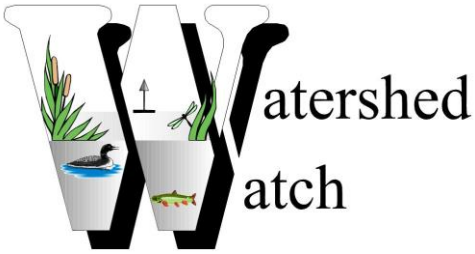
Mississippi Valley Conservation

State of the Lake Environment Report 2007

Mississippi Lake



Mississippi Lake

Mississippi Lake is situated in portions of Drummond, Beckwith and Mississippi Mills townships, in Lanark County. It is the last in a series of lakes in the Mississippi Valley watershed before the Mississippi river reaches the Ottawa River and is one of the largest inland lakes in South-Eastern Ontario. Mississippi Lake is at an elevation of 134.4 metres above sea level. The lake perimeter is approximately 55.9 kilometres and the deepest point is 9.2 metres. Mississippi Lake supports a warm water fishery. Common species include Walleye, Northern Pike, Smallmouth and Largemouth Bass. At last count in 1983, there were 16 resorts, 1498 cottages and 259 permanent houses on the lake.

Residents of Mississippi Lake have formed a highly active Lake Association, and have appointed a Lake Stewards, who area member of the Mississippi Valley Lake Stewardship Network and Steering Committee. The individual has volunteered their time in the past, to provide water quality testing, through the Ministry of the Environment (MOE) Self Help Program from 1968 and Lake Partner Program since 1996. This data is extremely valuable; the data provides a general picture of water quality conditions for the past 39 years. Comprehensive testing in 2002 and 2007 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program* provides for a comparison between water quality conditions as they exist now, to results obtained 32 years ago through the MOE Recreational Lakes Program.

In general, the water quality in Mississippi Lake is improving**.** There are two sampling stations at the deepest points in the Big and Second Lakes. Each station was sampled four times in 2007, thanks to the support of Canada Waste Management. Graphs will follow that show water clarity, as measured by Secchi Disc. The average reading for 2007 is 4.25 metres indicating that Mississippi Lake is a moderately enriched (some nutrients) or mesotrophic lake. Compared to 32 years ago, the average was 2.5 metres and a eutrophic lake environment (enriched, high levels of nutrients).

Directly related to water clarity is the amount of nutrients, in particular phosphorus, entering the lake. The Provincial Objective for phosphorus levels in shield lakes is a maximum of 20 micrograms per litre (ug/L). In 2007, the mean for the two stations in the euphotic zone (depth at which sunlight can penetrate or two times the secchi disk depth) was 12.9*ug*/L. The mean for the samples taken one metre off the bottom was 13.4*ug*/L. Thirty two years ago, the average phosphorus level was 26.4*ug*/L in the euphotic zone and 26.0*ug*/L one metre off the bottom of the lake, both over the Provincial Objective. Mississippi Lake decreased its average phosphorus levels by more than 10 *ug*/L, changing its trophic status from a eutrophic lake environment (enriched, high levels of nutrients) to a moderately enriched lake (some nutrients) and putting it well below the Provincial Objective.

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a density for the two sampling stations was 1.14*ug*/L, indicating a low algal density for Mississippi Lake in 2007. In 1975, chlorophyll a levels were extremely high at 13.7 *ug*/L, over ten times higher than 2007.

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. In total four profiles were conducted in 200, one in May, July, September and November, in order to generate a more concise picture of the oxygen content of the lake.

The dissolved oxygen and temperature data, measured at the deepest points in the Big Lake and Second Lake, indicate adequate levels all the way to the bottom for most of the ice-out season. Data collected during the sampling season, reveal that the oxygen concentrations in both Big Lake and Second Lake maintained useable habitat for warm water fish species, such as pike and bass throughout the entire water column.

By mid summer the oxygen levels had decreased slightly, then improving by fall. However, residents and users of Mississippi Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities.

Mississippi Lake was also tested for invasive species in 2007, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters. Mississippi Lake did *not* have spiny water flea present in the samples collected however, zebra mussel veligers (larvae) and adults were detected. Residents and property owners need to ensure that all access points to the lake have clearly posted signs indicating the presence of zebra mussels and the precautions they can take to avoid the spread of invasive species to other lakes.

Residents and users of Mississippi Lake and the Mississippi Lake Association should continue a stewardship approach to limit the amount of nutrients entering the lake. There are helpful tips throughout this report to help reduce your impact on Mississippi Lake. Additional water quality data, current and historic, is available for Mississippi 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.

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.

LOW PHOSPHORUS LIFESTYLE	**Amount of Phosphorus (grams)**	**HIGH PHOSPHORUS LIFESTYLE**	**Amount of Phosphorus (grams)**
Human waste	535	Human waste	535
No dishwasher	0	Dishwasher using powdered detergent once per day	650
No fertilizer	0	Lawn fertilized once/year	1960
Trees not cut down	20	Lot cleared of trees	30
Uses phosphate-free products	20	Uses products with phosphate	180
TOTAL	**575 grams**	**TOTAL**	**3355 grams**

Mississippi Lake

Most Common Fish Species
Walleye
Northern Pike
Smallmouth Bass
Largemouth Bass

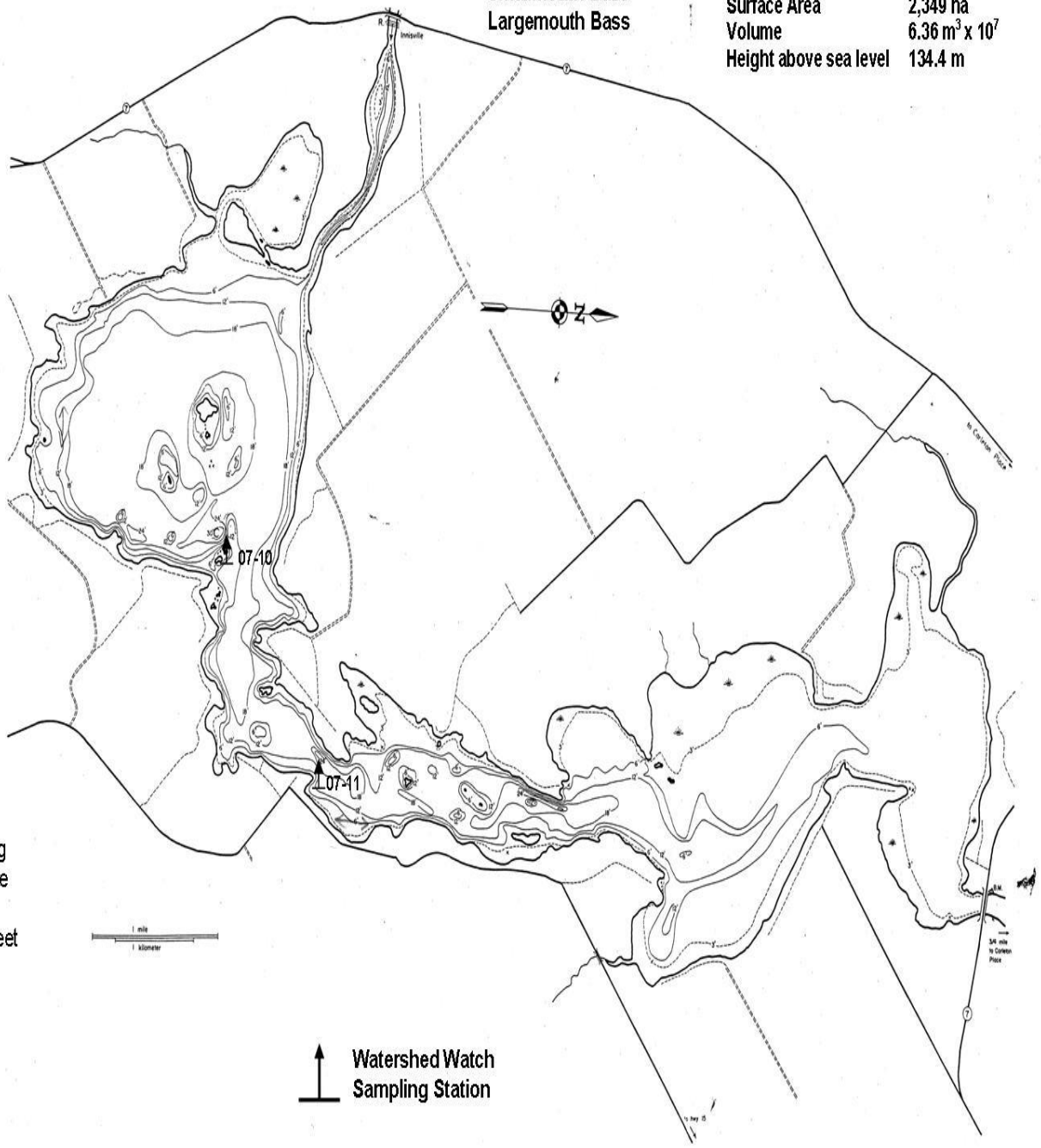
Latitude	45° 05'
Longitude	76° 10'
Max. Depth	9.2 m
Mean Depth	2.7 m
Perimeter	55.9 km
Surface Area	2,349 ha
Volume	6.36 m^3 x 10^7
Height above sea level	134.4 m

A Secchi Disc visually measures water clarity. The depth at which the disc disappears indicates the level of nutrients and algae growth. The higher the reading, the clearer the lake. The more nutrients that run into the lake, the more algae growth, thus causing reduced water clarity.

Secchi disc readings taken in 2007 indicate good clarity with the average for two stations being 4.25 m. Indicating a moderately enriched or mesotrophic lake.

This lake was last surveyed using imperial measurements, therefore the original bathymetric (depth) measurements are recorded in feet rather than metres.

3.28 ft = 1 m 1ft = 0.3048 m



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

Remember

Use non-lead sinkers to protect the health of the fish and this lake.

How Does Mississippi Lake Measure Up?

1973 – 2007 Water Quality Results – Second Lake

Sample Year	Secchi Disc Depth [Metre]	Total Phosphorus Euphotic Zone [Micrograms/Litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
1968	2.1			
1969	3.8			
1973	4.3			3.30
1974	3.7			3.00
**1975	2.5	26.4	26.0	13.70
1977	3.4			2.70
1978	4.1			3.00
1979	3.9			3.20
1980	2.7			4.50
1981	2.5			7.40
1982	2.6			5.40
1983	2.8			2.40
1984	3.1			5.80
1985	3.3			4.20
1986	3.0			3.00
1992	3.5			3.90
1994	3.3			3.20
1995	2.2			9.80
1996	3.1	13.0		
1997	3.3	22.0		
1998	3.3	14.0		
1999	3.5	8.0		
*2001	3.9			
2002	3.9	13.6	13.6	3.38
2007	4.3	12.3	15.5	0.87
n	25	7	3	18
Minimum	2.1	8.0	13.6	0.87
Maximum	4.3	26.4	26.0	13.70
Mean	**3.28**	**15.61**	**18.36**	**4.59**
Standard Deviation	0.626285	6.318868	6.678573	3.044485

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

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:

1 **PRESERVATION –** When purchasing a lakefront property, a natural shoreline is retained and access to the lake is designed to avoid shoreline damage.

2 **NATURALIZATION –** Degraded shorelines are left alone to return to their natural state.

3 **ENHANCEMENT –** Native species are planted and non-native species are removed.

4 **RESTORATION –** Cleared areas are planted with native species.

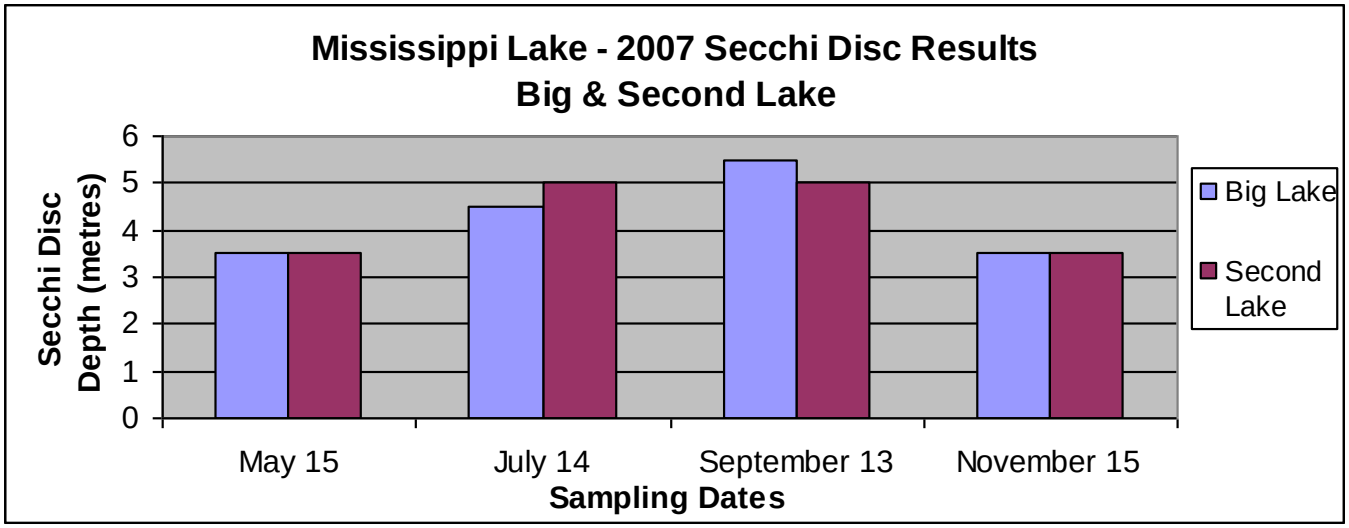
1976-2007 Water Quality Results – Big Lake

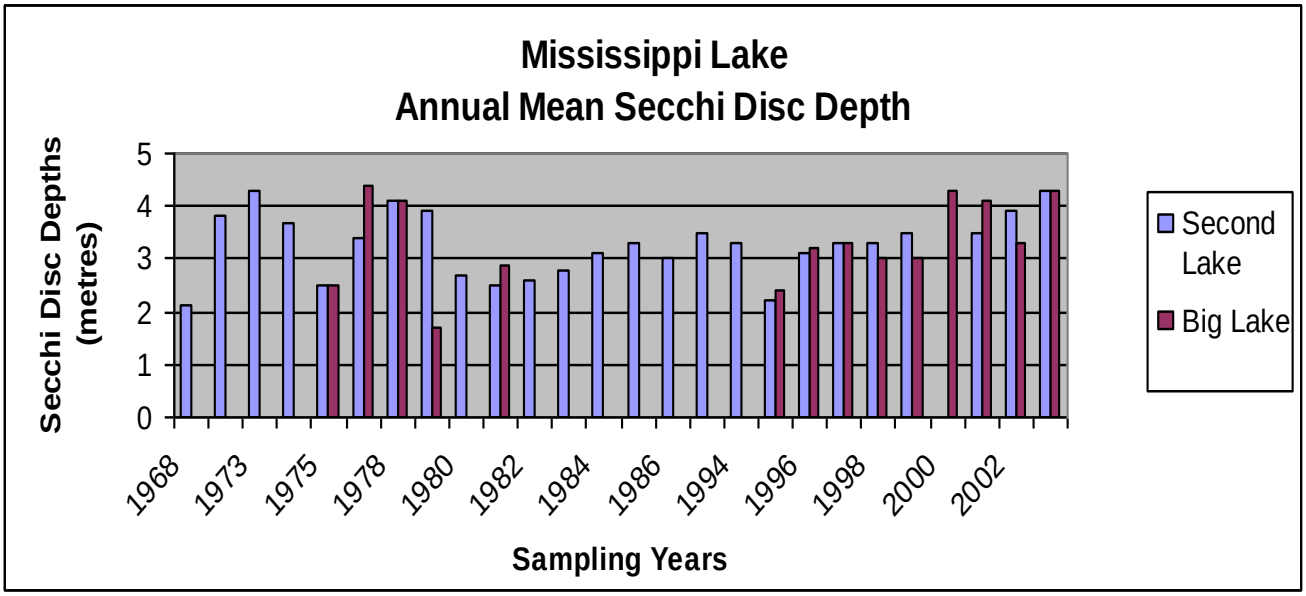
Sample Year	Secchi Disc Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/litre]	Chlorophyll a Composite [Micrograms/Litre]
**1975	2.5			13.70
1977	4.4			2.40
1978	4.1			3.00
1979	1.7			11.20
1981	2.9			7.60
1995	2.4			9.87
1996	3.2	17.0		
1997	3.3			
1998	3.0	20.0		
1999	3.0	12.0		
*2000	4.3	40.0		
*2001	4.1	13.0		
2002	3.3	17.0	15.5	3.83
2007	4.3	13.6	11.3	1.4
n	14	7	2	8
Minimum	1.7	12.0	11.3	1.15
Maximum	4.4	40.0	15.5	13.70
Mean	**3.32**	**18.94**	**13.4**	**6.62**
Standard Deviation	0.824788	9.696538	2.969848	4.606995

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

Evaluating Secchi Disc Readings:

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

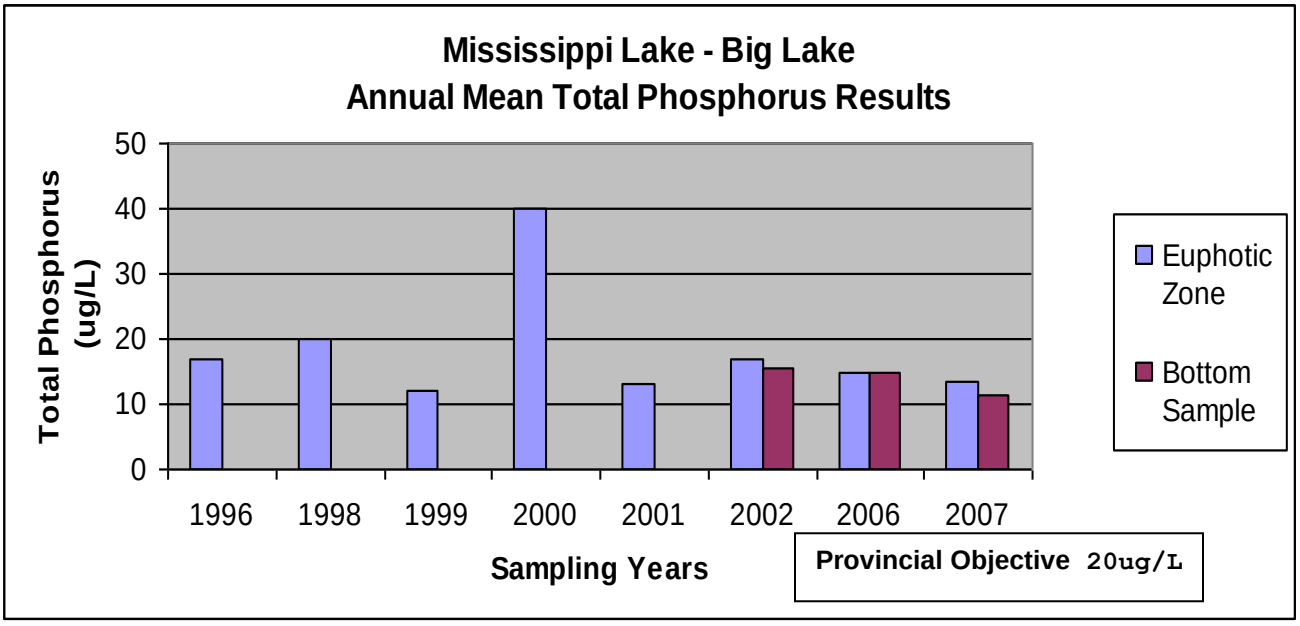


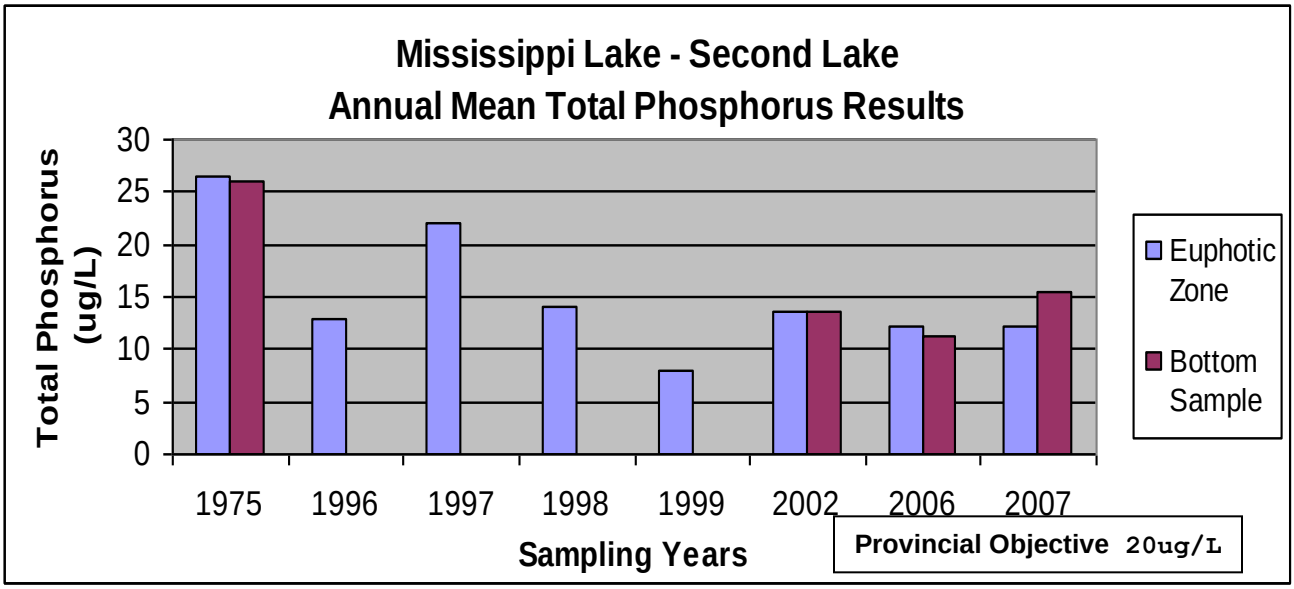


Evaluating Total Phosphorus Results:

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
10ug/L or less	Oligotrophic - unenriched, few nutrients
11 to 20ug/L	Mesotrophic – moderately enriched, some nutrients
21ug/L or more	Eutrophic – enriched, higher levels of nutrients



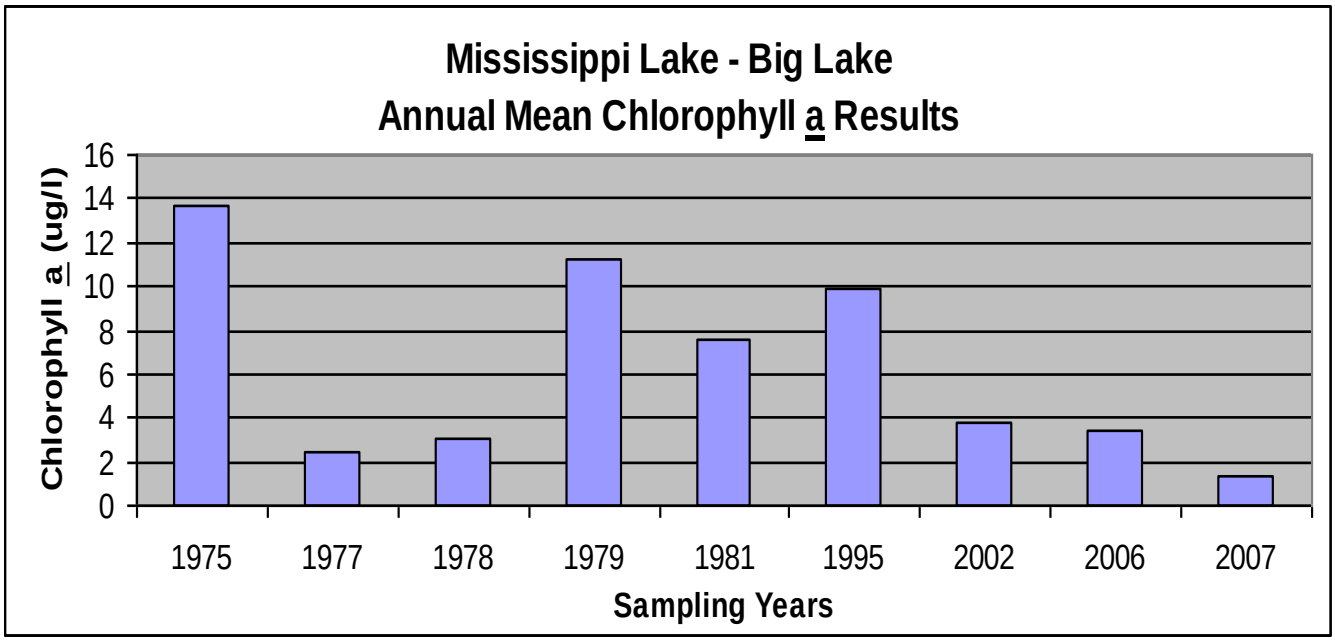


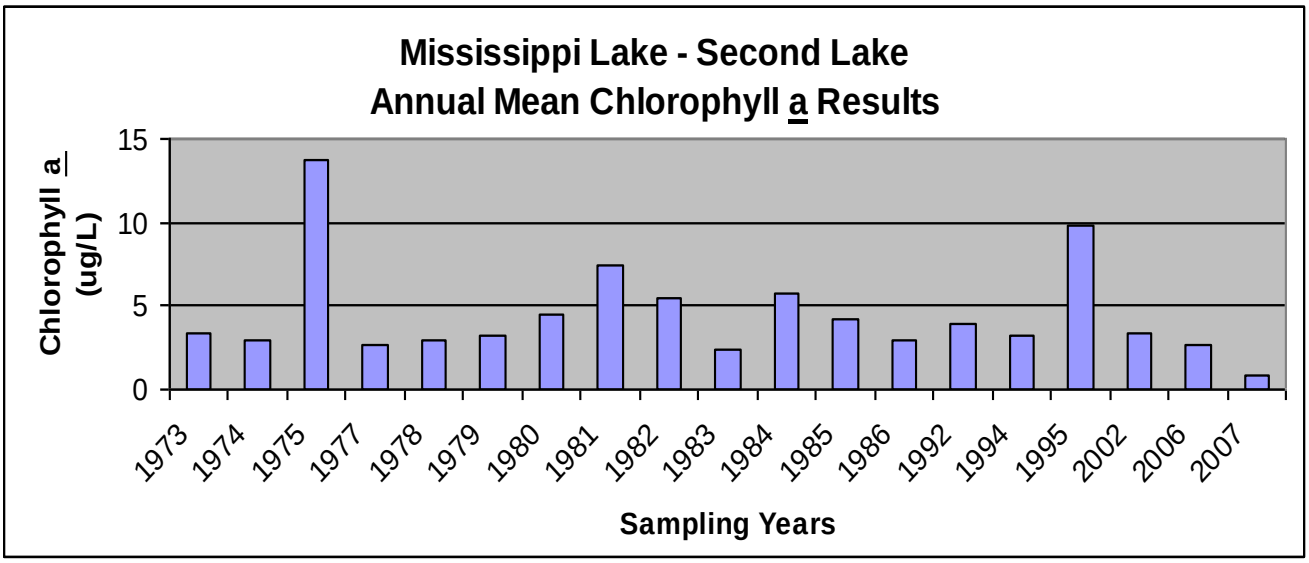
Evaluating your Chlorophyll a Results:

The lower the chlorophyll a density in your lake, the clearer your lake is. Chlorophylla 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 CHLOROPHYLLA RESULTS	
Secchi Reading	Lake Nutrient Status
Up to 2 ug/L - low algal density	Oligotrophic - unenriched, few nutrients

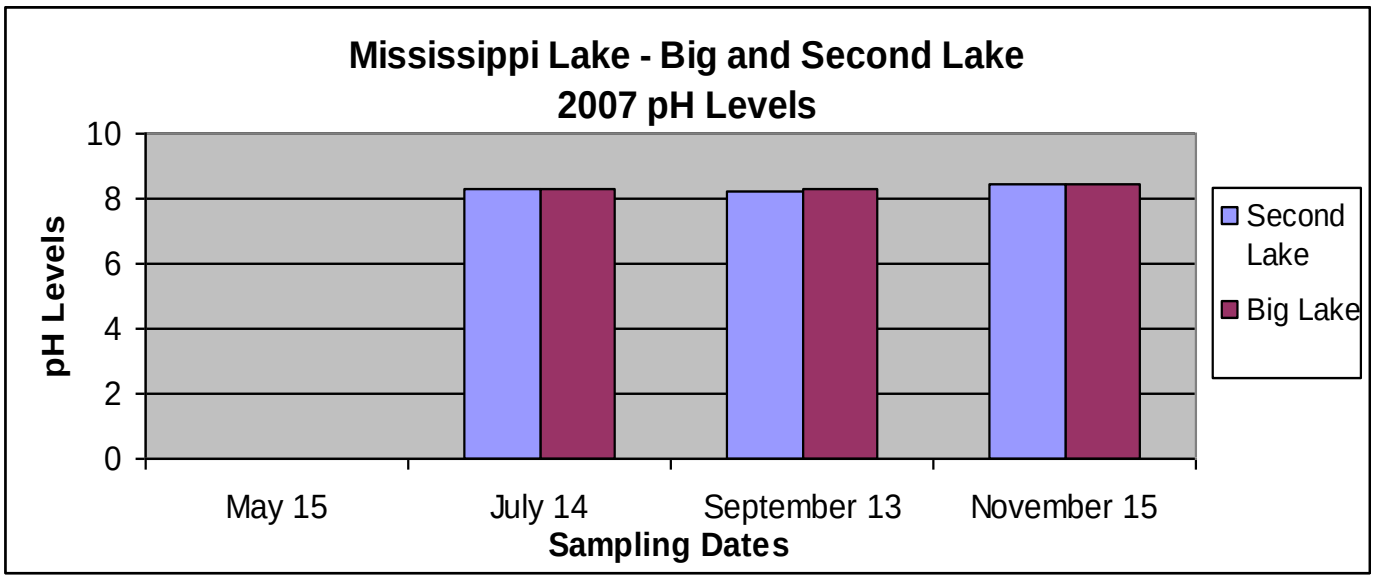
2-4 ug/L - moderate algal density	Mesotrophic - moderately enriched, some nutrients
More than 4 ug/L- high algal density	Eutrophic - enriched, higher levels of nutrients



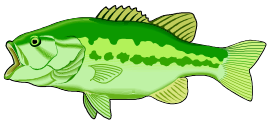


Evaluating your pH Results:

The pH value is a measure of the concentration of hydrogen ions of a substance, which ranges from very acidic (pH = 1) to very alkaline (pH = 14). At a normal to neutral acidity level, a lake supports a diversity of life. A pH of 7 is neutral and most lake waters range between 6 and 9. pH values less than 6 are considered acidic, and most life forms cannot survive at a pH of 4.0 or lower. This parameter directly influences the types of plants and animals that live in the lake. ***Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.**


Mississippi Lake - Big and Second Lake
2007 pH Levels
pH Levels
10
8
6
4
2
0
May 15
July 14
September 13
November 15
Sampling Dates
Second Lake
Big Lake

MISSISSIPPI LAKE – Big Lake
DISSOLVED OXYGEN/TEMPERATURE PROFILES
MOE Rec. Lks. Station # 19-3430-735-01, MVC Station # 07-10
Date: May 15, 2007
Depth: 10.0 Metres
Euphotic Zone (Penetration of Light) = 7.0 Metres



Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	16.4	10.0	98	
1.0	16.3	11.7	119	
2.0	16.3	12.1	117	
3.0	15.8	12.2	118	**Epilimnion**
4.0	15.5	12.1	115	
5.0	15.4	11.6	121	
6.0	15.4	11.2	108	
7.0	15.4	10.8	105	
8.0	15.4	10.1	96	
9.0	15.3	9.5	91	
10.0	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

MISSISSIPPI LAKE – Big Lake
Date: July 14, 2007
Depth: 10.0 Metres
Euphotic Zone (Penetration of Light) = 9.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	22.1	10.8	119	
1.0	22.1	10.5	115	
2.0	22.1	9.0	99	
3.0	22.1	8.6	95	
4.0	22.1	7.5	82	**Epilimnion**
5.0	22.0	7.1	76	
6.0	22.0	6.1	65	
7.0	22.0	5.5	59	
8.0	22.0	5.3	56	
9.0	22.0	5.0	54	
10.0	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

MISSISSIPPI LAKE – Big Lake
Date: September 13, 2007
Depth: 9.0 Metres
Euphotic Zone (Penetration of Light) = 10.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	20.3	9.0	96	
1.0	20.1	9.4	99	
2.0	19.8	9.4	98	**Epilimnion**
3.0	19.7	9.1	95	
4.0	19.5	9.0	95	
5.0	19.5	8.8	91	
6.0	19.5	8.7	90	
7.0	19.5	8.5	89	
8.0	19.5	8.5	89	
9.0	Bottom	Bottom	Bottom	

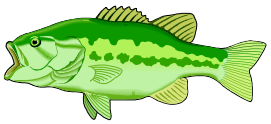
Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

MISSISSIPPI LAKE – Big Lake
Date: November 15, 2007
Depth: 8.0 Metres
Euphotic Zone (Penetration of Light) = 7.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	6.3	12.0	95	
1.0	6.3	12.1	96	
2.0	6.3	11.9	94	
3.0	6.2	11.7	93	
4.0	6.2	11.5	91	**Epilimnion**
5.0	6.2	11.1	87	
6.0	6.2	10.9	86	
7.0	6.2	10.8	85	
8.0	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25

MISSISSIPPI LAKE – Second Lake
DISSOLVED OXYGEN/TEMPERATURE PROFILES
Self-Help Station # 19-3430-014-01, MVC Station # 07-11



Date: May 15, 2007
Depth: 7.0 Metres
Euphotic Zone (Penetration of Light) = 8.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	15.9	9.8	95	**Epilimnion**
1.0	15.9	12.8	125	
2.0	14.2	15.9	150	**Thermocline 1**
3.0	14.2	15.9	150	
4.0	14.0	15.8	148	**Thermocline 2**
5.0	15.6	13.0	125	**Thermocline 3**
6.0	15.4	12.2	116	**Hypolimnion**
7.0	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

MISSISSIPPI LAKE – Second Lake
Date: July 14, 2007
Depth: 7.0 Metres
Euphotic Zone (Penetration of Light) = 7.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	22.1	10.2	111	
1.0	22.1	10.2	111	
2.0	22.1	9.6	105	**Epilimnion**
3.0	22.1	8.9	97	
4.0	22.1	8.3	93	
5.0	22.0	7.4	81	
6.0	22.0	7.1	76	
7.0	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

MISSISSIPPI LAKE - Second Lake
Date: September 13, 2007
Depth: 6.0 Metres
Euphotic Zone (Penetration of Light) = 10.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	20.3	8.8	93	
1.0	20.8	8.7	93	
2.0	19.8	9.0	95	**Epilimnion**
3.0	19.7	8.8	92	
4.0	19.6	9.0	95	
5.0	19.6	8.8	92	
6.0	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike, and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

MISSISSIPPI LAKE - Second Lake
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0.1	6.7	12.6	100	
1.0	6.7	12.5	100	
2.0	6.7	12.0	95	**Epilimnion**
3.0	6.7	11.8	93	
4.0	6.7	11.2	89	
5.0	6.6	10.8	86	
6.0	Bottom	Bottom	Bottom	

Warm Water Fisheries Habitat (Bass, Walleye, Pike, and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 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. ***Special Thanks to Melissa Dakers for volunteering her time and boat to help with the sampling process and Canadian Waste Management for once again showing their support with a generous donation.***

For more information regarding *Watershed Watch* or for free 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

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A WASTE MANAGEMENT COMPANY

Mississippi Valley Conservation