

MCKELLAR TOWNSHIP WATER TESTING PROTOCOLS

Conducted with the cooperation and participation of MLCA Volunteers

Revised: April, 2021

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1. Water testing for Phosphorus levels in partnership with the Lake Partner Program (LPP)

From the Provincial Water Quality Objectives (p. 29, February, 1999):

“Current scientific evidence is insufficient to develop a firm objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines which should be supplemented by site-specific studies:

To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 µg/L;

A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 µg/L or less. This should apply to all lakes naturally below this value;

Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 µg/L.”

2020 Testing:

The sampling for phosphorus was incomplete in 2020 because the Provincial lab was closed in May due to the pandemic. Our previous water testing coordinator received an email in early October saying that the lab was open and test samples could now be collected and sent in. Samples for phosphorus and calcium were collected at sites A, C and D (as shown on the map below in section 4 (Deep Water Oxygen) and sent for analysis. Secchi readings were also taken at that time. One other sampler was

unable to get out to sample in October. The average Total Phosphorus Concentration for the reported samplings in 2019 for Lake Manitouwabing was 10.4 µg/L.

2021 Testing and ongoing:

Engage with the Lake Partner Program to coordinate testing sites, receive kits and enlist more testers as needed.

Take Secchi disc readings on the schedule suggested by the LPP.

Report on results posted by the LPP on the MLCA web site and to the Township council.

Phosphorus and other data for the Lake Partner Program and Manitouwabing Lake can be seen at www.desc.ca/programs/LPP ([Lake Partner Program](#) | [DESC](#))

In addition to the continued work by LPP volunteers on Lake Manitouwabing, a Lake Capacity study will be conducted during the summer of 2021 by Dr. Carl Mitchell from the University of Toronto. MLCA is cooperating with the township in facilitating this study. Following is Dr. Mitchell's description of this project:

The Capacity Issue:

On-going lake water quality testing in McKellar, particularly in Lake Manitouwabing shows the water quality is generally good but also points to a handful of localized issues for phosphorous. Phosphorous concentrations are often related to the number of inhabitants around the lake since malfunctioning septic systems, lawn fertilizations, shoreline malfunctioning and other human disturbances are sources of phosphorous. More localized problems (eg. high E.coli "hot spots") can occur as well, especially in areas where the lake water naturally does not flush from an area very quickly. When phosphorous levels become elevated, algae and other micro – organisms can grow more efficiently, leading to blooms which later translate to lower dissolved oxygen levels in the lakes as larger quantities of dead algae are broken down and eaten by oxygen consuming micro-organisms. In extreme circumstances, these drops in oxygen levels can lead to fish kills. Other issues, such as septic maintenance, shoreline alteration and fisheries are closely linked to phosphorous levels and these levels are in turn closely linked to the density and/or inhabitation of the lake. High phosphorous levels contribute to blue green algae blooms that adversely affect the quality of the water and our enjoyment of the lake. The Ministry of the Environment in 2010 created a model to predict potential phosphate loading based on shoreline development. What is the impact on our lakes with the creation of more waterfront properties and the conversion of seasonal properties to retirement residences? What is the carrying capacity of our lakes? Is the first sighting of Blue Green Algae last summer an indication of a capacity problem?

Background:

A common model in Ontario used to better understand a lake's overall capacity for inhabitation is the Lakeshore Capacity Model. No model is perfect but one always learns something significant about the system under study so other newer approaches can be considered. The best case scenario is that the model works well, can be advanced to compensate for common issues (sensitivity to lake flushing in localized areas), and therefore can be used as a strong tool in assessing the Lake Manitouwabing capacity for development and possibly for other lakes in McKellar.

To date, we have been testing the quality of our water through the MLCA and Health Units for E. coli and phosphorous levels, through the Ridge at Manitou Environmental Committee phosphate testing program, various studies, reports have been completed related to Lake Capacity from FOCA and their lake partnership program; testing standards for the Ridge development 2003-04; various MNRF fish studies; reports on various capacities regarding the Weyeridge proposal in 2007-08, our EDC 2015 report which recommended this study: "to determine the capacity of the lakes and the possibility of planned growth and land development over time and determined that there is room to grow in a gradual and responsible way". Our new Official Plan and pending Zoning By Law has more relevant information to be considered.

Action Going Forward:

Thanks to the generosity and support of a resident and committee member, Dr. Carl Mitchell from UofT has volunteered to obtain a grant or self - fund and have a graduate student conduct the capacity study in 2021.

Further recommendations will be forthcoming after the initial study that will have two key components:

- 1- Educational ideas to ensure we all are doing everything we can to keep our lakes healthy
- 2- Regulatory ideas to ensure we maintain our proper lake capacity

2. Water testing for E. coli and coliform testing by MLCA Volunteers, and the Public Health Unit

Faecal indicators such as E. coli and enterococci are the best available indicators for the possible presence of enteric pathogenic microorganisms (bacteria, viruses, protozoa). Testing for E. coli is relatively inexpensive and sampling is straight-forward. Since human animal and wild fowl waste is also high in phosphorus, it might be inferred that a high E. coli count corresponds to higher phosphorus counts as well.

There are several testing groups- MLCA, Ridge, Health Unit - that must work together to ensure we are all on the same page, can resolve issues quickly and responsibly for the safety of our ratepayers and ultimately preserve the quality of our lakes.

- A. Beaches – We have four public beaches on Lake Manitouwabing (3) and Armstrong Lake (1). In the summer of 2020, the Public Health Unit tested one beach in each of June, July, and August; MLCA tested three.

The protocol for beach testing is to take five samples across the length of the beach. Beaches are closed to public swimming if the E. coli count is 200 CFU/100 ml. MLCA test results are received from the lab and communicated to the Township and the Health unit if they are above the limit. Health Unit test results are available on the Health Unit website with “open” depicting a good result and “closed” depicting a count higher than 200 CFU/100 ml – called a “hot spot”. If a hot spot is identified, the Health Unit will immediately post the beach with their signs as either “unsafe for swimming” or “closed.” The Township Clerk and the MLCA will post ‘signage’ on their websites ASAP. Once the beach is retested and is within limits, the Health Unit will inform the Township Clerk and remove the signs.

B. The Ridge at Manitou

The Ridge at Manitou golf course conducts testing for phosphate and E. coli on its grounds, a nearby creek and the lake immediately in front of the Golf Course and Club House. A report is sent to the township yearly. Testing has been conducted annually since ~ 2005.

2020: Test results for the Ridge at Manitou were received by the Township.

C. Recreational lake water testing for E. Coli

The MLCA Water Sampling Coordinator chooses sites on five lakes in McKellar Township – Manitouwabing, Armstrong, McKellar, Grey Owl and Moffat Lakes. The Coordinator selects the sites to be tested, collects the sampling bottles from the lab, communicates the sites to be sampled to the water samplers, distributes the sampling bottles and instructions to the samplers, collects the samples and ensures that they are received by the lab in a timely manner and in good (continuously refrigerated) condition. The Sampling Coordinator posts the test results on the MLCA website and informs the samplers and the Township of any “Hotspots” – test results that are over 200 CFU/100 ml. Hotspots will be retested by performing five tests along the shoreline with the original hot spot in the centre position in the following month. (NEW). Residents along the area in question will be informed of the initial high results, offered septic test tablets to purchase from the MLCA volunteer and will receive information about inspection and remediation of septics from the Township. The practice of wild fowl feeding will be discouraged.

Note: Volunteers collecting samples:

- will not go out to sample in inclement weather
- are encouraged to wear a personal flotation device at all times
- will leave the area immediately if a resident objects to them sampling the water near their property.

Resources:

Guidelines for Canadian Recreational Water Quality is available on Internet at the following address:

<http://www.healthcanada.gc.ca/>

3. Blue Green Algae monitoring and testing if present in cooperation with the MNRF

BGA blooms look like green pea soup, although they may also be other colours. Dense blooms form clumps. Fresh blooms smell like newly mown grass and older blooms may smell like rotting garbage. It is impossible to predict the occurrence of BGA. Sites have been known to move with the flow and wind. Phosphorous is the nutrient that controls the growth of algae. We need to continue testing and monitoring our lake levels of phosphorus through the LPP sampling. Phosphorus values are affected by shoreline development and shoreline vegetation clearing, land run-off from fertilizers, poorly functioning septic systems, atmospheric temperature increases due to climate change, watershed run-off, low deep water oxygen concentrations and other stressors. Not all Blue Green Algae blooms (cyanobacteria) produce toxins (microcystin), but if present they can be harmful, causing skin irritation and rashes; if consumed, they can cause diarrhea and vomiting, infrequent in adults. The toxins are more likely to be harmful to children and animals who may ingest them, however, deaths are rare. Our studies have shown that concentrations of phosphorous in our lake are similar throughout the lake. Phosphorous values are influenced by the watershed. There appears to be no deterioration of our watershed over time. Human activity can increase the phosphorus levels in the lake due to storm water runoff picking up phosphorus from fertilizers, malfunctioning septic systems and animal waste and discharging it into rivers and streams. Human, animal and wild fowl waste is very high in phosphorus. If the oxygen levels are too low at the bottom of the lake, phosphorus will be released from the sediment at the bottom of the lake. Deep water oxygen levels were measured this fall and show an average of 5.7 mg/L across the four deepest areas of the lake – high enough to prevent phosphorus release.

Precautions if BGA sited:

1. Report suspected BGA blooms to the MECP Spills Action Centre at 1-866-663-8477 or Ontario.ca/page/blue-green-algae report BGA – TIPS. Also take photographs, record what the weather has been over the past week (winds, temperature, precipitation) and take a sample and put it in the fridge or freezer. MLCA will help with sampling – please email at mlcawatertesting@gmail.com - if possible.
2. Avoid swimming or wading in the water in that area until test results are known. Children and animals are at risk of ingesting the toxins. Check your water intake system for BGA. Shower after swimming, and clean the algae off your pet's fur, if you were swimming in the area.
3. MECP will test the site and advise the township. Health Unit will give us the results. If positive, Health Unit will prepare a media release.
4. The township and the MLCA will inform area residents of the report and ask them to survey their shoreline for any other potential areas of BGA growth.
5. The MLCA Water Sampling Coordinator and the Water Samplers will photograph and take a sample of any sites of BGA not sampled by the ministry.
6. Follow the Guidelines from the NBPS Health Unit website after presence of BGA is confirmed by the MECP.
7. Once public, the municipality will post the media release on their website, social media and Lake Association websites, prepare information package for citizens in the area including media release, Health Unit FAQ's and info you should know about BGA and post signs on beaches and boat launches.
8. If test is not toxic, the Health unit will inform us and we will use all social media to inform everyone.

2020: BGA Issue:

In August 20, the Ministry of the Environment, Conservation and Parks informed McKellar about a positive test for Harmful Algae Bloom (HAB) in Lake Manitouwabing. This is the first time that a report about BGA in the lake in the last ten years. We will continue to work with the Ministry of the Environment, Health Unit and our Ad Hoc Committee on Lake Stewardship and the Environment to develop protocols to properly deal with a BGA report and to continue to recommend ways to prevent their development.

Future Action Items:

1. Continue to ensure that the Ridge regularly tests for phosphorus and makes periodic reports to Council
2. Create a BGA handout for residents like Seguin: "BGA-What you need to know"
Lake residents will be given a brochure which details:
 - how to identify algae that could be Blue Green Algae
 - how to report the occurrence of Blue Green Algae to the Ministry (MECP)
 - factors which encourage/discourage the growth of Blue Green Algae
 - potential health dangers of BGA
3. Work with the Health Unit to give us the site so we can inform our residents for their safety
4. Establish a log book for BGA incidents
5. Continue to educate everyone about BGA
6. Implement measures to prevent BGA overgrowth in our lakes

Resources:

For general information about Blue Green Algae visit

www.ontario.ca/page/blue-green-algae

Manitouwabing Lake Environment Report, Oct 2020

Manitouwabing Lake State of the Basin Review 2018

4. Deep water oxygen concentrations in the four deepest areas of Manitouwabing Lake

In Manitouwabing Lake – State of the Basin Review 2018, by Bev Clark states:

“In areas where the bottom waters have their oxygen concentrations reduced to below 1mg/L (this is called anoxia) in late summer there can be phosphorus released from the sediments into the bottom waters. In some cases, this phosphorus can be available to support algal blooms in the mixed, warmer surface water. For this reason, there is merit to measuring dissolved oxygen profiles in the lake for those areas that are deep enough to stratify (the process where warm surface water cannot mix with cold bottom water). In most cases the water needs to be about 7-8 m deep or deeper before this can occur. Shallower areas mix completely to the bottom. In

stratified areas, the cold bottom water cannot have its oxygen replenished from the surface such that when oxygen is consumed by bacteria the loss of oxygen cannot be reversed until the lake turns over again in the fall. Under these circumstances there may be phosphorus that enters the cold bottom water from the sediments. If this phosphorus ends up being entrained into the warmer surface water in sufficient quantities, it can help to support algal blooms under the right conditions.

Areas in Manitowabing where this may occur are shown in yellow on the map below and these areas could be assessed with oxygen/temperature profiles on or 14 days either side of Sept 01. Any additional areas that may stratify could be confirmed in the initial years of monitoring.”

A recommendation in the GBBR report received in late September of 2020 was to “Conduct late summer monitoring of dissolved oxygen in the deepest location and in isolated bays where depths are greater than 7-8m.” (Katrina Krievins, Manitowabing Lake Environment Report 2020, p.iii).

These areas referred to in the 2018 report, and now marked A, B, C and D were sampled in the fall of 2020 using a device for deep water sampling called a ‘Bacon bomb sampler’ by Fisher Scientific Co.

Unique markers were inserted into the rope holding the sampler at lake level for the various locations for later depth calculation. Samples in McKellar Bay (A) and SE of Tait’s Is. (B) were murky with floating particulates. The sample in Robinson Lake (C) was black with no visible particulates. The sample E. of Hurdville (D) was a muddy pinkish milk chocolate brown.

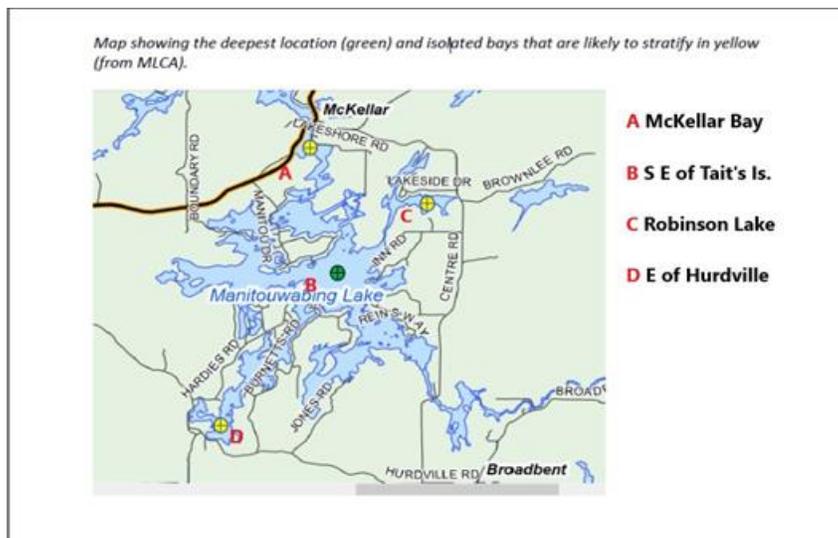
Date	Time	Location on Manitowabing Lake	Secchi depth	DO Measurement Depth	Temperature @ DO measurement depth	Dissolved Oxygen mg/L
Oct 9 2020	4:03 PM	A McKellar Bay	3 m	19 m.	12.7 ⁰ C	7.84
Oct 10 2020	12:10 PM	B SE of Tait’s Is.	2.42 m	27.7 m.	9.3 ⁰ C	6.13
Oct 10 2020	12:50 PM	C Robinson Lake	2.33 m	16.2 m.	8.3 ⁰ C	3.59
Oct 10 2020	11:00 AM	D E of Hurdville	1.43 m	6.16 m.	11.9 ⁰ C	5.26

What is the significance of the results of these dissolved oxygen (DO) measurements in the deepest parts of Manitowabing Lake? The results indicate that the DO is not in the low range that could lead to release of phosphorus from sediments into the bottom waters, as discussed by Bev Clark.

A discussion about oxygen levels in Loon Lake (U.S.) indicates that “dissolved oxygen levels below 4 mg/liter are too low to sustain warm water fish like bluegill, bass and pike and production for most fish begins to drop when oxygen levels fall below 5 mg/liter. Oxygen also is needed by virtually all algae and all macrophytes, and for many chemical reactions that are important to lake functioning.”¹

Another article states that “once dissolved oxygen levels drop below 2mg/l, the water is described as **hypoxic**. As it approaches 0mg/l, it becomes **anoxic**. A **dead zone** is an area within a lake that is either hypoxic or anoxic, and in which few organisms can survive. Oxygen-consuming organisms within dead zones either suffocate or leave the area. According to the Michigan water quality standards, a minimum oxygen concentration of 7mg/l is needed for cold-water fish and minimum of 5 mg/l is needed for warm water fish (MDEQ, 1994).”²

The two DO measurements taken at Secchi depth (McKellar Bay and Jones Bay) were 8.91 and 9.53 mg/L respectively. The DO measurements taken this fall indicate that there is sufficient oxygen to sustain aquatic life in Manitowabing Lake. Next fall, the sampling will be done earlier to ensure that the water has not turned over before sampling.



Plan for 2021:

The MLCA Water Sampling Coordinator will conduct deep water oxygen levels in the four deepest areas of the lake (as identified by Bev Clarke in 2018) annually between August 15 and September 15.

Research scientific references for deep water oxygen testing.

¹ (<https://loonlakesteubenny.com/lake-technical/general-information/dissolved-oxygen/the-importance-of-dissolved-oxygen/#:~:text=Dissolved%20oxygen%20is%20one%20of%20the%20most%20important,of%20supporting%20many%20different%20kinds%20of%20aquatic%20organisms.>)

² (<https://www.michiganseagrant.org/lessons/lessons/by-broad-concept/physical-science/dissolved-oxygen-and-lake-stratification/>).

5. Testing for pH (to be developed)

6. Cooperate with the Georgian Bay Biosphere to complete an initial three year benthic study

The Georgian Bay Biosphere (GBB) is partnering with the Township of McKellar to monitor 4 sites on Manitouwabing Lake for Benthic, a biological measure of the lakes, (i.e. what bugs, larva, etc. are present and living on the lake bottom). Combining MLCA's E.coli and chemical results with GBB's biological monitoring will provide a more complete picture of aquatic ecosystem health, the lake's exposure to stress and associated biological response. The GBB program is a three year minimum monitoring study, establishing base levels that can be compared to other similar lakes and provide a base from which to monitor change and problems. While this program has been active in the Muskoka's for some time, it has only been used in the Parry Sound area for the last two years, with more municipalities joining the program. This is a once per year testing for a three year minimum commitment of the lake by two GBB staff members.

The MLCA will sponsor a fourth site so that two sites can be monitored on the north portion of the lake, and two sites on the south portion. The expense of this fourth site will NOT be recoverable from the Township of McKellar, so will be a standalone expense for the MLCA.

The MLCA will be also supporting this program by aiding in site selection, obtaining land owner permission where necessary and providing guide support for monitoring days.

What is Benthic Monitoring? Benthos is the community of organisms that live on, in, or near the seabed, river, lake, or stream bottom, also known as the benthic zone. The study will focus on macro (visible to the eye) invertebrates. The information obtained from this study will be to evaluate the health of the lake, changes over time, and compare with other lakes in our region, from the Muskokas to Otter Lake to Whitestone Lake.

The following links, “Bugs in the Mud” and a YouTube video provide a good overview of the Benthic Monitoring Program.

[Bugs in the Mud.pdf](#)

https://www.youtube.com/watch?v=H0S3orX_cCg

2020 Activities:

MLCA Water Testing Coordinators facilitated the benthic testing by selecting 11 possible sites and forwarding photographs of the shoreline and the bottom in the shallow water for each site, as well as the GPS coordinates to the GBB. From these, the GBB personnel chose four sites and these will be sampled and documented for three years. The report has been posted on the MLCA website. After three years, a baseline will be established and will form the basis of comparison to other Ontario lakes that have had similar testing.

Plan for 2021:

The MLCA Water Sampling Coordinator will communicate with the GBB personnel in the spring to coordinate testing sites and dates and to offer any assistance needed. The report will be posted on the MLCA website and the Township website.

7. Nature Watch/ Ice Watch

This past year we uploaded information about our “Ice in/Ice Out” dates onto the NatureWatch.ca website. These readings were taken from the same location every year for the past 20 years. Below is a description of this program from the Nature Watch website.

“IceWatch is part of the NatureWatch suite of national volunteer monitoring programs designed to help identify ecological changes that may be affecting our environment. IceWatch allows Canadians of all ages to participate in discovering how – and more importantly, why – our natural environment is changing.

As citizen scientists, IceWatch volunteers, contribute to a scientific understanding of climate change. By analyzing citizen records, scientists have found that the freeze-thaw cycles of Northern water bodies are changing. However, since climate change is not consistent across the country and there are large gaps in the current monitoring network, scientists require critical data from many more regions. A citizen network of IceWatchers spread throughout Canada can help to supply that information.

Ice events – the freeze and thaw dates of lakes and rivers – are easily recorded yearly changes that, with your assistance, can help us to monitor the effects of climate change on Canadian ecosystems. All observations provide essential information that can be used in the analysis of climate records.

However, long-term ice data sets and records, from areas where we have little geographic coverage, are particularly valuable". ([home - IceWatch \(naturewatch.ca\)](http://home-IceWatch.naturewatch.ca))

We plan to continue these observations and uploading the data to the IceWatch database for use by environmental scientists.

8. Miscellaneous potential sources of lake water pollution

Monitor potential sources of lake water pollution. Plan and implement preventative and remedial action as needed in cooperation with MLCA, the Township of McKellar and the MNRF.

2020 - This past winter we found records that potentially up to 500 used automobile tires in groups of 30-40 were sunk in Manitouwabing Lake in 1987 to serve as fish habitat. This was done with the permission Ministry of Natural Resources. We are investigating whether it is advisable to remove these from the lake. The records found do not specify the location(s) of these tire reefs. If you have any knowledge of the location of one or more of these reefs please contact us at mlcawatertesting at gmail dot com or by snail mail at MLCA P.O. Box 77 McKellar ON. P0G 1C0. (please do not post the email address on social media). If you think you have found them please do not disturb or try to remove them. We have contacted and will work with the Ministries of the Environment and Natural Resources and McKellar Council through the Environmental Committee going forward on this.

2021 – This past winter an accidental spill of home furnace oil leaked into the lake in McKellar. This was successfully contained by the MNRF in cooperation with the township. Remedial measures are ongoing on land.