Mississippi Valley Conservation

State of the Lake Environment Report December 2005

Crotch Lake

Watershed Watch

CROTCH LAKE

Crotch Lake is a warm water lake located in the amalgamated Township of North Frontenac. A public boat launch is located on the south end of the lake by travelling Hwy #509 and turning onto Ardoch Road.

Crotch Lake Facts

Elevation: 240 meters above sea level.
Perimeter: 44.8 kilometers
Maximum depth: 24.2 meters
Fisheries include: Cisco (Lake Herring)
Northern Pike
Whitefish
White Sucker
Walleye
Smallmouth Bass

Individuals of Crotch Lake have volunteered their time to provide water quality testing through the Ministry of Environment (MOE) Self Help Program in 1993. 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 29 years ago through the MOE Recreational Lakes Program.

In general the water quality in Crotch Lake is very good. There are two sampling stations at the deepest points. Each station was sampled three times for 2005. You will find graphs which show water clarity, as measured by Secchi Disk readings, were observed as good. The mean for 2005 is 3.7 metres indicating that Crotch Lake is a moderately enriched (some nutrients) or mesotrophic 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 Crotch Lake is 20 micrograms/litre (*ug*/L). The average calculated from the total phosphorus results for 2005 for the euphotic zone (penetration of light) was 16.0 *ug*/L indicating a moderately enriched (some nutrients) The mean for the sample taken one metre off the bottom was 8.7 *ug*/L, indicating an unenriched (few nutrients) or 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 3.2 micrograms/litre indicating, a moderate algal density for Crotch 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 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.

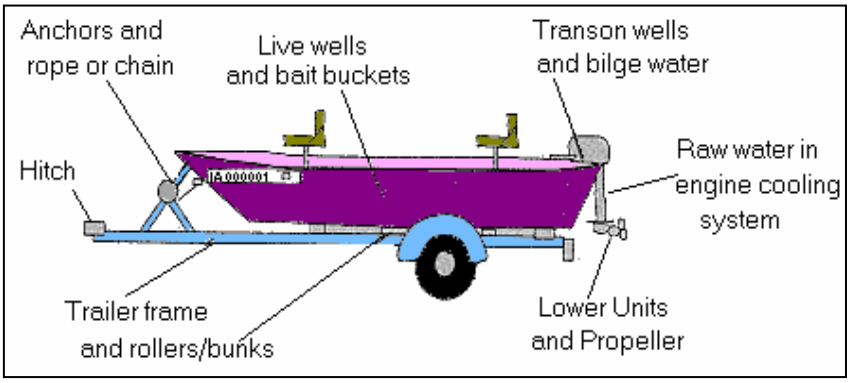
The dissolved oxygen and temperature data, measured at the deepest points in both the North and South basins, indicate oxygen concentrations in the deep water portion are poor by late summer. Warm water fish species, such as pike and bass are squeezed into the upper 7 metres of the lake by late summer. Residents and users of Crotch Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities.

Crotch 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. Crotch Lake did not detect zebra mussel veligers (larvae) but spiny water flea was present in the samples collected. Residents and property owners need to ensure that all access points to the lake have posted signs indicating the presence of the spiny water flea and the precautions they can take to avoid the spread of invasive species to other lakes.

Residents and users of Crotch Lake should adopt 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 Crotch Lake Measure Up?

1975 – 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)
**1975	4.9	13.4	*12.0	3.80
1993	*6.3			
2000	4.1	9.3	10.0	1.85
2005	*3.7	*16.0	*8.7	*3.2
n	4	3	3	3
Minimum	3.7	9.3	8.6	1.85
Maximum	6.3	16.0	12.0	3.80
Mean	4.75	12.9	10.2	2.93
Standard Deviation	1.14	3.37	1.66	0.99

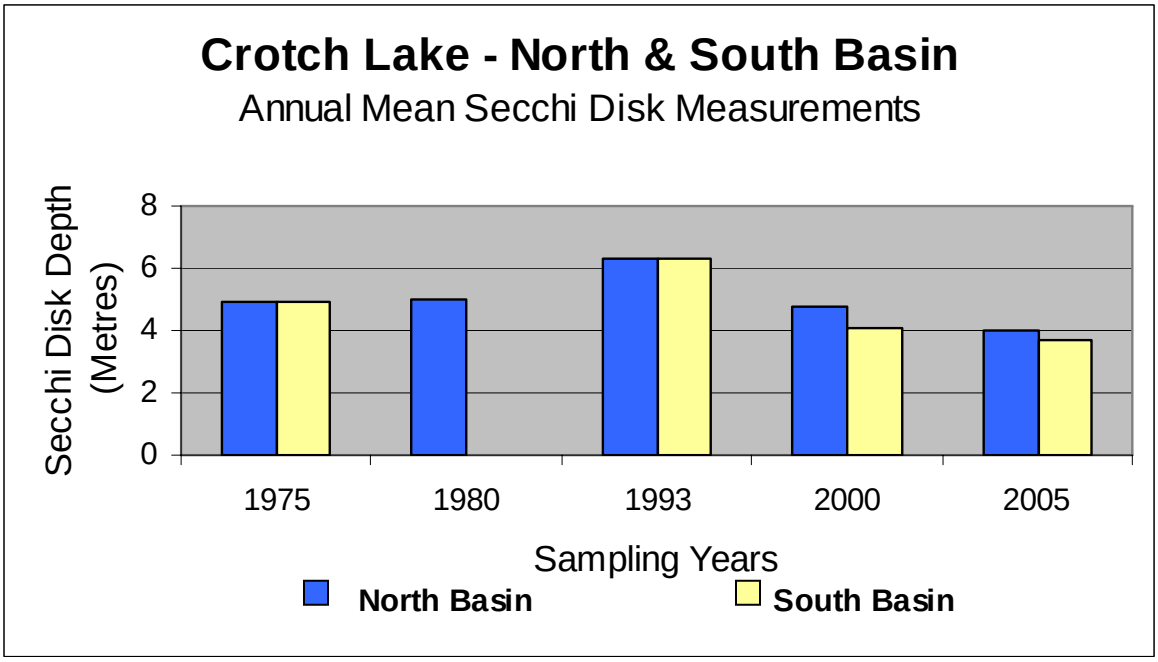
1975 – 2005 WATER QUALITY RESULTS – SOUTH BASIN

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)
**1975	*4.9			*3.80
**1980	*5.0			*3.00
1993	6.3			
2000	4.8	3.9	8.4	1.50
2005	*4.0	*19.7	*12.7	*3.5
n	5	2	2	4
Minimum	4.0	3.9	8.4	1.50
Maximum	6.3	19.6	12.6	3.80
Mean	5.0	11.75	10.5	2.94
Standard Deviation	0.82	11.17	3.04	1.01

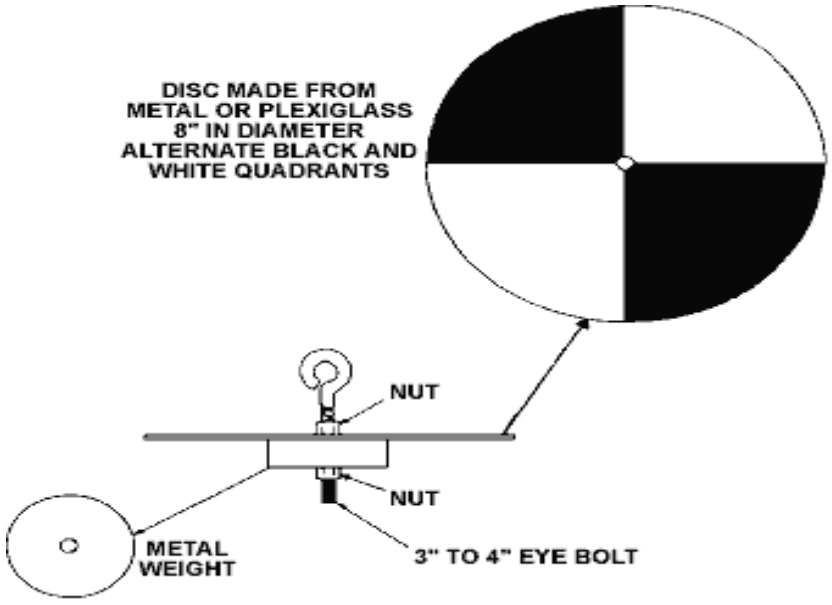
*Mean based on less than 6 measurements **Includes Recreational Lakes Program Data
Chlorophyll a data prior to 1985 has been adjusted to reflect new lab procedures
in filtering resulting in an increase in chl.a concentrations by 35%

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



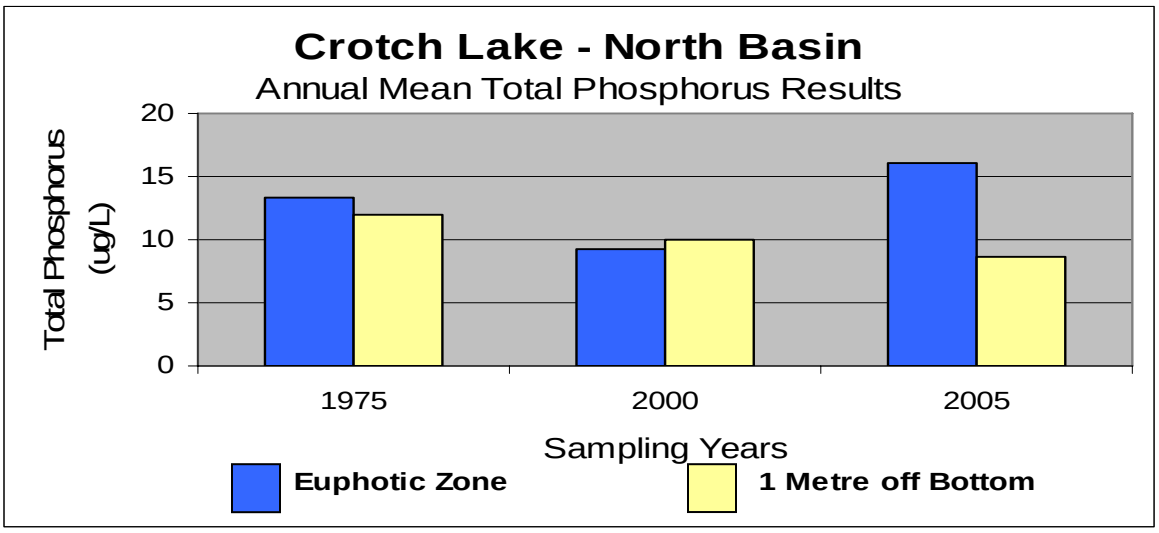
How to make your own Secchi Disk

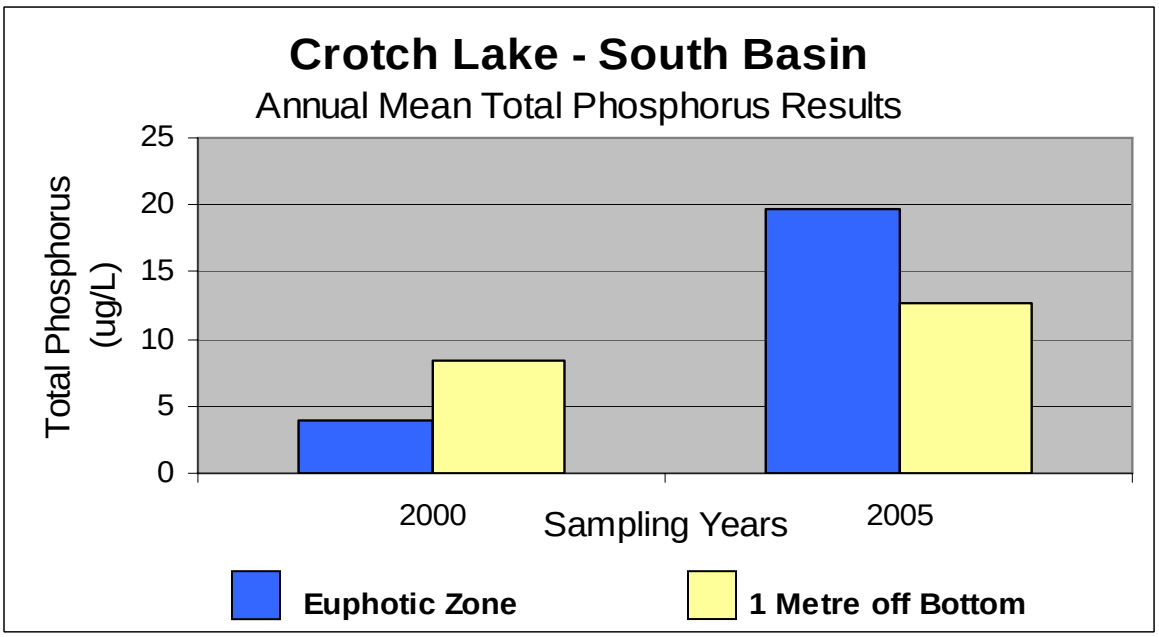


Interpreting Total Phosphorus Results:

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

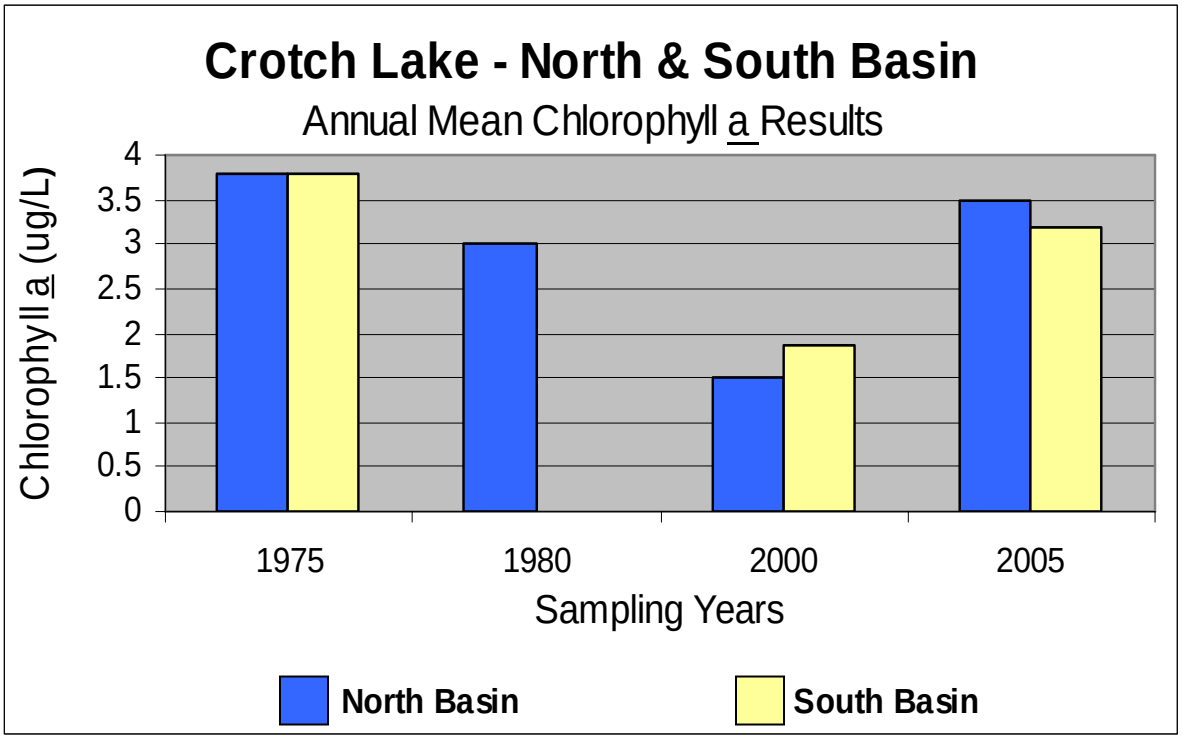




Evaluating your Chlorophyll a Results:

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

CROTCH LAKE – NORTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 19-3430-733-01 MVC # 05-16
Date: May 31, 2005
Euphotic Zone (Penetration of Light) = 8 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	19.4	9.8	101	Epilimnion
1.0	17.5	10.2	102	
2.0	16.8	10.5	105	Metalimnion
3.0	15.5	10.7	104	or Thermocline
4.0	14.0	11.1	104	
5.0	13.5	11.3	105	
6.0	12.6	11.2	101	
7.0	12.1	11.0	99	
8.0	11.6	10.9	97	
9.0	11.0	10.7	94	
10.0	10.3	10.5	90	
11.0	9.5	10.4	88	Hypolimnion
12.0	8.9	10.4	87	
13.0	8.7	10.3	85	
14.0	8.5	10.1	83	
15.0	8.4	10.2	83	
16.0	8.3	10.2	84	
17.0	8.3	10.0	83	
18.0	8.2	9.9	81	
19.0	8.1	9.9	81	
20.	8.1	9.7	79	
21.0	8.0	9.5	77	
22.0	Bottom	Bottom	Bottom	

CROTCH LAKE – NORTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 19-3430-733-01 MVC # 05-16
Date: July 19, 2005
Euphotic Zone (Penetration of Light) = 5.5 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	27.1	9.0	107	
1.0	27.1	9.0	107	
2.0	27.1	9.0	107	Epilimnion
3.0	27.0	9.0	107	
4.0	27.0	9.0	107	
5.0	26.6	8.9	105	
6.0	21.5	6.6	71	Thermocline
7.0	20.7	6.1	64	
8.0	17.8	6.3	63	
9.0	14.0	6.9	64	
10.0	14.1	7.5	71	Hypolimnion
11.0	11.0	7.5	65	
12.0	10.0	7.5	64	
13.0	9.4	7.4	62	
14.0	8.9	7.1	59	
15.0	8.7	7.0	58	
16.0	8.6	6.9	57	
17.0	Bottom	Bottom	Bottom	

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

CROTCH LAKE – NORTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 19-3430-733-01 MVC # 05-16
Date: September 22, 2005
Euphotic Zone (Penetration of Light) = 9 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	19.5	7.0	73	
1.0	19.6	7.0	73	
2.0	19.6	7.0	73	Epilimnion
3.0	19.6	7.0	73	
4.0	19.6	7.0	73	
5.0	19.6	7.0	73	
6.0	19.6	6.9	72	
7.0	18.5	6.2	63	Metalimnion
8.0	12.6	2.4	21	or Thermocline
9.0	10.5	2.1	18	
10.0	9.9	1.7	14	
11.0	9.6	1.6	14	
12.0	9.2	1.5	13	
13.0	8.9	1.3	10	
14.0	8.7	0.9	7	Hypolimnion
15.0	8.5	0.7	6	
16.0	8.5	0.4	3	
17.0	8.5	0.4	3	
18.0	Bottom	Bottom	Bottom	

CROTCH LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 19-3430-732-01 MVC # 05-15
Date: May 31, 2005
Euphotic Zone (Penetration of Light) = 7 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	16.5	11.0	109	
1.0	16.1	10.9	107	Epilimnion
2.0	15.7	11.1	108	
3.0	15.0	11.0	105	
4.0	13.5	11.5	106	Thermocline
5.0	12.9	11.6	106	
6.0	12.0	11.9	105	
7.0	11.5	11.7	103	
8.0	10.7	11.6	101	
9.0	10.2	11.4	98	
10.0	9.5	11.4	97	
11.0	9.1	11.1	94	
12.0	8.3	11.0	90	Hypolimnion
13.0	7.9	10.6	86	
14.0	7.6	10.7	86	
15.0	7.5	10.6	85	
16.0	7.4	10.4	84	
17.0	7.3	10.4	84	
18.0	7.1	10.3	82	
19.0	7.1	10.3	82	
20.	7.0	10.3	82	
21.0	7.0	10.2	81	
22.0	7.0	10.2	81	
23.0	6.9	10.1	80	
24.0	Bottom	Bottom	Bottom	

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

CROTCH LAKE – SOUTH BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 19-3430-732-01 MVC # 05-15

Date: July 19, 2005

Euphotic Zone (Penetration of Light) = 8 Meters Weather Conditions: Very Windy

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	26.6	8.6	102	
1.0	26.5	8.8	105	
2.0	26.4	8.8	105	Epilimnion
3.0	26.4	9.0	106	
4.0	25.6	8.8	103	
5.0	23.5	8.3	95	
6.0	17.7	8.6	86	Metalimnion
7.0	13.9	9.0	83	or Thermocline
8.0	14.5	8.8	83	
9.0	13.0	8.6	78	
10.	10.6	7.7	67	
11.0	10.1	7.1	61	
12.0	9.9	7.1	61	
13.0	8.8	7.0	58	
14.0	8.7	7.0	58	
15.0	8.1	6.5	53	Hypolimnion
16.0	8.1	6.4	52	
17.0	8.8	7.1	59	
18.0	8.8	7.0	59	
19.0	8.5	7.0	57	
12.0	8.3	6.8	56	
21.0	8.4	6.5	53	
22.0	8.2	6.6	54	
23.0	8.0	6.4	52	
24.0	7.9	6.0	49	
25.0	7.8	6.0	49	
26.0	7.9	5.9	48	
27.0	7.8	6.0	49	
28.0	7.9	5.9	48	
29.0	7.9	6.0	49	
30.0	7.9	6.1	50	
31.0	8.0	6.1	50	
32.0	Bottom	Bottom	Bottom	

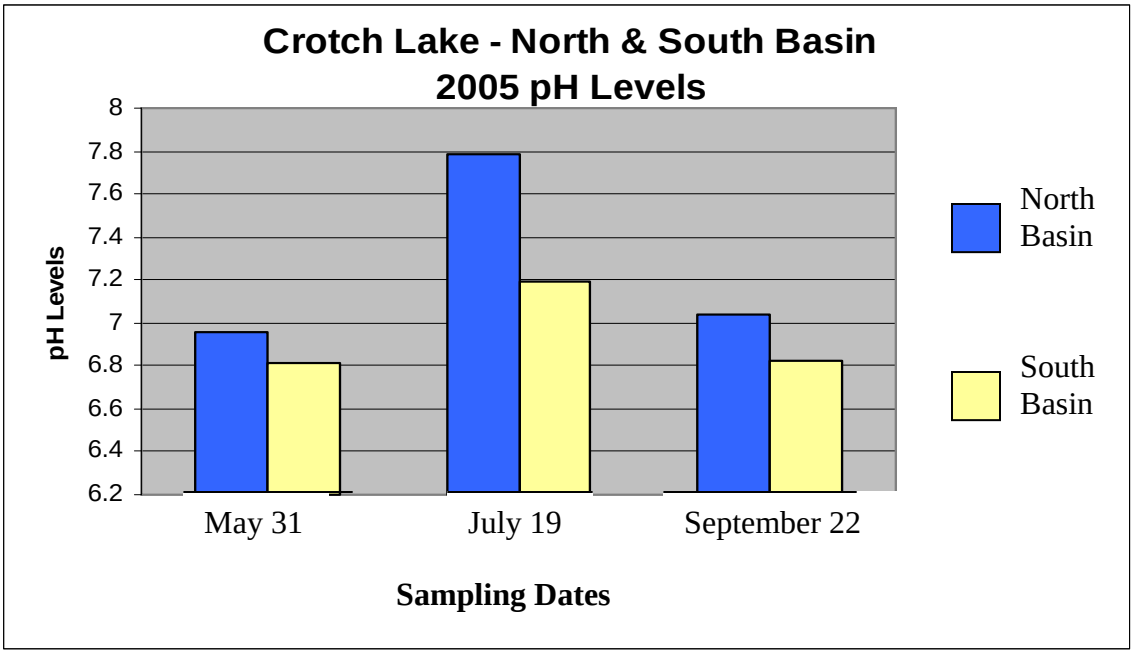
Warm Water Fisheries Habitat (Bass, Walleye, Pike, Perch) = DO > 4 mg/L at < 25°C

CROTCH LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 19-3430-732-01 MVC # 05-15
Date: September 22, 2005
Euphotic Zone (Penetration of Light) = 9 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	19.4	7.0	74	
1.0	19.4	7.1	74	
2.0	19.4	7.2	75	
3.0	19.4	7.1	74	Epilimnion
4.0	19.4	7.1	74	
5.0	19.4	7.0	73	
6.0	19.4	7.1	74	
7.0	16.1	4.4	44	
8.0	10.9	2.8	24	Metalimnion
9.0	9.9	1.5	13	or Thermocline
10.0	9.2	1.4	12	
11.0	8.9	1.4	12	
12.0	8.2	1.2	10	
13.0	8.0	1.0	8	Hypolimnion
14.0	7.9	1.0	8	
15.0	7.7	1.0	8	
16.0	7.7	1.0	8	
17.0	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.

.

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

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