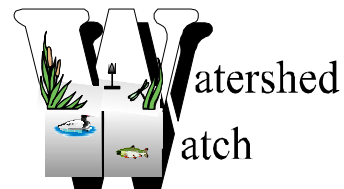




Mississippi Valley Conservation

*State of the Lake
Environment Report
December 2005*

Sunday Lake



SUNDAY LAKE

Sunday Lake is warm water lake located within the amalgamated Township of North Frontenac. A public boat launch is located on the north shore, off Cruise Road. Although few residents live on Sunday Lake there is an active cottage owners association.

Sunday Lake Facts

Elevation: approx. 247.3m above sea level

Area: 57.87 hectares

Perimeter: 6.64 kilometers

Maximum depth: 15.8 metres

Fisheries include: Northern Pike,
Large/Smallmouth Bass



Limited water quality data is available for Sunday Lake. Records indicate that shoreline property owners have participated in the Ministry of Environment's Self-Help Program also known as the Lake Partner Program, since 1996. Sunday Lake was not monitored by the Ministry of the Environment under the Recreational Lakes Program during the 1970's and early 1980's. However, comprehensive testing in 2000 and 2005 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program* provides comparison between water quality conditions as they exist now, to results obtained 9 years ago through the Self-Help Program.

In general the water quality in Sunday Lake is very good. There is one sampling station located at the deepest point (15.8 metres) which was sampled three times in 2005. A map is provided in the report for exact sampling station location. You will find graphs which show water clarity, as measured by Secchi Disk readings, observations were good. The mean for 2005 is 5.2 metres indicating Sunday Lake as a Unenriched (some nutrients) or a 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 in Sunday Lake is 20 micrograms/litre (*ug/L*). The average calculated for the total phosphorus results in 2005 for the euphotic zone (penetration of light) was 7.7 *ug/L*, indicating a Oligotrophic or unenriched lake in 2005. The average for the phosphorus sample taken one metre off the bottom was 18.3 *ug/L*, indicating a moderately enriched (some nutrients) or Mesotrophic lake.

Chlorophyll *a* is a measure of algal density in a lake. The average chlorophyll *a* density for Sunday Lake in 2005 was 6.6 micrograms/litre indicating a high algal density.

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.

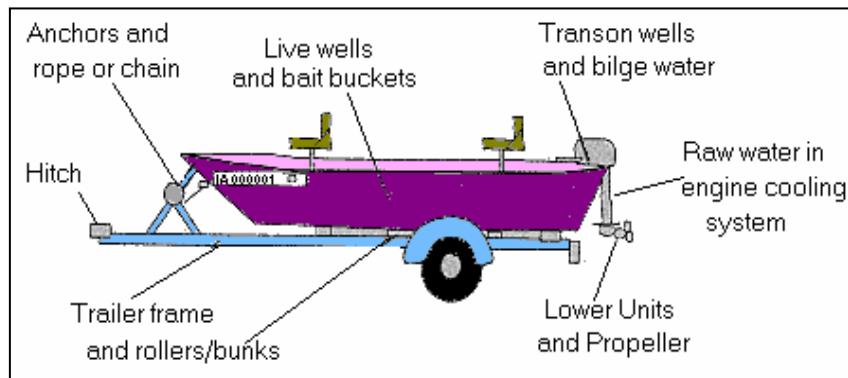
The dissolved oxygen and temperature data, measured at the deepest point in the main basin, indicate oxygen concentrations in the deep water portion are reduced by late-summer. Warm water fish species, such as walleye and smallmouth bass, are squeezed into the upper 7 metres of the lake by September.

Sunday 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. Sunday Lake did *not* have zebra mussel veligers (larvae) or spiny water flea present in the samples collected. Residents and property owners need to ensure that all access points to the lake have posted signs indicating the precautions they can take to avoid the spread of invasive species into Sunday Lake.

Residents and users of Sunday Lake should continue a stewardship approach to limit the amount of nutrients entering the lake. It is recommended that the Lake Association choose a Lake Steward to continue the water quality testing and to join the Mississippi Valley Lake Stewardship Network. Monitoring over time is essential to determine long term trends and changes. 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 Sunday Lake Measure Up?

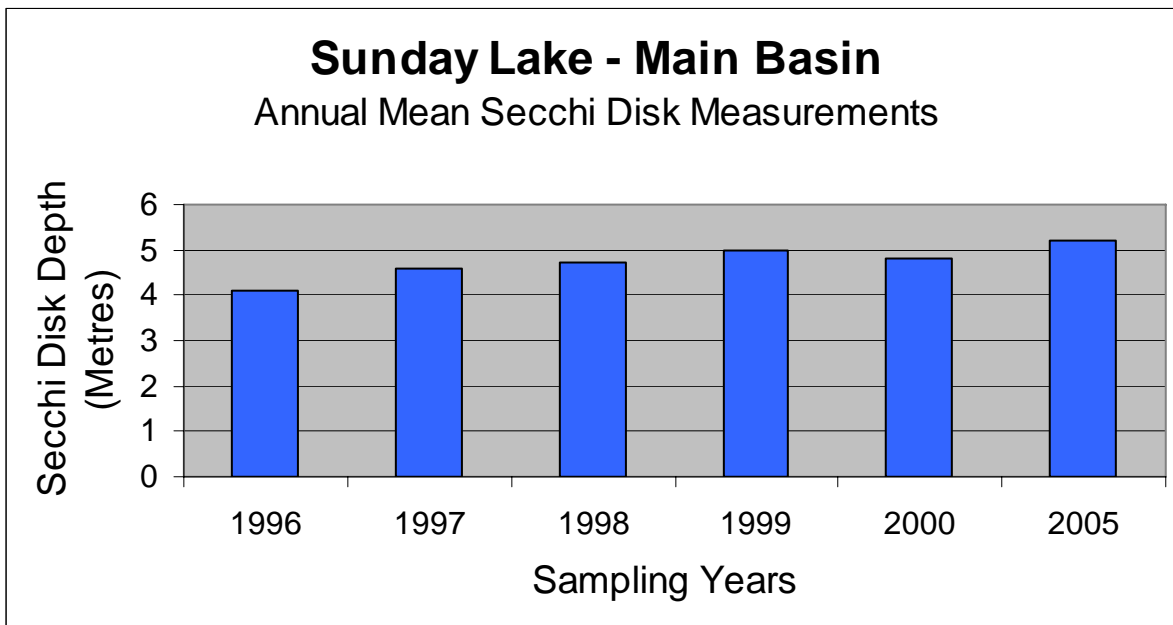
1996 – 2005 WATER QUALITY RESULTS – MAIN BASIN

Sample Year Mean	Secchi Disk Depth (Metres)	Total Phosphorus Euphotic Zone (Micrograms/litre)	Total Phosphorus 1 Metre off Bottom (Micrograms/litre)	Chlorophyll <u>a</u> Composite (Micrograms/litre)
1996	4.1*	7.5		
1997	4.6	6.0		
1998	4.7	7.6		
1999	5.0	12.0		
2000	4.8**	10.8**	21.8*	0.78
2005	5.2*	7.7*	18.3*	6.63*
n	6	6	2	2
Minimum	4.1	6.0	18.3	0.78
Maximum	5.2	12.0	21.8	6.63
Mean	4.7	8.6	20.1	3.7
Standard Deviation	0.37	2.28	2.47	4.13

*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!

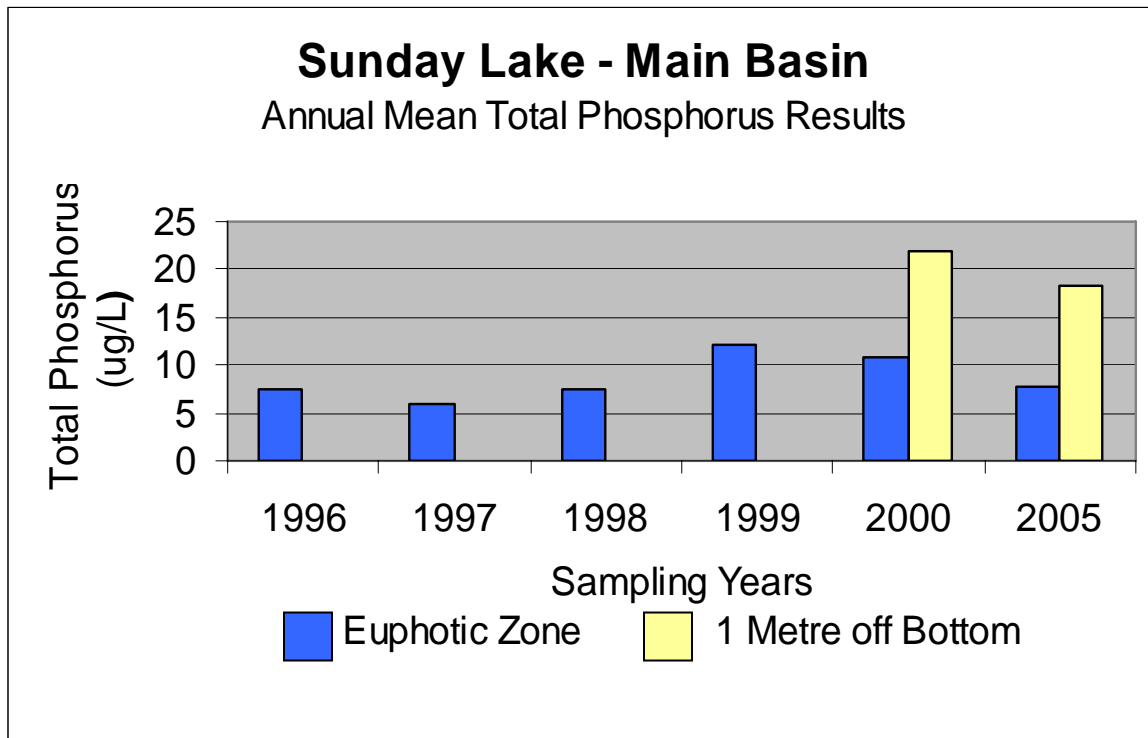
INTERPRETING YOUR SECCHI DISC RESULTS	
Secchi Reading	Lake Nutrient Status
Over 5 metres	Oligotrophic - unenriched, few nutrients
3.0 to 4.9 metres	Mesotrophic – moderately enriched, some nutrients
Less than 2.9 metres	Eutrophic – enriched, higher levels of nutrients



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.

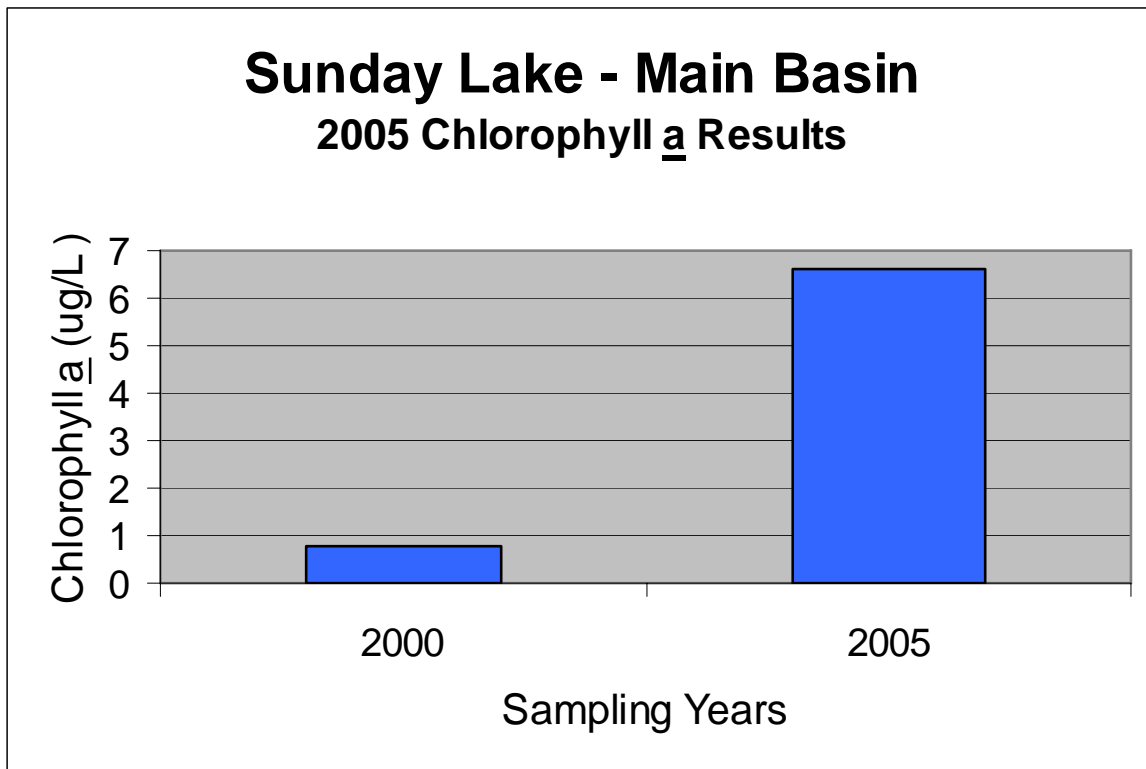
INTERPRETING YOUR TOTAL PHOSPHORUS RESULTS	
Total Phosphorus	Lake Nutrient Status
10 ug/L or less	Oligotrophic - unenriched, few nutrients
11 to 20 ug/L	Mesotrophic – moderately enriched, some nutrients
21 ug/L or more	Eutrophic – enriched, higher levels of nutrients



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 <u>A</u> RESULTS	
Chlorophyll <u>a</u> 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



SUNDAY LAKE – MAIN BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 19-3430-036-01

MVC # 05-14

Date: May 11, 2005

Euphotic Zone (Penetration of Light) = 9 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	16.8	13	128	Epilimnion
1.0	16.6	13.2	130	
2.0	12.4	14.7	133	Metalimnion or Thermocline
3.0	11.1	15.8	139	
4.0	9.4	15.6	131	
5.0	7.4	13.2	105	
6.0	7.4	12.2	97	
7.0	5.5	6.9	52	
8.0	4.5	4.9	36	
9.0	4.1	3.7	27	Hypolimnion
10.0	4.4	3.0	22	
11.0	4.0	1.8	12	
12.0	3.9	0.5	7	
13.0	3.9	0.3	2	
14.0	3.9	0.2	2	
15.0	Bottom	Bottom	Bottom	

SUNDAY LAKE – MAIN BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 19-3430-036-01

MVC # 05-14

Date: July 6, 2005

Euphotic Zone (Penetration of Light) = 8 Meters



Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	24.2	9.0	100	Epilimnion
1.0	24.0	9.3	105	
2.0	23.4	9.2	103	
3.0	20.5	8.8	93	Metalimnion or Thermocline
4.0	16.2	11.4	113	
5.0	12.7	11.3	103	
6.0	9.4	10.3	87	
7.0	7.7	6.0	48	
8.0	6.2	3.5	27	Hypolimnion
9.0	5.4	2.1	16	
10.0	4.8	0.5	4	
11.0	4.4	0.4	3	
12.0	4.1	0.4	2	
13.0	4.1	0.4	2	
14.0	Bottom	Bottom	Bottom	

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

SUNDAY LAKE – MAIN BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE


MOE Rec. Lks. Station 19-3430-036-01

MVC # 05-14

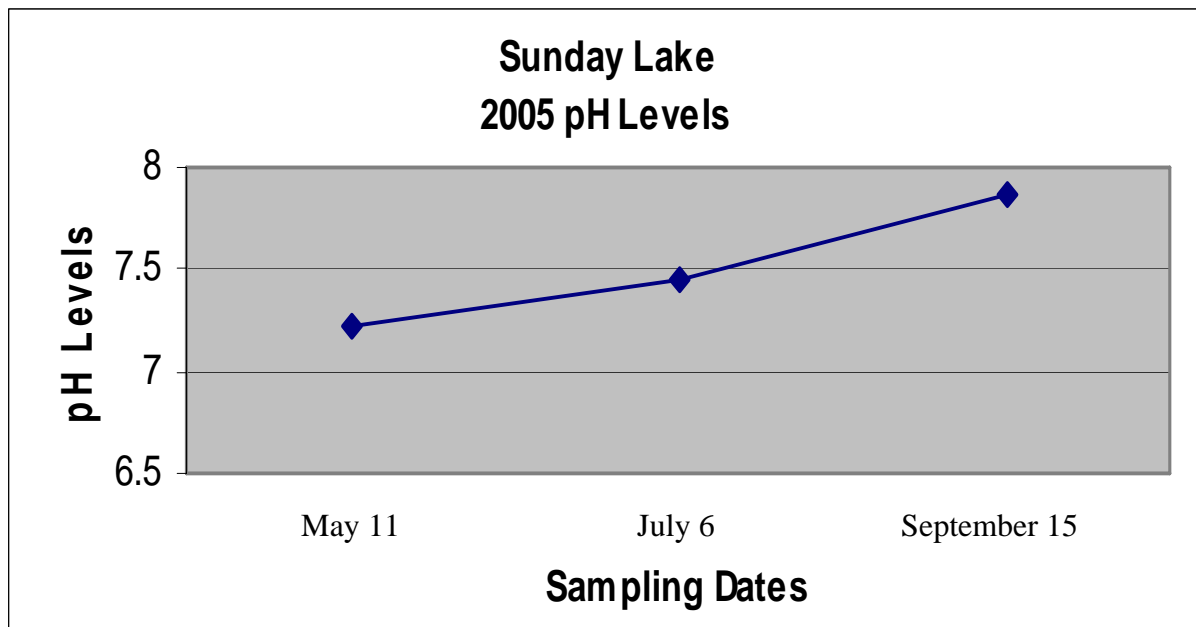
Date: September 15, 2005

Euphotic Zone (Penetration of Light) = 9 Metres

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	22.3	9.6	105	Epilimnion
1.0	22.0	9.9	108	
2.0	21.7	9.8	105	
3.0	20.7	10.1	107	
4.0	19.9	9.7	102	
5.0	16.8	9.7	95	Metalimnion or Thermocline
6.0	11.7	9.7	86	
7.0	9.2	8.9	75	
8.0	7.2	4.2	34	
9.0	6.1	0.7	5	
10.0	5.3	0.5	3	
11.0	4.8	0.3	2	
12.0	Bottom	Bottom	Bottom	

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

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.

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



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

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



Mississippi Valley Conservation

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 and enhance your lake environment, contact Susan Lee, Water Quality Technician at Mississippi Valley Conservation. (613) 259-2421 or slee@mvc.on.ca

