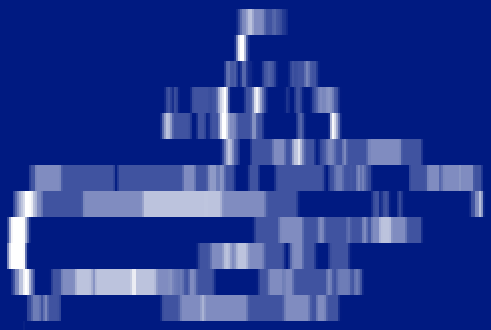
Watershed Watch Report
2015

BLUE LAKE



Watershed Watch

Mississippi Valley Conservation Authority

WHY WATERSHED WATCH?

A lake monitoring program of the Mississippi Valley Conservation Authority

Mississippi Valley Conservation Authority (MVCA) has long recognized the recreational and aesthetic value of lakes within the watershed and is committed to preserving and protecting water quality and fish habitat. Watershed Watch is an environmental monitoring and awareness program. The objectives of the program are to collect reliable environmental data to document current water quality conditions. This data is used as an essential educational tool to encourage residents to adopt sound stewardship practices aimed at maintaining water quality.

The primary impact of residential development along lake front properties on water quality is increased nutrient inputs to the lake. Increased nutrients such as phosphorous and nitrogen in the water enhance algal and other plant growth in the lake. As excess algal and plant growth decomposes it can consume large amounts of oxygen in the bottom of the lake. This depletion of oxygen at the lake bottom can cause problems as many aquatic organisms including fish require oxygen to survive. The loss of oxygen at the bottom of the lake limits or can completely remove the usable habitat for sensitive species such as Lake Trout.

We will assist shoreline residents, both seasonal and permanent, to become personal stewards of their lake by encouraging them to take an active role in restoring and enhancing their shorelines. In this way, we will work together to maintain healthy lake environments throughout the watershed.

ABOUT BLUE LAKE

Blue lake located in the township of North Frontenac has a lake perimeter of 2.8km and a lake area of 0.902km^2. At its deepest point Blue lake is 30m deep. As of 2012 there were 5 properties within 35m of the lake. Blue lake supports a cold water fishery and has been stocked with Splake by MNRF.

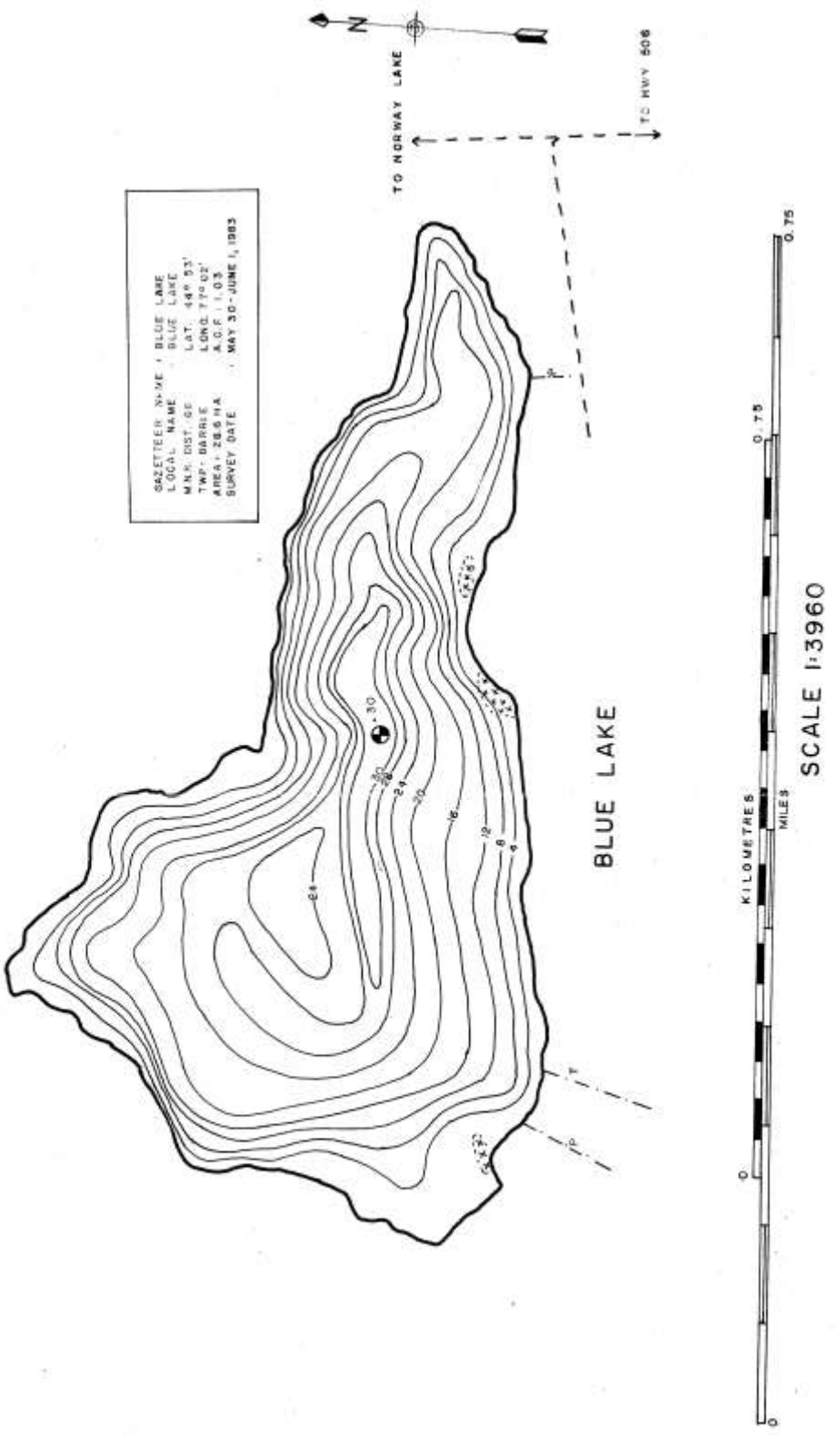
WHAT DO WE MEASURE?

The Watershed Watch program uses four sampling procedures to measure nutrient levels and their effects on lakes. This allows for the classification of lakes based on their level of nutrient enrichment or trophic state.

On one end of the scale, oligotrophic lakes have the lowest concentration of nutrients and are often characterized by low plant and algal growth. On the other end of the scale, eutrophic lakes have the highest concentrations of nutrients and typically have dense populations of aquatic plants and algae. Mesotrophic lakes fall in between these two extremes with a moderate level of nutrient enrichment.

The trophic state of a lake can be impacted by a variety of factors including lake shape and depth, the amount of shoreline development and the surficial geology of the surrounding area. Understanding the current conditions of our lakes can help us to identify trends and changes in the future.

Blue Lake

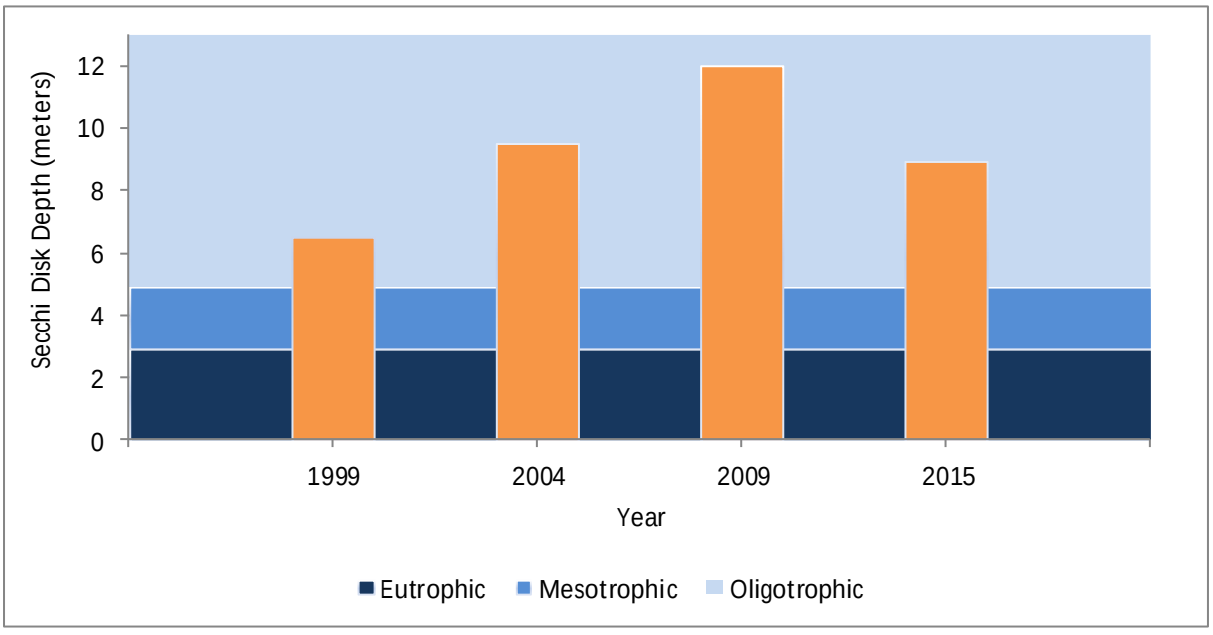

N
TO NORWAY LAKE
TO HWY 506
GAZETTEER NAME : BLUE LAKE
LOCAL NAME : BLUE LAKE
M.N.R. DIST. CE LAT. 44° 53'
TWP. BARRIE LONG. 79° 02'
AREA : 28.6 HA A.O.F. 1:03
SURVEY DATE : MAY 30 - JUNE 1, 1983
BLUE LAKE
KILOMETRES
MILES
0
0.75
SCALE 1:3960

WATER CLARITY

A Secchi Disc is a black and white coloured disc used to determine water clarity. The disc is lowered into the water on the shady side of the boat. As the disk is lowered the point when it is no longer visible is noted as well as the point at which it reappears when you bring it up. The average of these two depths is the Secchi depth. The greater the Secchi Disc measurement, the clearer your lake. Secchi depth is influenced by the concentration of phytoplankton (microscopic algae) in the water column; greater concentrations of phytoplankton in the water results in a smaller Secchi depth.

Interpreting SECCHI DISC Results	
Secchi Depth	**Lake Nutrient Status**
Over 5 metres	Oligotrophic – unenriched, few nutrients
3.0 to 4.9 metres	Mesotrophic – moderately enriched, some nutrients
Less than 2.9 metres	Eutrophic – enriched, higher levels of nutrients

Blue Lake Main Basin
Annual Mean Secchi Depth

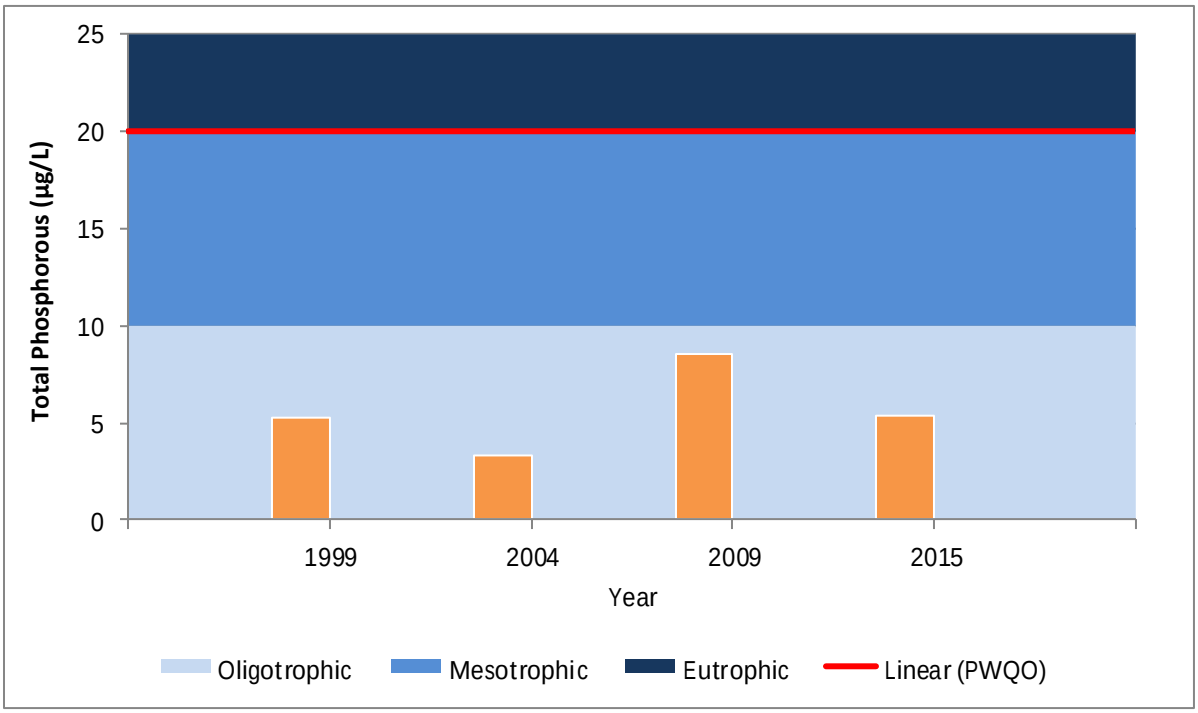


TOTAL PHOSPOROUS CONCENTRATION

Phosphorus is the nutrient that controls the growth of algae in most Ontario lakes. For this reason increases in phosphorus levels in the lake can result in an increase in the quantity of aquatic plants and algae. High levels of phosphorus can lead to algal blooms which, along with being unsightly, can in some cases affect the habitat of cold water fish such as lake trout. A general guideline exists to characterize a lake's trophic status based on the total phosphorus that is measured. The PWQO (Provincial water quality objective) is 20µg/L of total phosphorous for lakes. This goal is to help ensure aquatic health and maintain the recreational value of our lakes.

A Kremmerer Bottle (pictured to the right) is used to sample water at specific depths. The bottle is lowered to the required depth with both ends open. A weight on the rope is dropped. When the weight hits the bottle it causes both ends to close, sealing the sample water in the bottle.

Blue Lake Main Basin
Total Phosphorous Concentrations



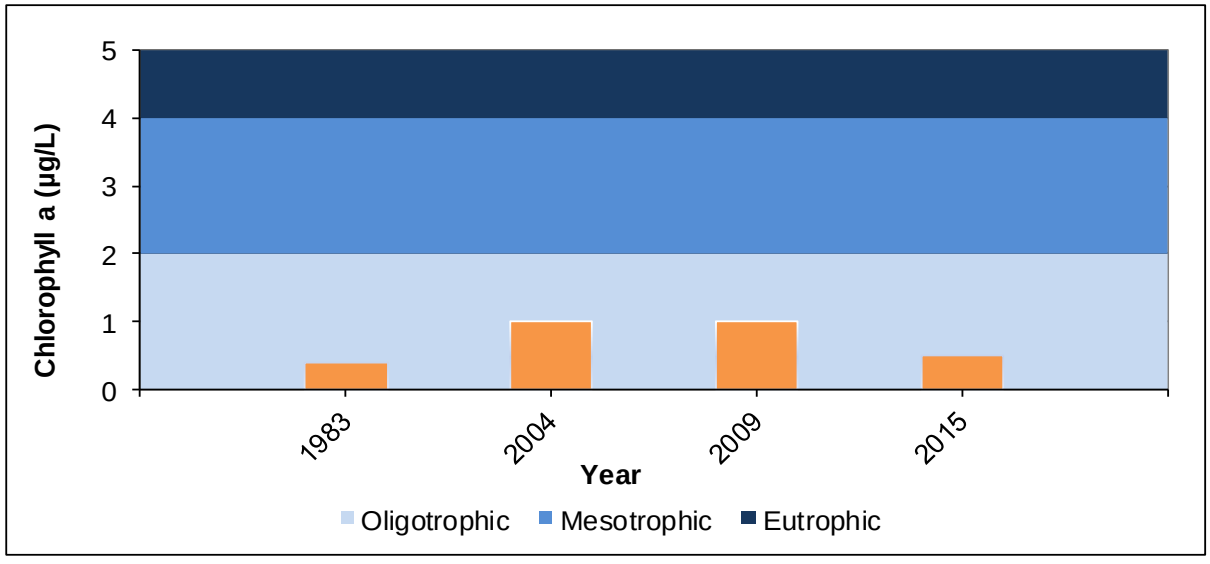
CHLOROPHYLL a

Water clarity is influenced by the amount of phytoplankton or microscopic algae present in the water. Chlorophyll a is the green pigment in phytoplankton. The lower the chlorophyll a density in your lake, the lower the phytoplankton concentration and, the clearer your lake is. Chlorophyll a and phytoplankton concentration is directly affected by the amount of phosphorus in your lake. The more phosphorus there is in the water, the greater the potential for phytoplankton growth to occur.

A Composite Sampler (pictured to the right) is used by dropping the tin container into the water. When it reaches the required depth it is slowly pulled back to the surface. The tin is filled as water enters one tube and air escapes the other. Some air remains in the tin to ensure collection throughout the haul to the surface.

Interpreting CHLOROPHYLL a Results	
Chlorophyll a Reading	**Lake Nutrient Status**
Up to 2 ug/L – low algal density	Oligotrophic – unenriched, few nutrients
2 – 4 ug/L – moderate algal density	Mesotrophic – moderately enriched, some nutrients
More than 4 ug/L – high algal density	Eutrophic – enriched, higher levels of nutrients

BLUE LAKE - MAIN BASIN
ANNUAL MEAN CHLOROPHYLL a RESULTS (ug/L)



DISSOLVED OXYGEN (D.O.)

Dissolved Oxygen (DO) is a dissolved form of oxygen vital for all underwater plants and animals to survive; it's what they need to breath. By monitoring DO levels in our lakes we can develop lake profiles showing the lake stratification and the state of the lake. Lake stratification is the separation of lakes into three layers:

Epilimnion (top layer of the lake)	Warmer water with higher D.O. concentrations.
Thermocline (middle layer of the lake)	Distinct layer in which temperature changes more rapidly with depth than it does in the layers above and below.
Hypolimnion (bottom layer of the lake)	Typically the denser and colder water at the bottom of the lake.

Adequate dissolved oxygen is important for good water quality and necessary to all forms of life. Poor (low) D.O. levels will cause stress on fish and may result in fish kills (mass death of a species in a season). DO is at its lowest during the late summer and early fall as water in the hypolimnion cannot recharge its oxygen since it is isolated from the atmosphere by the epilimnion and thermocline.

DO can also play a key role in binding phosphorous to iron in lake sediments. When D.O. levels get too low at the bottom of the lake phosphorous that was bound in lake sediments (removed from the water column) can get released and once again becomes available for plant and algal growth. This process is referred to as internal loading.

Increases in phosphorous near the lake bottom coinciding with low dissolved oxygen in the hypolimnion can indicate the occurrence of internal loading.

The Dissolved Oxygen Metre is used to gather D.O. and temperature readings. The probe is lowered into the lake at its deepest point and readings are taken at every metre from the hand-held screen.

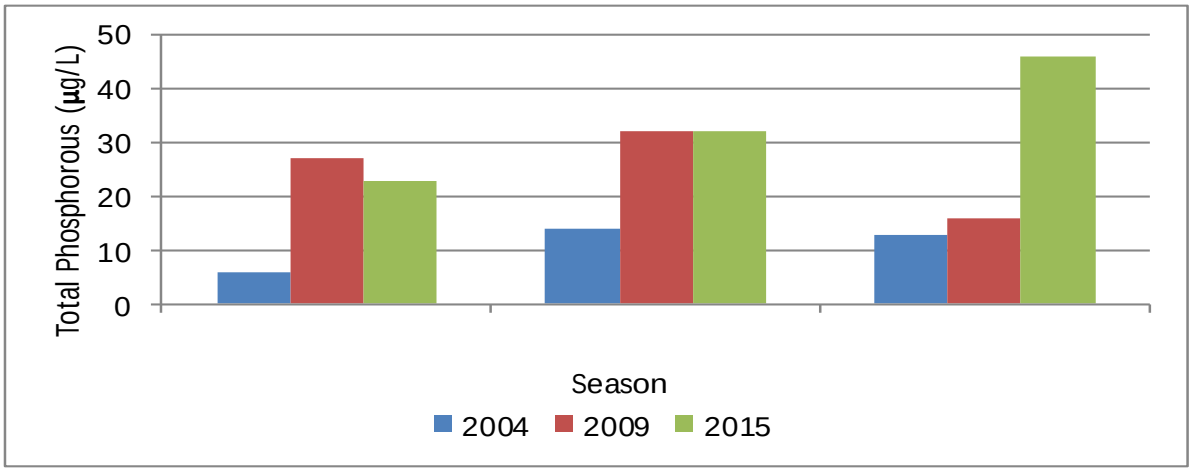
Blue Lake Main Basin
Fall Dissolved Oxygen Profiles

	30-Sep-99		2-Sep-04		Fall 2009		7-Sep-15	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO
Depth (m)	°C	(mg/L)	°C	(mg/L)	°C	(mg/L)	°C	(mg/L)
0.1	21.8	7	21.3	8.1			24.4	8.88
1	21.9	7	21.1	8.2			24.1	8.93
2	21.2	7	21	8.2			24	8.94
3	21.1	7	20.9	8.3	No Measure-		23.8	9.04
4	21	7	20.9	8.3	ments due to		23.6	9.13
5	21	7.1	20.9	8.3	lost DO Meter		23.2	9.13
6	20.9	6.9	20.8	8.4			22.8	9.16
7	20.9	7	20.5	8.7			21.7	10.68
8	16.6	14.2	19.5	12.3			17.8	17.12
9	13.6	13.8	15	16.6			14.7	17.04
10	12	12.3	13.3	16.3			12.7	16.08
11	9.9	11.9	11.4	14.9			10.9	14.44
12	8.6	10.9	9.8	13.3			9.3	11.55
13	7.6	8.2	8.7	12.9			8.5	9.1
14	6.9	8.1	8	12.1			7.8	5.91
16	6.7	6.8	7.3	11.5			7.1	2.31
17	6.5	6.5	6.8	10.7			6.6	0.55
18	5.9	4.6	5.9	6			6.4	0.31
19	5.4	2.7	5.6	2			6	0.27
20	5.2	1.2	5.3	0.6			5.9	0.24
21	5.1	0.6	5.3	0.3			5.5	0.09
22	4.9	0.2	5.3	0.3			5.4	0.06
23	Bottom	Bottom	5.3	0.3			5.1	0.04
24			5.2	0.3			5	0.03
25			5.2	0.3			5	0.01
26			Bottom	Bottom			4.9	0
27							4.9	0
28							4.9	0
29							4.9	0
30							Bottom	Bottom

Vital Habitat for Cold Water Fisheries (Trout) = DO > 4 mg/L at < 15.5°C

Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C

Blue Lake Main Basin
Bottom Total Phosphorous by Sample Season

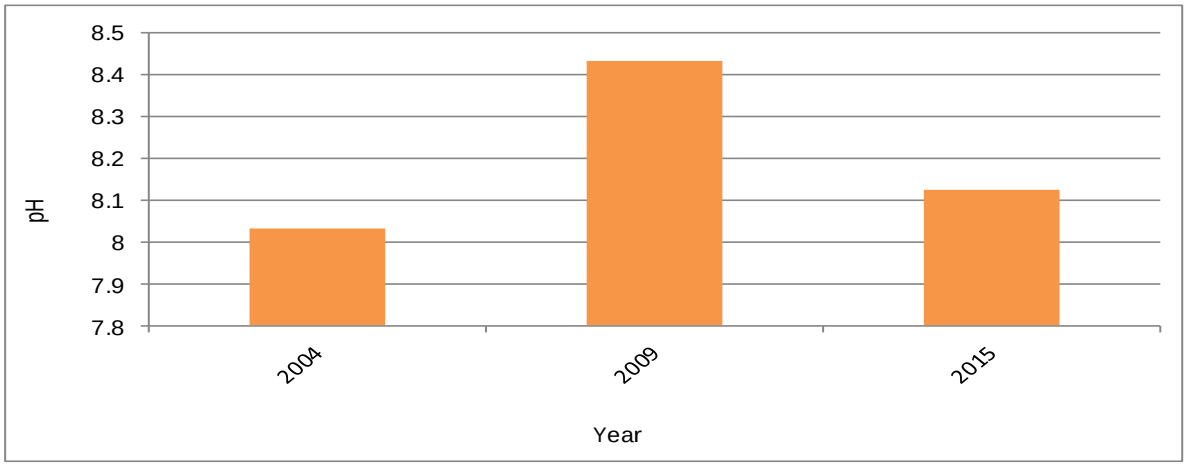


The increase in phosphorus at the bottom of the lake in late fall coupled with low dissolved oxygen near the bottom of the lake indicates a potential for internal loading. This means that nutrients maybe coming from within the lake as well as from outside the lake.

ACIDITY

Acidity of a water body can change the availability of metals such as Calcium and Aluminum. This has been shown to change zooplankton (small planktonic invertebrates) communities which are an important food source for many baitfish species.
The acidity of a solution is measured on the pH scale. The pH scale is a logarithmic measure of the concentration of hydrogen ions in solution. This means that a change from pH 7 to pH 8 is a ten-fold change in the concentration of hydrogen ions in solution.
Monitoring the pH of our lakes allows us to identify when changes are occurring. The Provincial Water Quality Objective for pH is between 6.5-8.5 in order to protect aquatic life.

Blue Lake Main Basin
Annual Average pH



Help MVCA and the Ontario Federation of Anglers and Hunters

Stop the Invasion!

Blue Lake was tested for invasive species, particularly zebra mussels and, spiny water flea in partnership with the Ontario Federation of Anglers and Hunters (OFAH). In 2009 and 2013, zebra mussel veligers (larvae) were present in the samples collected in 2009 but were not found in 2011. Sampling results from 2015 can be found in Ontario's Invading Species Awareness Program Annual report which will be available in the Spring of 2016 (www.invadingspecies.com).

Residents and property owners need to ensure that all access points to the lake have posted signs indicating the precautions that boaters and anglers can take to prevent the spread of invasive species into Blue Lake. Residents are also invited to participate in the Invading Species Awareness Program (www.invadingspecies.com) through MVCA and OFAH.

Pictured Top left—Rusty Crayfish Photo; Doug Watkinson, DFO
Middle left—Zebra Mussels Photo; Amy J. Benson
Bottom left– Spiny Waterflea Photo: Cathy Darnell

Check and clean watercraft every time it is moved to a different water body!

For more information on these and other invasive species, visit www.invadingspecies.com/invaders or call the Invading Species Hotline at 1-800-563-7711. If you would like to help monitor and prevent the spread of invasive species in the Mississippi Valley watershed, email monitoring@mvc.on.ca or call us at 613-253-0006.

MVCA and OFAH promote a proactive approach to invasive species management. This includes education and outreach about invasive species and how they are transported. Stop signs such as the one pictured above remind boaters to Inspect, Clean and Drain their boats so that they don't give invasive species a free ride.

HOW DOES BLUE LAKE MEASURE UP?

WATER QUALITY RESULTS (1983 - 2015) - BLUE LAKE - MAIN BASIN

Sample Year	Secchi Disc Depth (Metres)	Total Phosphorus Euphotic Zone (Micrograms/Litre)	Chlorophyll a Composite (Micrograms/Litre)	pH
1983*			0.41	
1999	6.9	5.3	0.78	8.4
2004	9.4	3.3	0.50	8.0
2009	12.0	8.5	0.50	8.4
2015	8.9	3.8	0.50	8.1
n	4	4	5	4
Minimum	6.9	3.3	0.4	8.0
Maximum	12.0	8.5	0.8	8.4
Mean	9.3	5.2	0.5	8.2
Standard Deviation	2.10	2.34	0.14	0.20

*Data not from Watershed Watch Program

Interpreting SECCHI DISC Results	
Secchi Depth	**Lake Nutrient Status**
Over 5 metres	Oligotrophic – unenriched, few nutrients
3.0 to 4.9 metres	Mesotrophic – moderately enriched, some nutrients
Less than 2.9 metres	Eutrophic – enriched, higher levels of nutrients

Interpreting TOTAL PHOSPHORUS Results	
Total Phosphorus	**Lake Nutrient Status**
10 ug/L or less	Oligotrophic – unenriched, few nutrients
11 to 20 ug/L	Mesotrophic – moderately enriched, some nutrients
21 ug/L or more	Eutrophic – enriched, higher levels of nutrients

Interpreting CHLOROPHYLL a Results	
Chlorophyll a Reading	**Lake Nutrient Status**
Up to 2 ug/L – low algal density	Oligotrophic – unenriched, few nutrients
2 – 4 ug/L – moderate algal density	Mesotrophic – moderately enriched, some nutrients
More than 4 ug/L – high algal density	Eutrophic – enriched, higher levels of nutrients

SEINE NETTING

Seine netting by hand is a way of sampling fish species that may live or visit the near shore areas of a waterbody. A seine net is a type of fishing net that has floats along one edge and weights along the other edge, to keep it upright in the water. It is then dragged through a section of water, encircling it, thus collecting all the fish within that area. The depth of the testing area is limited to areas wadeable by the field crew. This method has a very limited impact on the health of the fish sampled and is affordable, easy to do, and portable.

Seine netting was conducted at the boat launch sites of all the Watershed Watch lakes of the 2015 field season to help expand our knowledge of each lake beyond just its chemistry. Netting was conducted in August to avoid disturbing sensitive nesting and breeding sites.

The majority of the individual fish captured with the seine net are bait fish such as minnows and cyprinids, however some juvenile and adult game fish were also caught. Both groups (bait fish and juvenile game fish) tend to stick close to shore to avoid predation from larger fish that can be found in deeper waters. Near shore areas may also contain aquatic vegetation which is ideal camouflage for all sizes of fish that are either hiding from predators or waiting to surprise prey, explaining why some adult game fish were caught.

It is important to note that if something was not caught in the seine we cannot conclude that the fish species is not in the lake, rather that the species was not in the sampling zone when the sampling was done.

Most stakeholder interest in fish species within a water body has to do with game fish. However, baitfish far outnumber game fish and thus play a critical role within their ecosystem and the food chain. It is important to take note of their presence and provide them the same consideration you would for larger fish. If you are interested in learning more about baitfish, and how to identify the different species, please refer to the Department of Fisheries and Oceans *Baitfish Primer*. It is available online and at the MVCA office.

BLUE LAKE SEINE NETTING RESULTS - FISH SPECIES CAUGHT

No fish caught in 2015

HOW DOES BLUE LAKE MEASURE UP?

Sampling in 2015 indicates low levels of phosphorus in Blue lake with all concentrations falling below 10µg/L. Low phosphorus concentrations will help to limit the formation of nuisance algae blooms. This is supported by the excellent water clarity and low chlorophyll a concentrations found while sampling.

Blue lake maintains stable thermal stratification throughout the summer. Dissolved oxygen concentration remains fairly steady around 9.0mg/L throughout the epilimnion (top lake layer) until it rapidly increases when it hits the metalimnion (where the depth where water temperature rapidly changes) reaching a maximum concentration of 17.12mg/L. Dissolved oxygen quickly declines in the hypolimnion (the bottom layer of a lake). This low dissolved oxygen in the cold water of the hypolimnion could be stressing the cold water fish community of Blue lake.

Over the last three sampling rounds (2004,2009 and 2015) parameter results have been relatively stable, consistently classifying Blue lake as an oligotrophic lake.

WHAT CAN YOU DO?

The major impact of lake front development on water quality is caused by the change in land use from forest to low density residential development. This increases the amount of water that is directed to the lake during rainfall events, carrying sediments, nutrients and contaminants into the water.

These impacts can be limited by temporarily storing water (eg. rain barrels), directing runoff away from the lake (eg. installing properly working eaves troughs), and infiltrating more water (eg. using rain gardens). These methods are ways to help limit the effects of development but the best way to avoid impacts is to reduce the land use change. This can be accomplished by re planting or maintaining current vegetated buffers and reducing the vegetation cleared for buildings.

LOOKING TO HELP COLLECT LAKE DATA?

Please help the Mississippi Valley Conservation Authority (MVCA) track ice-in and ice-out dates for your lake.

The MVCA collects information about when lakes freeze over in the fall or winter (ice-in), and when the ice melts in the spring (ice-out). Historically most people have only noted ice-out, but increasingly we are recognizing the importance of knowing how long lakes are under ice cover, and therefore ice-in is becoming more widely tracked as well. This is an important trend to monitor, especially considering the unusual weather conditions that have occurred in recent years.

While ice in and ice out dates change somewhat from year to year depending on local weather conditions, we are interested in seeing whether there are notable changing trends over the long term. The more years of data we have for each of the lakes, the better we can adapt our water management regimes, particularly in terms of timing the fill-up of the reservoir lakes in the spring. It will also help to increase our understanding of the effects changing ice cover has on lake health, local wildlife and recreational lake use.

Volunteers are asked to record ice-on and ice-off dates for your lake, based on what you can see from shore, and submit the data to MVCA by e-mail. Ice-out is determined when the lake becomes clear of ice in the spring. Ice-in occurs when the lake is completely or nearly completely covered with ice.

If you're interested in helping MVCA track ice-in and ice-out please contact:
Alyson Symon (613) 253-0006 ext 227 or email asymon@mvc.on.ca

VOLUNTEERS NEEDED TO MONITOR RAINFALL

MVCA is looking for volunteers to help collect rainfall data throughout the Mississippi Watershed. By participating you will help to gather a larger amount and broader range of data than would otherwise be collected. Your observations will give us a better picture of differences in the amount and distribution of rainfall through our watershed. This type of data is extremely valuable in helping us to monitor and manage for changes in the river system.

Volunteer are provided with a 10" rain gauge that they will install on their property by attaching it to a fixed structure such as a deck or a fence post. Rainfall is read and recorded during or after each rainfall.

The data that is collected will be shared with municipal and government agencies, environmental organizations and researchers, and will be available to the general public.

If you are interested please contact Alyson Symon (613) 253-0006 ext 227 or email asymon@mvc.on.ca

ALGAE WATCH

Over the last few decades algae and plant growth appears to be increasing in our lakes. MVCA in partnership with Friends of the Tay Watershed Association, Carleton University and Rideau Valley Conservation, are trying to better understand aquatic plant and algae growth in Eastern Ontario lakes. Phosphorus, climate change and zebra mussels are all being examined for their possible effects.

You can help us get a handle on this issue by reporting algae blooms and excessive plant growth on your lake at www.citizenwaterwatch.ca.

SITE EVALUATION GUIDELINES

Water front development can introduce nutrients and suspended solids into surface water through migration from septic systems and runoff from cleared areas. Through lake stewardship, proper planning and education the negative effects of shoreline development on lake health can be greatly reduced. Mississippi Valley Conservation Authority (MVCA) along with Rideau Valley Conservation Authority (RVCA) and Cataraqui Region Conservation Authority (CRCA) have released Site Evaluation Guidelines for water front property which will help to address potential impacts on the aquatic environment for the review of development proposals.

For more information on these guidelines please contact Mississippi Valley Conservation Authority at 613-253-0006.

PLANT YOUR LAND

Our **free** shoreline planting service helps you restore the natural look of your shoreline while combating erosion, cleaning your water and creating a healthy habitat for fish, birds and wildlife. It'll save you time and money for lawn maintenance too.

Naturalizing your shoreline does not mean you lose your view or your shore access. MVCA staff will look at your property and create a planting layout that suits your needs. The designs will maintain open areas and let you enjoy your waterfront property while gaining the benefits of naturalization.

Contact Caleb about planting your land by phone at 613-253-0006ext.253 or by email at stewardship@mvc.on.ca

For more information about MVCA Monitoring Programs
please call: Susan Lee at
613.259.2421 ext. 235 or
email: slee@mvc.on.ca
or
visit: www.mvc.on.ca

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Mississippi Valley Conservation Authority