Wollaston Lake Home and Cottage Association

2018 Water Quality Testing Results

For 2018, the WLHCA tested four water quality parameters: Total Phosphorus, Water Clarity, Calcium, and Dissolved Oxygen. The Lake Steward requested that the MOE conduct Dissolved Oxygen and detailed water quality testing to ensure calibration of WLHCA test data. Despite not being funded to do so the MOE completed the requested testing in July and September.

A) Phosphorus (Lake Partner Program & WLHCA)

Prior to 2015, under the Lake Partner Program (LPP), we sampled for phosphorus once a year in early May in the main part of the lake. For Canadian Shield lakes, this is the best way to consistently assess year-to-year trends, since the water is unstratified (i.e. uniformly mixed) due to the "spring turnover." For 2015 and 2016, with the agreement of the MOECC, we sampled phosphorus monthly during the summer season to assess whether the lake behaves more like a non-Canadian Shield lake i.e. exhibits more seasonal variation in phosphorus. In 2018, again with the agreement of the MOECP, we returned to a monthly sampling.

For our own additional sampling program ("WLHCA Program") we also measure phosphorus levels in the three main lake basins in midsummer (July) and in the fall (September): the Main Lake, Second Lake, and Third Lake. Since 2015, we had been using an analytical lab (Trent University at Dorset) which had allowed us to measure down to much lower levels of Phosphorus. The Dorset lab ceased operating in 2018 so we moved our additional testing to the Caduceon lab in Ottawa at the recommendation of Watersheds Canada. At the same time, we added another sampling point at the inlet of the Deer river to Wollaston lake. The Caduceon results in 2018 were for control purposes to ensure alignment of procedures and results with the LPP labs.

The Significance of Phosphorus

Phosphorus is a vital nutrient for the growth of plants and algae and is a critical measure of the nutrient status of the lake. Excessive levels have the potential to trigger unwanted growth of plants and algae blooms.

To prevent such problems, it is important to keep the phosphorus below 10 micrograms per litre (ug/L), which is the Ministry objective for our lake.

Total Phosphorus (filtered - all in micrograms per litre – ug./L)					
Date (2018)	***Lake Partner Program (MOECC)***	***WLHCA Program (Caduceon)***			
	Main Lake: Deep spot	Main Lake: Deep spot	Second Lake	Third Lake	Inlet
May 30	11.0*				
July 3	5.4				
July 26 (MOE)	8.8				
Aug 11	6.8	7	7	N/A	8
Sept 23	8.6	8	7	5	6
Sept 27 (MOE)	*6.5*				
Average	***7.2***	***7.5***	***7.0***	***N/A***	***7.0***
Historical average: 1997 to 2016**	6.7		N/A	*N/A*	

** May 30 result is an outlier suspected to be inaccurate and is not included in the average.*

*** Historical averages for WLHCA program could not be calculated since most results prior to 2015 were less than the detection limit of the lab. Wollaston program for 2018 is for control purpose of establishing a new lab (Caduceon) as Trent U Dorset lab ceased operations.*

Interpretation of results

This year's Lake Partner and MOE phosphorus result was satisfactory, 7.2 ug./L. (micrograms per litre), although above the historical average of 6.7 ug/L but better than the 2017 average of 7.6 ug/L. The 2018 results are not typical of a Canadian Shield lake which typically start and end the season somewhat higher (usually around 6 ug/L and this year 8.8 ug/l in July), but settling down from June to September to relatively consistent lower levels (around 7 ug/L). The phosphorus levels in Wollaston lake have consistently ranged from 6.0 to 8.5 in the 15 years since 2003, when the program

started to use filtered samples.

Main Lake was higher in July, at 8.8 ug./L. but recovered to a satisfactory level of 6.5 in September. Historically, the Third Lake has tended to show higher phosphorus levels which may be due to the shallower depth.

Conclusion:

Phosphorus levels at the spring turnover and through the summer season continue to be satisfactory according to MOECC guidelines but are trending above the historical average until 2016.

B) Water Clarity (Lake Partner Program)

For the Lake Partner Program, we measure water clarity about every 2-3 weeks from May to October, using a Secchi disk. Clarity, measured in meters, can reflect changing phosphorus levels: increased phosphorus stimulates more algae growth which in turn decreases clarity. Typically, oligotrophic – or unproductive - lakes (like Wollaston) have phosphorus at less than 10 ug/L and Secchi readings of greater than 5 meters. The MOE attended on site on July 26, 2018 and September 27, 2018 with Secchi readings of 3.5 m and 5.2 m, in line with the WLHCA readings. In 2018 there were a higher than usual number of reports of filamentous algae.

Results

	Date (2018)	**Clarity - Secchi Disc depth (metres – higher is better)**
First reading	May 30	4.2
Last reading	Oct 7	3.3
Low (least clear)	Aug.11	3.25
High (most clear)	Sept 27	5.2
Average (of 11 samples)	May 30 – Oct 7	4.1
Prior year's annual average (2001 – 2017)		5.6

Interpretation of Results

As anticipated, water clarity reflected phosphorus levels, starting off with relatively low clarity in May, and improving in early July only to fall in August as the summer progressed. The annual average was slightly *less than* satisfactory (i.e. less than 5 meters) and below the historical average.

Conclusion:

Clarity was less than satisfactory overall for the second year in a row. It was average at the beginning of the season, reflecting higher phosphorus levels and then dropped in August – possibly due to the higher than average rainfall per single occurrence which probably caused additional runoff into the lake.

Note: Historical results available on MOECC's web site at
http://www.desc.ca/programs/LPP

C) Calcium (Lake Partner Program)

Calcium is measured in early May as part of the Lake Partner Program. We are looking for high levels of calcium to maintain a healthy population of zooplankton organisms (such as Daphnia - water fleas), as well as other animals with shells or exoskeletons (such as snails and crayfish). These are all important food sources for fish and larger aquatic animals. According to MOECC, the critical lowest survival threshold is 1.5 mg/L and "*Many lakes on the Precambrian Shield in Ontario are nearing or have recently crossed (below) this important threshold…. 35% of 770 Ontario lakes are below it.*" (MOECC)

Our historical readings for Wollaston show that we have been fortunate to have abundant calcium levels – averaging 27.2 mg/L from 2008 to 2016. The lake is therefore unlikely to suffer from depletion of daphnia or other crustaceans due to lack of Calcium.

Results

Calcium (mg/L)	
Location	**Lake Partner Program (MOECC)**
Main Lake – deep spot	27.5
Historical average (2008-17)	26.7

Interpretation of results

At 27.5 mg/L, the 2018 calcium result for Wollaston Lake was consistent with the 9-year prior average of 26.7 mg/L (8 samples); none was below 25 mg/L. These levels are well above the critical threshold and therefore very satisfactory.

Conclusion

Calcium levels in Wollaston Lake continue to be satisfactory according to MOECC guidelines.

D) Dissolved Oxygen (WLHCA Program)

Adequate dissolved oxygen is important for the survival of lake trout population present in the deeper, colder layer of the main lake. The MOECC guideline for lake trout lakes is an average of 7mg/l in the cold layer known as the hypolimnion. The average is calculated from a complete depth profile dataset as the "mean volume-weighted hypolimnetic dissolved oxygen" (MVWHDO).

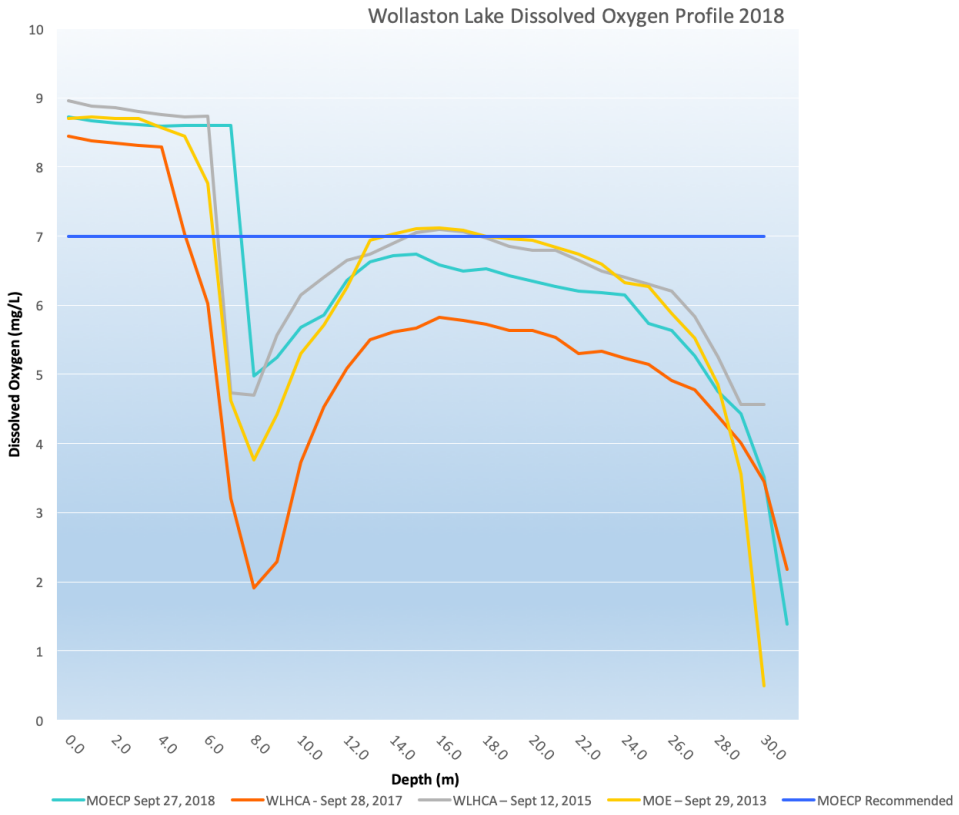
Using an electronic probe rented from Hoskins Scientific and calibrated by the MOECP, the MOECP measured dissolved oxygen and temperature every meter from the surface down to the lake bottom, at the deepest part of the Main Lake (about 30 meters). The measurements were taken in September 2018, when dissolved oxygen tends to reach its lowest levels in a stratified lake. The fall profile is shown in the graph below.

Organic matter decay leads to:

"excessive plant and algae growth, resulting in a loss of water clarity, depletion of dissolved oxygen and a loss of habitat for species of cold water fish such as lake trout."

Source: MOECC Lakeshore Capacity Assessment Handbook

Given the potentially concerning readings of 2017 the WLHCA requested (April 22, 2018) the MOECP to conduct the dissolved oxygen testing in Wollaston lake for 2018. They agreed, and conducted the testing in September 2018.


Wollaston Lake Dissolved Oxygen Profile 2018
Dissolved Oxygen (mg/L)
10
9
8
7
6
5
4
3
2
1
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
Depth (m)
MOECP Sept 27, 2018
WLHCA - Sept 28, 2017
WLHCA – Sept 12, 2015
MOE – Sept 29, 2013
MOECP Recommended

For September 2018 the average level (MVWHDO) based on the MOECP test was calculated as 6.2 mg/L, which is below the Ministry standard of 7mg/L, below the previous 2015 WLHCA average of 6.7 mg/L and the 2013 average of 6.6 mg/L when the MOECC previously tested. While all three of these averages are below the Ministry standard, the average in 2018 is at a level where lake trout populations become stressed.

While this is the second test in two consecutive years indicating a decline, it is important to note that this is not enough to be able to determine if this is the start of a sustained downward trend.

While it is not possible, at this time, to conclude the cause of the lower readings in 2017 and 2018 there are a number of possible explanations. These include a net increase in the total algae and plant matter in the lake (possibly due to the increase in Eurasian milfoil), climate change effects (2016 and 2018 were warmer than normal summers with 2017 being a wetter than normal summer), calibration of the testing meter, or other reasons.

Conclusion

Readings for dissolved oxygen are lower than the MOECC guidelines for deep cold lake trout lakes. The Ministry conducted the testing in Wollaston Lake in 2018, and 2013. For 2019 the WLHCA will rent from Hoskins Scientific and conduct the dissolved oxygen tests with the same model of meter and probe utilized by the MOECP.