Mississippi Valley Conservation

State of the Lake Environment Report December 2005

Grindstone Lake

Watershed Watch

GRINDSTONE LAKE

Grindstone Lake is a warm water lake located in the amalgamated township of North Frontenac. A public boat launch is located near the town of Plevna. While travelling east on Hwy #509 through Plevna turn left onto Mountain Road and turn once again onto Grindstone Lake Road. At last count in 1980 there were 33 cottages on the lake.

Grindstone Lake Facts

Elevation: 328 metres above sea level
Perimetre: 17.1 kilometres
Maximum depth: 19 metres
Fisheries include: Northern Pike
Largemouth Bass
Smallmouth Bass
Yellow Perch
Rock Bass

Residents of Grindstone Lake have volunteered their time in the past, to provide water quality testing in the north basin, through the Ministry of the Environment (MOE) Self Help Program in the late 1980's. This data is extremely valuable and provides a general picture of water quality conditions over the past 18 years. Comprehensive testing in 2000 and in 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 twenty-nine years ago through the MOE Recreational Lakes Program.

In general the water quality in Grindstone Lake is very good. There are two sampling stations at the deepest points in the north basin (18.7 metres) and the south basin (19 metres). Both stations were sampled three times throughout the summer. You will find graphs which show water clarity, as measured by a Secchi Disk, observations were good. The average for the two stations in 2005 is 5.2 metres indicating that Grindstone 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 Grindstone Lake is 20 micrograms/litre (*ug*/L). The average for the two stations in the euphotic zone (penetration of light) for 2005 is 6.8 *ug*/L indicating, an unenriched lake. Whereas, the average for one metre off the bottom is 14 *ug*/L, indicating a moderately enriched lake environment.

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a densities for the two sampling stations in 2005 was 2.04 micrograms/litre, indicating a moderate algal density or a Mesotrophic lake environment.

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.

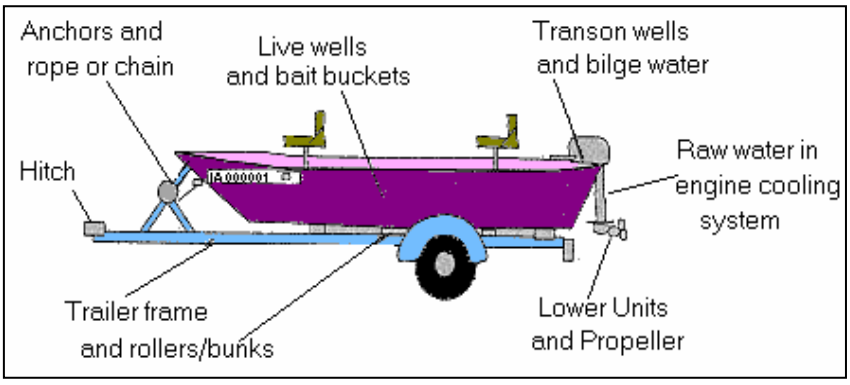
The dissolved oxygen and temperature data, measured at the deepest point in the north basin, indicates oxygen concentrations in the deep water portion are poor by late summer. Warm water fish species, are squeezed into the upper 9 metres of the lake by late summer. The south basin indicates oxygen concentrations in the deep water portion are also poor in September, squeezing fish into the upper 9 metres of the lake. Therefore, residents and users of Grindstone Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities.

Grindstone 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. Grindstone Lake *did not* have spiny water flea or zebra mussel veligers (larvae) 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 Grindstone Lake.

Residents and users of Grindstone 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. Additional water quality data, current and historic, is available for Grindstone 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 1-800-563-771

How does Grindstone measure up?

1976 – 2005 WATER QUALITY RESULTS – NORTH 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)
**1976	5.2	13.0	*24.0	2.70
**1980	4.6	*4.5	*26.0	2.40
1987	4.4			1.80
1988	5.0			1.80
1989	5.1			2.00
2000	5.4	14.3	*143.0	0.74
*2005	*5.2	*1.33	*18.0	*2.13
n	7	4	4	7
Minimum	4.4	1.33	18.0	0.74
Maximum	5.4	14.3	143.0	2.70
Mean	4.9	8.3	52.7	1.9
Standard Deviation	0.36	6.35	60.26	0.62

1976 – 2005 WATER QUALITY RESULTS – SOUTH BASIN

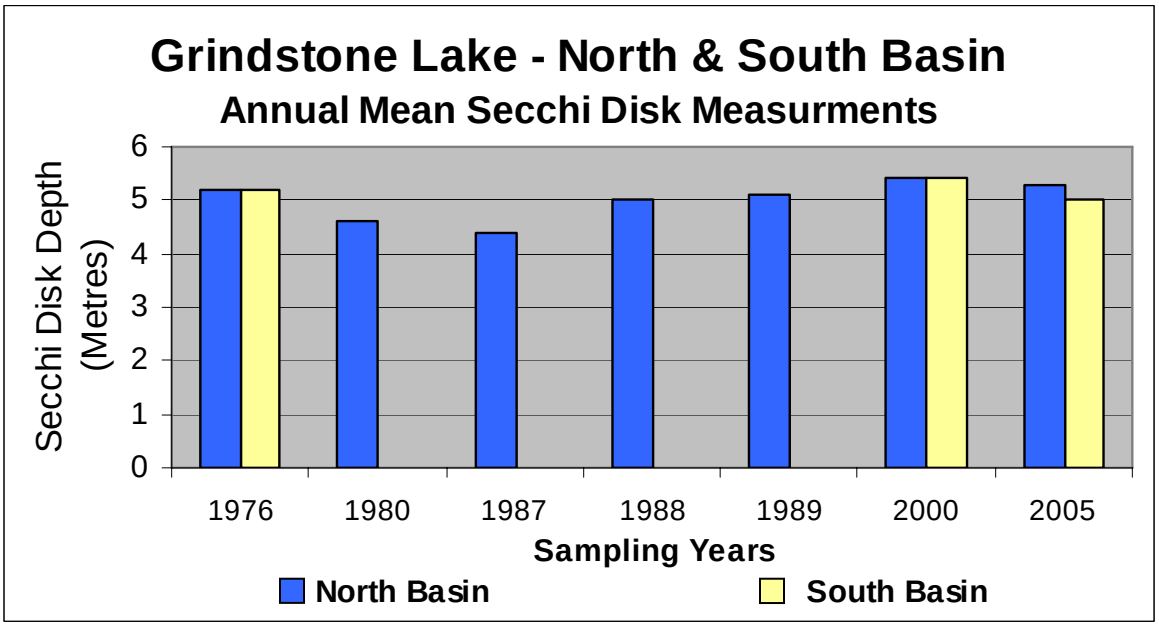
Sample Year Mean	Secchi Disk Depth (Metres)	Total Phosphorus Euphotic Zone (Micrograms/litre)	Total Phosphorus 1 Metre off Bottom (Micrograms/litre)	Chlorophyll a Composite (Micrograms/litre)
**1976	5.2	9.0	*18.0	2.30
2000	5.4	12.1	N/A	0.63
2005	*5.0	*12.3	*10.0	*1.96
n	3	3	2	3
Minimum	5.0	9.0	10.0	0.63
Maximum	*5.4	*12.3	*18.0	*2.30
Mean	5.2	11.1	14.0	1.63
Standard Deviation	0.2	1.85	5.65	0.87

*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%

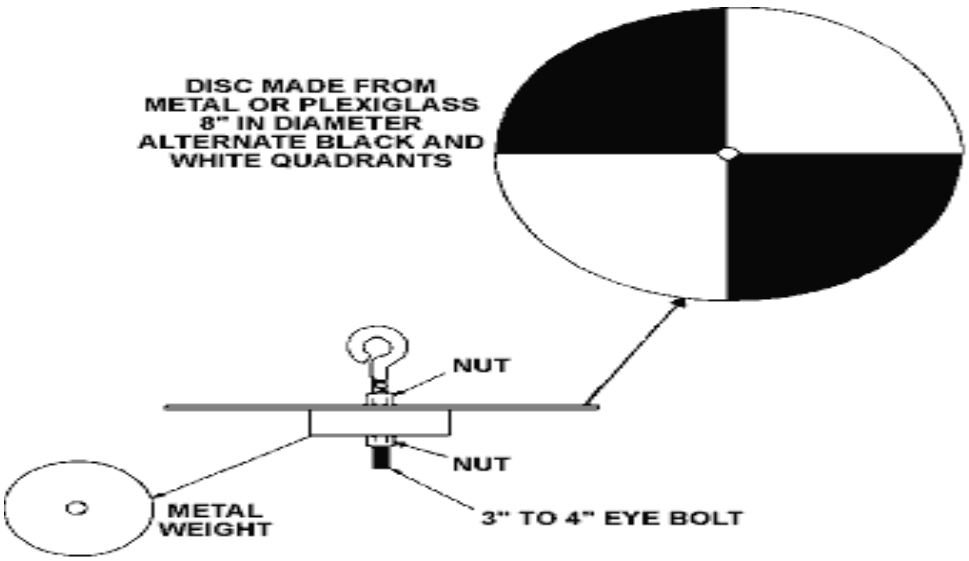
For more information on lakes in the Mississippi Valley Watershed, visit MVC online at
www.mvc.on.ca

The higher the Secchi Disk measurement the clearer your lake is!

INTERPRETING YOUR SECCHI DISK 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



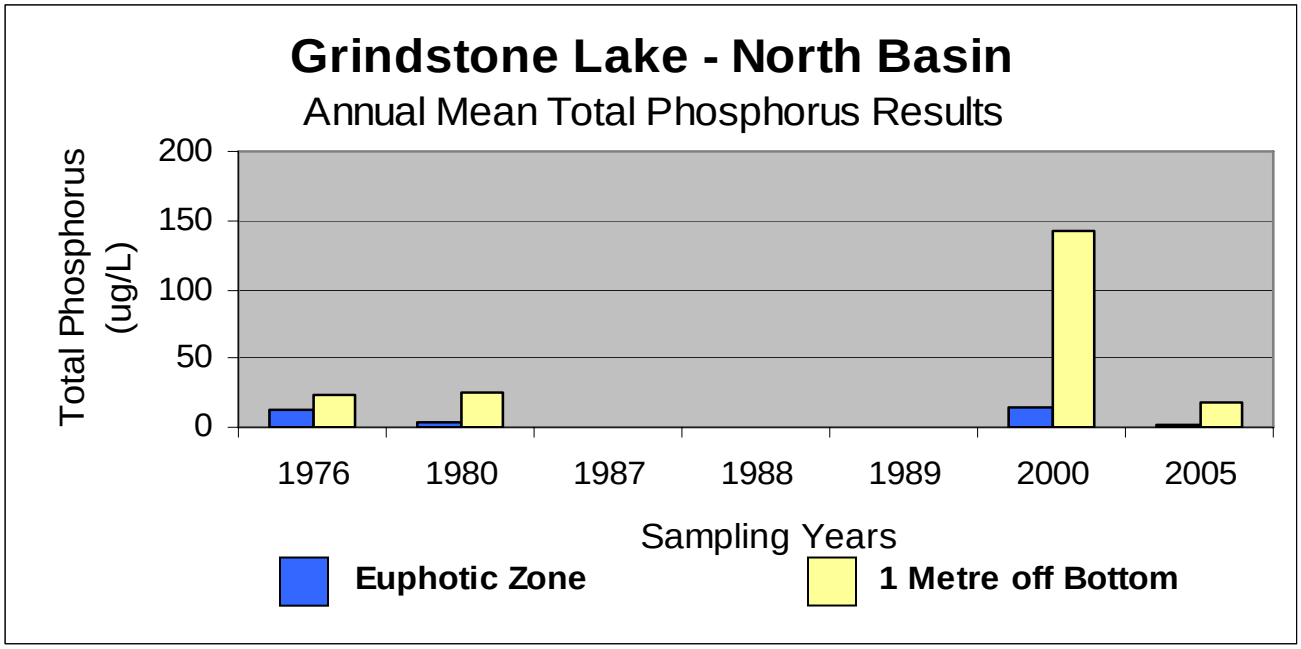
How to make a Secchi Disk

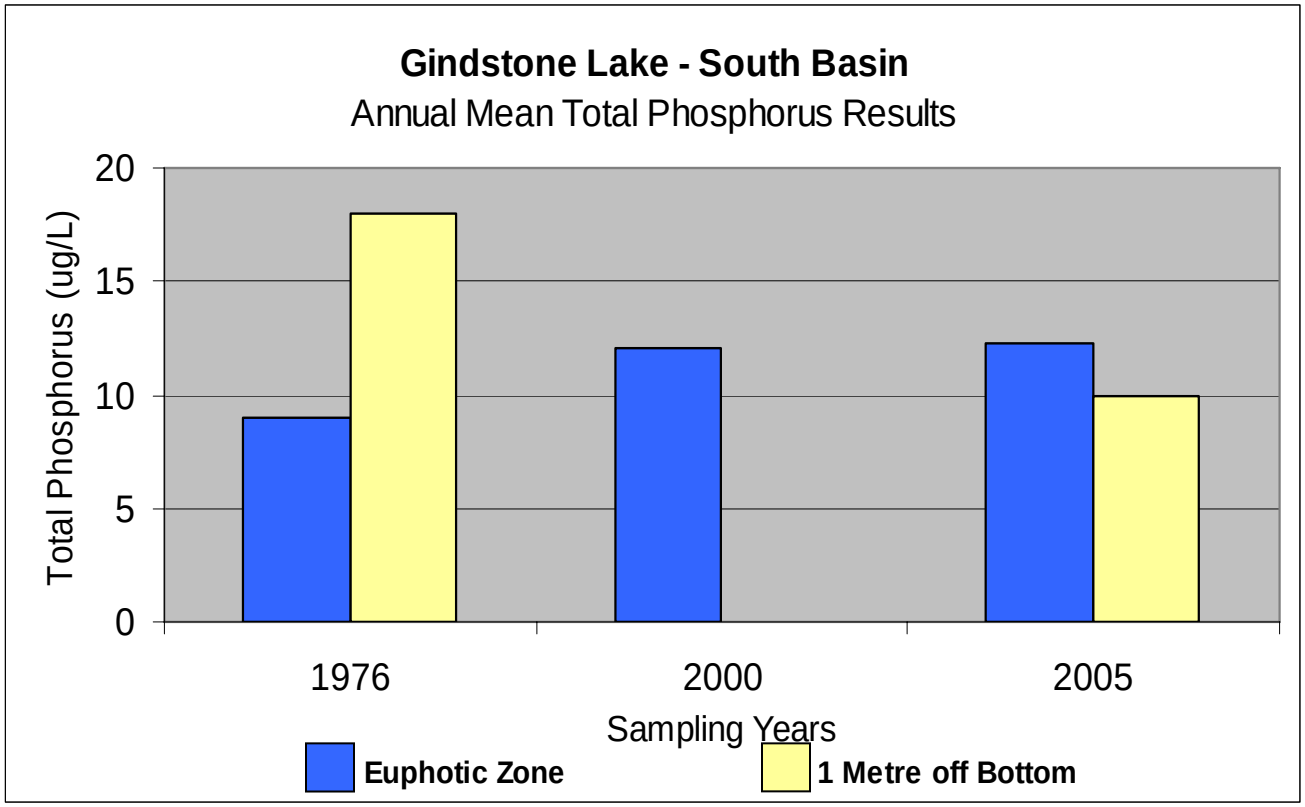


Interpreting Total Phosphorus Results:

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

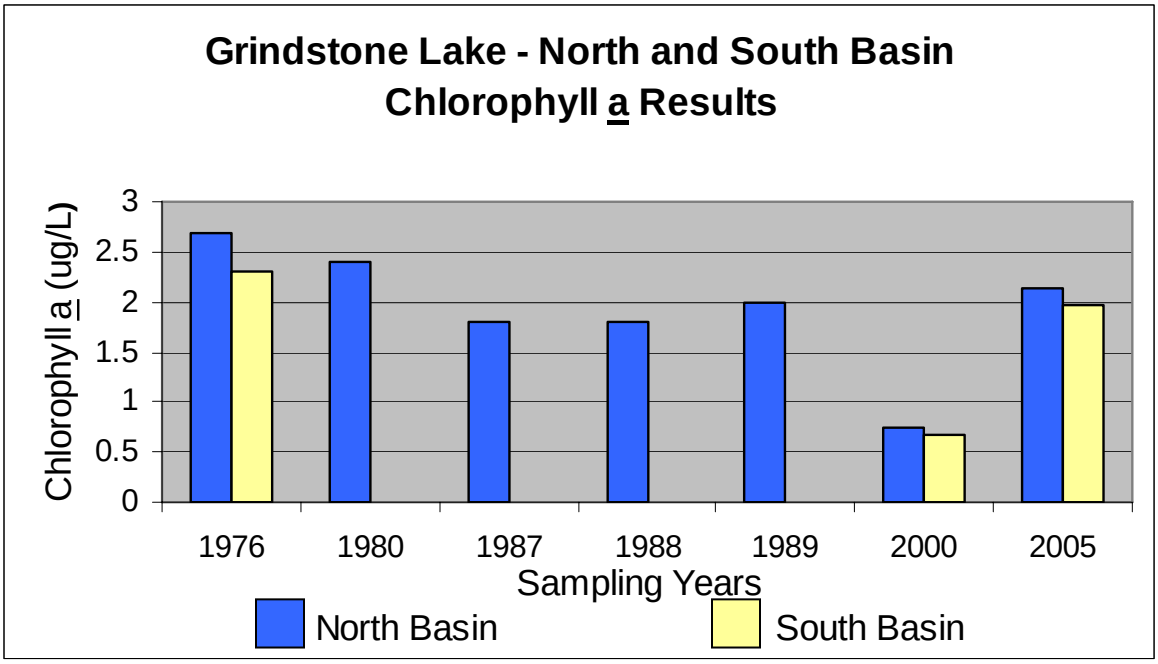




Evaluating your Chlorophyll a Results:

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



GRINDSTONE LAKE – NORTH BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 18-3430-708-01 MVC # 05-04

Date: May 19, 2005

Euphotic Zone (Penetration of Light) = 9 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	12.5	12.0	107	
1.0	11.9	12.3	104	
2.0	11.6	12.3	108	Epilimnion
3.0	11.5	12.3	108	
4.0	11.3	12.4	109	
5.0	11.0	12.7	110	
6.0	9.5	13.0	109	Metalimnion
7.0	8.9	12.8	106	or Thermocline
8.0	8.0	12.5	101	
9.0	7.7	11.8	104	
10.0	7.5	11.6	94	
11.0	7.2	7.2	87	
12.0	7.1	7.1	85	Hypolimnion
13.0	7.1	7.1	80	
14.0	7.0	7.0	80	
15.0	7.0	7.0	80	
16.0	6.9	6.9	79	
17.0	Bottom	Bottom	Bottom	

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

GRINDSTONE LAKE – NORTH BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 18-3430-708-01 MVC # 05-04

Date: July 11, 2005

Euphotic Zone (Penetration of Light) = 10 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	24.8	8.0	93	
1.0	23.8	7.8	88	Epilimnion
2.0	23.6	8.0	90	
3.0	23.5	8.0	90	
4.0	21.1	9.3	100	
5.0	19.3	10.0	105	
6.0	14.9	11.4	109	Metalimnion
7.0	12.4	10.9	98	or Thermocline
8.0	11.2	10.6	94	
9.0	10.3	9.0	77	
10.0	9.3	6.3	53	
11.0	8.5	4.3	30	
12.0	8.1	3.1	25	
13.0	7.7	1.4	10	Hypolimnion
14.0	7.6	0.8	6	
15.0	7.5	0.5	4	
16.0	7.4	0.4	3	
17.0	Bottom	Bottom	Bottom	

GRINDSTONE LAKE – NORTH BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 18-3430-708-01 MVC # 05-04

Date: September 15, 2005

Euphotic Zone (Penetration of Light) = 13 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	21.4	9.0	96	
1.0	21.4	9.5	102	
2.0	21.3	9.6	102	
3.0	21.3	9.6	102	Epilimnion
4.0	21.2	9.6	102	
5.0	20.8	9.7	103	
6.0	20.3	9.7	103	
7.0	17.9	9.6	96	
8.0	13.7	8.2	76	Metalimnion
9.0	11.7	4.2	38	or Thermocline
10.0	10.6	1.9	16	
11.0	9.7	0.7	6	
12.0	8.9	0.5	4	
13.0	8.1	0.4	4	Hypolimnion
14.0	8.0	0.4	4	
15.0	7.9	0.3	2	
16.0	Bottom	Bottom	Bottom	

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

GRINDSTONE LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-709-01 MVC # 05-05
Date: May 19, 2005
Euphotic Zone (Penetration of Light) = 10 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	13.0	12.0	108	
1.0	12.1	12.2	108	
2.0	11.9	12.4	110	Epilimnion
3.0	11.6	12.5	110	
4.0	11.3	12.5	110	
5.0	11.1	12.5	109	
6.0	10.8	12.6	109	
7.0	8.9	12.9	110	Metalimnion
8.0	7.6	12.1	97	or Thermocline
9.0	7.2	11.9	95	
10.	7.1	11.2	90	
11.0	6.8	11.0	87	
12.0	6.7	10.1	79	
13.0	6.7	10.0	78	Hypolimnion
14.0	6.6	9.7	76	
15.0	6.3	9.6	75	
16.0	6.1	8.6	67	
17.0	5.6	8.3	64	
18.0	Bottom	Bottom	Bottom	

GRINDSTONE LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-709-01 MVC # 05-05
Date: July 11, 2005
Euphotic Zone (Penetration of Light) = 9 Meters

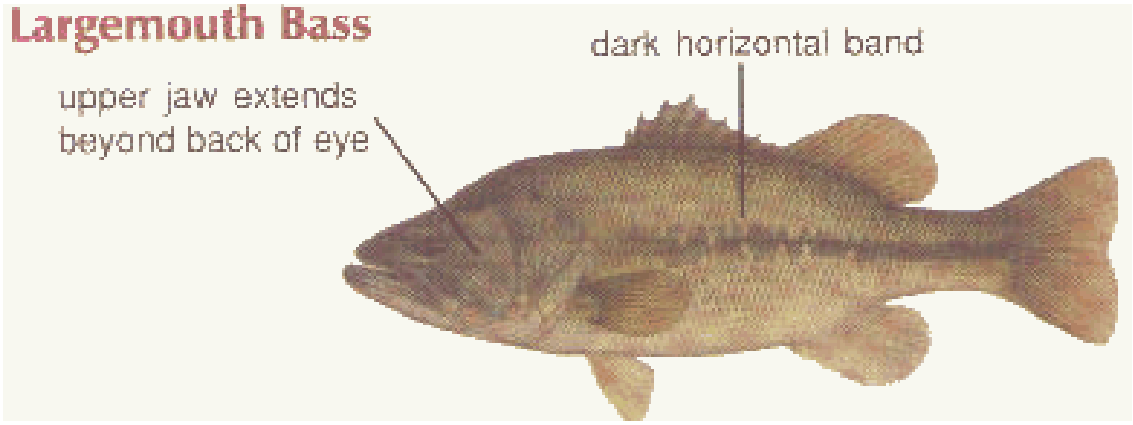
Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	25.4	7.7	90	
1.0	24.1	7.8	90	Epilimnion
2.0	23.8	7.9	90	
3.0	23.4	8.0	90	Thermocline
4.0	23.0	8.0	90	
5.0	19.4	9.8	102	
6.0	14.7	10.0	95	
7.0	12.7	10.0	90	Hypolimnion
8.0	10.8	10.2	89	
9.0	9.2	9.2	85	
10.0	8.4	6.9	56	
11.0	7.9	5.1	41	
12.0	7.5	3.4	27	
13.0	7.2	2.6	20	
14.0	7.0	1.9	14	Thermocline
15.0	6.7	0.8	6	
16.0	6.4	0.4	3	
17.0	6.4	0.3	3	
18.0	Bottom	Bottom	Bottom	

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

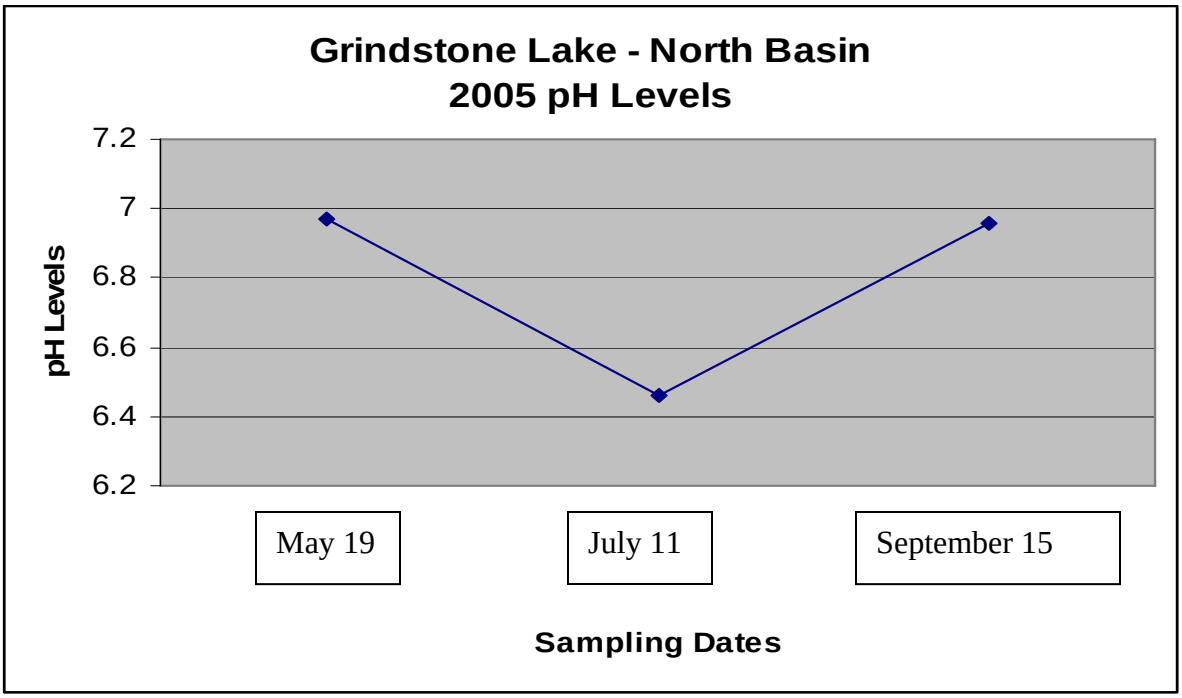
GRINDSTONE LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-709-01 MVC # 05-05
Date: September 15, 2005
Euphotic Zone (Penetration of Light) = 11 Meters

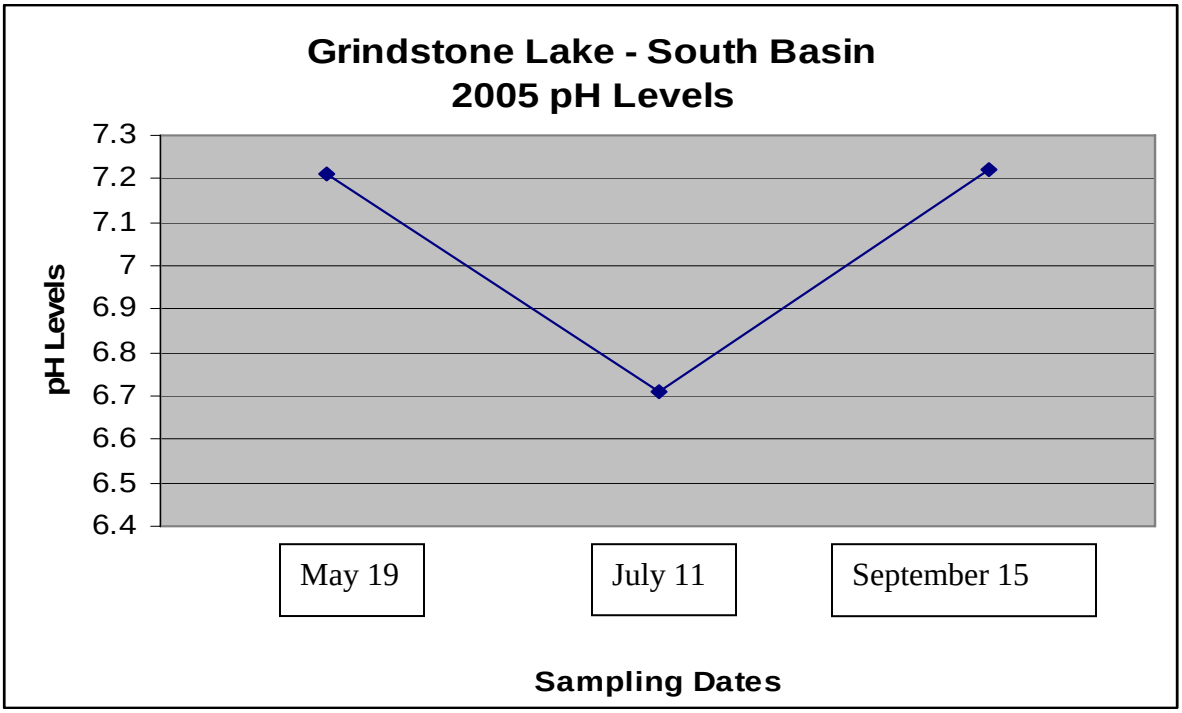
Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	21.4	9.5	102	
1.0	21.3	9.5	102	
2.0	21.2	9.5	102	Epilimnion
3.0	21.2	9.4	100	
4.0	21.0	9.5	101	
5.0	20.7	9.6	102	
6.0	20.0	9.6	101	
7.0	17.2	10.2	102	
8.0	12.9	10.2	93	Metalimnion
9.0	11.1	7.0	61	or Thermocline
10.0	10.0	3.7	32	
11.0	8.8	0.3	2	
12.0	8.0	0.3	2	
13.0	7.7	0.3	2	
14.0	7.5	0.2	2	
15.0	7.0	0.2	2	Hypolimnion
16.0	6.8	0.2	2	
17.0	6.5	0.2	2	
18.0	6.5	0.1	2	
19.0	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