Mississippi Valley Conservation

State of the Lake Environment Report December 2005

Silver Lake

SILVER LAKE

Silver Lake is a cold water lake located in the amalgamated Township of Central Frontenac and Bathurst Burgess and Sherbrooke. Public boat launches are located in Silver Lake Provincial Park and at a rest stop area both located along Hwy # 7. As, of 1995 there were 87 cottages, 1 house and 3 (185) resorts including Silver Lake Provincial Park.

Silver Lake Facts

Elevation: 206 metres above sea level
Perimetre: 9.2 kilometres
Maximum depth: 24.4 metres
Fisheries include: Lake Trout
Splake
Northern Pike
Smallmouth Bass

Members of the Lake Association have volunteered their time to provide water quality testing through the Ministry of Environment (MOE) Self Help Program, also known as the Lake Partner Program since 1975. This data is extremely valuable, and helps provide a general picture of water quality conditions over the past 30 years. Comprehensive testing in 2000 and 2005 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program* provides for a comparison between water quality conditions as they exist now, to results obtained 26 years ago through the MOE Recreational Lakes Program.

In general the water quality in Silver Lake is good but has decreased slightly since 2000. There is one sampling station at the deepest point (24.4 metres) which was sampled eight times in 2005. You will find graphs which show water clarity, as measured by Secchi Disk readings, observations were good. The mean for 2005 is 6.9 metres indicating that Silver 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 Water Quality Objective for Total Phosphorus for Silver Lake is 10 micrograms/litre (*ug*/L). The average calculated from the total phosphorus results in 2005 for the euphotic zone (penetration of light) was 8*ug*/L and for the sample taken one metre off the bottom was 9.8*ug*/L indicating both samples as unenriched or an Oligotrophic lake.

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a densities for the sampling station in 2005 was 1.2micrograms/litre indicating a low algal density for Silver Lake in 2005.

It is not all good news, 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.

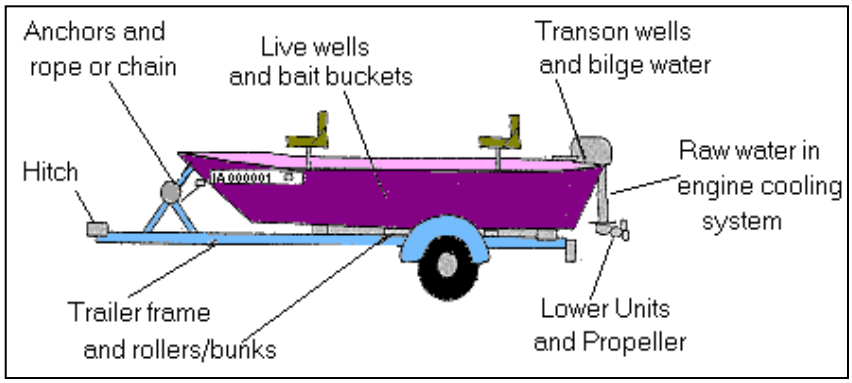
The dissolved oxygen and temperature data, measured at the deepest point in the main basin, indicate oxygen concentrations in the deep water portion are poor by late summer. Cold water fish species, such as lake trout are squeezed into 11 metres of the lake by late summer. Residents and users of Silver Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities, in order to protect this cold water resource.

Silver Lake was also tested for invasive species in 2005, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters. Spiny water flea was *not* detected in the samples collected for Silver Lake but zebra mussel veligers (larvae) and adults are present. 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.

Residents and users of Silver Lake should continue a stewardship approach to limit the amount of nutrients entering the lake. Monitoring over time is essential to determine long term trends and changes. There are helpful tips throughout this report to help reduce your impact on Silver Lake. Additional water quality data, current and historic, is available for Silver Lake and many other lakes in the Mississippi Valley watershed. Resources and information are readily available through the *Watershed Watch Program.* We all have a responsibility to preserve this precious natural resource for future generations.

MVC and OFAH need your help to Stop the Invasion!

Check & clean your boat every time you change water bodies



Working with Lake Associations, we hope to improve signage at public launching areas to identify lakes where zebra mussels and spiny water fleas are already present. We hope to focus on an ambitious educational campaign to help reduce their spread to lakes where they are not yet present.

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

How Does Silver Lake Measure Up?

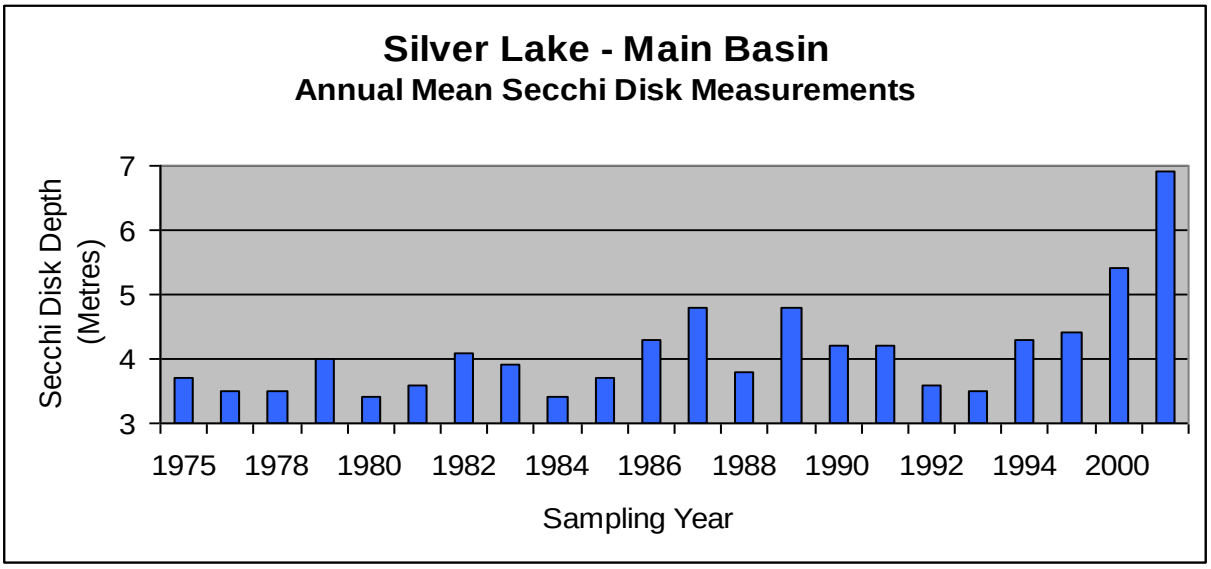
1975 – 2005 WATER QUALITY RESULTS – MAIN BASIN

Sample Year Mean	Secchi Disk Depth (Metres)	Total Phosphorus Euphotic Zone (Micrograms/litre)	Total Phosphorus 1 Metre off Bottom (Micrograms/litre)	Chlorophyll a Composite (Micrograms/litre)
1975	3.7			2.5
1977	3.5			2.4
1978	3.5			2.7
**1979	4.0	11.0	*9.0	*2.7
1980	3.4			3.6
1981	3.6			3.0
1982	4.1			2.4
1983	3.9			2.0
1984	3.4			3.0
1985	3.7			2.3
1986	4.3			3.2
1987	4.8			2.4
1988	3.8			1.8
1989	4.8			2.2
1990	4.2			3.1
1991	4.2			2.3
1992	3.6			2.4
1993	3.5			1.5
1994	4.3			3.6
1995	4.4			3.4
2000	5.4	17.3	*16.5	1.2
2005	6.9	8.0	9.8	1.2
n	22	3	3	22
Minimum	3.4	8.0	9.0	1.2
Maximum	6.9	17.3	16.5	3.6
Mean	4.1	12.1	11.7	2.5
Standard Deviation	0.80	4.74	4.11	0.68

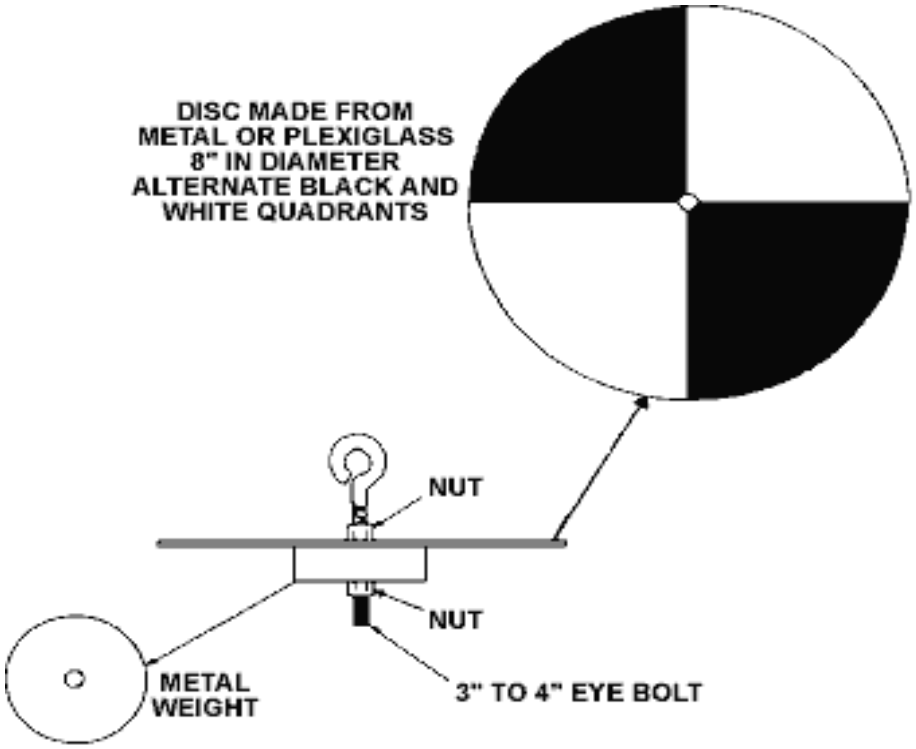
*Mean based on less than 6 measurements **Includes Recreational Lakes Program Data
Chlorophyll a data prior to 1985 has been adjusted to reflect new lab procedures
in filtering resulting in an increase in chl.a concentrations by 35%

The higher the Secchi Disk 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



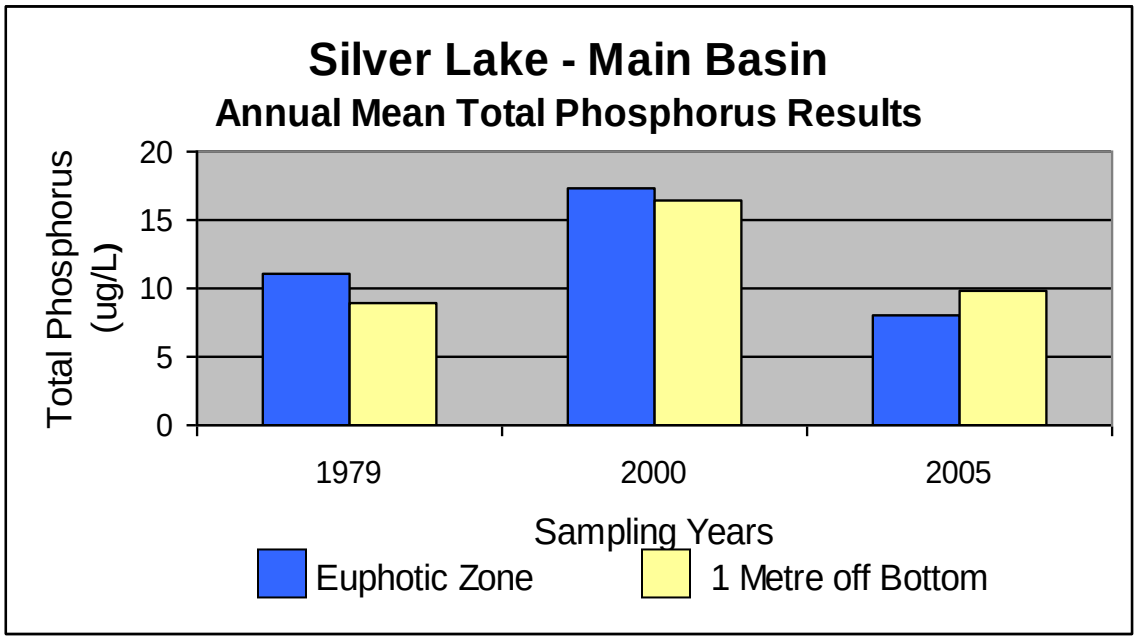
How to Make a Secchi Disk

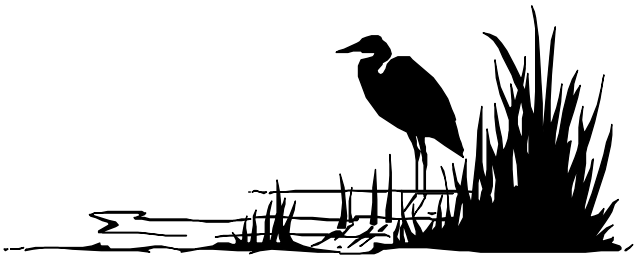


Interpreting Total Phosphorus Results:

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**
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

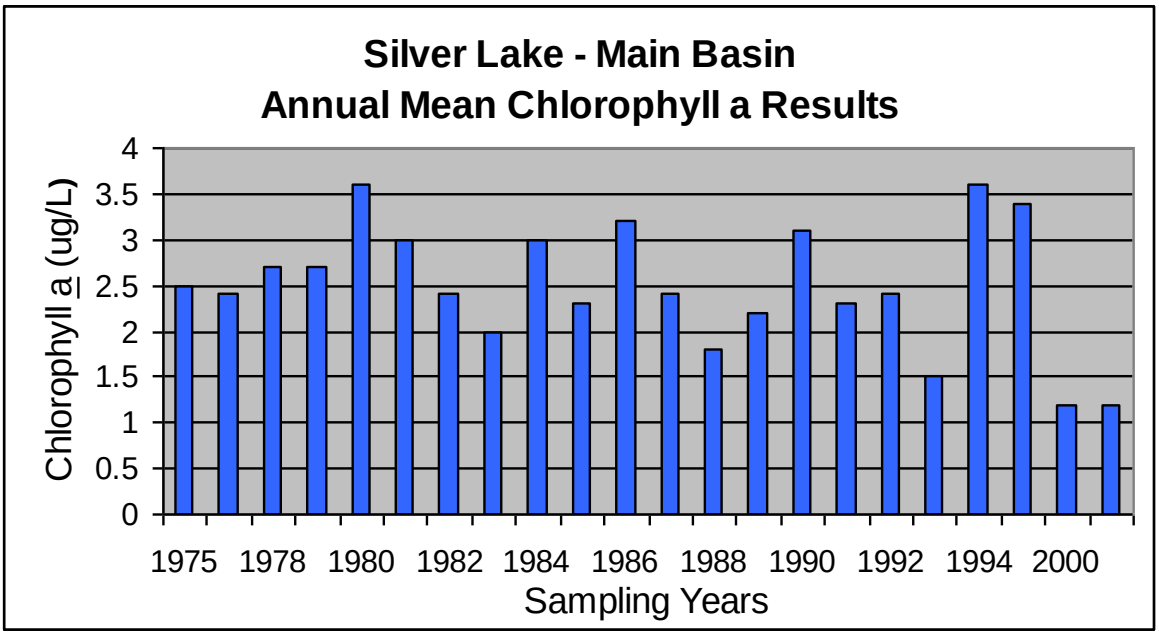




Evaluating your Chlorophyll a Results:

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	
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



For more information on lakes in the Mississippi Valley Watershed, visit MVC online at
www.mvc.on.ca

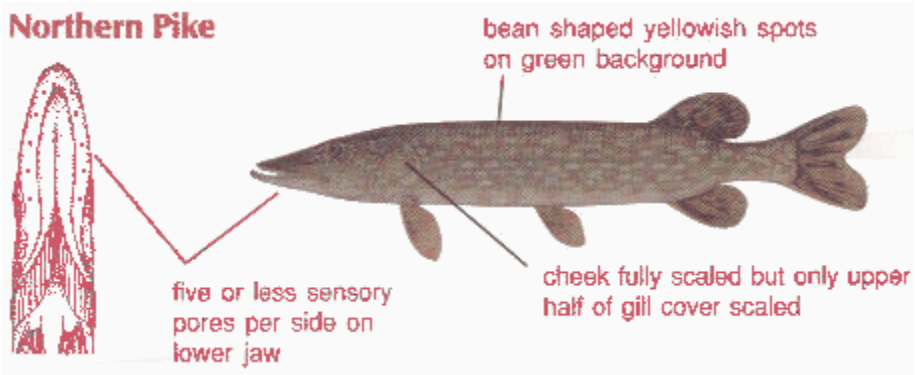
SILVER LAKE – MAIN BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-726-01 MVC # 05-01
Date: May 20, 2005
Euphotic Zone (Penetration of Light) = 14 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	14.9	9.1	86	
1.0	14.6	9.2	86	
2.0	13.8	9.3	86	
3.0	12.8	9.4	84	Epilimnion
4.0	12.1	9.5	84	
5.0	11.6	9.6	81	
6.0	11.3	9.5	80	
7.0	10.8	9.5	83	
8.0	10.5	9.5	82	
9.0	9.7	9.5	80	

10.0	9.4	9.6	81	
11.0	7.7	9.7	78	Thermocline
12.0	7.4	9.7	77	
13.0	6.9	9.6	76	
14.0	6.8	9.6	75	
15.0	6.5	9.5	74	
16.0	6.4	9.4	73	
17.0	6.3	9.3	72	Hypolimnion
18.0	6.3	9.2	71	
19.0	6.2	9.2	71	
20.0	6.2	9.1	71	
21.0	6.1	9.0	70	
22.0	6.1	8.9	69	
23.0	Bottom	Bottom	Bottom	

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

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



SILVER LAKE – MAIN BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 18-3430-726-01 MVC # 05-01

Date: July 28, 2005

Euphotic Zone (Penetration of Light) = 18 Meter

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	24.6	9.0	103	
1.0	24.5	9.1	105	
2.0	24.4	9.1	104	Epilimnion
3.0	24.4	9.1	104	
4.0	24.3	9.1	104	
5.0	24.0	8.7	89	
6.0	18.2	10.2	104	
7.0	15.1	10.4	100	Metalimnion
8.0	12.9	10.3	95	or Thermocline
9.0	11.2	10.1	89	

10.0	10.2	9.8	84	
11.0	9.3	9.6	81	
12.0	8.6	9.5	78	
13.0	7.8	9.6	77	
14.0	7.4	9.7	77	
15.0	7.1	9.7	77	
16.0	6.9	9.6	76	Hypolimnion
17.0	6.8	9.4	74	
18.0	6.7	9.0	71	
19.0	6.6	8.9	70	
20.0	6.5	8.2	65	
21.0	6.4	7.5	59	
22.0	6.4	6.7	53	
23.0	6.3	5.2	40	
24.0	Bottom	Bottom	Bottom	

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

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

Lake Trout

- light wormlike markings and spots on dark background, none red; deeply forked tail; white leading edge on lower fins, but no black line

SILVER LAKE – DISSOLVED TEMPERATURE

MAIN BASIN OXYGEN / PROFILE

MOE Rec. Lks.
MVC # 05-01

Station 18-3430-726-01

Date: September 23, 2005
Euphotic Zone (Penetration of Light) = 11 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	19.8	9.0	95	
1.0	19.8	9.3	97	
2.0	19.8	9.4	98	
3.0	19.8	9.4	98	
4.0	19.8	9.4	98	Epilimnion
5.0	19.8	9.4	98	
6.0	19.7	9.4	98	

7.0	19.7	9.2	96	
8.0	19.3	8.6	89	
9.0	12.8	6.0	53	Metalimnion
10.0	11.2	5.9	51	or Thermocline
11.0	9.8	6.0	51	
12.0	9.0	6.0	50	
13.0	8.5	5.9	48	
14.0	7.9	5.9	47	
15.0	7.5	6.4	52	
16.0	7.1	6.2	50	
17.0	6.9	5.7	45	Hypolimnion
18.0	6.7	5.4	40	
19.0	6.6	4.3	34	
20.0	6.6	3.3	26	
21.0	6.5	2.8	22	
22.0	6.5	1.3	10	
23.0	Bottom	Bottom	Bottom	

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

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

Splake – A Hybrid between Lake Trout and Brook Trout

●Splake and brook trout have very similar coloration patterns making it very difficult for the untrained eye to distinguish between the two species. Splake tend to have a slight forked tail, where brook trout have square tails.

SILVER LAKE – MAIN BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 18-3430-726-01 MVC # 05-01

Date: October 27, 2005

Euphotic Zone (Penetration of Light) = 14 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	10.7	9.0	78	
1.0	10.7	9.2	80	
2.0	10.7	9.2	80	
3.0	10.7	9.2	80	
4.0	10.6	9.2	80	
5.0	10.6	9.2	80	

6.0	10.6	9.2	80	Epilimnion
7.0	10.6	9.3	80	
8.0	10.6	9.2	79	
9.0	10.6	9.2	79	
10.0	10.6	9.2	79	
11.0	10.6	9.1	78	
12.0	10.4	9.1	78	
13.0	9.5	6.3	54	
14.0	8.5	4.8	4.7	
15.0	7.6	4.3	4.2	
16.0	7.4	4.1	4.0	
17.0	7.1	3.7	3.6	
18.0	6.9	3.6	3.5	
19.0	6.7	2.6	2.5	
20.0	6.6	1.9	1.8	
21.0	6.5	1.2	1.2	
22.0	6.5	0.7	0.7	
23.0	6.5	0.4	0.4	
24.0	Bottom	Bottom	Bottom	

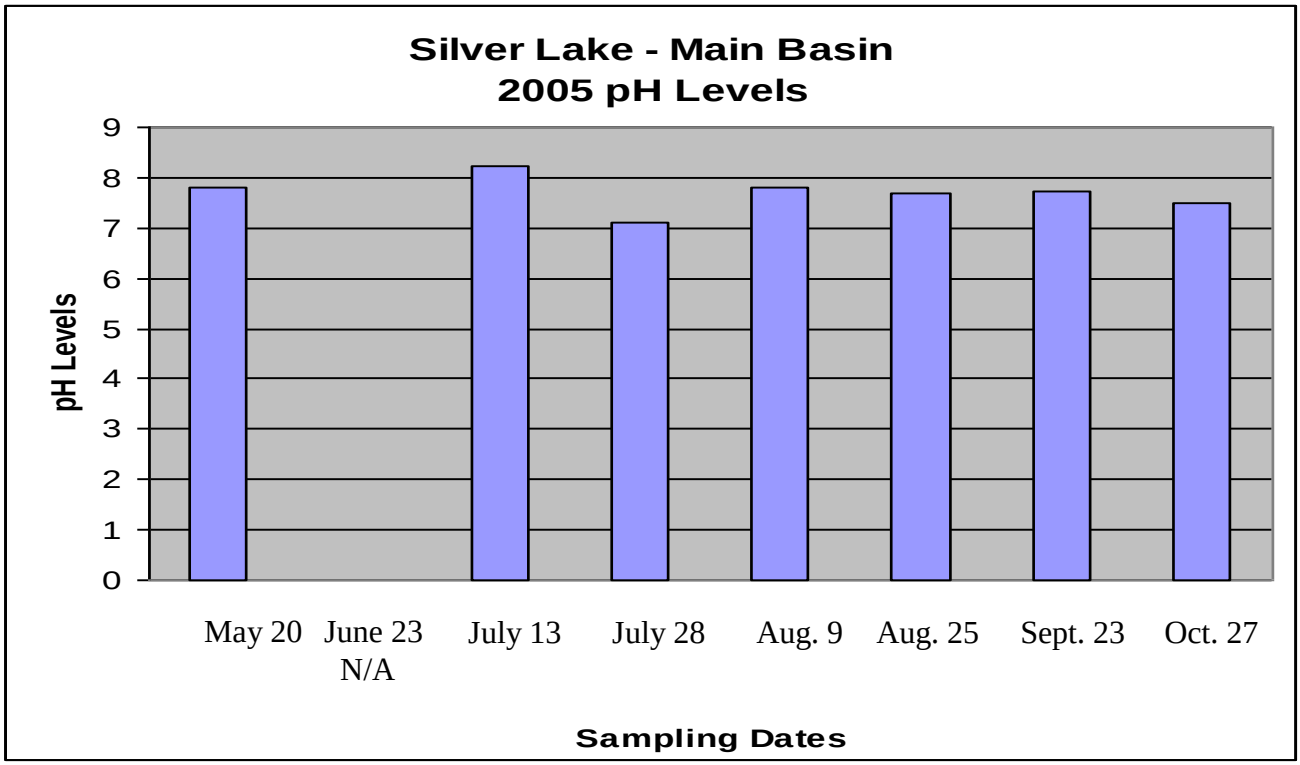
Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C.

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

Smallmouth Bass

● Both species of bass are plentiful throughout Ontario and are high on most anglers sought-after list. From the hard-fought pulls of the smallmouth to the weedy lair of the largemouth, you are sure to fall in love with these beautiful fish.
Ontario Record Largemouth - 10.43 lbs. Ontario Record Smallmouth - 9.84 lbs.

Evaluating your pH Results: Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.



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.

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

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

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

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**

Environmental Monitoring for you and your family.

There are numerous programs for you and your family to participate in, all of which are great ways to learn while monitoring your environment. The programs listed below are easy to use and created for those who are concerned for the environment.

***** The **Great Ontario Dip-In.** This program helps determine your lakes water clarity while contributing to the documentation of your province's water quality. For more information contact the Federation of Ontario Cottagers' Association Inc. at www.foca.on.ca or the Ministry of the Environment at www.ene.gov.on.ca

***** Borrow a **Zebra Mussel Kit** from MVC or the Ontario Federation of Anglers and Hunters (OFAH). This will give you the opportunity to help stop the spread of invasive species such as zebra mussels and spiny water flea in Ontario waters. For more information contact MVC or OFAH at www.ofah.org

***** Become a **Citizen Scientist**. Environment Canada's Environmental Monitoring and Assessment Network (EMAN) are working with the Canadian Nature Federation (CNF) to create nature watch programs. These programs give people the opportunity to learn about the environment while helping gather information needed to protect it. There is a wide variety of watch programs to choose from such as frog watch, plant watch, ice watch and worm watch, this is a great program for kids. To become a citizen scientist check out the nature watch website at www.naturewatch.ca

*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 Canadian Waste Management for adopting Silver Lake with a generous donation. We would also like to thank Glenn Jackson for his time and for the use of his boat.***

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

CANADIAN WASTE
A WASTE MANAGEMENT COMPANY