



Mississippi Valley Conservation

*State of the Lake
Environment Report
December 2004
Big Gull Lake*



Big Gull Lake

Big Gull Lake is located in the Townships of Central and North Frontenac. Big Gull Lake is at an elevation of 253 metres above sea level. The lake perimeter is approximately 88 kilometres and the deepest point is 26 metres. Big Gull Lake supports a warm water fishery, in particular Lake Whitefish, Lake Herring, Walleye, Northern Pike, Smallmouth and Largemouth Bass. Currently, accurate shoreline development information is not available. However at last count in the early 1970's, there were approximately 280 cottages on the lake.



Members of the Lake Association have volunteered their time to provide consistent water quality testing through the Ministry of Environment (MOE) Self Help and Lake Partner Programs since 1976. This data is extremely valuable because it provides a general picture of water quality conditions over the past thirty-two years. Comprehensive testing in 1999 and 2004 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program*, provides for a comparison between water quality conditions as they exist now, to results obtained in 1973 and 1975, through the MOE Recreational Lakes Program.

In general, the water quality in Big Gull Lake remains good. There are three sampling stations on the lake as indicated on the bathymetric map included in this report. They are located in the West, Main and East Basins. Each station was sampled eight times for 2004, thanks to a grant from Canadian Waste Services. You will find graphs which follow, that water clarity, as measured by Secchi Disk readings, were observed as good. The average for the three stations for 2004 is 4.26 metres, compared to 5 years ago, when the average was 4.2 metres. Thus indicating that Big Gull 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 Objective for phosphorus levels in warm water lakes is 20 micrograms per litre (ug/L). In 2004, the mean for the three stations in the euphotic zone (depth at which sunlight can penetrate or two times the secchi disk depth) was 6.34 ug/L . The mean for the samples taken one metre off the bottom was also 6.25 ug/L . Five years ago, the average phosphorus level was 11.6 ug/L in the euphotic zone and 15.25 ug/L one metre off the bottom of the lake. Big Gull Lake decreased its average phosphorus levels by more than half, changing it to an Oligotrophic lake environment 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 three sampling stations was 2.49 ug/L . Thus, indicating a moderate algal density for Big Gull Lake in 2004. In 1999, chlorophyll a levels were slightly lower at 1.81 ug/L .

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 (DO) and temperature data, measured at the three sampling stations, indicate adequate levels all the way to the bottom until mid-summer. Data collected in the Main and East Basins revealed that warm water fish species were pushed above the 7 metre mark. In the West Basin warm

water fish species, such as pike and bass, received adequate DO levels throughout the season. Overall, there is a slight decrease in DO levels from 1999.



Big Gull Lake was also tested for invasive species in 2004, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters (OFAH). Big Gull Lake tested *negative* for zebra mussel veligers (larvae) but *positive* for spiny water flea in the Main Basin near Pinnacle Point. 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 from Big Gull Lake to other lakes. Another recommendation is for residents to continue participation in the invasive species monitoring program through MVC.

Residents and users of Big Gull Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities. Human sources of phosphorus include leachate from sewage disposal systems, erosion from the clearing of shorelines and the use of lawn fertilizers. The Lake Association should continue monitoring the water quality. 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 Big Gull Lake. Additional water quality data, current and historic, is available for Big Gull 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

How Does Big Gull Lake Measure Up?

1975 – 2004 Water Quality Results – West Basin

Sample Year [Various Stations]	Secchi Disk Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/Litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
**1975	2.2	20.0	22.0	7.46
1999	3.9	11.8		1.54
2004	4.2	8.3	8.1	2.73
n	3	3	2	3
Minimum	2.2	8.3	8.1	1.5
Maximum	4.2	20.0	22.0	7.5
Mean	3.4	13.4	15.1	3.9
Standard Deviation	1.09294709	6.026400252	9.807571055	3.13143737

1973 – 2004 Water Quality Results – Main Basin

Sample Year [Various Stations]	Secchi Disk Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/Litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
*1973	5.3			2.20
**1975	4.1	14.9	10.0	3.30
1999	4.4	11.0	12.5	2.10
2004	4.2	11.0	12.5	2.61
n	3	3	3	3
Minimum	4.1	11.0	10.0	2.1
Maximum	4.4	14.9	12.5	3.3
Mean	4.2	12.3	11.7	2.7
Standard Deviation	0.15011107	2.25166605	1.443375673	0.602245797

1975 – 2004 Water Quality Results – East Basin

Sample Year [Various Stations]	Secchi Disk Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/Litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
**1975	3.9	14.2	8.0	7.50
1999	4.3	12.0	18.0	1.80
2004	4.3	4.9	4.5	2.14
n	3	3	3	3
Minimum	3.9	4.9	4.5	1.8
Maximum	4.3	14.2	18.0	7.5
Mean	4.2	10.4	10.2	3.8
Standard Deviation	0.22810816	4.87163217	7.005949852	3.197269669

*Mean based on less than 6 measurements

**Includes Recreational Lakes Program Data

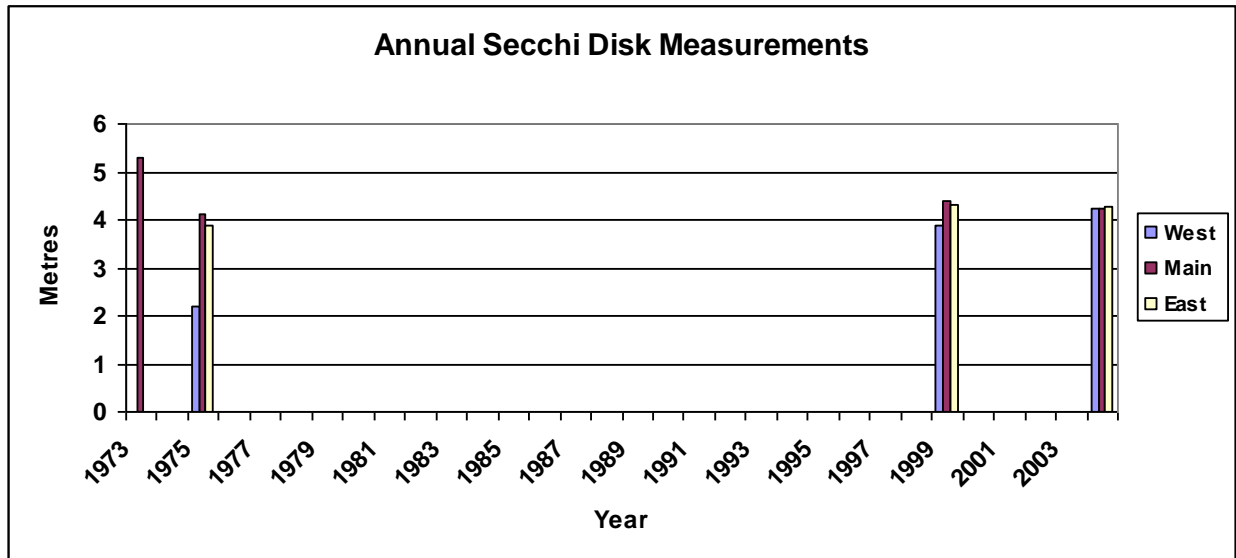
Chlorophyll-a data prior to 1985 has been adjusted to reflect new lab procedures in filtering resulting in an increase in chl.a concentrations by 35%

Interpreting Secchi Disc Readings:

A Secchi disk is a black and white coloured disk used to determine water clarity. The disk is lowered into the water. The point, at which you can no longer distinguish the black and white, is called the Secchi depth.

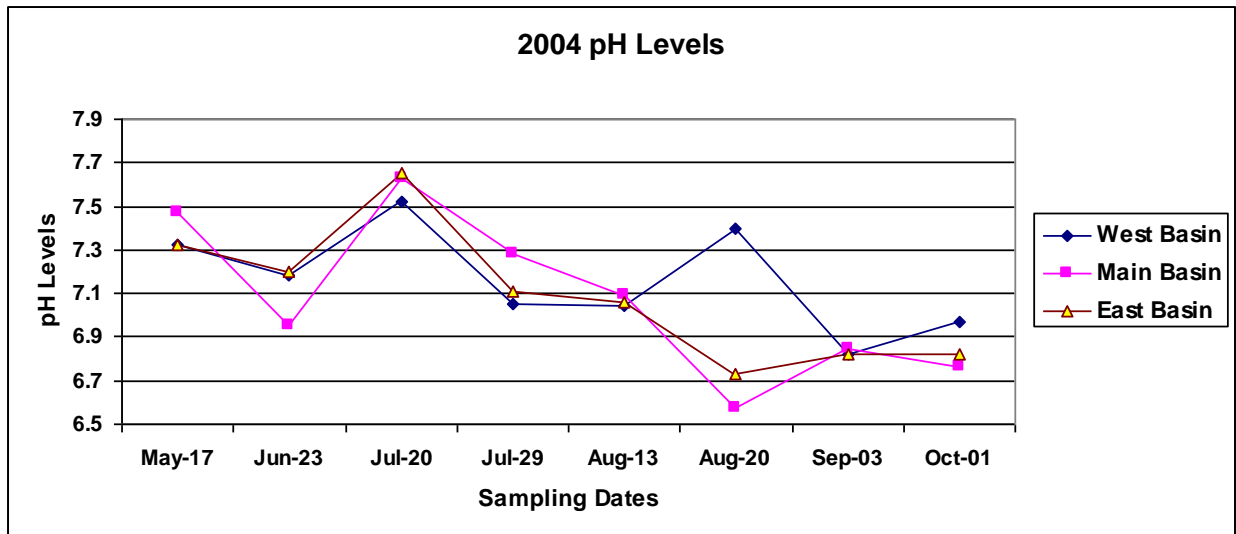


The higher the Secchi Disk measurement the clearer your lake is.	
INTERPRETING YOUR SECCHI DISC RESULTS	
Secchi Reading	Lake Nutrient Status
Over 5 metres	Oligotrophic - unenriched, few nutrients
3.0 to 4.9 metres	Mesotrophic – moderately enriched, some nutrients
Less than 2.9 metres	Eutrophic – enriched, higher levels of nutrients



Evaluating your pH Results:

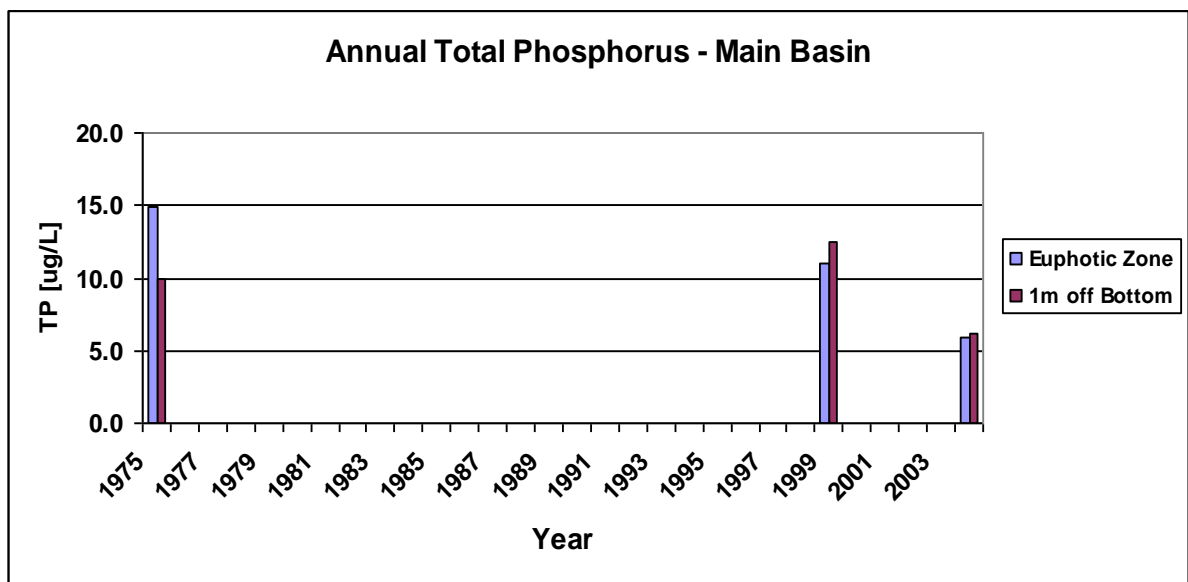
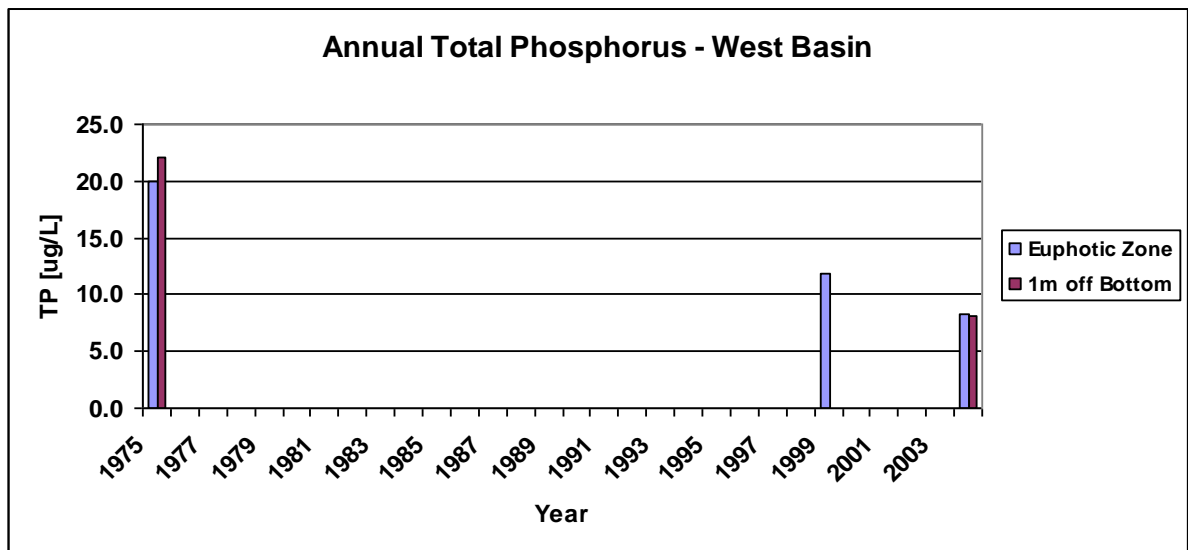
Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.

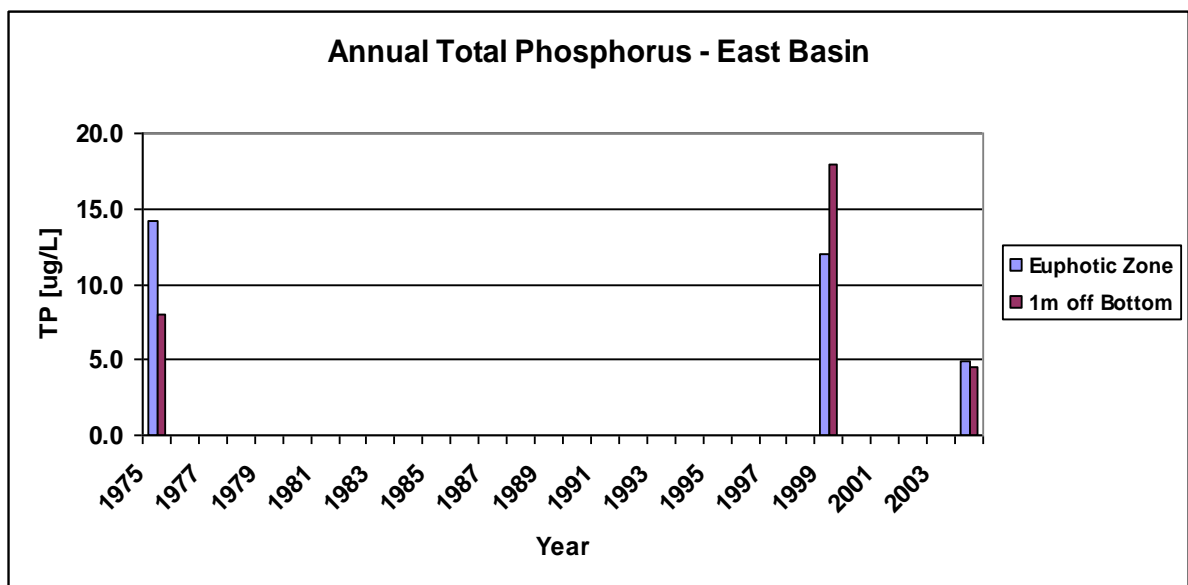


Interpreting Total Phosphorus Results:

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

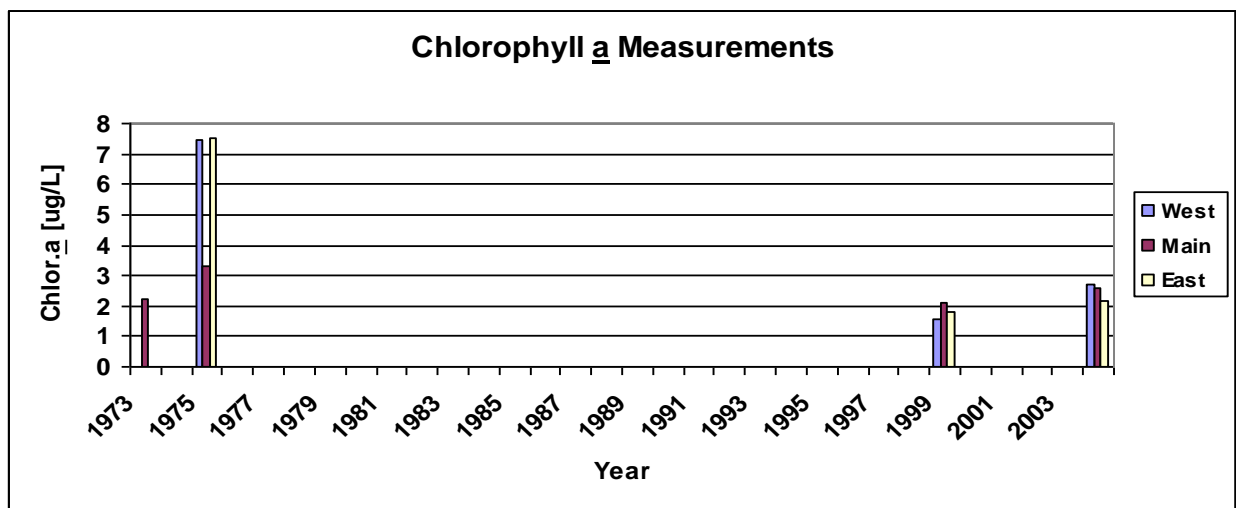




Evaluating your Chlorophyll a Results:

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.

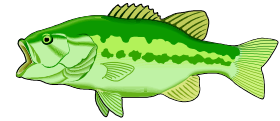
INTERPRETING YOUR CHLOROPHYLL <u>A</u> RESULTS	
Chlorophyll <u>a</u> Reading	Lake Nutrient Status
Up to 2 ug/L - low algal density	Oligotrophic - unenriched, few nutrients
2-4 ug/L - moderate algal density	Mesotrophic - moderately enriched, some nutrients
More than 4 ug/L- high algal density	Eutrophic - enriched, higher levels of nutrients



BIG GULL LAKE – West Basin

DISSOLVED OXYGEN/TEMPERATURE PROFILES

MOE Rec. Lks. Station # 19-3430-728-01, MVC Station # 04-12



Date: May 17, 2004

Depth: 6.0 Metres

Euphotic Zone (Penetration of Light) = 6.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	18.6	7.9	80	Epilimnion
1.0	18.6	7.9	80	
2.0	18.4	8.0	81	
3.0	16.9	8.4	84	Thermocline
4.0	16.4	8.7	85	Hypolimnion
5.0	15.5	9.2	88	
6.0				Bottom

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

Date: July 29, 2004

Depth: 7.0 Metres

Euphotic Zone (Penetration of Light) = 6.4 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	25.8	6.6	76	Epilimnion
1.0	23.2	6.9	76	
2.0	22.6	6.9	76	
3.0	22.4	6.7	74	
4.0	22.2	6.6	73	
5.0	22.2	6.5	72	
6.0	22.2	6.5	72	Bottom
7.0				

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

Date: September 3, 2003

Depth: 7.0 Metres

Euphotic Zone (Penetration of Light) = 7.0 Metres

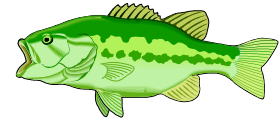
Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	21.1	8.8	95	Epilimnion
1.0	21.0	8.9	96	
2.0	21.0	8.8	95	
3.0	20.9	8.8	95	
4.0	20.8	8.8	94	
5.0	20.6	8.4	90	
6.0	20.5	8.1	87	Bottom
7.0				

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

BIG GULL LAKE – Main Basin

DISSOLVED OXYGEN/TEMPERATURE PROFILES

MOE Rec. Lks. Station # 19-3430-729-01, MVC Station # 04-13




Date: May 17, 2004

Depth: 21.0 Metres

Euphotic Zone (Penetration of Light) = 6.7 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	14.7	9.8	93	Epilimnion
1.0	14.7	9.8	93	
2.0	14.7	9.9	94	
3.0	14.6	9.9	94	
4.0	14.6	9.9	94	
5.0	12.4	10.4	94	Metalimnion or Thermocline
6.0	10.2	10.2	87	
7.0	9.7	10.2	86	Hypolimnion
8.0	9.2	10.0	84	
9.0	9.0	9.8	82	
10.0	8.7	9.7	80	
11.0	8.4	9.7	79	
12.0	8.2	9.7	79	
13.0	8.1	9.7	79	
14.0	8.0	9.7	78	
15.0	7.9	9.7	78	
16.0	7.8	9.6	77	
17.0	7.7	9.5	76	
18.0	7.6	9.2	74	
19.0	7.5	9.1	73	
20.0	7.4	8.4	67	
21.0				

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

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:

PRESERVATION

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

ENHANCEMENT

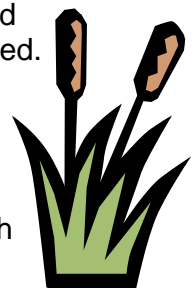
Native species are planted and non-native species are removed.

NATURALIZATION

Degraded shorelines are left alone to return to their natural state.

RESTORATION

Cleared areas are planted with native species.



BIG GULL LAKE – Main Basin Continued...

Date: July 29, 2004

Depth: 21.0 Metres

Euphotic Zone (Penetration of Light) = 7.6 Metres

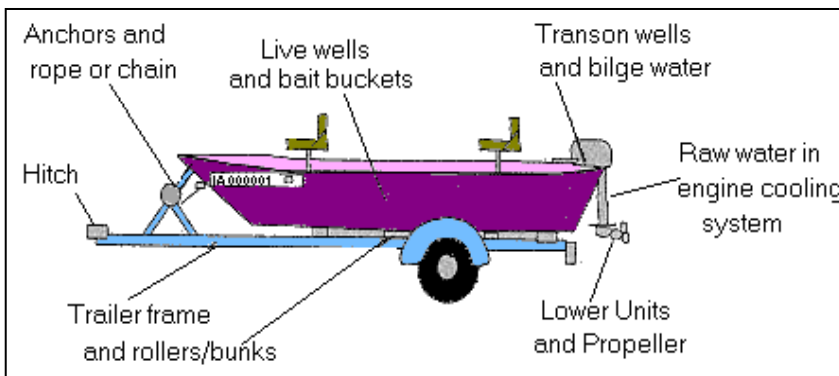
Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	23.4	7.1	80	Epilimnion
1.0	23.1	7.3	80	
2.0	22.6	7.4	81	
3.0	22.4	7.3	80	
4.0	22.3	7.3	80	
5.0	22.0	7.0	76	
6.0	19.0	5.0	53	Metalimnion or Thermocline
7.0	17.4	4.3	43	
8.0	15.3	3.6	35	Hypolimnion
9.0	13.2	3.5	32	
10.0	11.6	3.7	33	
11.0	10.7	3.8	33	
12.0	10.2	4.0	35	
13.0	9.8	4.3	37	
14.0	9.4	4.6	39	
15.0	9.0	4.8	40	
16.0	8.8	4.8	40	
17.0	8.6	4.4	36	
18.0	8.4	4.2	35	
19.0	8.3	4.4	36	
20.0	8.1	4.1	33	
21.0				Bottom

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



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.



BIG GULL LAKE – Main Basin Continued...

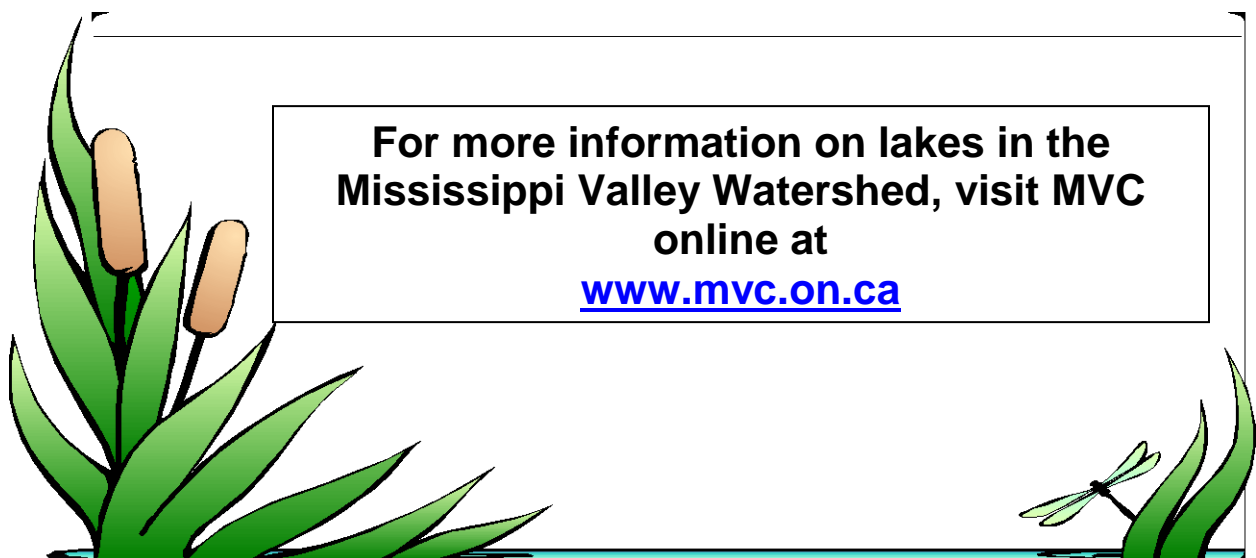
Date: September 3, 2003

Depth: 23.0 Metres

Euphotic Zone (Penetration of Light) = 10.4 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	20.5	9.0	96	Epilimnion
1.0	20.5	9.1	96	
2.0	20.5	9.0	96	
3.0	20.4	9.0	96	
4.0	20.4	9.0	96	
5.0	20.3	9.0	95	
6.0	20.2	9.0	95	
7.0	20.2	8.9	94	
8.0	17.4	4.5	46	Metalimnion or Thermocline
9.0	14.3	1.6	15	
10.0	12.6	1.7	15	
11.0	11.2	1.9	16	
12.0	10.7	2.0	16	Hypolimnion
13.0	10.2	2.6	22	
14.0	9.7	3.2	27	
15.0	9.2	3.6	30	
16.0	8.9	3.6	30	
17.0	8.7	3.3	27	
18.0	8.6	3.0	24	
19.0	8.4	2.7	22	
20.0	8.2	2.2	17	
21.0	8.0	1.4	11	
22.0	7.9	0.7	5	
23.0				

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



BIG GULL LAKE – East Basin

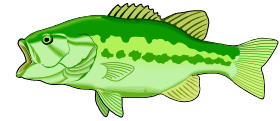
DISSOLVED OXYGEN/TEMPERATURE PROFILES

MOE Rec. Lks. Station # 19-3430-730-01, MVC Station # 04-14

Date: May 17, 2004

Depth: 17.0 Metres

Euphotic Zone (Penetration of Light) = 7.6 Metres



Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	16.6	9.3	91	Epilimnion
1.0	16.5	9.4	92	
2.0	16.5	9.4	92	
3.0	16.4	9.4	92	
4.0	16.0	9.4	91	
5.0	12.2	9.8	87	Metalimnion or Thermocline
6.0	11.1	9.5	83	
7.0	10.1	9.7	83	
8.0	9.4	9.4	78	Hypolimnion
9.0	9.1	9.3	77	
10.0	8.9	9.2	76	
11.0	8.8	9.3	77	
12.0	8.7	9.3	76	
13.0	8.6	9.1	76	
14.0	8.5	9.2	76	
15.0	8.4	9.1	75	
16.0	8.3	9.1	75	
17.0				

Date: July 29, 2004

Depth: 17.0 Metres

Euphotic Zone (Penetration of Light) = 9.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	23.1	7.3	82	Epilimnion
1.0	22.5	7.4	82	
2.0	22.2	7.4	81	
3.0	22.1	7.3	80	
4.0	22.0	7.0	76	
5.0	21.6	6.6	72	
6.0	19.1	5.0	53	Metalimnion or Thermocline
7.0	18.5	4.5	37	
8.0	16.3	3.7	36	
9.0	14.1	3.0	28	
10.0	12.7	2.6	23	Hypolimnion
11.0	11.7	2.2	19	
12.0	11.1	2.0	17	
13.0	10.6	2.0	16	
14.0	10.5	1.9	15	
15.0	10.5	1.9	15	
16.0	10.4	1.8	14	
17.0				Bottom

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

BIG GULL LAKE – East Basin continued...

Date: September 3, 2004

Depth: 16.0 Metres

Euphotic Zone (Penetration of Light) = 10.4 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	20.8	9.2	98	Epilimnion
1.0	20.8	9.2	98	
2.0	20.6	9.2	98	
3.0	20.5	9.1	97	
4.0	20.5	9.0	96	
5.0	20.4	8.8	94	
6.0	20.0	7.8	83	
7.0	19.4	6.9	72	Metalimnion or Thermocline
8.0	18.3	5.5	56	
9.0	16.0	2.7	26	
10.0	13.0	0.9	7	Hypolimnion
11.0	12.1	0.7	5	
12.0	11.4	0.7	5	
13.0	11.2	0.8	7	
14.0	11.0	0.8	7	
15.0	10.8	0.7	5	
16.0				Bottom

 Warm Water Fisheries Habitat (Bass, Walleye, Pike, Perch) = DO > 4 mg/L at < 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 Canadian Waste Management for adopting Big Gull Lake with a generous donation. We would also like to thank Dr. Ron Niblett for supplying the Watershed Watch crew with his time, a boat & fuel for the 2004 sampling season.

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

