Water Quality Report 2019

Gordon Moore, May 2020

DIRECTOR WATER QUALITY, WOLFE LAKE (WESTPORT) ASSOCIATION

Assisted by Daniel Spitzer

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.

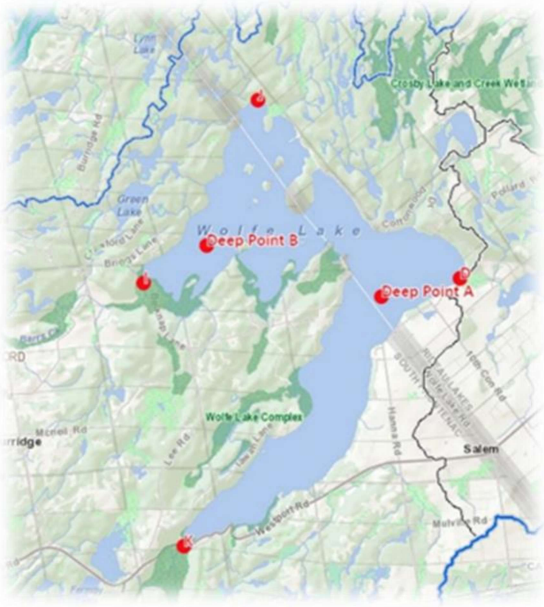
Another factor influencing water quality is the runoff from urban areas. It will collect debris littering the streets and take it to the receiving stream or water body. Urban runoff worsens the water quality in rivers and lakes by increasing the concentrations of such substances as nutrients (phosphorus 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.

Water Quality Sampling in Wolfe Lake

The water quality was tested by the Water Quality Director and by RVCA on 7 occasions in 2019. The water clarity (Secchi Disk depth) was measured and deep-water samples were taken at sites DP1 and DP3 on May 14, July 02 and 13, August 02 and 06, September 09 and October 03. The samples were analyzed for total phosphorus (TP) concentration through the Lake Partner Program (Ontario Ministry of the Environment and Climate Change). 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.

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 below displays the results of the water sampling and analyses over a period of nine years.



The laboratory results are summarized in the Appendix. In this spread sheet, yearly average values for the period 2010 – 2019 are presented as well as a detailed RVCA sampling dataset for 2019.

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

LAKE	LAKE CODE	PARAMETER	TOTAL # OF SAMPLES	MAXIMUM	MINIMUM	AVERAGE (RVCA AND LPP)	MEDIAN	# SAMPLES > STANDARD	% SAMPLES > STANDARD	STANDARD
WOLFE LAKE	RVL-27	E.COLI (cfu/100 mL)	202	280	0	9	2	3	1%	100
sample period: 2010 - present		TKN (µg/L)	333	890	160	370	360	24	7%	500
		TP (µg/L)	333	63	2	12	10	20	6%	20
		Ca (mg/L)	49	31	23	27	26	49	100%	20
		Secchi depth (m)	106	11.5	3.0	6.1	6.0	0	0%	2
2019		E.COLI (cfu/100 mL)	17	1	0	0	0	0	0%	100
		TKN (µg/L)	24	380	160	294	310	0	0%	500
		TP (µg/L)	24	17	2	10	9	0	0%	20
		Ca (mg/L)	1	25.6	25.6	26	26	1	100%	20
		Secchi depth (m)	6	6.0	3.0	4.9	4.6	0	0%	2
2018		E.COLI (cfu/100 mL)	8	39	0	12	4	0	0%	100
		TKN (µg/L)	14	890	270	462	450	5	36%	500
		TP (µg/L)	14	48	4	17	13	3	21%	20
		Ca (mg/L)	2	26.9	26.5	27	27	2	100%	20
		Secchi depth (m)	6	7.0	3.5	5.1	5.0	0	0%	2
2017		E.COLI (cfu/100 mL)	8	20	2	8.5	6	0	0%	100
		TKN (µg/L)	16	500	220	338	315	0	0%	500
		TP (µg/L)	16	34	7	13	11	1	6%	20
		Ca (mg/L)	2	26.2	26.1	26.2	26.2	2	100%	20
		Secchi depth (m)	6	6	4.5	5.3	5.4	0	0%	2
2015		E.COLI (cfu/100 mL)	8	62	2	11	2	0	0%	100
		TKN (µg/L)	16	540	280	363	350	1	6%	500
		TP (µg/L)	16	25	4	8	7	1	6%	20
		Ca (mg/L)	2	27.3	25.4	26	26.4	2	100%	20
		Secchi depth (m)	8	9.3	3.1	5	4.8	0	0%	2
2014		E.COLI (cfu/100 mL)	22	38	2	6	2	0	0%	100
		TKN (µg/L)	30	880	260	457	415	7	23%	500
		TP (µg/L)	30	17	2	12	12	0	0%	20
		Ca (mg/L)	2	29.7	28	29	29	2	100%	20
		Secchi depth (m)	8	6.8	5.0	6.0	6.1	0	0%	2
2013		E.COLI (cfu/100 mL)	8	42	2	7	2	0	0%	100
		TKN (µg/L)	16	690	260	332.5	315	1	6%	500
		TP (µg/L)	16	63	6	19	12	4	25%	20
		Ca (mg/L)	0							20
		Secchi depth (m)	10	9.5	5.25	6.8	6.5	0	0%	2
2012		E.COLI (cfu/100 mL)	7	6	2	3	2	0	0%	100
		TKN (µg/L)	15	340	220	282	290	0	0%	500
		TP (µg/L)	15	34	3	10	9	1	7%	20
		Ca (mg/L)	2	29.9	28.3	29	29.1	2	100%	20
		Secchi depth (m)	7	8.5	5	6.471429	6.5	0	0%	2
2011		E.COLI (cfu/100 mL)	7	54	2	11	2	0	0%	100
		TKN (µg/L)	15	350	190	266	280	0	0%	500
		TP (µg/L)	15	22	7	10	9	1	7%	20
		Ca (mg/L)	2	26.4	25.5	26	26	2	100%	20
		Secchi depth (m)	8	11.5	5.5	7.5	6.9	0	0%	2
2010		E.COLI (cfu/100 mL)	8	39	0	10	1	0	0%	100
		TKN (µg/L)	14	490	210	341	340	0	0%	500
		TP (µg/L)	14	27	7	12	11	1	7%	20
		Ca (mg/L)	2	27	25.9	26	26	2	100%	20
		Secchi depth (m)	6	8.5	5.0	6.8	7.0	0	0%	2

Results

All measured concentrations are far lower that the standards.

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

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 overall 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 2019. 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 remains 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 Sarah Macleod-Neilson. The LLP data were provided by Emily Shapiera, Ontario Ministry of the Environment and Climate Change www.ontario.ca/data/ontario-lake-partner. Daniel Spitzer (our previous water quality director) provided the draft report.

COVID-19

Please note that as of the date of writing this (May 11th/2020) all water sampling, whether in conjunction with Rideau Valley Conservation Authority (RVCA) or with the Ministry of the Environment , Conservation and Park's (MOE) Environmental Sciences & Standards division/Lake Partner Program (LLP), have been suspended due to COVID-19 until such time as the applicable labs can ensure the safety of their employees. We have been informed by the MOE that temporarily suspending the water quality sampling of the many lakes involved will not significantly impact the ability to track long term trends determined by data collected over many years of sampling.

Appendix

2019 - worksheet - wolfe lake water quali