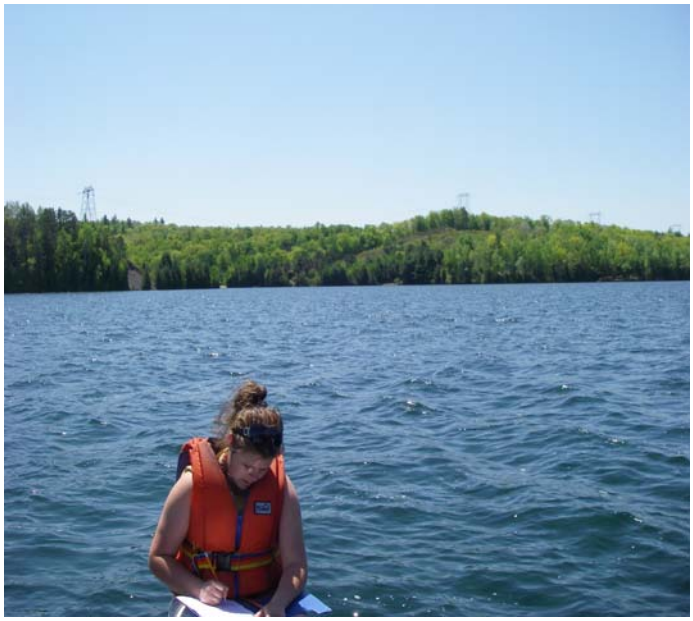
Mississippi Valley Conservation

State of the Lake Environment Report 2008

Mississagagon Lake

Mississagagon Lake

Mississagagon Lake is located in the Township of North Frontenac. Mississagagon Lake is at an elevation of 268 metres above sea level. The lake perimeter is 35.2 kilometres and the deepest point is 24 metres. Mississagagon Lake supports a warm water fishery, this includes; Lake Herring, Yellow Pickerel, Northern Pike, Smallmouth Bass, Largemouth Bass, Yellow Perch, Rock Bass and Pumpkinseed. There are approximately 105 residences on the lake, this includes permanent homes as well as cottages and trailers. There are 5 resorts on the lake and 20 permanent residences.



Residents of Mississagagon Lake have recently formed a Lake Association. They held their first annual meeting in 1998. Members have volunteered their time to initiate water quality testing through the Ministry of Environment Lake Partner Program which includes several secchi disc (water clarity) measurements throughout the season. This data will provide a general picture of water quality conditions over the long term. Comprehensive testing in 1998, 2003 and 2008 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program*, provides for a comparison between water quality conditions as they exist now, to results obtained in 1976, (32 years ago), through the Ministry of Environment Recreational Lakes Program.

There are two sampling stations on the lake, one in the west basin and one in the east basin, each station was sampled three times in 2008.

The average secchi disc reading for the two stations in 2008 was 6.25 metres, only as slight difference compared to 5 years ago when the average was 6.48 metres. Thus indicating that Mississagagon Lake is an unenriched (few nutrients) or oligotrophic lake.

Directly related to water clarity is the amount of nutrients, in particular phosphorus, entering the lake. The Provincial Objective for phosphorus levels in warm water lakes is 20 micrograms per litre (ug/L). In 2008, the mean for the two stations in the euphotic zone (depth at which sunlight can penetrate or two times the secchi disc depth) was 10.9 *ug*/L, an increase from a 2003 reading of 7.17ug/L. The mean for the samples taken one metre off the bottom was 17.2 *ug*/L an increase from the 2003 reading of 8.0 ug/L. Both sample locations have gone from oligotrophic (few nutrients to mesotrophic (some nutrients).

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a density for the two sampling stations was 1.5 *ug*/L. Thus, indicating a low algal density for Mississagagon Lake in 2008. In 1998, chlorophyll a levels slightly lower at 0.8 *ug*/L.

Plants and animals are a direct reflection of their environment. The most critical time of year for conducting dissolved oxygen and temperature profiles is after August 31. Profiles are generally conducted at this time of year and at the deepest point in the lake. Aquatic vegetation and algae that has grown over the summer, has died off and settled on the bottom, using the available oxygen necessary to sustain aquatic life in the lower portion of the lake or the hypolimnion. Two other profiles were conducted in 2008, in order to generate a more concise picture of the oxygen content of the lake.

The dissolved oxygen (DO) and temperature data, measured at the two sampling stations, indicate adequate levels all the way to the bottom for most of the ice-out season. The oxygen levels in the west basin dropped throughout the summer however remained as useable fish habitat. The east basin started the summer well oxygenated however by September there was only 15 metres of useable fish habitat.

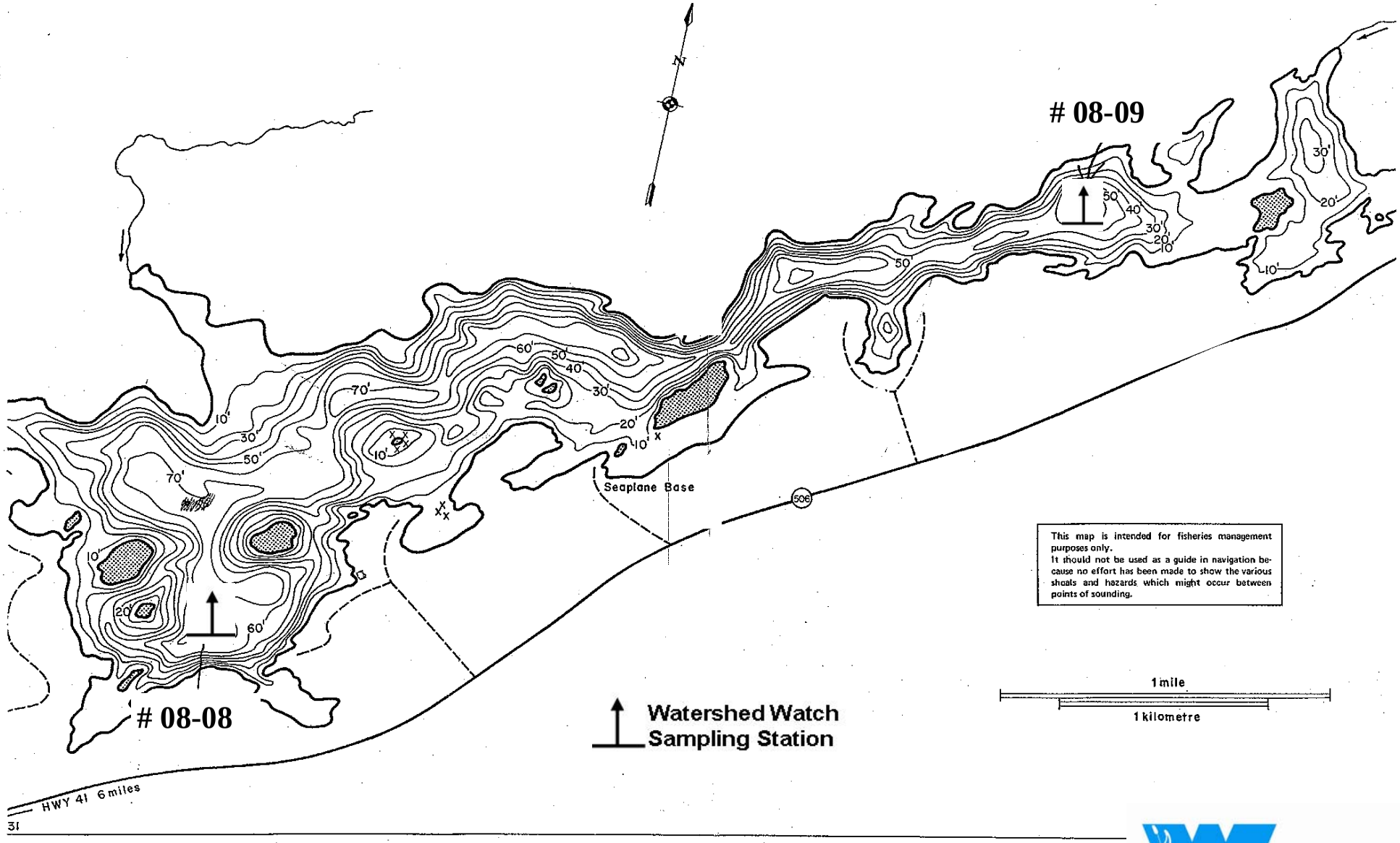
Residents and users of Mississagagon Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities. Human sources of phosphorus include leachate from sewage disposal systems, erosion from the clearing of shorelines and the use of lawn fertilizers. There are helpful tips throughout this report to help reduce your impact on Mississagagon Lake. Additional water quality data, current and historic, is available for Mississagagon Lake and many other lakes in the Mississippi Valley watershed. Contact MVC for more information on how you can become a good lake steward for your lake.

For more information on lakes in the Mississippi Valley Watershed, visit MVC online at

www.mvc.on.ca

Mississippi Valley Conservation

Mississagaon Lake



This map is intended for illustration only; it should not be used as a navigation guide.

WATERSHED WATCH

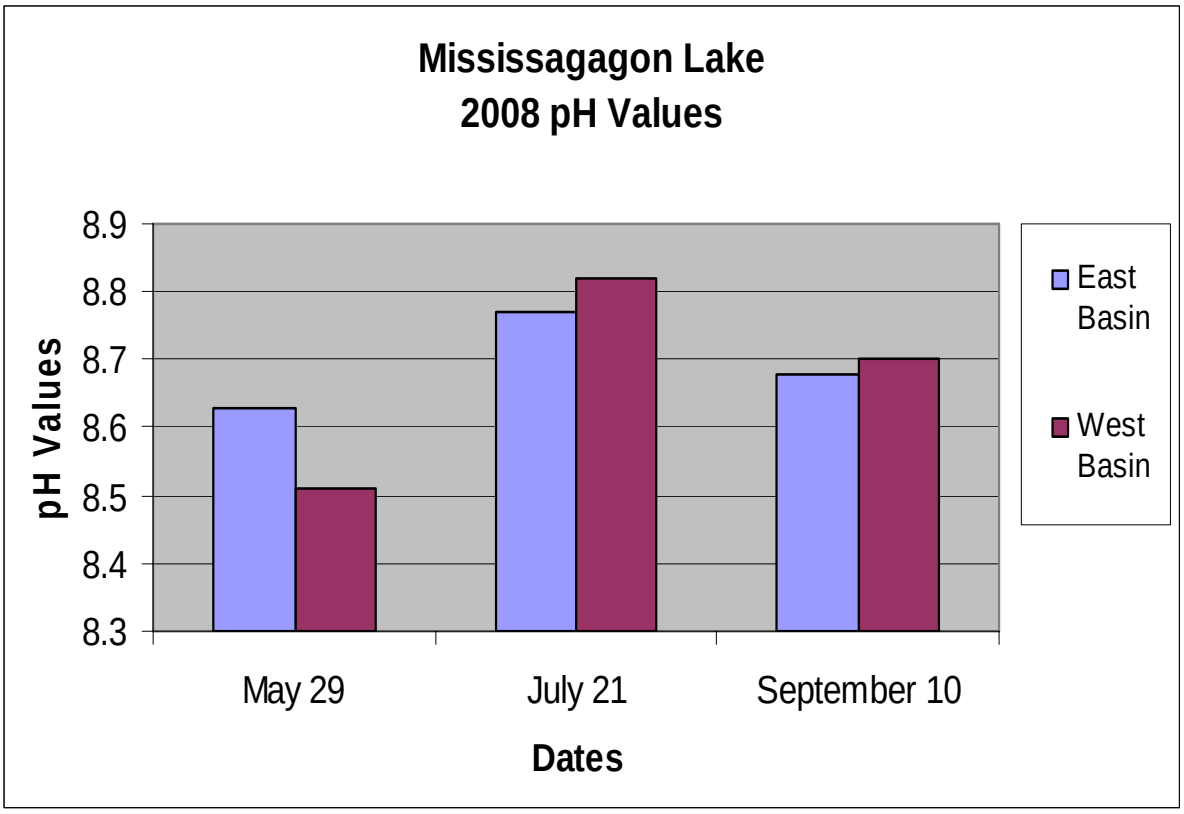
MVC and OFAH need your help to Stop the Invasion!

Check & clean your boat every time you change water bodies

Mississagagon Lake was also tested for invasive species in 2008**,** in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters. Mississagagon Lake did not have spiny water flea or zebra mussels present however, zebra mussels have been detected in previous years. Residents and property owners need to ensure that all access points to the lake have posted signs indicating the presence of zebra mussels and the precautions they can take to avoid the spread of invasive species to other lakes.

Evaluating your pH Results

Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.



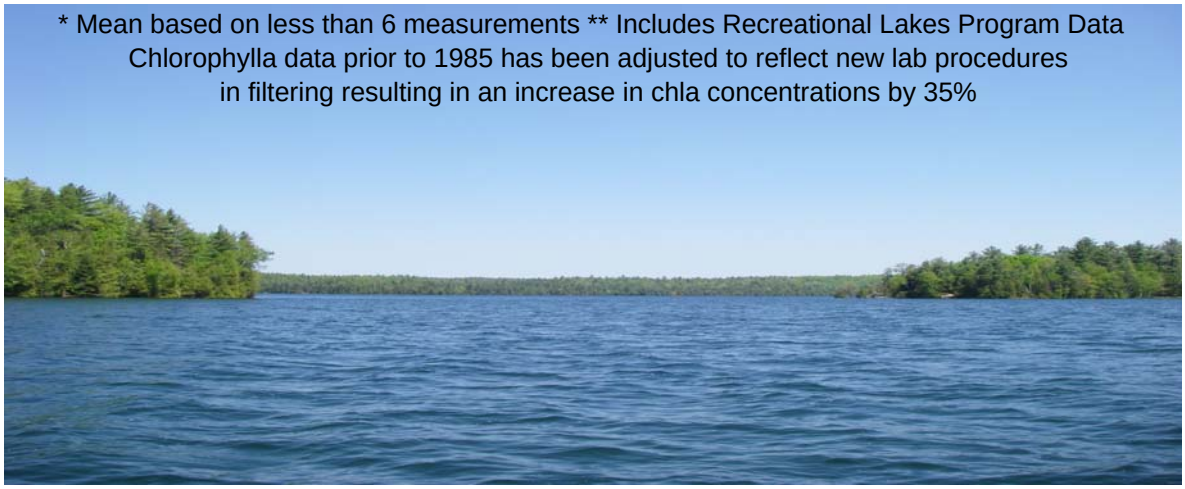
For more information call MVC at (613)259-2421 or the Invading Species Hotline 1-800-563-7711.

How Does Mississagagon Lake Measure Up?

1975 – 2008 Water Quality Results

Sample Year [Various Stations]	Secchi Disc Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/Litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
*1975	6.5			
**1976	5.65	10.1	14.0	2.0
*1979	7.0			
*1980	6.5			
*1981	5.63			
*1982	7.75			
*1983	8.5			
*1986	7.75			
*1987	5.0			
*1988	6.0			
*1989	6.5			
*1991	7.0			
*1992	7.0			
1997	6.8			
1998	6.7	8.6	13.7	0.8
1999	6.8			
2000	6.6			
2001	6.9			
2002	6.8			
2003	6.48	7.17	8.0	1.57
*2008	6.25	10.9	17.2	1.5
n	21	4	4	4
Minimum	5.0	7.17	8.0	0.8
Maximum	8.5	10.1	14.0	2.0
Mean	6.7	9.2	13.2	1.5
Standard Deviation	0.767356625	1.651330272	3.826551973	0.496881944

* Mean based on less than 6 measurements ** Includes Recreational Lakes Program Data
Chlorophylla data prior to 1985 has been adjusted to reflect new lab procedures
in filtering resulting in an increase in chla concentrations by 35%

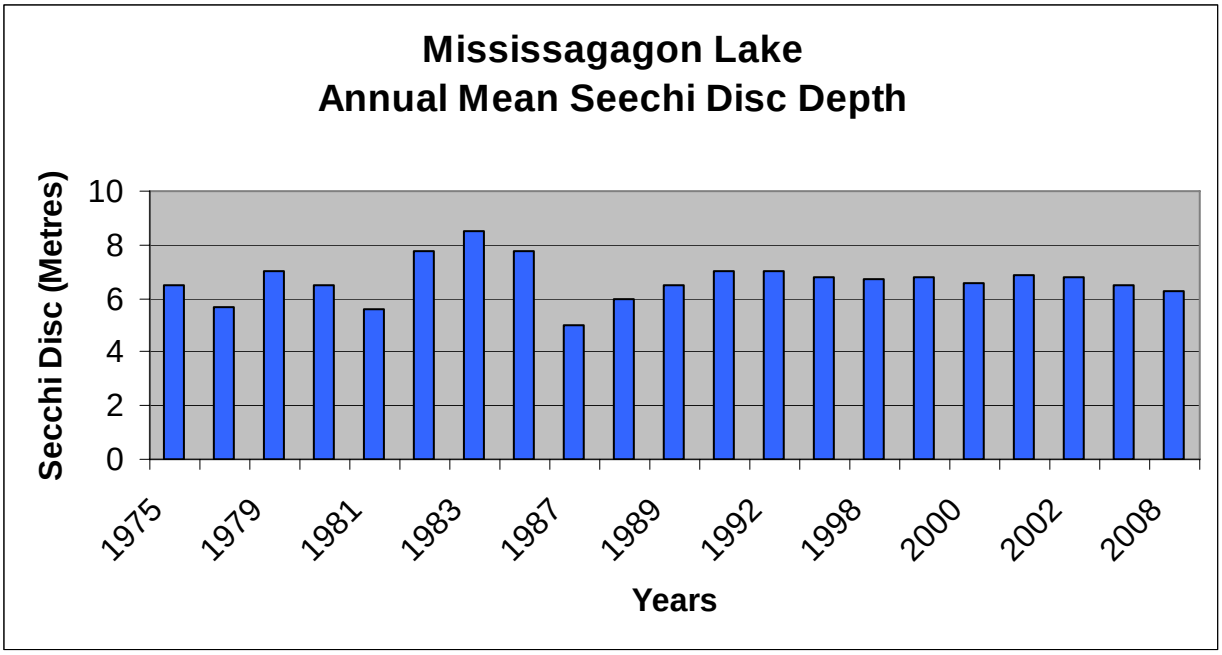


Secchi Disc Depth

A Secchi disc is a black and white coloured disc used to determine water clarity. The disc is lowered into the water. The point, at which you can no longer distinguish the black and white, is called the Secchi depth.

The higher the Secchi Disc measurement the clearer your lake is.

INTERPRETING YOUR SECCHI DISC RESULTS	
Secchi Reading	**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



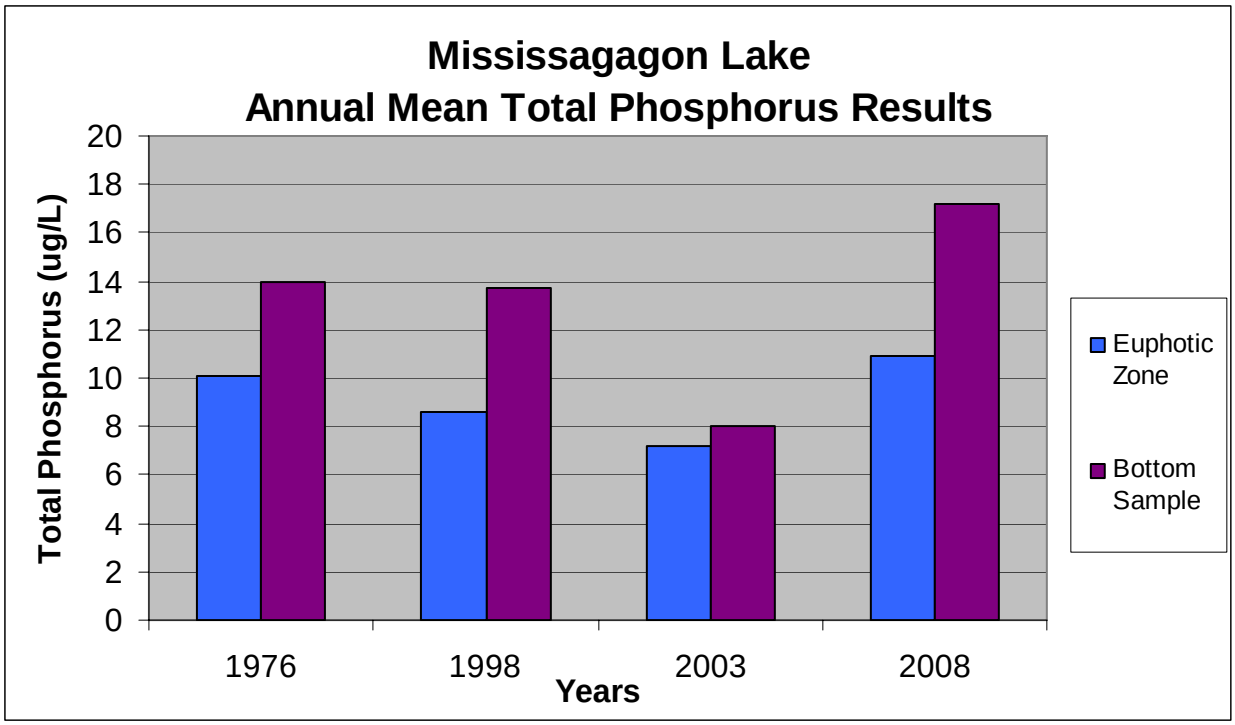
FIVE EASY STEPS TO IMPROVE WATER QUALITY

1. Build at least 30 metres away from the shoreline.
2. Keep your lot well treed and preserve or replant native vegetation along the shoreline.
3. Pump out your septic tank every three to five years.
4. Reduce water use and use phosphate free soaps and detergents.
5. Keep the size of your lawn to a minimum; do not use fertilizers, herbicides or pesticides.

Total Phosphorus

Phosphorus is the nutrient that controls the growth of algae in most Ontario lakes. For this reason any increase in phosphorus in the lake will increase the quantity of algae that can grow. High levels of phosphorus can lead to algal blooms and in some cases affect the habitat of cold water fish such as lake trout. A general guideline exists to characterize your lake based on the total phosphorus that is measured.

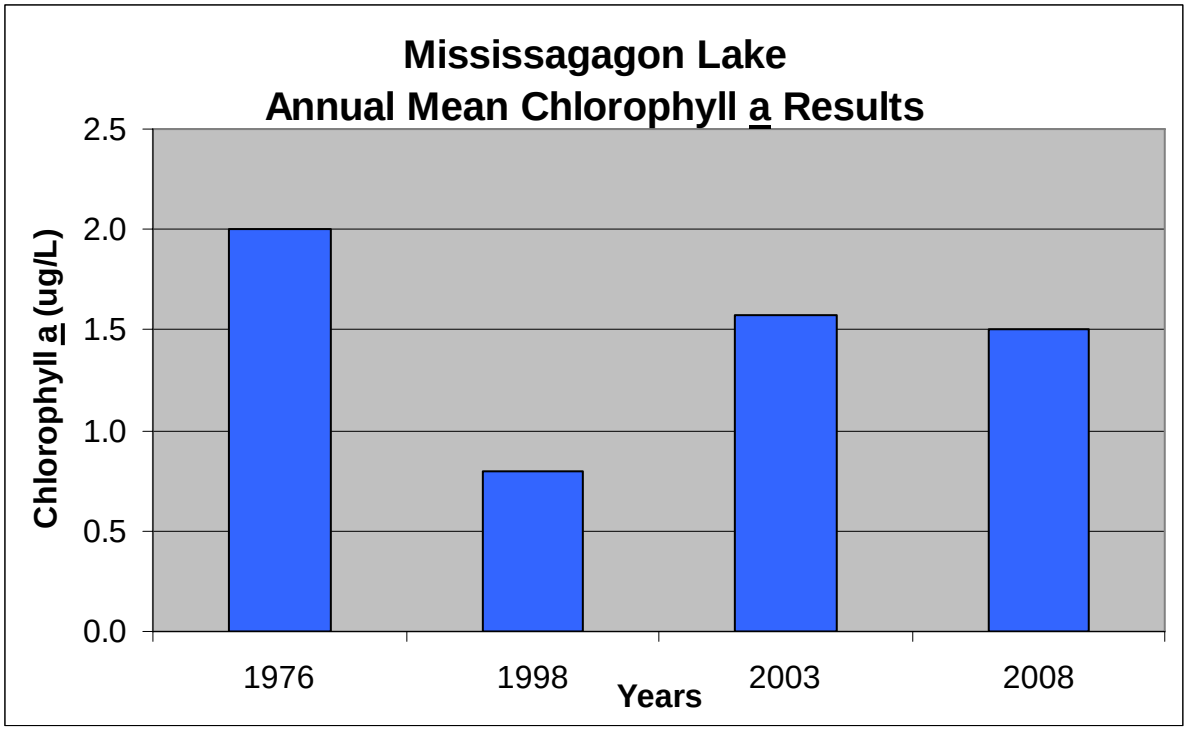
INTERPRETING YOUR TOTAL PHOSPHORUS RESULTS	
Total Phosphorus	**Lake Nutrient Status**
10 ug/L or less	Oligotrophic - unenriched, few nutrients
11 to 20 ug/L	Mesotrophic – moderately enriched, some nutrients
21 ug/L or more	Eutrophic – enriched, higher levels of nutrients

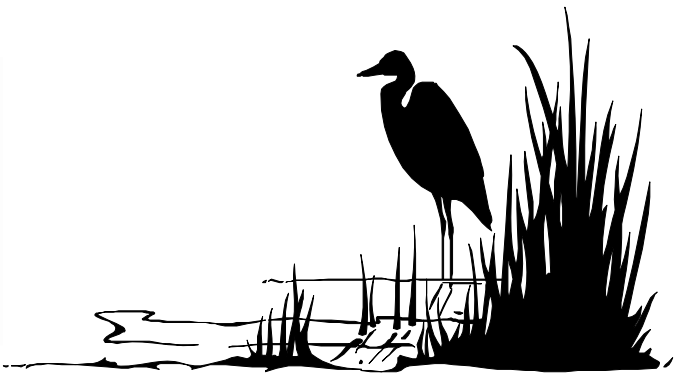


Chlorophyll a

The lower the chlorophyll a density in your lake, the clearer your lake is. Chlorophyll a is directly affected by the amount of total phosphorus in your lake. The more phosphorus there is in the water, the more algal growth will occur.

INTERPRETING YOUR CHLOROPHYLL A RESULTS	
Secchi 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





MISSISSAGAGON LAKE – West Basin

DISSOLVED OXYGEN/TEMPERATURE PROFILES
MOE Rec. Lks. Station # 19-3430-715-01, MVC Station # 08-08
Date: May 29, 2008
Depth: 28 Metres *Drifting occurred during sampling.
Euphotic Zone (Penetration of Light) = 13.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	14.7	11.5	109	
1	14.5	12.5	118	
2	14.5	12.1	114	
3	14.5	12.1	114	Epilimnion
4	14.4	12.0	113	
5	14.2	12.1	113	
6	14.1	12.2	115	
7	13.7	13.0	120	
8	11.1	13.2	116	Thermocline
9	9.7	13.5	126	
10	8.8	13.3	111	
11	8.9	13.1	110	
12	7.9	13.1	108	
13	7.2	12.7	102	
14	6.8	11.8	94	
15	6.5	11.5	93	
16	6.2	10.8	85	
17	5.9	10.5	82	Hypolimnion
18	5.7	9.8	74	
19	5.4	9.6	73	
20	5.3	9.0	68	
21	5.2	8.9	66	
22	5.0	8.5	64	
23	5.0	8.5	64	
24	4.7	6.7	50	
25	4.6	6.4	46	
26	4.6	5.8	43	
27	4.6	5.7	42	
28	Bottom	Bottom	Bottom	Bottom

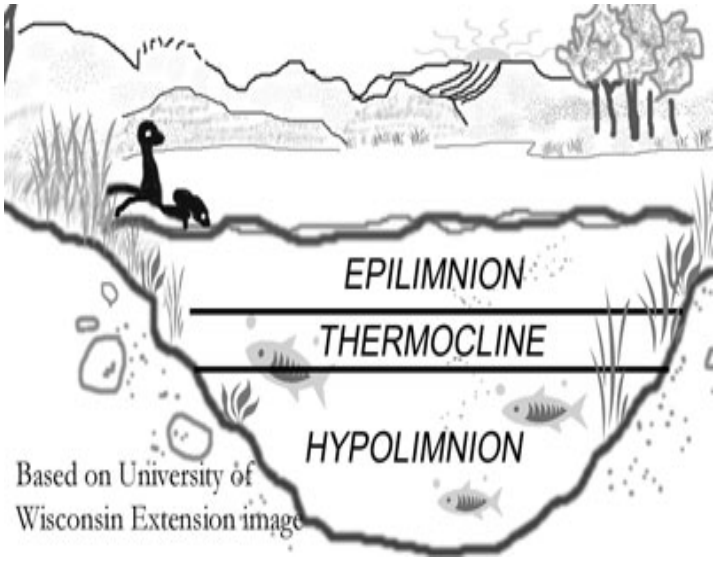
Warm Water Fisheries Habitat (Bass, Walleye, Pike, Perch) = DO > 4 mg/L at < 25°C

MISSISSAGAGON LAKE – West Basin

Date: July 21, 2008
Depth: 21.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	23.5	7.2	81	
1	23.5	7.2	81	
2	23.3	7.4	85	
3	23.3	7.2	81	Epilimnion
4	23.3	7.5	85	
5	23.2	7.2	81	
6	23.2	7.4	84	
7	21.8	7.6	84	
8	16.4	10.2	100	Metalimnion
9	12.5	10.8	98	or Thermocline
10	10.2	1.9	95	
11	8.2	9.7	81	
12	8.3	9.7	81	
13	7.9	8.6	70	
14	7.6	8.4	68	Hypolimnion
15	7.3	7.8	64	
16	7.0	7.7	62	
17	6.8	7.2	57	
18	6.4	6.8	53	
19	6.0	5.2	40	
20	6.6	4.2	33	
21	Bottom	Bottom	Bottom	Bottom

Warm Water Fisheries Habitat (Bass, Walleye, Pike, Perch) = DO > 4 mg/L at < 25°C



Epilimnion (warm surface layer)

Thermocline or **Metalimnion** (transition zone between warm and cold water, depth can change throughout the day)

Hypolimnion (cold bottom water)

MISSISSAGAGON LAKE – West Basin

Date: September 10, 2008
Depth: 21.0 Metres
Euphotic Zone (Penetration of Light) = 14.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	21.0	10.0	107	
1	20.7	10.0	107	
2	20.5	10.3	110	
3	20.5	10.3	110	Epilimnion
4	20.3	10.1	107	
5	20.3	10.3	110	
6	20.5	10.3	110	
7	20.4	10.2	108	
8	20.1	10.1	108	
9	16.9	12.8	127	
10	11.9	13.5	122	Metalimnion
11	10.5	13.0	112	or Thermocline
12	8.9	12.3	101	
13	8.3	11.1	91	
14	7.9	10.1	82	
15	7.4	9.1	73	
16	7.1	8.7	70	
17	6.9	7.6	60	Hypolimnion
18	6.7	7.1	56	
19	6.4	5.2	41	
20	6.2	4.5	35	
21	Bottom	Bottom	Bottom	Bottom

Warm Water Fisheries Habitat (Bass, Walleye, Pike, Perch) = DO > 4 mg/L at < 25°C

How to protect or restore a shoreline depends on the conditions of the site and the energy and resources of the owner.

There are four main strategies to choose from

Preservation
When purchasing a lakefront property, a natural shoreline is retained and removed. Access to the lake is designed to avoid shoreline damage.

Enhancement
Native species are planted and non-native species are removed

Naturalization
Degraded shorelines are left alone to return to their natural state.

Restoration
Clear areas are planted with native species.

MISSISSAGAGON LAKE – East Basin

DISSOLVED OXYGEN/TEMPERATURE PROFILES

MOE Rec. Lks. Station # 19-3430-715-01, MVC Station # 08-09

Date: July 29, 2008

Depth: 13.0 Metres

Euphotic Zone (Penetration of Light) = 13.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	15.3	11.8	113	
1	15.3	12.0	115	
2	15.2	12.0	115	
3	15.3	11.9	115	Epilimnion
4	15.1	12.0	113	
5	15.1	12.0	115	
6	15.0	12.1	115	
7	15.0	11.9	114	
8	14.9	12.0	114	
9	12.4	12.7	115	Metalimnion
10	9.4	12.7	108	or Thermocline
11	7.5	11.9	97	
12	7.0	11.8	95	
13	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike, Perch) = DO > 4 mg/L at < 25°C

Mississagaon Lake - East Basin

Date: July 21, 2008

Depth: 17.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	23.6	7.0	79	
1	23.7	7.1	80	
2	23.7	7.2	81	Epilimnion
3	23.7	6.9	77	
4	23.4	6.7	75	
5	23.1	6.9	77	
6	21.9	7.6	84	
7	19.8	7.8	82	Metalimnion
8	16.6	9.0	89	or Thermocline
9	14.00	9.2	86	
10	11.6	9.4	83	
11	9.3	8.3	70	
12	8.9	8.7	73	
13	8.2	8.2	67	Hypolimnion
14	8.0	8.0	65	
15	7.7	7.0	56	
16	7.4	4.9	39	
17	Bottom	Bottom	Bottom	Bottom

Mississagaon Lake - East Basin

Date: September 10, 2008
Depth: 17.0 Metres
Euphotic Zone (Penetration of Light) = 10.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	21.0	10.2	110	
1	20.9	10.2	109	
2	20.5	10.4	111	Epilimnion
3	20.6	10.3	110	
4	20.5	10.4	111	
5	20.5	10.4	111	
6	20.4	10.4	111	
7	20.3	10.4	111	
8	20.0	10.5	111	
9	16.5	12.8	126	
10	12.2	12.6	112	Metalimnion
11	10.0	11.3	97	or Thermocline
12	8.9	11.0	92	
13	8.3	8.7	72	
14	8.0	8.4	69	Hypolimnion
15	7.9	5.4	44	
16	7.2	2.4	18	
17	Bottom	Bottom	Bottom	Bottom

Warm Water Fisheries Habitat (Bass, Walleye, Pike, Perch) = DO > 4 mg/L at < 25°C

The Watershed Watch program was made possible thanks to the generous support of the Ministry of Environment, Lake Associations, area Stewardship Councils, the Lake Stewardship Network and concerned citizens.

For more information regarding *Watershed Watch* or for advice on how you can help protect or enhance your lake environment, contact Susan Lee, Watershed Monitoring Supervisor, Mississippi Valley Conservation at (613) 259-2421 or slee@mvc.on.ca

Mississippi Valley Conservation

WATERSHED WATCH