Water Quality Report 2018

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Introduction to Water Quality

Reference: https://www.ec.gc.ca/eau-water/default.asp?lang=En&n=2C3144F5-1

We tend to think of water in terms of a particular purpose: is the quality of the water good enough for the use we want to make of it? Water fit for one use may be unfit for another. We may, for instance, trust the quality of lake water enough to swim in it, but not enough to drink it. Along the same lines, drinking water can be used for irrigation, but water used for irrigation may not meet drinking water standards. It is the quality of the water which determines its uses.

Scientists, on the other hand, are interested in other aspects of water quality. To them quality is determined by the kinds and amounts of substances dissolved and suspended in the water and what those substances do to inhabitants of the ecosystem. It is the concentrations of these substances that determine the water quality and its suitability for particular purposes.

The water of even the healthiest rivers and lakes is not absolutely pure. All water (even if it is distilled) contains many naturally occurring substances -- mainly bicarbonates, sulphates, sodium, chlorides, calcium, magnesium, and potassium.

Many factors affect water quality. Substances present in the air affect rainfall. Dust, volcanic gases, and natural gases in the air, such as carbon dioxide, oxygen, and nitrogen, are all dissolved or entrapped in rain. When other substances such as sulphur dioxide, toxic chemicals, or lead are in the air, they are also collected in the rain as it falls to the ground.

Rain reaches the earth's surface and, as runoff, flows over and through the soil and rocks, dissolving and picking up other substances. For instance, if the soils contain high amounts of soluble substances, such as limestone, the runoff will have high concentrations of calcium carbonate. Where the water flows over rocks high in metals, such as ore bodies, it will dissolve those metals. In the Canadian Shield, there are large areas with little soil and few soluble minerals. Consequently, the rivers and lakes in these areas have very low concentrations of dissolved substances.

Another factor influencing water quality is the runoff from urban areas. It will collect debris littering the streets and take it to the receiving stream or water body. Urban runoff worsens the water quality in rivers and lakes by increasing the concentrations of such substances as nutrients (phosphorus and nitrogen), sediments, animal wastes (fecal coliform and pathogens), petroleum products, and road salts.

Industrial, farming, mining, and forestry activities also significantly affect the quality of Canadian rivers, lakes, and groundwater. For example, farming can increase the concentration of nutrients, pesticides, and suspended sediments. Industrial activities can increase concentrations of metals and toxic chemicals, add suspended sediment, increase temperature, and lower dissolved oxygen in the water. Each of these effects can have a negative impact on the aquatic ecosystem and/or make water unsuitable for established or potential uses.

<u>Water Quality Sampling in Wolfe Lake</u>

The water quality was tested by the Water Quality Director on 6 occasions in 2017. The water clarity (Secchi Disk depth) was measured and deep-water samples were taken at sites DP1 and DP3 on May 25, June 27, July 10, July 05, August 24 and September 22. The samples were analyzed for total phosphorus (TP) concentration through the Lake Partner Program (Ontario Ministry of the Environment). Deep and shallow-water samples were also taken at several sites by the Rideau Valley Conservation Authority (RVCA). These were analyzed for a number of variables including TP, calcium, total nitrogen, E. coli and dissolved oxygen concentration. The laboratory results from the Lake Partner Program are summarized in Table 1. Figure 1 shows the map of the Wolfe Lake with sampling sites and depth contours indicated.

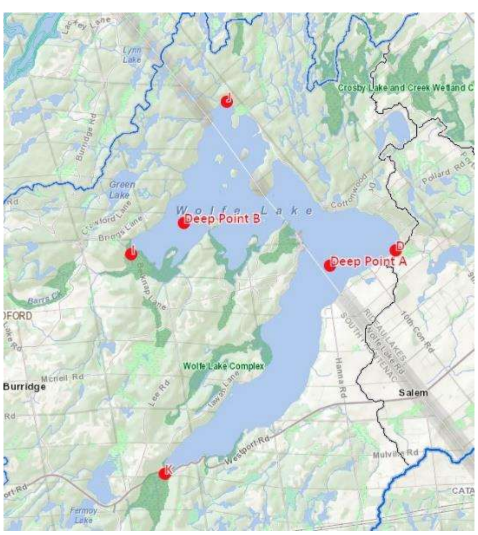

Figure 1. Map of the Water Quality sampling sites

<u>Results</u>

Total Phosphorus (TP) and Total Nitrogen (TKN) are two of the main indicators of water pollution due to runoff from lake surrounding areas. The concentration of the E. Coli bacteria is another important indicator of water contamination released by the fecal material of human or animal origin. The measured Secchi depth (SD) refers to the turbidity of the water caused by algae, pollen and sediments.Table 1 below displays the results of the water sampling and analyses.

WOLFE LAKE | WATER QUALITY | 2018						
LAKE NAME & SITE DESCRIPTION	SAMPLE DATE	CALCIUM	DISSOLVED ORGANIC CARBON	TOTAL PHOSPHORUS		SECCHI DEPTH
		mg/L	mg/L	ug/L	ug/L	m
		Ca	DOC	TP	TP	SD
WOLFE LAKE | Mid Lake, deep spot	6/3/2018			9.2	9.2	
WOLFE LAKE | Mid Lake, deep spot	6/3/2018	5.16	4.6			
WOLFE LAKE | N/W Basin Woods Bay	5/25/2018			8.4	9.8	4.5
WOLFE LAKE | N/W Basin Woods Bay	5/25/2018	30	4.5			4.5
WOLFE LAKE | N/W Basin Woods Bay	6/27/2018			9.8	11.4	5.6
WOLFE LAKE | N/W Basin Woods Bay	7/5/2018			10.4	11.2	5
WOLFE LAKE | N/W Basin Woods Bay	8/24/2018			10	11.2	5.2
WOLFE LAKE | N/W Basin Woods Bay	6/27/2018	27.2				
WOLFE LAKE | N/W Basin Woods Bay	7/5/2018	28				
WOLFE LAKE | N/W Basin Woods Bay	9/22/2018			13	13.8	4
WOLFE LAKE | S/E end, deep spot	5/25/2018			7	7.2	
WOLFE LAKE | S/E end, deep spot	5/25/2018	29.4	4.5			5
WOLFE LAKE | S/E end, deep spot	6/27/2018			9.4	8	5
WOLFE LAKE | S/E end, deep spot	7/5/2018			9.8	9.6	5.5
WOLFE LAKE | S/E end, deep spot	8/24/2018			11	11.8	5.7
WOLFE LAKE | S/E end, deep spot	6/27/2018	28.4				
WOLFE LAKE | S/E end, deep spot	7/5/2018	27.8				
WOLFE LAKE | S/E end, deep spot	9/22/2018			12.4	12.4	3.3
Average				10.4	10.5	4.8

Table 1: Results of the water sampling analyses (DESC and WQ Director.

All measured concentrations are far lower that the standards.
Detailed set of the WQ data, as provided by RVCA, can be found in Appendix.

<u>Trends</u>

Average the water clarity continues to decrease as compared with the previous two years.
Average Total Phosphorus concentration remains low, comparable with the previous years.

<u>Protect Your Waterfront Environment</u>

EURASIAN MILFOIL INFESTATION = WOLFE LAKE ENEMY # 1

It appears that the milfoil infestation remains the key environmental issue for Wolfe Lake. In 2018, we continued our efforts to identify the best monitoring and eradication methodologies.

Technical and scientific articles dealing with various lake vegetation elimination techniques were reviewed. A large number of relevant publications were collected and downloaded by Paul Thompson during the past years.

The experimental procedures were supported by underwater photography, using the Olympus TG5 camera with GPS. The camera acquisition was kindly funded by the FOCA.

Series of underwater images were taken in a heavily infested area around the laminar flow underwater aeration system at the south-western corner of Woods Bay.

Milfoil eradication methods were summarized in an article by Peter Neve in the 2019 issue of the Wolfe Lake Association Magazine.

PREVENTION IS BETTER THAN PROTECTION

Proliferation of invasive bottom vegetation (milfoils) along Wolfe Lake shores and in its bays is the major environmental and recreational issue that needs to be addressed. Protecting our waterfronts against the milfoil spread is therefore a priority.

It is recommended to be vigilant and to monitor your waterfront frequently. Keep the unaffected areas free of any invasive species. Remove any new plants immediately.

Eurasian Milfoil

UNDERWATER OBJECTS SUCH AS DEAD TREES AND BRANCHES CAN STIMULATE UNWANTED MILFOIL INFESTATIONS.

Fortunately, at many shores of our lake, currents help to prevent the milfoil contamination. Milfoils do not easily root in streaming water. Therefore, it is important that cottage owners, who are 'blessed' with having currents along their waterfronts, take care that the natural water streaming is not disturbed. Remove any objects that do not belong there (dead trees, branches) and that could affect the free flow.

PLASTIC IN WATER

In a recent statement of the annual meeting of the Canadian Council of Ministers of the Environment, zero plastic litter in our environment is a priority, confirmed by Federal Minister of Environment and Climate Change.

Needles to emphasize that plastic litter such as cups, pieces of nylon rope, chunks of Styrofoam etc. are harmful for the aquatic environment. Zero should be zero, also for Wolfe Lake.

It is recommendable to check frequently your waterfront and to remove any plastic debris from your shorelines and the water bottom.

In some fish habitat improvement projects, bundled trees are submersed in water close to the shores. For the bundling, nylon rope is used. This may soon become an illegal practice. It is well predictable that, after some time, the trees will decay, and the nylon ropes become loose litter. Highest caution is recommended before taking decisions on placing tree bundles in the lake waters. This holds not only from the boating safety point of view, but also from the lake-pollution aspect.

Of course, using nylon ropes for sport and recreational purposes (boating etc.) is a ‘different story’, not an environmental risk, as compared to illegal depositing nylon ropes at the bottom of the lake for an undetermined period of time. The association provides monofilament line recycling stations at all public boat launches.

RELEASE OF METHANE INTO THE ATMOSPHERE

Decaying biomass in water releases methane into the atmosphere. Methane is one of the most potent Green House Gases, contributing to Climate Change. Practice of sinking discarded Christmas trees, as suggested in some fish habitat improvement projects, must be reevaluated, considering the newest Climate Change policies. The sunken trees will start to decay after some time and release fugitive methane. Even if the amounts of these methane emissions may seem to be small, at times when every individual is requested to minimize his/her carbon footprint, dumping trees in lakes is worth of reconsideration.

Conclusions

Overall results were very comparable to the period on record. In general, the Water Quality in Wolfe Lake remains excellent, The E. Coli concentrations were far below the required provincial maximum values.

Water clarity, as expressed by the annual average Secchi Disk depth, seems to have decreased in the past few years. This trend continued also in 2018. A probable cause for the decrease in water clarity over the past few years may be the rapid decline in zebra mussel numbers which has occurred over that time.

Proliferation of invasive bottom vegetation (Eurasian milfoil) along Wolfe Lake shores and in its bays is the major environmental and recreational issue that needs to be addressed. Protecting our waterfronts against the milfoil spread is therefore a priority.

Finally, regarding the current general scientific knowledge on aquatic lake environment, there is an excellent publication by Marten Scheffer: https://archive.org/details/springer_10.1007-978-1-4020-3154-0. Highly recommendable reading.

Acknowledgements

The RVCA water quality data were provided by Greg Melvin. The LPP data were provided by Emily Shapiera, Ontario Ministry of the Environment and Climate Change https://www.ontario.ca/data/ontario-lake-partner.

Federation of Ontario Cottager’s Association, FOCA has kindly provided funding for the acquisition of the Olympus TG5 underwater camera with GPS.

Appendix

Wolfe Lake 2018 (RVCA).xlsx