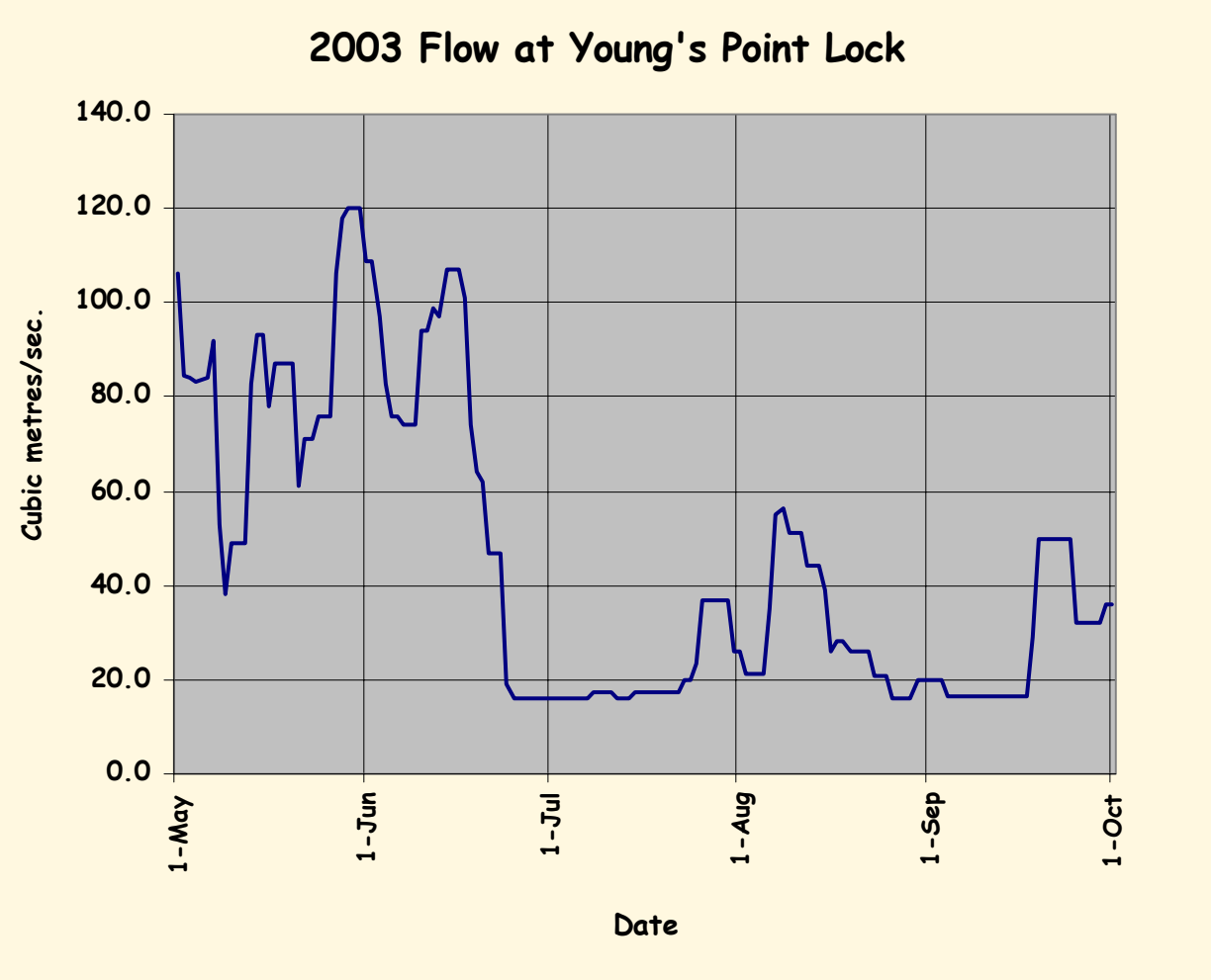
What Drives the Seasonal Phosphorus Cycle on Our Lakes?



The above graph shows an average phosphorus level for eight connected Trent-Severn Waterway lakes, from Pigeon Lake to Katchewanooka. (This phosphorus curve is almost identical to that of 2002.) These lakes start out in the spring with a

relatively low phosphorus level of about 12 ppb. This rises steadily until it reaches the mid-twenties in August. It then decreases to about 19 ppb in October.

What causes these huge changes in phosphorus over the summer? To answer this, you need to first answer the question, "Where does our water come from?"



In May, there is an enormous amount of snowmelt water that 'flushes' the Trent-Severn Waterway. This water comes from as far north as Algonquin Park, down the Gull River into Balsam Lake, and on down through the system. This northern water is low in phosphorus (about 8 ppb throughout the summer) because:

- It washes off low-phosphorus granite, the rock that lies beneath our northern pine forests;
- Fewer humans live up north, and therefore runoff contains less phosphorus (less agriculture, fewer golf courses, lawns, sewage treatment plants, septic systems).

However, in June, the volume of flushing water from the north decreases. Local runoff now becomes a major source of our lake water. This local runoff is much higher in phosphorus because:

- It washes off high-phosphorus limestone, the rock that lies beneath the agricultural fields and deciduous forests of southern Ontario;
- More humans mean more phosphorus is added to the runoff (farms, lawns, golf courses, etc.).

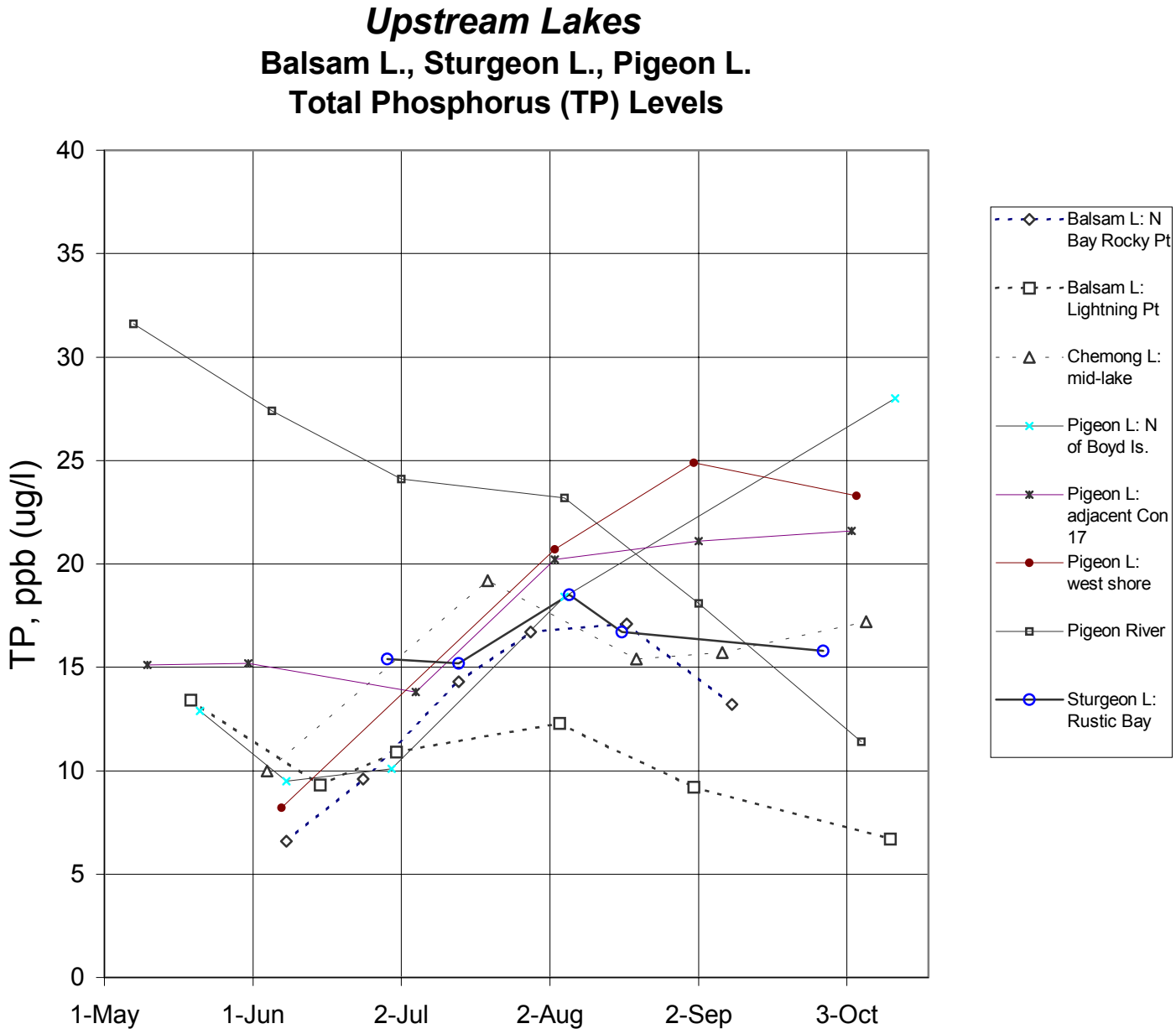
We are very fortunate that our lakes are 'flushed out' every spring. However, if we want to keep phosphorus levels down during July and August, we need to make sure our local waters are clean. We also need to make sure our upstream neighbours are doing their share.

Let's all think on a watershed level: "Act locally, think watershed-ly!"

Daybreak on Low Phosphorus Source Water Lake

Do Phosphorus Levels Change from Lake to Lake?

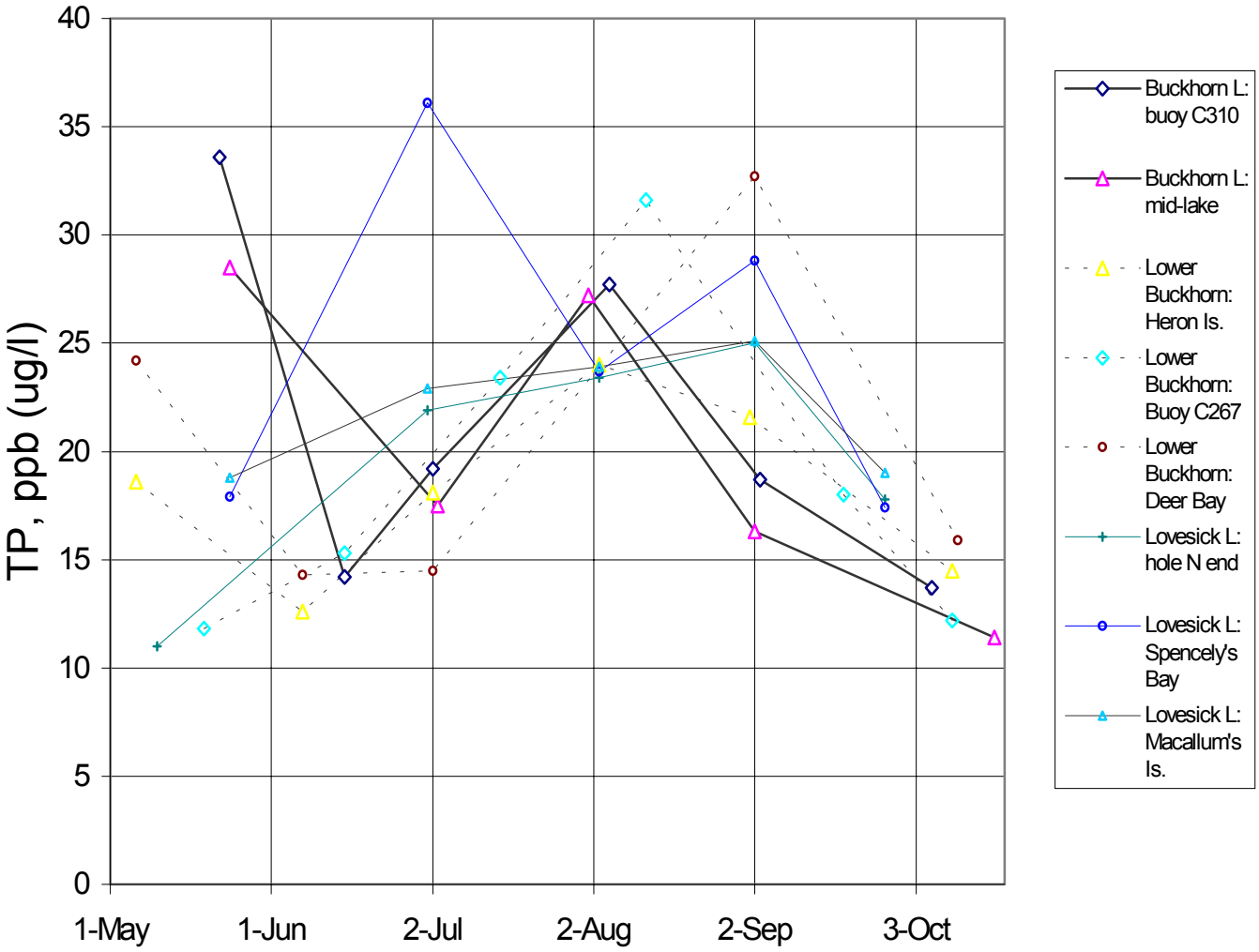
It is interesting to compare phosphorus levels in the Kawartha lakes as the water flows downstream from Balsam Lake/Lightning Point to Lake Katchewanooka. Take a look at the following 4 graphs: Upstream Lakes, Mid-stream Lakes, Downstream Lakes, and Low Phosphorus Lakes. Then we will discuss some interesting points arising from the graphs.



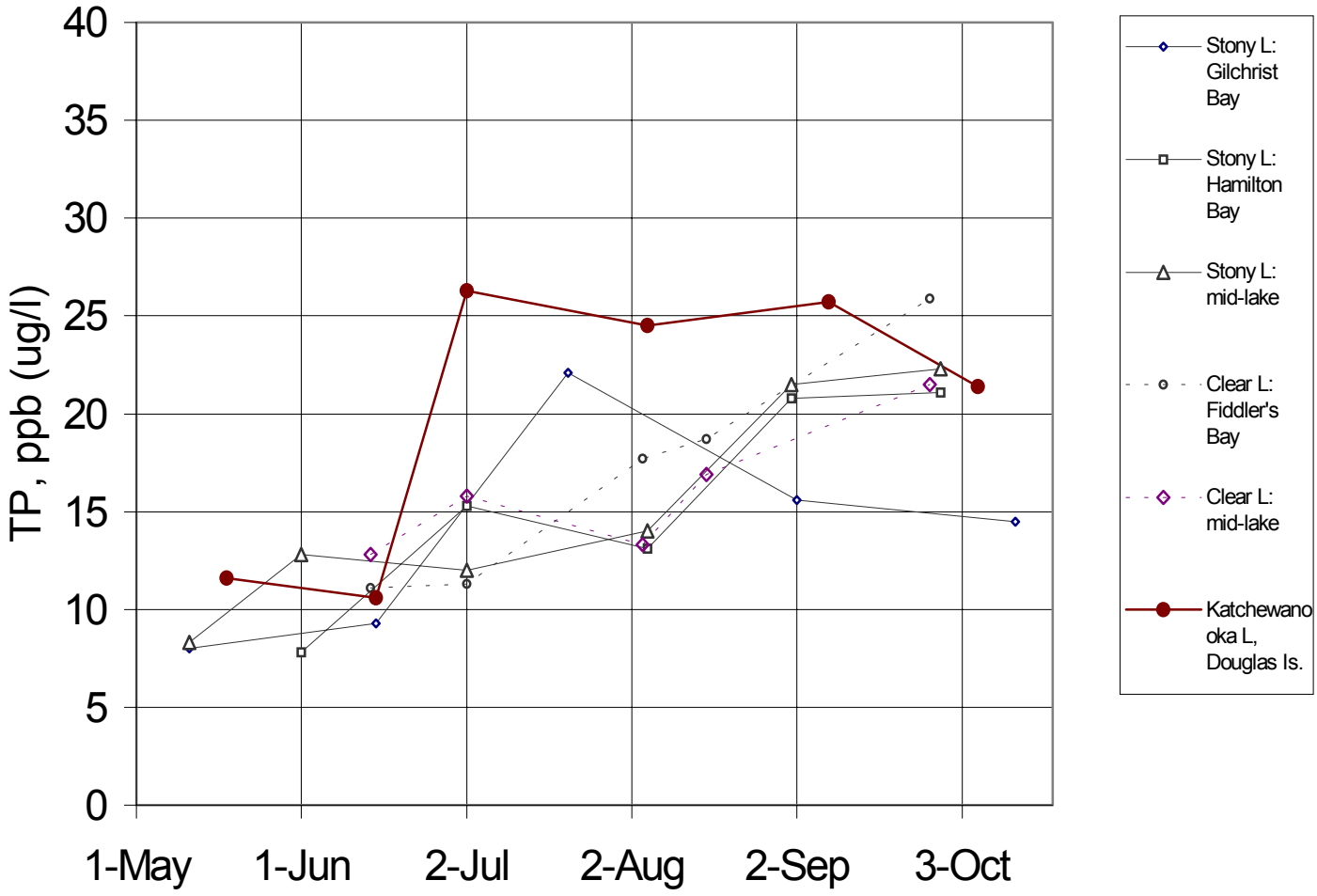
Midstream Lakes

Buckhorn L., Lower Buckhorn L., Lovesick L.

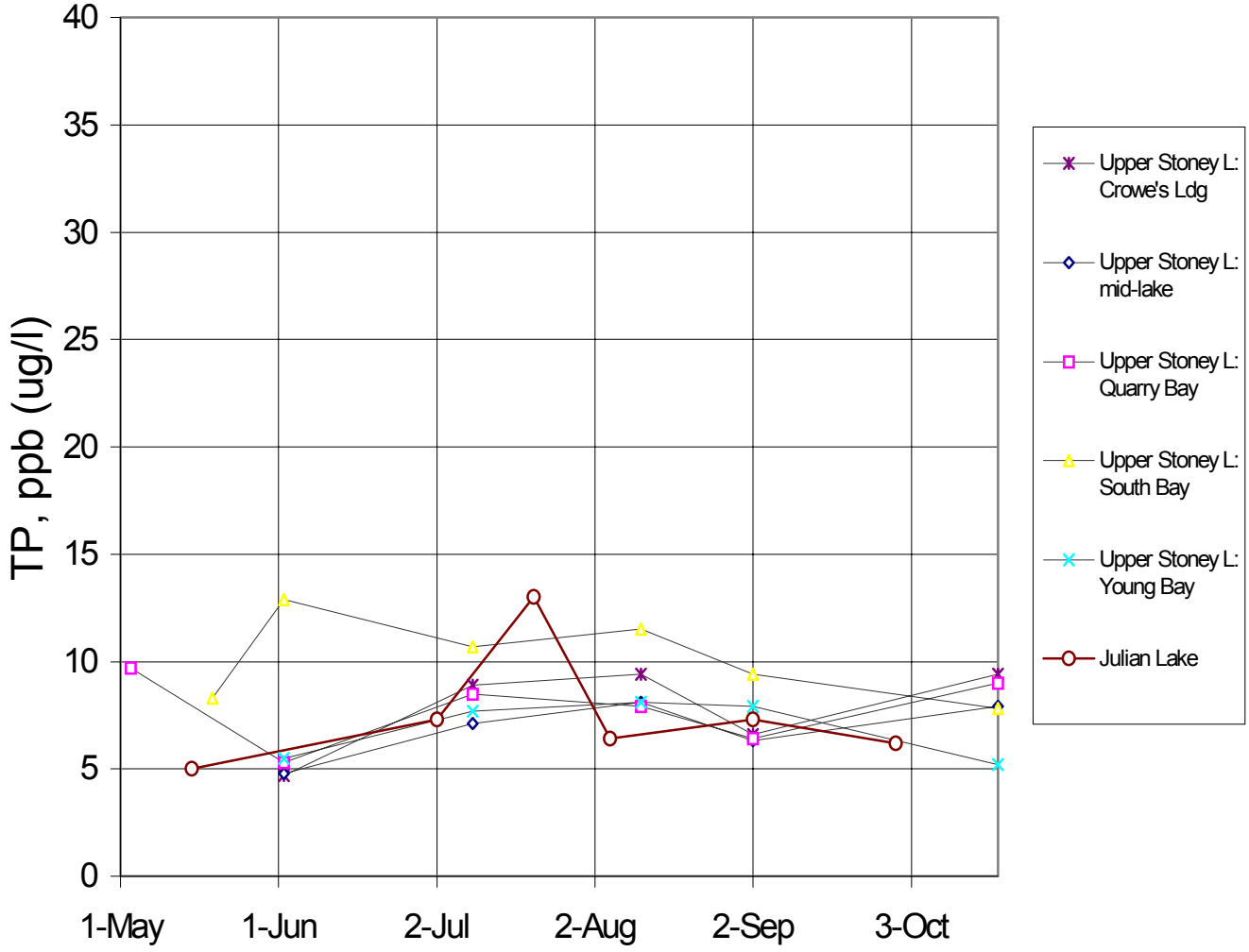
Total Phosphorus (TP) Levels



Downstream Lakes
Stony L., Clear L., Katchewanooka L,
Total Phosphorus (TP) Levels



Low Phosphorus Lakes
Julian L., Upper Stoney L.
Total Phosphorus (TP) Levels



Consider the following points:

- Julian and Upper Stoney have very low and stable phosphorus levels (see "Low Phosphorus Lakes" graph). Why? This is because these 2 lakes are not part of the main Trent-Severn Waterway flow. These 2 lakes are fed by northern Canadian Shield waters, and they then flow *into* the Trent-Severn Waterway.
- Similarly, the location where water flows into the Trent-Severn Waterway from the north (Balsam/Lightning Pt) has low phosphorus levels.
- As water flows through Balsam, then through Sturgeon and Pigeon, phosphorus levels start to rise (see "Upstream Lakes" graph).
- Phosphorus levels are somewhat higher again in the next group of lakes: Buckhorn, Upper Buckhorn, and Lovesick (see "Mid-stream Lakes" graph).
- Phosphorus levels decrease somewhat in the downstream lakes: Stony, Clear, and Katchewanooka. Might this be due to low-phosphorus water flowing in from Upper Stoney?
- There were a few peculiarities in the data at specific locations:
    - Several locations on the mid-stream lakes (Buckhorn, Lower Buckhorn, Lovesick) exhibited very high May readings. This was not seen on other lakes.
    - On July 2nd there was a significant peak on Lovesick/Spencely's Bay, a new sampling site in 2003. This was the highest phosphorus reading in all of our lakes.
    - Pigeon River flows into Pigeon Lake from the south. This river was very high in phosphorus during May, June, and July, and would almost certainly cause higher phosphorus levels in the southern end of Pigeon Lake. It would be worthwhile to find the sources of this phosphorus.
    - There were 3 readings that were taken on July 20/2l (Chemong/mid-lake, Stony/Gilchrist Bay, and Julian), and they all showed significant peaks. These are somewhat enclosed bodies of water, so might be expected to be affected by a heavy rainfall. However, there was very little rainfall at this time. What was happening right around these dates to give a phosphorus 'blip'?
    - Stony/Gilchrist Bay is at the junction between Stony and Upper Stoney. However, its phosphorus curve was quite different from either of these lakes. What is determining phosphorus levels on Gilchrist Bay?

Changing as We Flow

Generally, then, phosphorus levels are "changing as we flow". They rise as the water flows downstream from Balsam, decrease somewhat in Stony and Clear, and rise again in Katchewanooka. Inflows from the south (e.g., Pigeon River) may be raising phosphorus levels in the Waterway, while inflows from the north (e.g., Upper Stoney) probably lower phosphorus levels in the Waterway.

Conclusion: Should We Be Concerned About Phosphorus Levels?

After three years of KLSA data, it is obvious that the lakes within the flow of the Trent-Seven Waterway have high phosphorus levels during the summer months. All of them are close to or above the 20 ppb level that the Ministry of the Environment warns may lead to nuisance algal blooms.

Where is this phosphorus coming from? Obviously, the major phosphorus source is not water flowing into the Waterway from the north (Upper Stoney, Gull River), where phosphorus levels rarely exceed 10 ppb. High-phosphorus sources include:

- *Water flowing in from the south*. Only one inflow from the south, Pigeon River, was measured, and it had very high phosphorus levels. Runoff from the south would be expected to be a contributor due to the high-phosphorus limestone countryside, agriculture, and relatively larger human population.
- *Phosphorus 'belched' from deep-water sediments*. During the spring and summer, deeper lakes form a warm layer on top, and a cold layer on the bottom. These layers remain separate until late October or November. The bottom layer is about 10 °C (18°F) colder than the top layer. This bottom layer, in a high-phosphorus lake, can lose its oxygen due to algae rotting on the bottom. As soon as the bottom layer loses oxygen, its chemistry changes, resulting in a huge release of phosphorus from the bottom sediments. Is this happening in the deep areas of our lakes? It certainly is happening on many other lakes in North America. We would need temperature and dissolved oxygen information to be able to answer this.
- *Phosphorus from shoreline runoff*. Fertilizer is the worst culprit. Septic systems and erosion also contribute.
- *Precipitation.* This can be significant.
- *Sewage treatment plants.* Sewage treatment plants have been continually improving their phosphorus-removal techniques over the past 30 years. However, inputs from the treatment plants may still be significant.

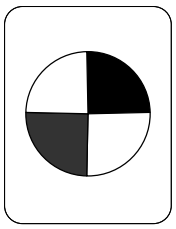
KLSA would very much like to know where our phosphorus is coming from. According to a leading aquatic scientist, a budget of $40,000 would be the funds required to do a study on the breakdown of phosphorus sources for the Balsam-to-Katchewanooka watershed.

In the meantime, area Municipalities, landowners and shoreline residents can take actions in the following areas:

- Don't use fertilizer;
- Keep your septic system running well;
- Use phosphorus-free detergents (especially dishwater detergent, which can be extremely high in phosphorus); persuade your local store to stock no-phosphate products, and persuade your neighbours to buy them;
- Keep a naturalized shoreline; these plants prevent erosion, and filter runoff water. In fact, the more trees, bushes, and other plants you keep on your property, the less erosion you will have. Good for the land, good for the lake;
- Keep as many wetlands around your lake as you can; these areas filter runoff water;
- Keep your politicians aware of your concerns. Explicit shoreline protection must be incorporated into local Municipal and County Official Plans and Policies.

Measuring Water Clarity (Secchi Disk Depth)

Secchi disk depth is a measure of lake water clarity. A Secchi disk is a circle the size of a paint can lid. It looks like a pie cut in quarters with alternating black and white sections. The disk is lowered until it disappears from sight. This is called the Secchi disk depth. A clear lake will have a larger Secchi disk depth than a murky lake.



KLSA volunteers took Secchi disk readings at the same time as phosphorus, and Secchi readings were submitted to the Lake Partner Program. See Appendix E for a complete set of data.

Over the past five to seven years, the Kawartha Lakes have become much clearer due to the presence of Zebra mussels. It will be interesting to follow this trend over the next few years, as the mussel invasion levels off.

Aquatic Weeds

Lovesick Water Weeds Study

In 2003, the Lovesick Lake Association conducted a pilot study of aquatic weeds in our lake. For the past three summers, weeds have been an increasing problem. Cottagers and resort owners have been raking huge floating weed mats out of the lake by hand. Heavy weed growth has made swimming and boating difficult in some parts of the lake

Weed control has been somewhat haphazard. People in our Association have not wanted to use chemicals in the water, and so have tried other means of control, such as pulling weeds out by the roots in swimming and boating areas, merely cutting them off as close to the roots as possible, and putting down benthic barriers, or dark fabric to smother weed growth near swimming docks.

The Lovesick Lake Stewards felt that it was time to get a better grip on the weed problem. If we knew what species of weeds we had in the lake, and understood their life cycles better, perhaps we could learn better ways of controlling weeds.

Methodology

In the fall of 2002, Rhonda Bell, an aquatic weeds expert who wrote her Master's thesis at Trent University on water milfoil, met with our Lake Stewards and helped us design our study. The purposes of the study for the first year were simple: to discover which species of weeds grew near our shorelines in the summer, and to note whether their growth was "sparse" (1-20 plants or stems per square metre), "moderate" (21-50) or "dense" (51+) throughout the season. Our committee created an easy-to-use log for our Association members who agreed to be "weed watchers," with space to record sightings of various weed species and their densities. We encouraged participants to draw maps of their shoreline where observations were made, to note the substrate and other physical conditions, and to take water temperatures in weed beds. Weed watchers went out at weekly intervals six times, from July 13 to August 17, to observe the weeds and record their observations.

For an identification key, we used the Ministry of Natural Resources's excellent drawings of submerged vascular aquatic plants from "Permits for Aquatic Plant Control" of Feb. 1999, Appendix J, reprinted here on pages 31-34 and available online at http://www.ene.gov.on.ca/envision/gp/3745e.pdf . For more detailed information, we used Wetland Plants of Ontario by Newmaster, Harris, and Kershaw.

Members at five cottages and two resorts participated in the study, although only four weed watchers were able to complete the log in detail for the six weeks. Those four sites are at different locations around our lake, so we believe they are representative.

Results

Lovesick's major problem weed, which came as no surprise to anyone, was tape grass, or wild celery. This is the weed that has to be physically raked out of the lake. At three out of our four sites, tape grass was found growing in "dense" patches by early August; by mid-August it had sent up a bladder-like flower on a spiral stem and was forming floating mats. Other weed species described as "dense" in different locations were coontail, smartweed, and northern water milfoil. Eurasian water milfoil, an invasive species that first appeared in the Kawarthas in the 1970s, was found less often in our lake, which is good news. It was described as "dense" at only two of our four locations.

Some species became denser through the summer, like tape grass and northern milfoil, while others appeared to peak and then decline, like Canada water weed and coontail.

Plans for 2004

A major accomplishment of the pilot study was that volunteers learned to recognize about a dozen different species of aquatic weeds. We will be building on this knowledge base in 2004, our second year of the study.

One aim of the second year will be to correlate weed growth with other factors such as our lake's phosphorus levels, summer weather, and the preceding winter conditions. Two of our volunteers live at the lake in the winter, and have been noting winter conditions such as the dates of freeze up and thaw, the thickness of ice on the lake, and the depth of snow cover on top of the ice. (Conventional wisdom has it that the colder the winter, the thicker the snow, the darker the water in the lake, and the fewer weeds during the next season. We hope to test this hypothesis in this and future years.)

We are planning two changes in our protocol in 2004:

1) We will record algae sightings as well as weeds; volunteers felt compelled to make notes on algae last summer, as sometimes it was difficult to see the weeds for the algae!

2) We will start weed observations earlier, in May, and continue later, until September or October, and observe at bi-weekly rather than weekly intervals, hoping to capture the weeds' entire seasonal cycles in our logs.

The Big Picture

Observing aquatic weeds is a long-term project. Cottagers are ideally situated to conduct a study like this. Over the years we may find that different species of weeds take over the lake, or that winter conditions do have a dramatic impact on weed growth, or that higher phosphorus levels correlate with denser weed growth. Someday our current nuisance weed, tape grass, may give way to a more worrisome invasive species like Eurasian water milfoil. As we learn more, hopefully someday soon we will be able to use intelligent, lake-friendly controls on the particular species of weeds that may be hampering our enjoyment of the water and even choking the lake itself.

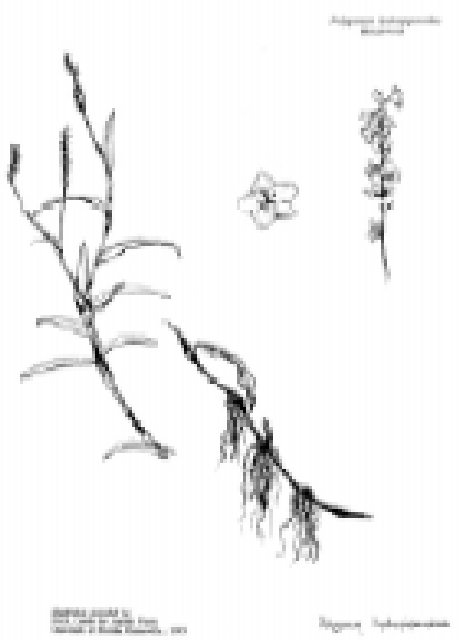
We encourage other KLSA Associations to join us this year and begin long-term studies of water weeds in other lakes. The more information we gather throughout the Kawarthas, the better.

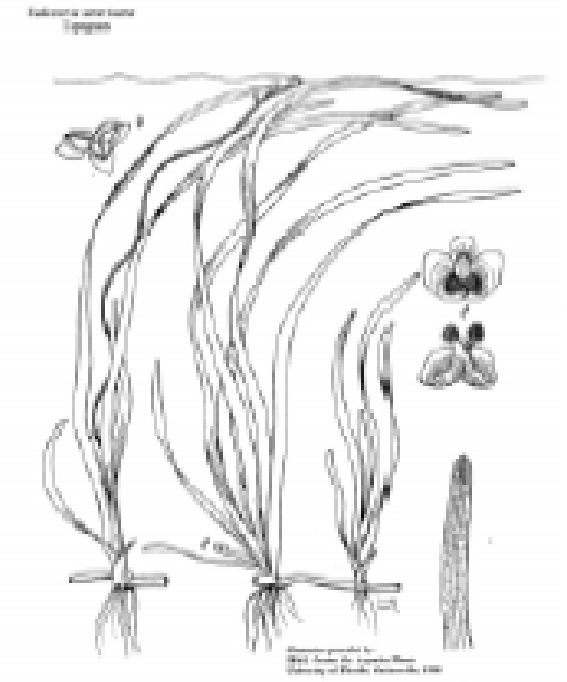
Pat Moffat

Aquatic Weeds in the Kawarthas

Smartweed (*Polygonum sp*)

- may be partly terrestrial
- bright pink flower above water surface
- leaves have network of veins branching from midribs
- leaves partly submerged with only flower above water surface



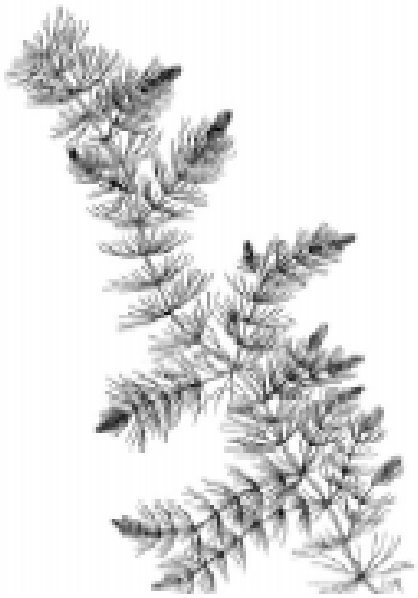


Tape Grass/Wild Celery (*Vallisneria americana*)

- leaves ribbon-like, up to several metres in length
- short flared root
- tiny white flower at surface on coiled stem
- long pod-shaped fruiting bodies
- new plants grow at nodes along buried stems

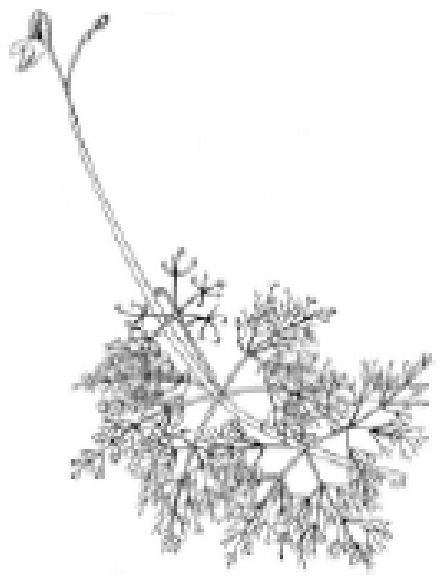
Coontail (*Ceratophyllum sp.*)

- plants entirely submerged, no roots
- paired leaflets grouped at regular intervals along stem
- stem may be branched



Water milfoil (*Myriophylum sp.)*

- four leaves at each stem node
- each leaf symetrically subdivided
- many stems from one root; stems may be branching
- there are a number of native and exotic species
- flowers in spikes above water surface



Bladderwort (*Utricularia sp.*)

- asymmetrical branching
- tiny bladders easily recognizable

Curly-leaf pondweed (*Potamogeton crispus*)

- edge of leaf serrated
- leaves strongly crinkled
- base of leaf does not clasp stem

Bassweed (*Potamogeton amplifolius*)

- longest lived member of the pondweed family

Richardson's Pondweed (*Potamogeton richardsonii*)

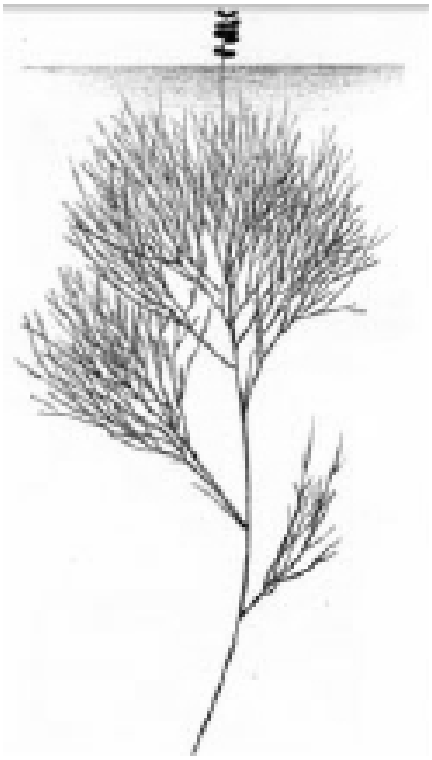
- edge of leaf smooth
- leaves moderately crinkled
- base of leaf clasps stem

Flat-stemmed Pondweed (*Potamogeton zosteriformis*)

- main leaves ribbon-like and long, 1-3 mm wide
- stem multi-branched
- stipules delicately reined either green or white

Floating-leaf pondweed (*Potamogeton natans*)

- brownish-green leaves float on water surface
- leaves heart-shaped at base
- flower spike above water surface



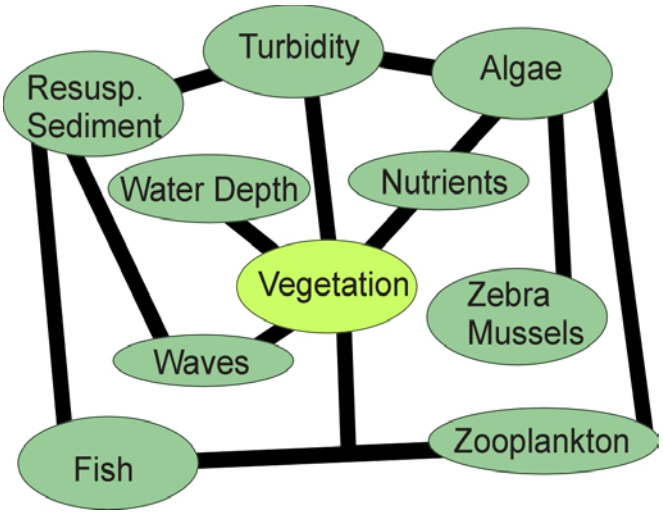
Sago Pondweed (*Potamogeton pectinatus*)

- leaf tips with long tapering points
- numerous thread-like leaves spread in fan-like fashion from stem
- found primarily in hard or brackish water or slow moving streams

More About Weeds

By Bev Clark, Coordinator,
MOE, Lake Partner Program
Dorset Environmental Science Centre

Factors Influencing Weed Growth



With a large public involvement program like the Lake Partner Program we hear, first hand, a great deal about observations that our volunteers make with regards to their lakes. We can tell, for example, if Ontario Lakes are experiencing algal blooms that are weather related by the number of calls we receive. Many of these observations are anecdotal, we often hear, for example, that there is more periphyton (algae that grows on solid things) on the rocks than in years past or that there are fewer crayfish than before. One of the most common recent observations is that there are more aquatic plants than there used to be in certain locations.

Whether there are more aquatic plants than there were historically at any given location is difficult to verify. We often hear from people with longer histories on their lakes that the "weeds" have been as thick as they are today at different times in the past. We may eventually develop a technique to infer past weed growth in lakes but unless aquatic plants have been mapped in the past, there is no way to know for sure about the changes that have taken place with time in their densities.

What we do know about aquatic plants is that their growth depends on a number of variables. The above diagram illustrates the many factors that influence aquatic plant growth. The connecting lines indicate that a relationship exists between the individual factors. Many of these relationships are too complex to be explained with simple directional arrows. You can see, for example, that zebra mussels can impact algae, which will change the turbidity of the water, which will directly affect the growth of aquatic plants. See if you can imagine how other factors are influenced by their neighbours in the diagram.

We see changes in many of these variables in our ecosystems as a result of climate change, invading species, etc. and it follows that the increased growth of aquatic plants could be the result of a combination of these stressors.

What's In Store for 2004?

After each year of testing, the KLSA feels they have found another clue to 'the mystery of the watershed'. In our third year, we are finding it easier to distinguish between what is normal and what is unusual, what is temporary and what is persistent. We look forward to continuing this monitoring program. Every year of data, interesting in itself, enhances the meaning of the work done in previous years.

This work is also of interest to others. There have been many requests for these reports, usually other groups interested in monitoring, but also students doing research, and agencies wanting to use the information. We hope to have our reports in more web-friendly format. We are hoping that students might help us to create some simple maps and diagrams to communicate our ideas in the easiest possible fashion.

We hope that many of our Lake Associations will begin ongoing weed surveys using Lovesick's study as a model, and will also participate in ORCA's benthic invertebrate study. These initiatives will expand KLSA's focus. Water weeds may be an indirect measure of water quality, but more importantly cottagers, residents, and tourists are increasingly concerned about them. Benthic invertebrates are a more subtle and biologically meaningful indicator of water quality than our current *E.coli* and phosphorus testing.

For those who wish to learn more about water and shoreline stewardship issues, please refer to Appendix G for a list of brochures or pamphlets that may be helpful to you or your Association. These can be obtained from the Federation of Ontario Cottagers Associations (FOCA) and other agencies.

We look forward to continuing support from our faithful and capable volunteers, and to all our sponsors. With your help and involvement, KLSA will continue to thrive.

Appendix A:
KLSA Mission Statement, Executive & Other Volunteers

Mission Statement

The Kawartha Lake Stewards Association objects are to carry out a coordinated, consistent, water quality testing program (including bacteria and phosphorus) of lake water on lakes within the Trent Canal System watershed. The Kawartha Lake Stewards Association will ensure water quality test results, prepared by an accredited laboratory with summary analysis, are made available to all interested parties. In future years the Kawartha Lake Stewards Association may expand its water quality program and may concern itself with other related matters.

Executive

Jim Keyser, Chair	(416) 694-4141, (705) 654-3839
Lower Buckhorn Lake Owners' Ass'n	email: jjameskeyser@aol.com
Pat Moffat, Vice-Chair	(519) 884-6549, (705) 654-4012
Lovesick Lake Cottagers' Ass'n	email: patmoffat@yahoo.com
Kathleen Mackenzie, Vice-Chair	(416) 283-7659, (705) 654-3051
Ass'n of Stony Lake Cottagers	email: k_mackenzie@sympatico.ca
Jeff Chalmers, Sec/Treas.	(705) 743-8671, (705) 652-8992
Birchcliff Prop. Owners' Ass'n (Clear Lake)	email: jeffreychalmers@cogeco.ca
Mark Potter, Director	(416) 232-4007, (705) 654-4340
Newcomb Dr. Cottagers' Ass'n (Lwr Buckhorn)	email: potter4@sympatico.ca
Ron Elliott, Director	(705) 731-0759
North Pigeon Lake Ratepayers' Ass'n	

KLSA E-mail: kawarthalakestewards@yahoo.ca

Other Volunteers

Big Bald Lake	Big Bald Lake Ass'n - Richard Dean, Susan Isles, Jason Makowchik, Bob Saunders
Buckhorn Lake	Buckhorn Sands Property Owner's - Mary and Mike Belas Sandbirch Estates - Keith Clark
Clear Lake	Birchcliff Property Owner's Assn - Jeff Chalmers Kawartha Park Cottager's Assn. - Judith Platt West Side - Jim Gillespie
Julian Lake	Julian Lake Cottagers - George Loyst
Katchewanooka Lake	Peter Fischer
Lovesick Lake	Lovesick Lake Cottager's - Pat Moffat, Marlene Steele,

	Ron and Katie Brown, Ann Ambler
Lower Buckhorn Lake	Lower Buckhorn Lake Owners' Ass'n - Mark Potter, Don McLeod, Fred Turk, Harry Shulman, Jim and Cindy Chapman, Mike Piekny, Jeff Lang and Peter Miller
Pigeon Lake	Concession 17 Cottager's Ass'n - Gary Adams
	Gamiing - Mieke Schipper, Elaine Petreman
	North Pigeon Lake Ratepayers' Ass'n - Ron Elliot, Don Fieghen
	Victoria Place - Dennis Hearse, Bill Bedley, Gary Westlake
	Sugar Bush - Tall Cedars - James Cole
Sandy Lake	Harvey Lakeland - Doug Russell
Stony Lake	Stony Lake Cottager's Ass'n -Kathleen MacKenzie, Bob Woosnam, Gail Szego, Ralph Reed
Sturgeon Lake	Sturgeon Lake Ass'n - Bill Parish, Rod Martin, Don Holloway
Upper Stoney Lake	Upper Stoney Lake Cottagers' Ass'n- Karl and Kathy MacArthur, Peter Knapp

Listed are our primary volunteers; many others helped on many occasions.

Volunteers at Workshop in Burleigh Falls

Appendix B: Donors and Sponsors of the KLSA

The Township of Galway, Cavendish and Harvey
The Township of Douro-Dummer
The Township of Smith, Ennismore and Lakefield
The Trent Severn Waterway
Mattamy Homes, Big Island, Pigeon Lake
Buckhorn Tourist Association
Marrick's Landing, Lovesick Lake
Carol McCanse, Katchewanooka Lake
Julian Lake Cottagers' Association, Julian Lake
North Pigeon Lake Ratepayers' Association
Pigeon Lake Cottagers' Association
Sandbirch Estates Association, Buckhorn Lake
Lower Buckhorn Lake Owners' Association
Lovesick Lake Cottagers' Association, Lovesick Lake
Stoney Lake Stewardship Council (Upper & Lower Stoney Lake)
Birchcliff Property Owners' Association of Douro-Dummer, Clear Lake
Kawartha Park Cottagers' Association, Clear Lake
Buckhorn Sands Property Owners' Association
Scugog Shoreline Millenium Project
Bassmania Tournaments Inc.
Victoria Place Association Inc.

Lower Rapids at Burleigh Falls

Appendix C: Financial Report

2003 Revenue & Expenses

31-Dec-2003

Balance Forward from December 31, 2002		**$3,004.96**
Revenue		
Scugog Shoreline Millenium Project (2002 testing)	300.00	
Buckhorn Tourist Association	250.00	
Twsp. of Smith-Ennismore Lakefield	225.00	
Carol McCanse	50.00	
Twsp. of Galway-Cavendish & Harvey	1,000.00	
Buckhorn Sands Property Owner's Assoc. (for 2003 testing)	200.00	
Marrick's Landing	50.00	
Twsp. of Douro-Dummer	750.00	
Mattamy Homes	1,500.00	
Julian Lake Cottagers	150.00	
Pigeon Lake Cottagers Association	150.00	
Birchcliff Property Owners Assoc. of Douro-Dummer	500.00	
Lovesick Lake Cottagers Association	300.00	
Sandbirch Estates, Buckhorn Lake	100.00	
North Pigeon Lake Ratepayers	300.00	
North Pigeon Lake Ratepayers - 25 reports	100.00	
Bassmania Tournaments Inc.	50.00	
Victoria Place Association Inc.	200.00	
Victoria Place Association Inc. - Past President's Donation	100.00	
Lower Buckhorn Lake Owner's Association	600.00	
Parks Canada, Trent-Severn Waterway	1,800.00	
Stoney Lake Stewardship Council (Upper & Lower Stoney)	1,000.00	
GIC Interest	30.00	
Kawartha Park Cottagers Association	200.00	
Buckhorn Sands Property Owner's Assoc. (for 2004 testing)	200.00	
Total Revenue	10,105.00	**$10,105.00**

Expenses

Bank Fees	0.90	
Jim Keyser	104.99	
Bank Fees	0.75	
Bank Fees	0.90	
Fleming College (printing 01 & 02 report)	885.60	
Kathleen Mackenzie	27.94	
Bank Fees	1.20	
LMS Prolink Insurance	923.40	
Jeff Chalmers (postage & supplies)	379.35	
Fleming College (printing 02 report)	361.80	
Buckhorn Community Centre	30.00	
Bank Fees	6.75	
F.O.C.A. 2003 Association Membership	144.45	
Bank Fees	3.30	
Bank Fees	5.00	
SGS Lakefield Research Limited - #C47169	629.16	
SGS Lakefield Research Limited - #C47939	1,632.82	
Bank Fees	5.00	
SGS Lakefield Research Limited - #C48701	1,939.91	
Transfer to GIC account	2,000.00	
Kathleen Mackenzie	31.01	
Bank Fees	5.44	
Bank Fees	5.00	
Bank Fees	5.00	
Total Expenses	9,129.67	**$9,129.67**
	Net Balance	**$3,980.29**

GIC Investment Account

Transaction	Debit	Credit	Balance	
Balance Forward			2,000.00	
Deposit from other account		2,000.00	4,000.00	
Year closing balance in GIC account			4,000.00	
Account Balance			4,000.00	**$4,000.00**
			Year End Total	**$7,980.29**

Receivables & o/s Expenses

Trent Severn Waterway (balance of 2003 funding)	1,200.00	
SGS Lakefield Research Limited - #C49597	-1,071.07	
Allowance for other o/s 2003 Expenses	-150.00	
Total	-21.07	**-$21.07**
	Year End Grand Total	**$7,959.22**

A. Jeffrey Chalmers, Secretary/Treasurer

Financial Statements of

KAWARTHA LAKES STEWARDS ASSOCIATION

December 31, 2003

Note to the Financial Statements

Review Engagement Report

Statement of Financial Position

Statement of Operations

Note To The Financial Statements
December 31, 2003

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.

As a non-profit association under section 149(1)(l) of the Income Tax Act, the association is not responsible to pay income tax and is therefore prohibited from distributing any of its profits to, or for the personal benefit, of its members, directors or affiliates.

McCOLL TURNER

McCOLL TURNER

McColl Turner LLP
Chartered Accountants
362 Queen St., Peterborough, ON
K9H 3J6

Telephone 705 743 5020
Facsimile 705 743 5081
Email info@mccollturner.com
Website www.mccollturner.com

REVIEW ENGAGEMENT REPORT

To Mr. A. Jeffrey Chalmers, Secretary/Treasurer

KAWARTHA LAKES STEWARDS ASSOCIATION

We have reviewed the statement of financial position of Kawartha Lakes Stewards Association as at December 31, 2003 and the statement of operations for the year then ended. Our review was made in accordance with Canadian generally accepted standards for review engagements and accordingly consisted primarily of enquiry, analytical procedures and discussion related to information supplied to us by the Association.

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 generally accepted accounting principles.

McColl Turner LLP

Peterborough, Ontario
April 17, 2003

KAWARTHA LAKES STEWARDS ASSOCIATION

Statement of Financial Position - December 31, 2003

(Unaudited)

	2003	2002
ASSETS		
Current Assets		
Cash	$ 3,980	3,005
Guaranteed Investment Certificate	$ 4,000	2,000
Amounts receivable	1,200	-
	9,180	5,005
LIABILITIES		
Current Liabilities		
Accounts payable and accrued liabilities	$ 1,221	$ 150
NET ASSETS	7,959	4,855
	$ 9,180	$ 5,005

Statement of Operations

Year ended December 31, 2003

(Unaudited)

	2003	2002
REVENUE		
Parks Canada, Trent-Severn Waterway	$ 1,800	$ -
Municipal grants	1,975	3,500
Associations	4,550	4,076
Private contributions	1,750	2,476
Pledge receivable	1,200	-
Interest	30	40
	11,305	10,092
EXPENDITURE		
Water testing fees	5,273	6,756
Annual report costs	886	869
Registration fees, insurance and membership fee	1,068	922
Telephone, copies and other administrative costs	935	211
Bank charges	39	52
	8,201	8,810
EXCESS OF REVENUE OVER EXPENDITURE FOR THE YEAR	$ 3,104	$ 1,282
NET ASSETS - BEGINNING OF YEAR	4,855	3,573
NET ASSETS - END OF YEAR	$ 7,959	$ 4,855

McCOLL TURNER

Appendix D: Lake-by-Lake *E.coli* Results

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Big Bald Lake

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date					
Site No.	06-Jul-03	20-Jul-03	27-Jul-03	11-Aug-03	01-Sep-03
1	1	0	2	0	-
2	2	2	<2	-	-
3	2	1	20	12	-
4	3	6	2	1	-
5	0	5	2	1	-
6	-	-	-	23	-
6A	-	-	-	-	6
6B	-	-	-	-	8
6C	-	-	-	-	5
6D	-	-	-	-	4
6E	-	-	-	-	0

Counts were all very low except for a slightly elevated count at Site 6/Aug. 11. Site 6, which had several high counts in 2002, needs to be tested next year; it was mistakenly neglected this year.

Bev Clark of the MOE Demonstrates *E.coli* Sampling Method

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Buckhorn Lake: Buckhorn Sands

2003 *E.coli* Lake Water Testing
***E.coli* count, *E.coli*/100 ml**
Test Date

Site No.	02-Jul-03	21-Jul-03	29-Jul-03	05-Aug-03	12-Aug-03	03-Sep-03
A	0	0	2	0	0	0
B	20	0	<2	20	1	5
C	0	0	<2	1	0	2
D	2	0	20	17	0	0

As in 2001 and 2002, counts were uniformly low. There had been heavy rain 3 days before the Aug. 5 samples, but this did not result in higher counts. Counts are similar to the previous two years.

Buckhorn Lake: Sandbirch Estates

2003 *E.coli* Lake Water Testing
***E.coli* count, *E.coli*/100 ml**
Test Date

Site No.	03-Jul-03	27-Jul-03	04-Aug-03	10-Aug-03	17-Aug-03	01-Sep-03
A	0	2	18	23	4	20
B	0	<2	37	0	0	3
C	0	4	1	0	0	11

Counts were low; with occasional readings between 20 and 50. This was similar to the two previous years. This is also typical for most Kawartha lakes.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

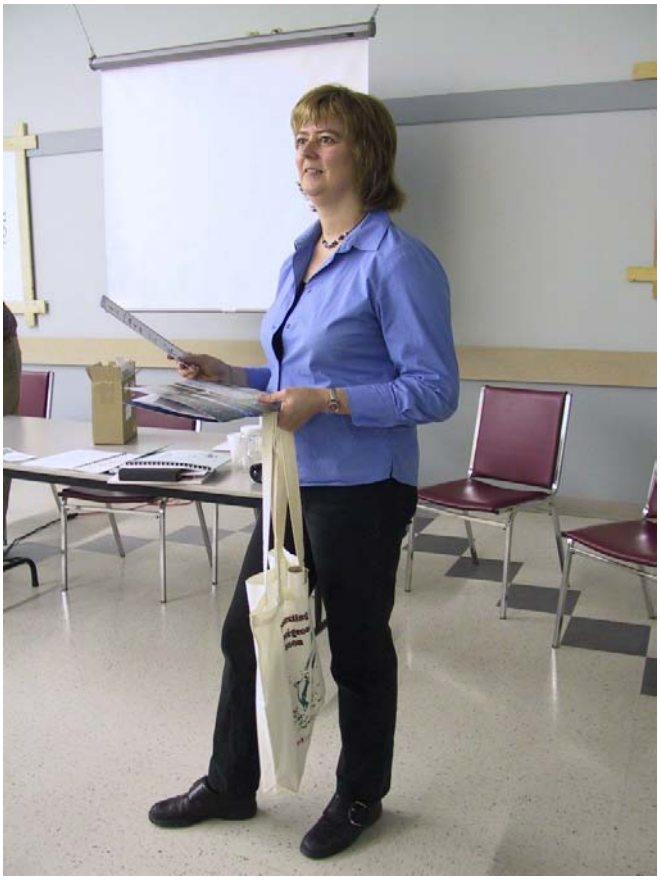
Clear Lake: Birchcliff Property Owners of Douro-Dummer

There are occasional readings between 20 and 50, similar to the two previous years. This is typical for most Kawartha lakes.

Site BB on Clear Lake is the same as Site N on the Stony Lake ASLCA chart. Samples were taken by the Birchcliff Assoc.

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date						
Site No.	02-Jul-03	20-Jul-03	29-Jul-03	04-Aug-03	13-Aug-03	02-Sep-03
1	1	6	2	10	2	0
2	3	0	2	0	0	1
3	20	0	<2	10	0	1
4	0	15	<2	22	1	1
4A	-	-	-	-	8	-
4B	-	-	-	-	0	-
5	17	2	<2	6	1	0
6	5	5	4	25	3	37
6A	-	-	-	-	1	-
6B	-	-	-	-	0	-
7	0	0	<2	1	0	0
8	2	1	2	13	0	0
B-B	4	0	2	16	0	11

B-B is site N on the Stony Lake ASLCA chart



Brenda Coons of Peterborough Green-Up

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Clear Lake: Kawartha Park Cottagers' Ass'n

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date						
Site No.	03-Jul-03	21-Jul-03	27-Jul-03	05-Aug-03	11-Aug-03	01-Sep-03
A	0	0	2	0	0	-
B	0	0	2	1	0	1
C	0	3	<2	0	0	-
D	0	0	<2	0	0	6

The counts here were all below 10, similar to the two previous years. This is somewhat lower than many Kawartha lakes.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Clear Lake: West Shore

2003 *E.coli* Lake Water Testing
***E.coli* count, *E.coli*/100 ml**
Test Date

Site No.	02-Jul-03	21-Jul-03	27-Jul-03	04-Aug-03	11-Aug-03	18-Aug-03	01-Sep-03	07-Sep-03
1	10	5	36	-	0	-	2	-
1A	-	-	-	0	-	-	-	-
1B	-	-	-	2	-	-	-	-
1C	-	-	-	1	-	-	-	-
2	5	1	18	**55**	**174**	-	12	-
2A	-	-	-	-	-	0	-	-
2B	-	-	-	-	-	0	-	-
2C	-	-	-	-	-	1	-	-
2D	-	-	-	-	-	1	-	-
2E	-	-	-	-	-	0	-	-
3	33	1	20	**66**	1	-	**60**	-
3A	-	-	-	-	-	-	-	10
3B	-	-	-	-	-	-	-	4
3C	-	-	-	-	-	-	-	15
3D	-	-	-	-	-	-	-	26
3E	-	-	-	-	-	-	-	13

Site 2's sporadic high counts were similar to counts in 2001. There were many Canada Geese observed in this area in late July and early August, especially August 9/10. On August 11, there were signs of geese droppings washing into the lake. Short grass extending to the water's edge makes this an attractive location for geese. On August 11, the water also had been recently churned up by a powerboat, which may have raised the counts.

Site 3 is an exposed location (high circulation), and no waterfowl were observed nearby. Possible sources for the elevated counts were construction of a cottage, and a small inflow.

There were high rains in the area before the July 27 and Aug 4 sampling dates, which may have caused the elevated counts.

Over the past 3 years, each of these sites has had at least 2 readings over 20, and at least 1 reading over 50. This would seem to be due to inflows at Sites 1 and 3, and high populations of geese at Site 2. These sites should continue to be monitored.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Julian Lake

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date						
Site No.	02-Jul-03	21-Jul-03	28-Jul-03	05-Aug-03	11-Aug-03	02-Sep-03
A	0	2	20	0	0	0
B	1	1	20	2	3	0
C	1	1	4	4	1	0

This lake, unlike most lakes tested, is not on the Trent-Severn Waterway, but is a few kilometres north. As in 2002, counts were consistently 20 or below.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Katchewanooka Lake

2003 *E.coli* Lake Water Testing

***E.coli* count, *E.coli*/100 ml**

Test Date

Site No.	02-Jul-03	07-Jul-03	21-Jul-03	28-Jul-03	05-Aug-03	11-Aug-03	18-Aug-03	08-Sep-03	14-Sep-03
1	1	-	0	26	-	20	-	**400**	-
1A	-	-	-	-	4	-	-	-	7
1B	-	-	-	-	14	-	-	-	9
1C	-	-	-	-	10	-	-	-	7
1D	-	-	-	-	-	-	-	-	3
1E	-	-	-	-	-	-	-	-	6
2	3		0	20	4	**54**	-	26	-
2A	-	-	-	-	-	-	-	-	-
2B	-	-	-	-	-	-	-	-	-
3	5	-	0	6	15	15	-	2	-
4	2	-	0	20	8	17	-	14	-
5	**200**	-	-	46	-	**140**	-	-	-
5A	-	20	0	-	1	-	38	7	-
5B	-	**119**	0	-	4	-	32	6	-
5C	-	50	0	-	11	-	**81**	6	-
5D	-	-	-	-	8	-	**91**	15	-
5E	-	-	-	-	20	-	-	**57**	-
6	0	-	0	4	0	13	-	4	-

The reason for the very high count at Site 1/Sep.8 is unknown. This is a bay with little circulation, but there had been no recent rains so runoff would probably not be a source. There is normally fairly heavy boat traffic here but this was a week after the Labour Day weekend, so boat traffic would not have been heavy. Cottages in this area are new, so it is unlikely that septic systems are malfunctioning. However, there were counts of 50 and 51 in 2002, so this location does have a tendency to have elevated counts.

The reason for elevated counts at Site 2 on Aug. 11 and Sep. 8 is unknown.

It is interesting that high rains before the July 28 and August 5 sampling dates did not significantly raise the *E.coli* counts. Heavy rains in 2002 similarly had no obvious effect on the various locations.

Site 5 had frequent high counts throughout the summer. Site 5 had consistently low counts in 2001 or 2002. The only change that was obvious in2003 was construction of a new cottage. It will be interesting to see if low counts return in 2004, when construction is complete. Also, at Site 5 on July 2, carp were observed spawning, which disturbed the sediments.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Lovesick Lake

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date							
Site No.	02-Jul-03	21-Jul-03	28-Jul-03	05-Aug-03	11-Aug-03	22-Aug-03	02-Sep-03
1	1	0	2	0	0	-	0
4	2	0	4	3	23	-	20
5A	1	1	20	1	4	-	80
6	4	0	20	1	**81**	-	0
6A	-	-	-	-	-	0	-
6B	-	-	-	-	-	1	-
9	0	3	2	0	5	-	1
11	4	0	<2	2	4	-	0

Bacteria results were generally good, with only two samples out of a total of 36 that were of concern. One, at 81 *E.coli*/100 ml on Aug. 11th, was off a private dock on the north side of the lake. There was no obvious reason for the high reading -- no geese in the area, no heavy rains -- and upon retesting, the levels of *E.coli* dropped down to 0 and 1, more normal readings for Lovesick. The second high reading, of 80 on Sept. 2, was at a resort. Because it was late in the season, the site was not retested. Again, there appeared to be no obvious reason for the high reading.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Lower Buckhorn Lake

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date						
Site No.	02-Jul-03	22-Jul-03	27-Jul-03	02-Aug-03	11-Aug-03	01-Sep-03
1	0	4	10	0	1	1
2	0	3	4	4	0	0
3	25	24	-	-	0	41
3A	-	-	34	**73**	-	-
3B	-	-	39	**73**	-	-
3C	-	-	21	**77**	-	-
4	31	7	7	**230**	0	8
5	0	2	2	1	2	0
6	0	2	-	20	2	0
7	0	1	2	0	0	2
8	0	3	9	7	4	0
9	1	5	4	2	0	1
10	1	1	0	2	0	2
11	2	18	11	3	0	3
12	4	30	-	**51**	-	**60**
12A	-	-	12	-	-	-
12B	-	-	14	-	-	-
12C	-	-	6	-	-	-
13	1	14	-	-	-	-

Site 3 had recurring elevated counts throughout the summer. This location is the mouth of a river that drains a large area of wetland

Both Site 3 and Site 4 are the inflows of rivers that drain a large area of wetland. Previous to the August 5 sampling, there had been heavy rains for 2 days (as recorded by the sampler), which may have 'flushed' the wetlands, raising bacterial counts. This was similar to 2002, when Sites 3 and 4 showed elevated counts after a rainy period.

Site 12, a new site in 2003, had recurring elevated counts. More investigation will be done here next year.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Pigeon Lake: Concession 17 Cottagers' Ass'n

2003 *E.coli* Lake Water Testing
***E.coli* count, *E.coli*/100 ml**
Test Date

Site No.	03-Jul-03	21-Jul-03	28-Jul-03	05-Aug-03	11-Aug-03	02-Sep-03
3	0	0	<2	10	0	2
4	2	8	4	0	0	0
A	2	1	4	0	1	0

As in 2001 and 2002, counts were very low. They must be doing something right! There were no sampling dates with previous heavy rain.

Pigeon Lake: Gamiing

2003 *E.coli* Lake Water Testing
E.coli count, *E.coli*/100 ml
Test Date

Site	13-Aug-03	27-Aug-03	02-Sep-03
East	*	0	0
West	*	12	17
South	*	2	1

*** No analysis due to power outage**

Due to boat problems, the Gamiing group did only partial testing this year. Counts were low, but the information is too incomplete to draw any conclusions, or be able to compare to previous years.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Pigeon Lake: North Pigeon Lake Ratepayers' Ass'n

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date					
Site No.	03-Jul-03	21-Jul-03	05-Aug-03	12-Aug-03	02-Sep-03
2	10	18	0	1	2
3	1	<2	6	6	0
4	6	12	11	7	11
5	8	22	-	36	18
5A	-	-	3	-	-
5B	-	-	4	-	-
6	25	14	47	27	36
7	**150**	**66**	-	47	**200**
7A	-	-	**460**	-	-
7B	-	-	**240**	-	-
8	4	8	0	16	1
9	11	<2	0	15	0
11	-	-	-	38	-
12A	-	-	-	-	**120**
12B	-	-	-	-	21

Site 7 has had frequent high *E.coli* counts during 3 years of testing. A possible reason for this is that the shoreline attracts a large population of Canada Geese and there is low water circulation. Fortunately, there is no swimming in the area. The landowner knows of the *E.coli* problem and would like to correct it. At the end of this summer, a first attempt was made, with the advice of Peterborough Public Health, to localize the source of the *E.coli*. Next year Site 7 will be investigated further.

Site 7 is very close to the Oliver Centre on Pigeon Lake. Oliver Centre rain data (see Appendix F) indicates a rainfall of 41.5 mm on Aug. 2. This heavy rainfall may have contributed to the high counts on Aug. 5. Rainfall also seemed to raise counts at Site 7 in 2002.

Sites 5 and 6 are swimming areas near Site 7. Site 6 counts are somewhat elevated.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Pigeon Lake: Victoria Place

2003 *E.coli* Lake Water Testing
***E.coli* count, *E.coli*/100 ml**
Test Date

Site No.	26-Jun-03	09-Jul-03	24-Jul-03	04-Aug-03	11-Aug-03	02-Sep-03	09-Sep-03
1	1	0	1	0	1	0	-
2	12	2	2	1	0	1	-
3	0	0	15	1	0	0	-
4	1	0	10	4	0	1	-
5	6	5	6	6	0	123	-
5A	-	-	-	-	-	-	0
5B	-	-	-	-	-	-	2
5C	-	-	-	-	-	-	3
5D	-	-	-	-	-	-	0

The only count over 20 was at Site 105/Sep.2. This site was the entrance to a small bay where a large number of boats were parked. It was also close to an area where a large number of people were staying for the weekend. There was no swimming right at this location, but there was heavy use on land and water very nearby. No waterfowl were seen, and there was no inflow visible.

This was the first year of testing in the Victoria Place area. There was little or no rain previous to all testing dates.

Sandy Lake: Harvey Lakeland

2003 *E.coli* Lake Water Testing
***E.coli* count, *E.coli*/100 ml**
Test Date

Site No.	21-Jul-03	28-Jul-03	05-Aug-03	11-Aug-03	02-Sep-03
1	14	20	7	8	29
2	1	6	1	1	40
3	0	<2	3	3	2
4	1	2	0	0	0
5	1	<2	0	0	0
6	2	<2	0	1	20

Sandy Lake is not directly connected to the Trent-Severn Waterway, but is very close to the TSW lakes.

Generally, *E.coli* counts are very low on this lake. Site 1 has, over the 3 years of testing, shown somewhat elevated counts, thought to be caused by waterfowl congregation on a nearby raft. In 2002, the runoff from the raft was sufficient to make the water murky. This year, there was less evidence of waterfowl on the raft, and lower counts over the summer.

Site 2 also had a raft nearby, where a population of waterfowl was obvious this summer. This may have been the cause of the elevated count on Sep. 2.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Stony Lake: Ass'n of Stony Lake Cottagers

2003 *E.coli* Lake Water Testing

***E.coli* count, *E.coli*/100 ml**

Test Date

Site No.	29-Jun-03	21-Jul-03	28-Jul-03	05-Aug-03	11-Aug-03	02-Sep-03
A	8	1	<2	11	0	11
E	24	**60**	-	-	0	1
E1	-	-	16	10	-	-
E2	-	-	16	4	-	-
E3	-	-	40	8	-	-
F	15	18	<2	0	1	0
G	12	7	2	2	1	20
I	17	12	4	4	5	7
J	34	0	8	27	0	20
K	**70**	0	4	1	0	1
L	22	1	<2	21	0	1
N	4	0	2	16	0	11
P	32	38	-	1	1	2
P1	-	-	20	-	-	-
P2	-	-	<2	-	-	-
P3	-	-	<2	-	-	-

Site N samples were done by the Birchcliff Assoc. on July 2, 20, 29, Aug. 4, 13 and Sept. 2, 2003.

The June 29 sampling date showed somewhat elevated counts generally around the lake. There were heavy rains and thunderstorms in the area that day and lighter rains several days previous, which could account for these.

Site E showed several elevated counts, which were not seen at this site in the previous 2 years. This is an area of heavy boat traffic.

Site K is located at an inflow, which may have been swollen by the rains, causing an elevated reading on Jun. 29.

Stony Lake Sample N from 2001 and 2002 was sampled by the Clear Lake Birchcliff Assoc. in 2003 as their site B-B.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Sturgeon Lake: East Shore

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date				
Site No.	06-Aug-03	17-Aug-03	18-Aug-03	24-Aug-03
1	20	1	-	1
2	**50**	3	-	5
2A		-	3	-
2B		-	0	-
2C		-	1	-
3	2	2	-	2
4	10	2	-	0
5	10	3	-	2
6	**180**	2	-	-
6A		-	0	0
6B		-	0	0
6C		-	0	0
6D		-	0	-
6E		-	0	-
7	3	4	-	1

This was the first year of KLSA *E.coli* testing on Sturgeon Lake.

The very high reading of l80 at Site 6 on Aug. 6 may have been due to a large number of people using the lake in this location on the August long weekend. Also, there had been heavy rain the evening before and morning of this sampling date. However, there is no inflow and no sign of Canada Geese, so runoff would not have been unusually high or unusually polluted in this area. This site should have been retested immediately, but was not due to confusion in the paperwork with this new group.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Sturgeon Lake: North Shore Combined Group

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date	
Site No.	03-Sep-03
1	2
2	4
3	4
4	4
5	1
6	2
SPGOLF	2
SPPD	3
WS1	1

This is the first year of KLSA *E.coli* testing on Sturgeon Lake. Counts were low on the one sampling date. This is a good beginning!

Sturgeon Point View on a sunny afternoon.

To put the results in perspective:

- 100 *E.coli*/100 ml is the level at which public beaches are posted unsafe for swimming;
- Kawartha Lake Stewards Association believes the safe swimming level for our lakes should be more stringent than this, and have set the acceptable level at 50 *E.coli*/100 ml. KLSA regards counts over 50 as cause for concern;
- Counts 20 and below, with an occasional reading between 20 and 50, are normal for the Kawartha lakes;
- A "-" indicates no data available for that date.

Upper Stoney Lake: Upper Stoney Lake Cottagers' Ass'n

2003 *E.coli* Lake Water Testing *E.coli* count, *E.coli*/100 ml Test Date						
Site No.	09-Jul-03	20-Jul-03	27-Jul-03	04-Aug-03	11-Aug-03	02-Sep-03
6	16	12	22	4	4	7
20	4	4	40	-	15	0
20A	-	-	-	13	-	-
20C	-	-	-	10	-	-
21	3	1	<2	0	1	0
52	26	21	-	-	10	27
52A	-	-	**120**	-	-	-
52B	-	-	12	-	-	-
52C	-	-	40	-	-	-
52B1	-	-	-	20	-	-
52B2	-	-	-	17	-	-
52B3	-	-	-	15	-	-
52F1	-	-	-	22	-	-
52F2	-	-	-	23	-	-
52F3	-	-	-	30	-	-
56	3	5	16	9	2	2
62	3	2	14	7	7	1
63A	0	0	18	1	5	0
65	1	0	20	2	5	0
70	3	0	24	1	0	1
78A	9	0	20	5	6	0
85	0	0	20	4	1	1
99	0	0	10	1	1	0

On July 27, counts were generally somewhat elevated. On this date there had been heavy rain only 3 hours before sampling, and the lake water in many locations appeared somewhat murky due to high runoff.

Site 52 had counts over 20 for most of the summer, which is unusual for Upper Stoney Lake, and for the Kawartha Lakes in general. This site had lower counts in the previous 2 years. There is no obvious reason for these higher counts in 2003.

Appendix E: 2002 Phosphorus and Secchi Data

Following is the complete record of phosphorus and Secchi disk measurements taken in 2003. Look up your lake and ask:

- How close is our lake to the 20 ppb seasonal average limit?
- How well do our Secchi readings and phosphorus readings correlate?
- How do your lake's phosphorus levels change throughout the season?

2003 Secchi Depth Results			2003 Total Phosphorus Results				
Secchi(m)	Date	Lake	Site Description	Date	TP1 (ug/L)	TP2 (ug/L)	TP Avg.
7.5	8-Jun-03	**BALSAM LAKE**	**N Bay Rocky Pt.**	8-Jun-03	6.5	6.7	6.6
6.5	15-Jun-03			-	-	-	-
5.5	24-Jun-03			24-Jun-03	9.1	10.0	9.5
5.0	30-Jun-03			-	-	-	-
5.5	14-Jul-03			14-Jul-03	13.9	14.6	14.3
4.5	29-Jul-03			29-Jul-03	16.6	16.8	16.7
5.0	18-Aug-03			18-Aug-03	16.7	17.5	17.1
4.5	9-Sep-03			9-Sep-03	13.2	13.3	13.2
3.9	19-May-03	**BALSAM LAKE**	**Lightning Point**	19-May-03	12.6	14.3	13.4
4.9	15-Jun-03			15-Jun-03	8.2	10.4	9.3
3.4	1-Jul-03			1-Jul-03	10.8	11.1	11
3.6	21-Jul-03			-	-	-	-
2.8	4-Aug-03			4-Aug-03	11.8	12.8	12.3
4.8	1-Sep-03			1-Sep-03	10.2	8.2	9.2
3.5	12-Oct-03			12-Oct-03	6.6	6.8	6.7
3.1	4-Jun-03	**CHEMONG LAKE**	**Mid-lake, Causeway**	4-Jun-03	11.0	9.0	10
2.8	17-Jun-03			-	-	-	-
2.6	6-Jul-03			-	-	-	-
2.0	20-Jul-03			20-Jul-03	19.3	19.2	19.2
2.5	7-Aug-03			-	-	-	-
2.1	20-Aug-03			20-Aug-03	15.9	14.9	15.4
2.7	7-Sep-03			7-Sep-03	15.6	15.8	15.7
2.7	21-Sep-03			-	-	-	-
2.1	7-Oct-03			7-Oct-03	17.8	16.6	17.2
2.5	20-Oct-03			-	-	-	-
-	-	**CLEAR LAKE**	**Main Basin, Mid-lake**	14-Jun-03	13.6	12.0	12.8
3.8	2-Jul-03			2-Jul-03	16.5	15.2	15.8
3.8	4-Aug-03			4-Aug-03	13.6	13.0	13.3
-	-			16-Aug-03	15.8	18.0	16.9
-	-			27-Sep-03	21.0	22.0	21.5

2003 Secchi Depth Results			2003 Total Phosphorus Results				
Secchi(m)	Date	Lake	Site Description	Date	TP1 (ug/L)	TP2 (ug/L)	TP Avg.
-	-	**CLEAR LAKE**	**Fiddlers Bay**	14-Jun-03	11.0	11.3	11.1
3.7	2-Jul-03			2-Jul-03	12.2	10.4	11.3
3.6	4-Aug-03			4-Aug-03	19.0	16.4	17.7
-	-			16-Aug-03	20.0	17.4	18.7
-	-			27-Sep-03	26.0	25.9	25.9
5.0	15-May-03	**JULIAN LAKE**	**Mid-lake**	15-May-03	5.2	4.9	5
6.5	2-Jul-03			2-Jul-03	5.9	8.6	7.3
4.2	21-Jul-03			21-Jul-03	13.5	12.5	13
4.0	28-Jul-03			-	-	-	-
4.5	5-Aug-03			5-Aug-03	6.0	6.8	6.4
5.0	11-Aug-03			-	-	-	-
6.0	2-Sep-03			2-Sep-03	8.2	6.5	7.3
5.2	30-Sep-03			30-Sep-03	6.6	5.8	6.2
5.8	18-May-03	**KATCHEWANOOKA LAKE**	**S/E Douglas Island**	18-May-03	11.3	11.9	11.6
3.9	1-Jun-03			-	-	-	-
6.4	15-Jun-03			15-Jun-03	10.5	10.7	10.6
5.1	2-Jul-03			2-Jul-03	30.6	22.0	26.3
3.5	14-Jul-03			-	-	-	-
3.5	28-Jul-03			-	-	-	-
3.6	5-Aug-03			5-Aug-03	28.0	21.0	24.5
5.1	8-Sep-03			8-Sep-03	25.5	26.0	25.7
7.1	6-Oct-03			6-Oct-03	19.2	23.6	21.4
4.5	12-May-03	**LOVESICK LAKE**	**deep hole N. end**	10-May-03	10.7	11.4	11
3.5	2-Jul-03			1-Jul-03	22.5	21.4	21.9
3.3	21-Jul-03			-	-	-	-
3.1	5-Aug-03			3-Aug-03	23.2	23.6	23.4
3.8	2-Sep-03			2-Sep-03	25.3	24.8	25
4.0	29-Sep-03			27-Sep-03	18.0	17.6	17.8
3.0	29-May-03	**LOVESICK LAKE**	**Spenceley's Bay**	24-May-03	17.2	18.5	17.9
3.5	2-Jul-03			1-Jul-03	39.8	32.5	36.1
3.3	5-Aug-03			3-Aug-03	23.4	24.0	23.7
3.5	2-Sep-03			2-Sep-03	27.0	30.7	28.8
4.3	29-Sep-03			27-Sep-03	17.4	17.4	17.4
3.0	29-May-03	**LOVESICK LAKE**	**Macallums Island**	24-May-03	32.0	18.8	18.8
3.8	2-Jul-03			1-Jul-03	21.8	24.0	22.9
2.8	5-Aug-03			3-Aug-03	23.8	24.0	23.9
3.5	2-Sep-03			2-Sep-03	26.2	24.0	25.1
4.0	29-Sep-03			27-Sep-03	17.0	21.0	19
5.0	5-May-03	**LOWER BUCKHORN LAKE**	**Heron Island**	6-May-03	17.5	19.8	18.6
3.8	10-Jun-03			7-Jun-03	12.4	12.7	12.6
3.3	2-Jul-03			2-Jul-03	19.3	17.0	18.1
2.0	2-Aug-03			3-Aug-03	24.0	24.0	24
2.5	2-Sep-03			1-Sep-03	9.0	21.6	21.6
3.9	1-Oct-03			10-Oct-03	14.4	14.6	14.5

Secchi(m)	Date	Lake	Site Description	Date	TP1 (ug/L)	TP2 (ug/L)	TP Avg.
5.7	19-May-03	**LOWER BUCKHORN LAKE**	**Deer Bay West Buoy C267**	19-May-03	11.8	11.9	11.8
3.7	1-Jun-03			-	-	-	-
5.2	15-Jun-03			15-Jun-03	15.2	15.5	15.3
4.2	2-Jul-03			-	-	-	-
2.5	15-Jul-03			15-Jul-03	22.5	24.3	23.4
2.4	28-Jul-03			-	-	-	-
2.4	12-Aug-03			12-Aug-03	31.6	31.6	31.6
2.5	17-Aug-03			-	-	-	-
4.1	19-Sep-03			19-Sep-03	18.0	18.0	18
4.7	28-Sep-03			-	-	-	-
6.8	10-Oct-03			10-Oct-03	11.8	12.6	12.2
4.5	5-May-03	**LOWER BUCKHORN LAKE**	**Deer Bay-centre**	6-May-03	26.7	21.7	24.2
3.4	10-Jun-03			7-Jun-03	14.7	13.8	14.3
2.7	2-Jul-03			2-Jul-03	14.7	14.3	14.5
2.7	2-Aug-03			3-Aug-03	32.8	18.0	n/a
2.0	2-Sep-03			2-Sep-03	32.4	33.0	32.7
3.7	1-Oct-03			11-Oct-03	17.4	14.4	15.9
-	-	**PIGEON LAKE**	**N end, 400m N of Boyd Is.**	21-May-03	12.5	13.2	12.9
5.7	8-Jun-03			8-Jun-03	8.8	10.2	9.5
5.6	30-Jun-03			30-Jun-03		10.1	10.1
3.3	21-Jul-03			-	-	-	-
3.1	5-Aug-03			5-Aug-03	18.2	18.6	18.4
5.1	13-Oct-03			13-Oct-03	27.8	28.2	28
4.4	14-May-03	**PIGEON LAKE**	**N end, Adjacent Con 17**	14-May-03	11.8	18.4	15.1
6.0	3-Jun-03			3-Jun-03	19.5	11.0	15.2
4.2	3-Jul-03			3-Jul-03	14.2	13.3	13.8
3.1	5-Aug-03			5-Aug-03	20.2	20.2	20.2
3.1	2-Sep-03			2-Sep-03	21.7	20.5	21.1
4.5	2-Oct-03			2-Oct-03	21.6	21.6	21.6
3.7	8-Jun-03	**PIGEON LAKE**	**N end, S end of Boyd Island**	-	-	-	-
4.0	26-Jun-03			-	-	-	-
3.0	24-Jul-03			-	-	-	-
4.0	4-Aug-03			-	-	-	-
3.0	2-Sep-03			-	-	-	-
-	-	**PIGEON LAKE**	**S end W shore**	7-Jun-03	8.8	7.7	8.2
-	-			3-Aug-03	21.0	20.4	20.7
-	-			1-Sep-03	25.7	24.1	24.9
-	-			5-Oct-03	22.6	24.0	23.3

2003 Secchi Depth Results			2003 Total Phosphorus Results				
Secchi(m)	Date	Lake	Site Description	Date	TP1 (ug/L)	TP2 (ug/L)	TP Avg.
1.6	7-May-03	**PIGEON RIVER**	**Pigeon R.-Emily Park**	7-May-03	34.3	28.8	31.6
1.6	5-Jun-03			5-Jun-03	27.7	27.1	27.4
1.5	8-Jun-03			-	-	-	-
2.1	2-Jul-03			2-Jul-03	52.0	24.1	24.1
2.1	5-Aug-03			5-Aug-03	23.8	22.6	23.2
2.6	2-Sep-03			2-Sep-03	19.3	16.9	18.1
2.7	6-Oct-03			6-Oct-03	10.2	12.6	11.4
4.8	11-May-03	**STONY LAKE**	**Gilchrist Bay**	11-May-03	7.8	8.2	8
5.5	15-Jun-03			15-Jun-03	9.7	8.8	9.3
2.5	21-Jul-03			21-Jul-03	22.3	22.0	22.1
4.5	2-Sep-03			2-Sep-03	15.0	16.3	15.6
4.5	13-Oct-03			13-Oct-03	14.2	14.8	14.5
3.9	11-May-03	**STONY LAKE**	**Mid-lake, Mouse Island**	11-May-03	8.3	8.4	8.3
3.9	1-Jun-03			1-Jun-03	14.4	11.2	12.8
3.0	2-Jul-03			2-Jul-03	12.2	11.9	12
4.1	5-Aug-03			5-Aug-03	14.0	14.0	14
4.0	1-Sep-03			1-Sep-03	21.2	21.8	21.5
5.1	29-Sep-03			29-Sep-03	21.6	23.0	22.3
5.0	8-Oct-03			-	-	-	-
4.7	19-May-03	**STONY LAKE**	**Hamilton Bay**	-	-	-	-
3.9	1-Jun-03			1-Jun-03	7.8	7.8	7.8
3.9	2-Jul-03			2-Jul-03	14.7	15.8	15.3
4.1	5-Aug-03			5-Aug-03	13.4	12.8	13.1
3.9	1-Sep-03			1-Sep-03	19.2	22.4	20.8
4.0	29-Sep-03			29-Sep-03	18.4	23.8	21.1
4.2	8-Oct-03			-	-	-	-
4.0	18-May-03	**STURGEON LAKE**	**S end, Rustic Bay**	-	-	-	-
3.3	15-Jun-03			-	-	-	-
3.2	29-Jun-03			29-Jun-03	15.9	14.9	15.4
2.7	14-Jul-03			14-Jul-03	16.2	14.3	15.2
2.4	6-Aug-03			6-Aug-03	18.0	19.0	18.5
2.1	17-Aug-03			17-Aug-03	15.3	18.1	16.7
2.6	30-Aug-03			-	-	-	-
2.9	28-Sep-03			28-Sep-03	15.0	16.6	15.8
2.1	22-May-03	**UPPER BUCKHORN LAKE**	**N end, buoy C310**	22-May-03	38.5	28.7	33.6
2.7	15-Jun-03			15-Jun-03	14.8	13.7	14.2
2.4	2-Jul-03			2-Jul-03	18.1	20.4	19.2
1.0	13-Jul-03			-	-	-	-
1.9	5-Aug-03			5-Aug-03	27.4	28.0	27.7
2.1	3-Sep-03			3-Sep-03	18.4	19.0	18.7
3.7	6-Oct-03			6-Oct-03	14.0	13.4	13.7

2003 Secchi Depth Results			2003 Total Phosphorus Results				
Secchi(m)	Date	Lake	Site Description	Date	TP1 (ug/L)	TP2 (ug/L)	TP Avg.
-	-	**UPPER BUCKHORN LAKE**	**Mid-lake, 30m from shore**	24-May-03	28.5	-	28.5
-	-			3-Jul-03	18.2	16.8	17.5
-	-			1-Aug-03	22.6	31.8	27.2
-	-			2-Sep-03	16.1	16.5	16.3
-	-			18-Oct-03	11.2	11.6	11.4
5.3	2-Jun-03	**UPPER STONEY LAKE**	**Quarry Bay**	2-Jun-03	5.4	5.1	5.3
5.0	9-Jul-03			9-Jul-03	8.8	8.2	8.5
5.3	11-Aug-03			11-Aug-03	7.2	8.6	7.9
6.4	2-Sep-03			2-Sep-03	5.9	6.9	6.4
8.7	20-Oct-03			20-Oct-03	9.6	8.4	9
5.5	2-Jun-03	**UPPER STONEY LAKE**	**Young Bay**	2-Jun-03	5.5	5.5	5.5
5.5	9-Jul-03			9-Jul-03	8.0	7.4	7.7
5.4	11-Aug-03			11-Aug-03	8.6	7.6	8.1
6.3	2-Sep-03			2-Sep-03	6.9	8.8	7.9
7.0	20-Oct-03			20-Oct-03	5.2	5.2	5.2
3.4	2-Jun-03	**UPPER STONEY LAKE**	**S Bay**	2-Jun-03	12.7	13.0	12.9
3.2	9-Jul-03			9-Jul-03	10.5	10.9	10.7
3.2	11-Aug-03			11-Aug-03	12.0	11.0	11.5
3.2	2-Sep-03			2-Sep-03	8.8	10.0	9.4
3.2	20-Oct-03			20-Oct-03	8.0	7.6	7.8
5.0	2-Jun-03	**UPPER STONEY LAKE**	**Crowes Landing**	2-Jun-03	4.8	4.7	4.7
5.5	9-Jul-03			9-Jul-03	9.0	8.8	8.9
5.4	11-Aug-03			11-Aug-03	10.0	8.8	9.4
6.5	2-Sep-03			2-Sep-03	6.6	6.7	6.6
8.0	20-Oct-03			20-Oct-03	8.8	10.0	9.4
5.0	7-May-03	**UPPER STONEY LAKE**	**Mid-lake, Deepest area**	-	-	-	-
5.3	2-Jun-03			2-Jun-03	4.9	4.6	4.8
5.5	9-Jul-03			9-Jul-03	7.2	7.1	7.1
5.6	11-Aug-03			11-Aug-03	8.2	8.0	8.1
5.6	2-Sep-03			2-Sep-03	6.1	6.5	6.3
7.4	20-Oct-03			20-Oct-03	7.0	8.8	7.9

Appendix F: Rainfall in the Kawarthas

Rainfall (mm) at Three Locations in the Kawarthas, Summer 2003

Oliver Centre (North Pigeon Lake), Trent University (North Peterborough, Peterborough Airport (South Peterborough)

Water Testing Dates are Shaded T=Y Means Thunderstorm T Means Trace of rain <0.2 mm

June							July							August							September						
Date	Oliver	Trent University				Ptbo.	Date	Oliver	Trent University				Ptbo.	Date	Oliver	Trent University				Ptbo.	Date	Oliver	Trent University				Ptbo.
	Centre	9am	5pm	Total	T	En. Can.		Centre	9am	5pm	Total	T	En. Can.		Centre	9am	5pm	Total	T	En. Can.		Centre	9am	5pm	Total	T	En. Can.
1							1							1							1			0.70	0.70		
2							2							2	41.50		12.80	12.80	Y	11.60	2						
3							3							3	0.10		0.80	0.80		1.40	3	1.10					T
4	3.90					11.40	4	2.00					0.20	4	0.20	0.40		0.40			4						3.60
5	7.00	14.40	1.60	16.00		13.80	5	0.10	0.80		0.80		3.60	5						T	5						
6	0.10	T		T			6							6	21.00	16.80	T	16.80	Y	26.20	6						
7							7			T	T		0.40	7	0.10					0.20	7						
8	18.90					23.60	8		T		T			8						1.60	8						
9	2.10	22.00	T	22.00		2.60	9							9	1.80	T		T		1.00	9						
10	1.40					0.60	10	0.90		0.80	0.80		10.20	10	0.90		0.60	0.60		0.60	10						
11	0.40	5.20		5.20		T	11	6.00	9.60	0.80	10.40		4.40	11	8.50	T	3.40	3.40		1.00	11						
12						1.80	12	0.60					1.20	12							12						
13	14.20	4.20	3.40	7.60		5.60	13	0.10	T		T		T	13							13						
14	0.10						14							14							14	8.70	T		T		0.40
15							15	10.70		1.80	1.80		8.40	15							15	10.90	0.60	2.80	3.40		10.80
16							16		4.40		4.40		T	16							16	0.10	5.60	T	5.60		0.20
17							17							17						T	17						
18							18							18							18	0.30					0.40
19	1.50	1.40		1.40		0.80	19							19							19	20.90	T	23.80	23.80	Y	30.00
20							20	0.70		1.40	1.40		4.40	20							20						
21							21		1.60	1.00	2.60		0.80	21	3.20					0.20	21	0.10					
22							22			2.30	2.30		14.80	22		1.60		1.60			22	13.40		2.80	2.80		26.80
23							23	0.30	8.80		8.80			23							23	1.30	13.60	0.60	14.20		1.60
24							24	3.40	0.40	0.40	0.80		29.60	24							24	2.00					0.60
25							25	0.10	1.20		1.20		0.20	25						2.00	25	6.90	4.80		4.80		2.00
26	2.60	0.80		0.80		0.80	26	1.40		T	T		T	26	0.10	1.00		1.00			26			T	T		0.60
27	1.50						27	0.60	0.60	2.20	2.80		6.00	27							27	21.10	23.60	10.40	34.00		34.80
28							28							28							28						
29	9.90		9.20	9.20	Y	18.60	29							29	0.10		1.20	1.20		0.20	29	2.20		1.00	1.00		0.20
30	0.10						30							30							30	2.00		0.80	0.80		0.40
							31							31													
Ttl	63.70			62.20		79.60	Ttl	26.90			38.10		84.20	Ttl	77.50			38.60		46.00	Ttl	91.00			91.10		112.40

Appendix G: Brochures/Pamphlets for FOCA Lake Stewards

This is a list of brochures and pamphlets on lake stewardship issues, published by various agencies and selected by FOCA staff. FOCA encourages you to order these for yourself or your association, either online, by telephone, or by visiting the FOCA office. Please note that we may charge postage on large orders.

All brochures listed here are on display at the FOCA office; feel free to visit and surf the shelves. The office is usually open Mon. – Fri., 10 – 5, but please phone ahead to ensure someone will be available to help you.

PHONE: (416) 429-0444 E-MAIL: WWW.FOCA.ON.CA

Availability Codes

CODE	MEANING OF CODE	WHO TO CONTACT
DFO	Available from Dept. of Fisheries & Oceans website; download and copy	www/dfo-mpo.gc.ca/regions/central/pub/fact-fait/index_e.htm
*FOCA >10	Available in large quantities (more than 10) from the FOCA office.	Info@foca.on.ca 416-429-0444
FOCA <10	Available in small quantities (less than 10) from the FOCA office.	Info@foca.on.ca 416-429-0444
Green-Up	Available from Peterborough Green-Up website; download and copy.	www.greenup.on.ca 1-705-745-3238
ISP	Available from Invading Species Program; download and copy or have copies mailed (free postage) .	www.invadingspecies.com 1-800-563-7711
LRC	Available from LandOwner Resource Centre website; download and copy	www.LRCONLINE.com 1-888-571-4636
OSCIA	Available From Ontario Soil & Crop Improvement Association website; download and copy.	www.ontariosoilcrop.org/brochures_available.htm

The LandOwner Resource Centre is a rich source of lake stewardship information, including some interesting videos. For a complete listing of their materials, go to their website, and click on "Download a PDF of our Product Line".

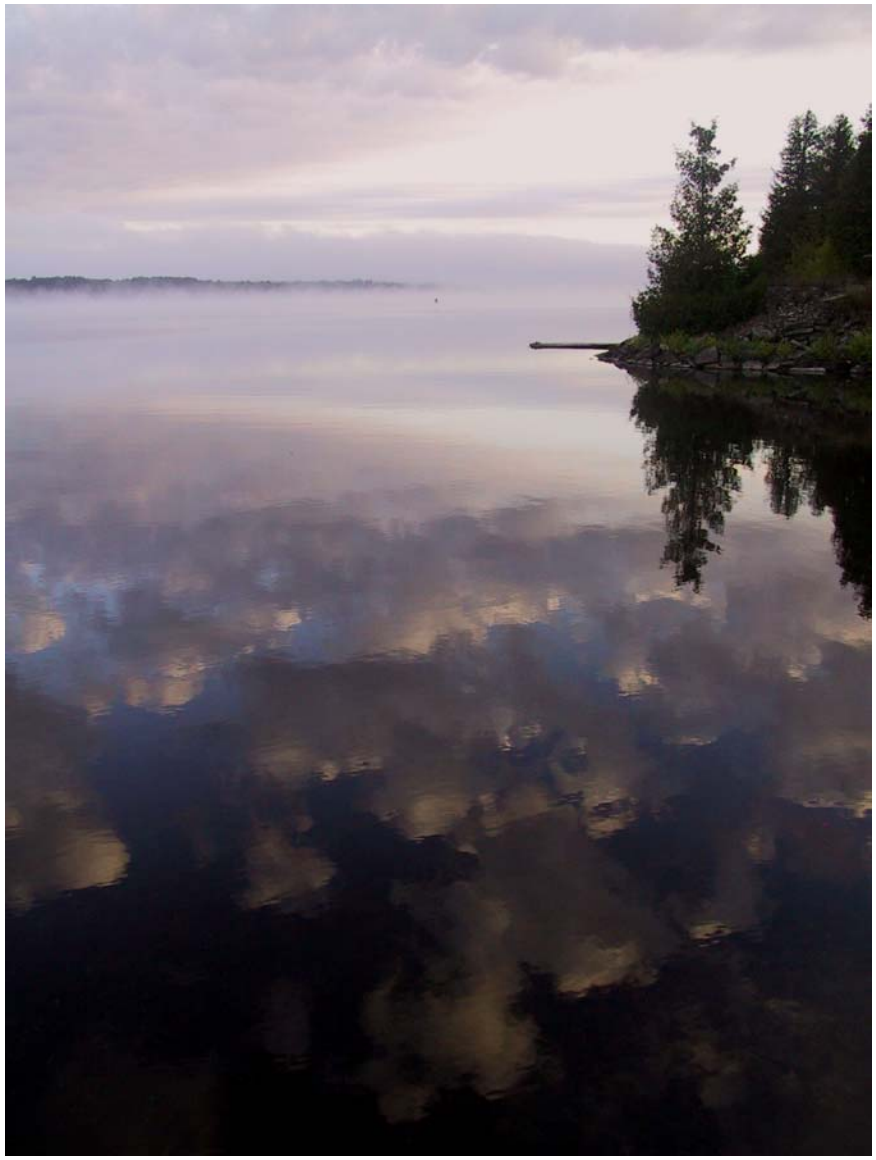
List of Brochures/Pamphlets Available at FOCA

TITLE OF BROCHURE	AVAILABILITY
BOATING	
Outboard motors and personal watercraft (pollution levels)	FOCA <10, Green-Up
Safe Refueling *new!*	*FOCA >10
Wise choice – now wear it (buying and maintaining lifejackets)	*FOCA >10
IN AND AROUND THE COTTAGE	
Alternative Cleaners	FOCA <10, Green-Up
Burn it smart! Enjoy the fire, not the smoke	*FOCA >10
The carpenter ant and its control	FOCA <10
Flies in and around the home	FOCA <10
Go green at the cottage	FOCA <10
Help preserve our night sky	FOCA <10
House mouse	FOCA <10
Improve fireplace efficiency	FOCA <10
What to do with home renovation waste	FOCA <10
Wood decay, wood preservatives and treated wood products	FOCA <10
DRINKING WATER	
Rural Water Stewardship (folder with information on wells and septic systems)	*FOCA >10
Recommended methods for plugging abandoned water wells	FOCA <10
SEPTIC SYSTEMS	
About your house: Your septic system	*FOCA >10
About your house: buying a toilet?	*FOCA >10
Septic Smart: New ideas for household septic systems on difficult sites	FOCA <10, OSCIA

INVASIVES	
Aquarium hobbyists: You can help the environment	FOCA <10, ISP
Cedar leafminers	FOCA <10, LRC
European frog-bit invades Ontario waters	FOCA <10, ISP
Fanwort invades Ontario waters	FOCA <10, ISP
Fish hook water flea invades the Great Lakes	FOCA <10, ISP
Forest tent caterpillar	FOCA <10
Gobies in the Great Lakes	FOCA <10, ISP
Gypsy moth in Ontario + gypsy moth websites	FOCA <10
Invasive exotic plants in Ontario	FOCA <10, Green-Up
Spiny water flea invades Ontario waters	FOCA <10, ISP
Zebra mussels: a guide for boaters and cottagers	FOCA <10, ISP
LAKE PLANNING	
Lake planning to ensure the health of your lake	FOCA <10
Subwatershed planning	FOCA <10
Water management on a watershed basis: Implementing an ecosystem approach	FOCA <10
SHORELINES	
Buffers protect the environment	FOCA <10, LRC
The Dock Primer	*FOCA >10
The Healthy Shore List: How does your waterfront check out? new!	*FOCA >10
I want to protect my shoreline property (self-evaluation form)	*FOCA >10
Landowner Resource Centre Product Line	*FOCA >10, LRC
Preserving and restoring natural shorelines	FOCA <10, LRC
The Shore Primer	*FOCA >10
The True Nature of Your Shoreline 55 x 70 cm poster	*FOCA >10
Water Protectors Program: Shoreline Visit Service	FOCA <10
Waterfront Living (8 ½ x 11" picture contrasting low- and high-impact shoreline living)	*FOCA >10
Waterfront Living 43 x 56 cm poster	*FOCA >10

"Working Around Water" series: What you should know about….	
Fish Habitat	FOCA <10
Fish Habitat and Dredging	FOCA <10
Fish Habitat and Controlling Aquatic Plants	FOCA <10
Fish Habitat and Docks, Boathouses and Boat Launches	FOCA <10
Fish Habitat and Building a Beach	FOCA <10
Fish Habitat and Building Materials	FOCA <10
Fish Habitat and Shoreline Stabilization	FOCA <10
Fish Habitat and the Effects of Silt and Sediment	FOCA <10
WATER QUALITY	
Acid sensitivity of lakes in Ontario	FOCA <10
Acidification – warning signs	FOCA <10
Aquatic plants	FOCA <10, Green-Up
Filamentous algae and acid rain in Ontario lakes	FOCA <10
IceWatch	FOCA <10
The Ontario Lake Partner Program: A Closer Look at Your Lake	FOCA <10
Preserving water quality	FOCA <10, LRC
Seven hints on protecting your lake	FOCA <10
Swimmer's itch	FOCA <10
What are algae? *new!*	FOCA <10
WETLANDS	
A Wetland Tale	FOCA <10
Wetlands: You Can Save Them	FOCA <10
WILDLIFE	
Bees, wasps, and hornets	FOCA <10
Building nesting platforms for ospreys	FOCA <10, LRC
Cavity trees are refuges for wildlife	FOCA <10, LRC
Ducks of Canada 97 x 33 cm poster *new!*	FOCA <10
Geese and your shoreline property	FOCA <10, Green-Up

Helping your trees survive storm damage	FOCA <10
Living with black bears in Ontario	FOCA <10
Loon-friendly lakes	FOCA <10
Ontario Turtles	FOCA <10
Options for controlling beaver on private land	FOCA <10, LRC
Protecting trees from vole damage	FOCA <10, LRC
Reptiles need your help!	FOCA <10
West Nile Virus	FOCA <10
Wildlife friendly waterfront	FOCA <10



Early Morning on Clear Lake

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