



Wollaston Lake Home & Cottage Association

Wollaston Lake: Environmental Health Score Card - 2015



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Wollaston Lake: Background

Wollaston Lake is a 360 hectare lake, located in Wollaston Township near the hamlet of Coe Hill. It is populated by a mix of seasonal cottages, campgrounds and lakefront homes and offers excellent opportunities for boating, sailing, fishing, swimming and watersport activities. The lake generally has clean water. There are over 300 lake-front properties or lots on record.

Wollaston Lake Home and Cottage Association (WLHCA) is a not-for-profit organization representing primarily the interests of lake-front property owners. The WLHCA undertakes environmental programs and social activities for the benefit of its members. Typically, between 50% and 60% of homeowners become paid-up members in any given year.

As part of its environmental mandate, this is the second environmental scorecard published by the Association. It is intended to be a comprehensive summary of environmental conditions in the lake in 2015, based on all available data.

The Scorecard compiles environmental data from various sources, including

- WLHCA's own testing programs
- Government programs (MOE and MNR)
- Crowe Valley Conservation Authority
- Observations made under WLHCA's new OWL program
- OFAH/MNR sponsored invasive species monitoring program

Wollaston Lake – Background Information



Geography

Area: 361 Hectares

Max depth: 32 m

Mean depth 9.4m

Total volume: 34,637,800 m³

Shoreline length: 13 km

Percent Crown shoreline:
12%

CATCHMENT

Area: 11,000 Hectares (Ha -
not including the lake
itself)

Wetland: 928 Ha (8%)

Wooded: 8970 Ha (81.5%)

Cleared: (18%)

FISH

Wollaston Lake has lake trout, largemouth and smallmouth bass and northern pike. From a fishing regulation perspective, the lake is in MNR's Fisheries Management Zone #15.



Summary of WLHCA Environmental Initiatives in 2015

Priority A: Water Quality Testing and Observation

WLHCA's monitoring program:

- Phosphorous
- E Coli
- Dissolved Oxygen

Participate in MOE's Lake Partner Program:

- Phosphorous
- Calcium
- Clarity

Observers of Wollaston Lake (OWL)

Priority B: Invasive Species

- Participate in the OFAH / MNR sampling program

Priority C: Advocacy

- Work with Township on septic tank re-inspection and education programs
- Keep abreast of trends/issues/opportunities for environmental awareness and information sharing

Priority D: Communication & Education

- Newsletter articles
- Website
- Environmental Health Scorecard
- Communication with government agencies and other organisations (MOE, MNR, CVCA, CHA, NORKLA, FOCA)
- Wollaston Young Stewards Environmental Camp

This scorecard focuses on Priorities A and B.



Part 3: Summary of Chemical and Biological Monitoring Programs in Wollaston Lake

Program	Parameters monitored ¹	Who is responsible?	Timing, frequency	Program Objective
Chemical Monitoring				
<i>WLHCA water quality monitoring program</i>	Phosphorus	WLHCA Lake Steward	3 samples, 2x year, July, Sept	Assess trends in the lake's nutrient status
	Dissolved Oxygen	WLHCA	Ad hoc: Done in May and Sept for 2015	Assess whether sufficient oxygen to support trout population
<i>MOE Lake Partner Program</i>	Phosphorus, Calcium,	WLHCA Lake Steward (for MOE)	Monthly, May to October	Assess trends in nutrient status and calcium in shield lakes
	Water Clarity (Secchi disk)		2 x per month, May to Oct	Assess impact of nutrient levels on lake's clarity
<i>MOE comprehensive lake monitoring</i>	Dissolved Oxygen, Phosphorus, pH, nitrogen, ammonia and other water chemistry parameters	MOE staff	Planned every 5 years; last done in 2013	Periodically assess trends in water quality in Ontario lakes
Biological Monitoring				
<i>WLHCA water quality monitoring program</i>	E Coli	WLHCA Lake Steward	2x year, July, August	Assess whether lake is safe for swimming
<i>Public Beach sampling program</i>	E Coli	Hastings & Prince Edward Health Unit	5 days in each month for June, July, August.	Required to assess whether public beaches are safe for swimming
<i>OFAH Invasive</i>	Invasive species	WLHCA (for OFAH/MNR)	Annually in July / August	Determine whether spiny water flea or zebra mussels have invaded



Program	Parameters monitored ¹	Who is responsible?	Timing, frequency	Program Objective
<i>species</i>		program)	since 2009	the lake

Part 4: Water Quality Testing Results

For 2015, we tested for the following water quality parameters: Total Phosphorus; Water Clarity; Calcium; and Dissolved Oxygen

Phosphorus (Lake Partner Program & WLHCA)

Phosphorus 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. Historically, under the Lake Partner program, we have 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, the MOECC agreed to allow us to sample phosphorus monthly during the summer season. This is recommended for non-Canadian Shield lakes which can show significant seasonal variation in phosphorus. We wanted to assess whether the phosphorus might increase or vary over the summer season. For our own sampling program, we also sample in the Second and Third Lakes, in July and September.

For comparison, the MOE’s objective for phosphorus for our lake is 10 ug/L

Results

Total Phosphorus (filtered - all in micrograms per litre – ug/L)				
Date (2015)	Lake Partner Program (MOE)	WLHCA Program		
	Main Lake: Deep spot	Main Lake: Deep spot	Second Lake	Third Lake
May 8	7.5			
June 6	6.5			



Total Phosphorus (filtered - all in micrograms per litre – ug/L)				
<i>Date (2015)</i>	<i>Lake Partner Program (MOE)</i>	<i>WLHCA Program</i>		
	Main Lake: Deep spot	Main Lake: Deep spot	Second Lake	Third Lake
<i>July 16</i>	6.2	7.1	6.5	10.3
<i>Aug 5</i>	5.1			
<i>Sept 12</i>	4.9	4.8	4.6	6.2
<i>Oct 2</i>	6.5			
<i>Average</i>	6.1	6.0	5.6	8.3
Historical average: 1997 to 2014*	6.9			

Note: Historical averages for WLHCA program not calculated since most results were less than the detection limit

Interpretation of results

This year’s Lake Partner phosphorus result was very satisfactory, averaging 6.1 ug/L (micrograms per litre), a little below the historical average of 6.9. Although phosphorus levels appeared to decrease somewhat over the summer, the magnitude of the seasonal variation was not large. The phosphorus levels in our lake are very consistent from year to year, with a range from 6.0 to 8.5 in the 13 years since 2003, when the program started to use filtered samples.

Our own sampling program (“WLHCA Program”) measures phosphorus levels in the three main lake basins in midsummer (July) and in midsummer (July) and in the fall (September). We are now using a new analytical lab which gives allows us to measure down to much lower levels. The phosphorus levels in the Main and Second Lake were satisfactory and were consistent with those measured for the Lake Partner Program (sampling was done at the same time). The concentration in the Third Lake was



significantly higher in July (just above the benchmark standard), but recovered to satisfactory levels 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 continues and through the summer season continue to be very satisfactory.

Water Clarity (Lake Partner Program)

In the Lake Partner Program, water clarity is measured about every 2 weeks from May to October, using a Secchi disk. Clarity, measured in metres, often reflects 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 metres.

Results

	Date (2015)	Clarity - Secchi Disc depth (metres)
<i>First reading</i>	May 8	3.4
<i>Last reading</i>	Sep 23	6.7
<i>Low (least clear)</i>	May 20	3.4
<i>High (most clear)</i>	Aug 6	6.7
<i>Average (of 9 samples)</i>	May 8 – Sept 23	5.3
<i>Prior years annual average (2001 – 2013)</i>		5.1

Interpretation of Results

As expected, water clarity reflected phosphorus levels to some extent, starting off with relatively poor clarity in May, and improving as the summer progressed. The annual average was satisfactory (i.e. 5 metres) and in line with the historical average.



Conclusion:

Clarity was satisfactory overall, but was a little poor at the beginning of the season, reflecting higher phosphorus levels.

Note: Historical results available on MOE’s web site at <http://www.desc.ca/programs/LPP>

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 MOE, the critical lowest survival threshold is 1.5 mg/L. *“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.”* (MOE)

In the past, we have been fortunate to have abundant calcium levels – averaging 27.1 mg/L from 2008 to 2014. The Lake is therefore highly unlikely to suffer from depletion of daphnia or other crustaceans. This is probably partly due to the fact that Wollaston Lake is considered by MOE to be ‘not sensitive’ to acid rain and is ranked as a ‘5’ – the least sensitive rating. Lakes sensitive to acid rain are more likely to have calcium depletion due to the excess historical leaching of calcium from nearby soils.

Results

Calcium (mg/L)	
Location	Lake Partner Program (MOE)
Main Lake – deep spot	28.5
Historical average (2008-14)	27.1

Interpretation of results

At 28.5 mg/L, the 2015 calcium result for Wollaston Lake was consistent with the 7-year prior average of 27.2 mg/L (6 samples); none was below 25 mg/L. These levels are well above the critical threshold and therefore very satisfactory.

Conclusion: Our calcium levels continue to be extremely satisfactory.



Dissolved Oxygen

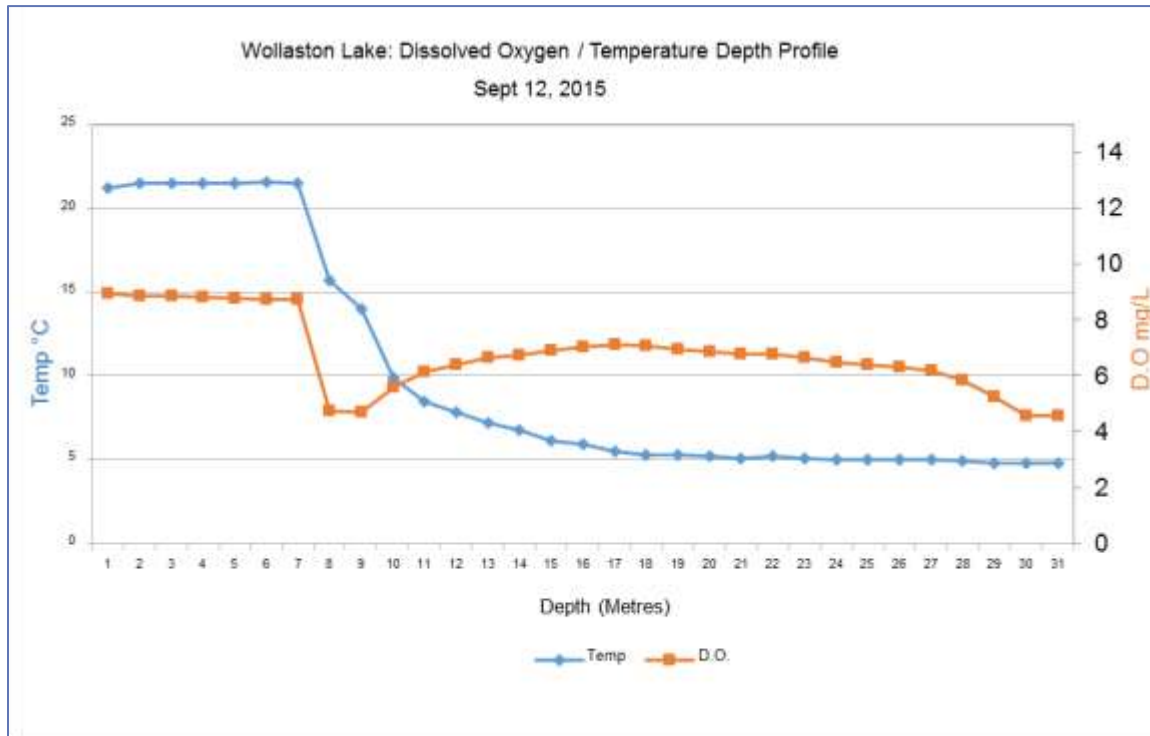
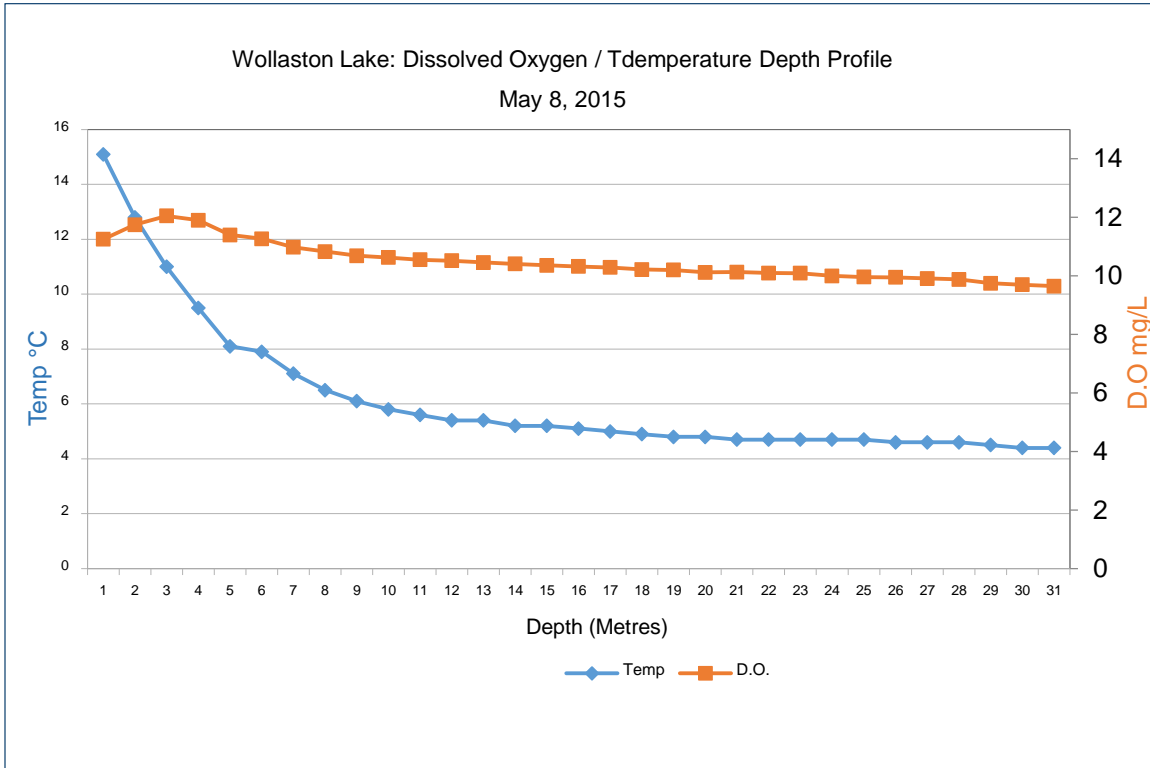
Adequate dissolved oxygen is important for the survival of lake trout population present in the deeper, colder layer of the main lake. The MOECC guideline for lake trout lakes is an average of 7mg/l in the cold layer – known as the hypolimnion. The average is calculated from a complete depth profile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

Using an electronic probe borrowed from the MOECC, we measured dissolved oxygen and temperature every metre from the surface down to the lake bottom, at the deepest part of the Main Lake (about 30 metres). The measurements were taken in May and again in September, when the dissolved oxygen tends to reach its lowest levels in a stratified lake. The spring and fall profiles are shown in the charts below.

The May profile demonstrates complete mixing due to the spring turnover; as a result the oxygen levels are uniform throughout the depth profile. The September profile exhibits a “negative heterograde oxygen curve,” that is typically seen in Wollaston Lake – i.e. a low point in the oxygen level at the thermocline (about 8 metres deep) of less than 5 micrograms per litre (mg/L), below which the oxygen recovers to more satisfactory levels of 6-7mg/L.

For September, the average level (MVWHDO) was calculated as 6.7mg/L, just below the Ministry standard of 7mg/L. While this level is marginal, it is not considered critical enough to threaten the survival of our lake trout population. However the marginal level makes it unlikely that the “At Capacity” designation for Wollaston Lake would be removed in the foreseeable future.

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Conclusion: Dissolved oxygen levels in the fall were just below the recommended level for lake trout, but were not sufficiently low to threaten the survival of the trout population.



Part 5: Invasive Species

Zebra Mussels

For the first time, adult zebra mussels have been found in Wollaston Lake. These sightings were confined to the area in or near the “Second Lake.” In late August there were two separate reports of a few small mussels on off-shore rocks. In October a resident found some 200-400 small mussels on the bottom of their boat.

Zebra mussels are invasive molluscs that settle on hard surfaces like rocks and boat hulls. They are present in the Great Lakes, the St. Lawrence, the Severn Trent and Rideau waterways, and other inland lakes in southern Ontario. They spread as hitchhikers on recreational boats and in bait containers, and can rapidly proliferate once established. Zebra mussels are highly adaptable, prolific breeders, whose colonies may result in significant changes to the lake’s ecosystem, such as:

- Filtering out large amounts of phytoplankton from the water, resulting in increased clarity, but decreasing food sources of other species.
- Dramatic declines in native clams and mussels
- Fouling the bottom of boats, docks and blocking water intakes
- Cutting of swimmers’ feet.

Follow-up activities: These sightings were reported to the Invading Species Hotline, whose staff confirmed the sightings from a photo. Since 2011, WLHCA has participated in the Invading Species Watch (ISW) program, a partnership between the Ontario Federation of Anglers and Hunters and the Ontario MNRF. We sample for zebra mussel veligers (larval stage) at three locations in the main lake each August since 2011. Despite the presence of adult mussels in the second lake, veligers were not detected in the main lake in 2015 (or in prior years). We will continue to monitor this issue carefully in 2016 and beyond. Our invasive watch sampling program may be revised to take into account the new invasion.

What you can do: The Ontario’s Invasive Species Awareness program provides the following advice to anglers and other boaters to help prevent the spread of zebra mussels by taking precautions when moving from one lake to another:

- Inspect your boat, trailer and equipment and remove all plants, animals and mud, and dispose of them on dry land or in the garbage.
- Drain water from motor, live well, bilge and transom wells while on land.
- Empty your bait bucket on dry land, or freeze or salt the bait for later use. It is illegal to release live baitfish from one water body into another.
- Remove organisms you can’t see on your boat, trailer or equipment by rinsing them with hot water (>40°C); spraying with high pressure water (250 p.s.i.); or drying them in the sun for at least five days.



- Submerge hard-to-clean fishing equipment and nets in hot water (40°C) for ten minutes
(condensed from ISAP fact sheet)

Spiny Water Flea

The ISW sampling program covers a second invasive species, the spiny water flea.

From 2011 to 2013, spiny water flea was not detected in Wollaston Lake. However in 2014, one of three sample locations tested positive for spiny water flea. Repeat testing in 2015 failed to show any evidence of spiny water flea.

The summary of the ISW program results for Wollaston Lake for 2015 are as follows:

Species	Date Sampled (2015)	Result (Positive or Negative)
Zebra mussel veligers	Late August	Negative
Spiny water flea	Late August	Negative

Other Invaders

Two Double Crested **Cormorants** were reported by several boaters around the downstream end of the main lake in late August and September. These birds have not been seen in our lake before. They are not a concern unless they establish large nesting colonies in isolated islands, in which case their droppings can kill all nearby trees and vegetation. However they do eat fish and therefore compete with other fish predators.

Follow-up activities: The sighting was reported to the MNRF, which is involved in the management of cormorants. We will continue to monitor this issue.



Part 6: Biological Testing Results

E Coli

The WLHCA tests the lake for the presence of E Coli bacteria (which indicate presence of fecal waste from warm blooded animals). This analysis is designed to show whether a water body should be flagged as unsafe for recreational use (e.g. swimming). This year we changed our sampling regime and tested at four common swimming areas in the main lake, in July and August,. Results are tabulated below.

E Coli levels: cfu per 100 ml (cfu = colony forming units)		
	Date (2015)	
Location	July 17	August 5
Anson Bay	0	0
Off Red Eagle	1	3
Off Bear Ridge	1	1
Near Jumping Rock	1	0

In both July and August, in all locations, the levels of these bacteria were well below the government guideline for recreational use, which is 100 colony-forming units (cfu) per 100 ml. The highest level recorded was 3 cfu.

Note: While we do compare our lake samples against the government guideline for E Coli, this guideline was intended primarily for the use of Medical Officers of Health to assess the suitability of beaches for swimming and bathing (see below). The guideline requires a calculation of the geometric mean of at least 5 samples to be taken within a one month period. This number is then assessed against the maximum guideline level of 100 cfu. We only take one sample at each location.

Meeting the recreational (swimming) guideline does not mean that the water is safe for drinking without further treatment.

Wollaston Lake Beach:

The Hastings/Prince Edward County Public Health Unit takes monthly E Coli samples at public beaches and other swimming areas during the swimming season. An average of 5 samples is taken over a one week period in each month (June, July and August), to determine whether the government’s recreational standard is being met. (If not, the beach is “posted” as unsafe for swimming). For 2015, the



June result for Wollaston Lake Beach was somewhat higher than normal, averaging 48 cfu; however this is still well below the Ministry guideline for recreational use of 100cfu (Colony Forming Units). For July and August the levels were lower, at 11 and 10 cfu respectively. No beach postings were required as a result of these readings. For comparison, the average for 2014 was 10cfu for all three months. In fact, the Health Unit has posted no beach closures since 2008.

The health unit's sample data can be found at: <http://forms.hpechu.on.ca/web/index.php/beach-reports/local-beach-reports>

Conclusion: Bacteriological testing did not flag a need to be concerned with respect to recreational use (swimming) in the areas tested.



Part 7: Observations (OWL program)

The section summarizes lake conditions and wild life during the summer season of 2015 of, as observed by 7 "OWL" volunteers (Observers of Wollaston Lake).

General Water and Weather Conditions

- Clarity reported as similar to last year- reasonably clear. No reports of significant algae growth (similar to last year). Generally, lake levels remained reasonably high over the summer, due to a few heavy rainfall events.

Native Weeds

- Increase in emergent weeds in Main / Second Lake
- Weed growth in Third Lake similar to 2014, and less than in previous years.

Fish

- Early May sighting on south side of main lake (Gilbert Bay area): school of about 10 small **Perch**, around 6" length. Similar sightings seen each spring for 14 years, although numbers and fish size seem to be decreasing each year.
- **Lake trout**: a 9-10 lb lake trout was confirmed to be caught in early summer.
- **Largemouth bass**: evidence of breeding (guarded nests) in shallow water at downstream end of Third Lake
- Small **Walleye** (Pickerel) - 2 pound range - caught in various locations throughout the summer.
- 4.5 lb **Pike**, reported to have been caught by trolling on Main lake
- **Cisco** (Lake Herring) caught near narrows between Main and Second lakes
- *Note: MNRF's "Fish On-Line" web site* reports the following fish can be found in Wollaston Lake: White Sucker, Rock Bass, Lake Trout, Pumpkinseed, Brown Bullhead, Small-and Largemouth Bass, Yellow Perch.*
*http://www.web2.mnr.gov.on.ca/fish_online/fishing/fishingExplorer_en.html

Other native animals and birds

- Beaver, mink, muskrat, ermine.
- Large snapping turtle, frogs, toads, salamanders. Frog sounds (spring peepers) more prevalent this year than recently.
- Osprey, Grey Heron, Seagulls, Goldeneye, Common Merganser with 3 chicks (2/3 narrows), Mallards / ducklings, Belted Kingfisher.



- Loons – at least one breeding pair. One or more chicks thought to be lost to predation. One OWL expressed concern about boater harassment of loon pair with single chick, possibly resulting in death of chick.
- Fewer snails / clams than 2014 (third lake).

Aquatic invading animals

- For the first time, adult **Zebra Mussels** were observed by several residents in the Second Lake, between Late August and October.
- Two **Double Crested Cormorants** observed at downstream end of main lake in late August through September.
- See the Invasive Species section of the Scorecard for further details about these issues.

Additional comments

- Concern with amount of rubbish found in the Main/ Second Lake narrows: beer bottles, broken glass, rolling pin, plastic, duct tape, dog toys, tracker tire, drinking cups etc.



Part 8: Summary and Conclusions

Wollaston Lake generally exhibits good water quality that is enjoyed by the many seasonal and permanent residents around the lake.

The most significant issue for 2015 was evidenced that Wollaston Lake has been invaded by adult zebra mussels.

Wollaston Lake can be considered to be “oligotrophic,” or have low productivity, with phosphorus levels generally below 10 ug/L and clarity readings near or above 5 metres. However higher phosphorus levels have been recorded occasionally, especially in the shallower bays (including the Third Lake), where phosphorus is typically more variable.

Based on MOE’s testing in 2013, when referenced against the spring turnover levels in May, it appears that phosphorus levels in the main lake may increase over the summer season, presumably due to increased seasonal occupancy. However, monthly sampling for the Lake Partner Program did not confirm this trend in 2015.

For 2015, the heavier than normal rain in spring seems to have resulted in increased phosphorus levels and lower clarity readings in the spring, but these recovered to more typical levels later in the summer. The heavier rainfall may also have contributed to the somewhat higher E Coli readings at the public beach in June.

The most important sources of phosphorus in our lake are likely septic tank effluent and garden fertilizers. Now that we know that the lake is vulnerable to increases in phosphorus, especially during wet weather, it is important that all lakeside residents understand these issues, are vigilant in designing, maintaining and operating their septic tanks systems and refrain from the use of chemical fertilizers.

Unlike some lakes on the Canadian Shield, Wollaston has abundant calcium levels, sufficient to support growth of food source animals with shells and exoskeletons.

Marginal dissolved oxygen readings historically resulted in the designation of the lake as “At Capacity” for planning and development purposes, meaning that no new development should be allowed within 300 metres of the lake. It is recommended that the “At Capacity” status should remain in place based on our marginal September 2015 measurements. Despite this, based on a 2008 fishery study, Wollaston Lake supports a healthy lake trout population. This good news is perhaps a little surprising given the extensive development around the lake.

Observers of Wollaston Lake (the OWL program) was initiated in 2014. For 2015 we increased the number of OWLs from 3 to 7. Based on their observations over the last two years, Wollaston Lake appears to support a relatively vibrant ecosystem, with generally low phosphorus and E coli, and high calcium levels. As a result, no excess growth of algae or weeds were noted.

