Mississippi Valley Conservation

State of the Lake Environment Report December 2002

Clyde Lake

Watershed Watch

Clyde Lake

Clyde Lake is situated in the Township of Lanark Highlands, in Lanark County. It is a headwater lake of the Clyde River system, in the Mississippi Valley watershed. Clyde Lake is at an elevation of 274.4 metres above sea level. The lake perimeter is approximately 10.3 kilometres, with a maximum depth of 12.2 metres. Clyde Lake supports a warm water fishery. Common species include Northern Pike and Largemouth Bass. At last count in 1980, there were 18 cottages and 3 vacant lots on the lake.

Limited water quality data is available for Clyde Lake. Records indicate that shoreline property owners have not yet formed a Lake Association or participated in the Ministry of Environment's Self-Help or Lake Partner Program. Comprehensive testing in 2002 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program* provides for a comparison between water quality conditions as they exist now, to results obtained 19 years ago through the MOE Recreational Lakes Program.

In general, the water quality in Clyde Lake is improving. There is one sampling station at the deepest point, in the main basin of the lake. This station was sampled eight times for 2002. You will find graphs which follow, that water clarity, as measured by Secchi Disk readings, were observed as good. The average for 2002 is 3.5 metres, indicating that Clyde Lake is a moderately enriched (some nutrients) or mesotrophic lake. Nineteen years ago, the average Secchi Disk depth was 3.3 metres, indicating a slight improvement in water clarity.

Directly related to water clarity is the amount of nutrients, in particular phosphorus, entering the lake. The Provincial Objective for phosphorus levels in shield lakes, is a maximum of 20 micrograms per litre (*ug*/L). In 2002, the mean for the station in the euphotic zone (depth at which sunlight can penetrate or two times the secchi disk depth) was 12.5 *ug*/L. The mean for the sample taken one metre off the bottom was 26.3 *ug*/L. Nineteen years ago, the average phosphorus level was 22.0 *ug*/L in the euphotic zone and 84.0 *ug*/L one metre off the bottom of the lake, both over the Provincial Objective. Clyde Lake decreased its average phosphorus level in euphotic zone, putting it below the Provincial Objective. The sample taken one metre off the bottom dropped by almost 60 *ug*/L, changing its trophic status from a eutrophic lake environment (enriched, high levels of nutrients) to a moderately enriched lake (some nutrients).

Chlorophyll-a, is a measure of the algal density in the lake. The average chlorophyll-a density for the sampling station, was 2.86 *ug*/L, indicating a moderate algal density for Clyde Lake in 2002. In 1983, chlorophyll-a levels were slightly lower at 2.25 *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. Two other profiles were conducted in 2002, one in May and one in July, in order to generate a more concise picture of the oxygen content of the lake.

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 mid-summer but slightly improve over the summer. Warm water fish species, such as pike and pickerel, are squeezed into the upper 3 metres of the lake in July and by September into upper 4 meters. Therefore, residents and users of Clyde Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities.

Clyde Lake was also tested for invasive species in 2002, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters (OFAH). Clyde Lake did *not* have zebra mussel veligers (larvae) or spiny water flea present. 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 Clyde Lake. Another recommendation is for residents to begin participation in the invasive species monitoring program through MVC.

Residents and users of Clyde Lake need to adopt a stewardship approach to limit the amount of nutrients entering the lake. The first step to achieve this is to form a Lake Association. It is recommended that a Lake Steward be appointed to undertake ongoing 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*. There are helpful tips throughout this report to help reduce your impact on Clyde Lake. Additional water quality data, current and historic, is available for Clyde 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. We all have a responsibility to preserve this precious natural resource for future generations.

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 Clyde Lake Measure Up?

1983-2002 Water Quality Results

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]
**1983	3.3	22.0	*84.0	2.25
2002	3.5	12.5	26.3	2.86
n	2	2	2	2
Minimum	3.3	12.5	26.3	2.25
Maximum	3.5	22.0	84.0	2.86
Mean	3.4	17.3	55.2	0.78
Standard Deviation	0.14142	6.71751	18.59691	0.43134

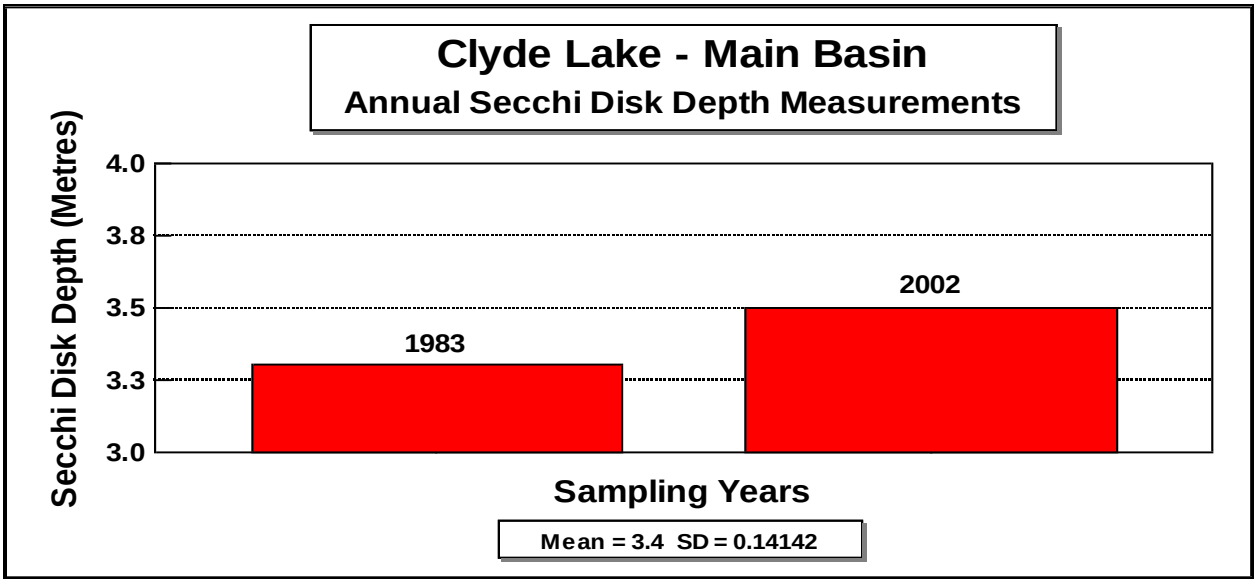
*Mean based on less than 6 measurements **Includes Recreational Lakes Program Data
Chlorophyll-a data prior to 1985 has been adjusted to reflect new lab procedures
in filtering resulting in an increase in chla concentrations by 35%

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.

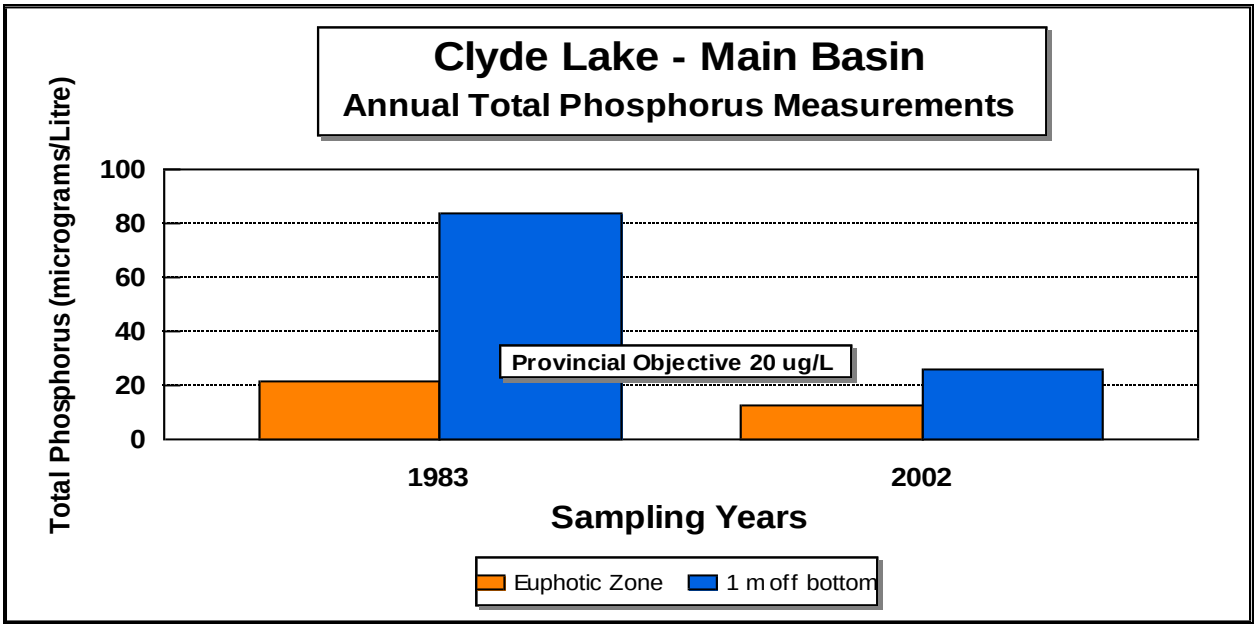
INTERPRETING YOUR SECCHI DISC RESULTS	
Secchi Reading	Lake Nutrient Status
Over 5 metres	Oligotrophic - unenriched, few nutrients
3.0 to 4.9 metres	Mesotrophic – moderately enriched, some nutrients
Less than 2.9 metres	Eutrophic – enriched, higher levels of nutrients



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.

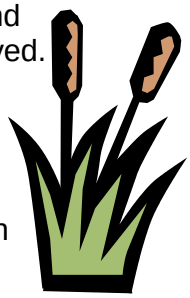
INTERPRETING YOUR TOTAL PHOSPHORUS RESULTS	
Total Phosphorus	Lake Nutrient Status
10ug/L or less	Oligotrophic - unenriched, few nutrients
11 to 20ug/L	Mesotrophic – moderately enriched, some nutrients
21ug/L or more	Eutrophic – enriched, higher levels of nutrients



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.

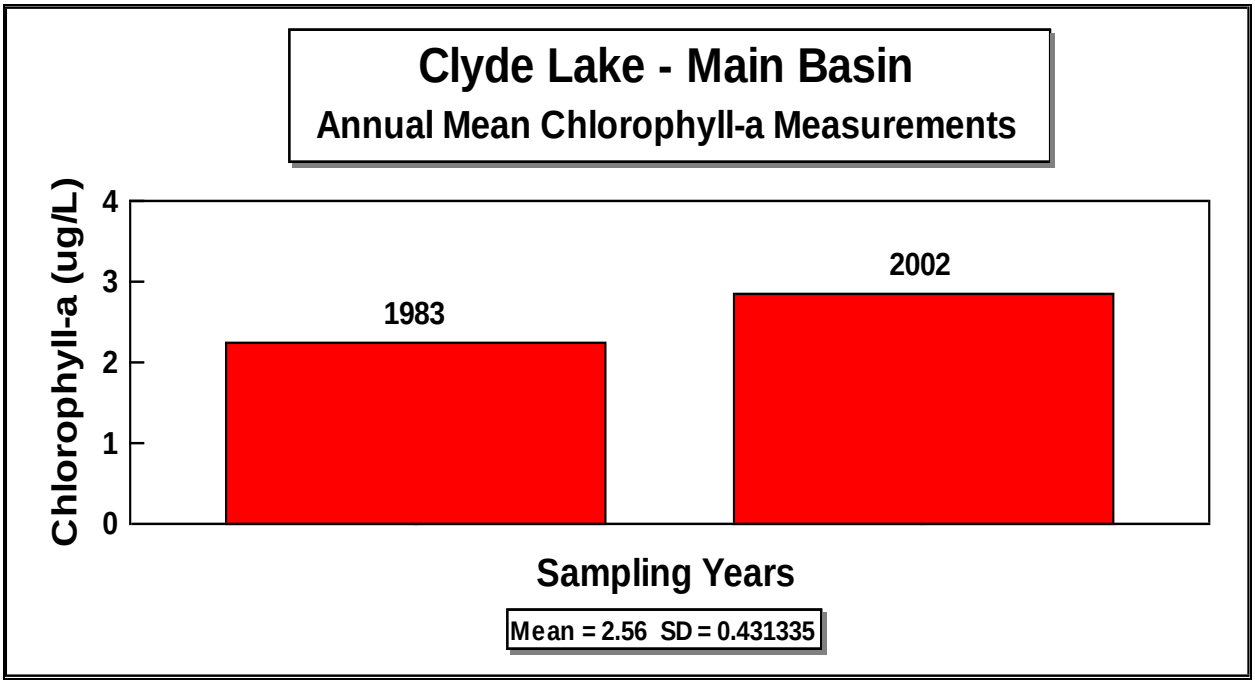


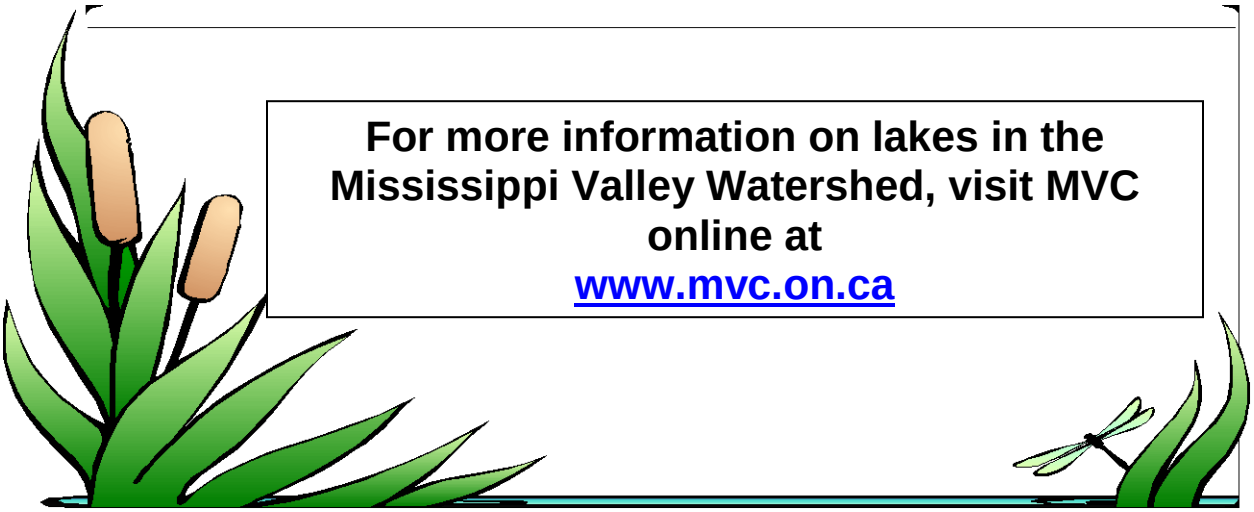
Interpreting Chlorophyll-a Results:

Chlorophyll-a, is a measure of the algal density in the lake. 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

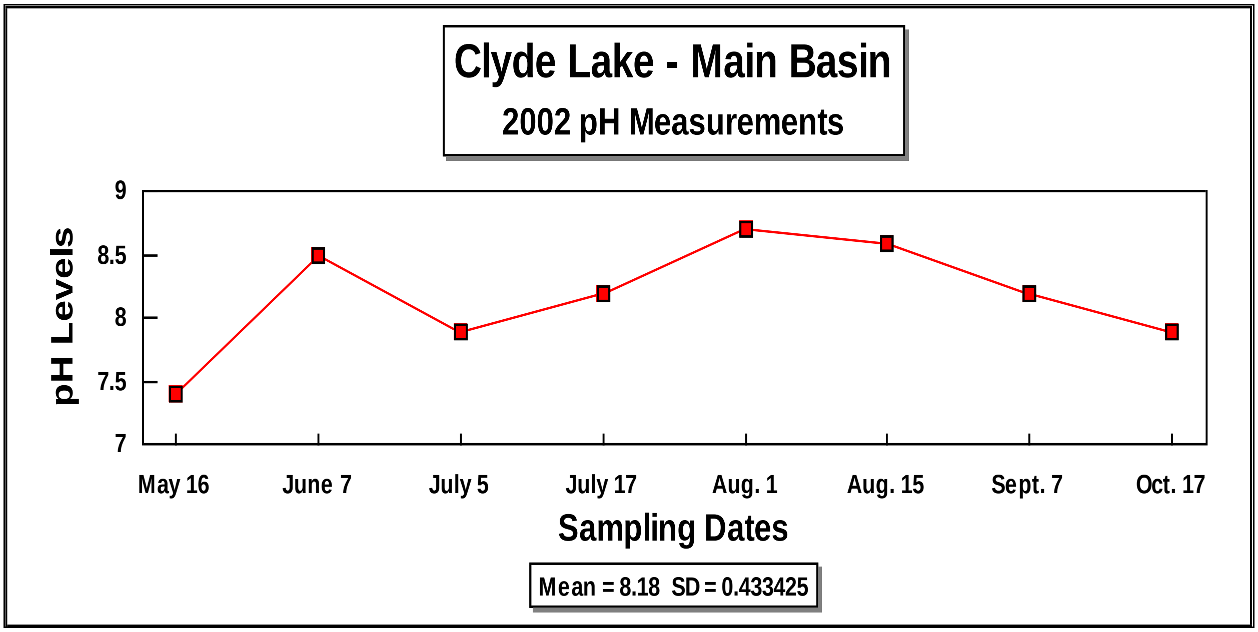
More than 4 ug/L- high algal density	Eutrophic - enriched, higher levels of nutrients





Interpreting pH Results:

The pH value is a measure of the concentration of hydrogen ions of a substance, which ranges from very acidic (pH = 1) to very alkaline (pH = 14). At a normal to neutral acidity level, a lake supports a diversity of life. A pH of 7 is neutral and most lake waters range between 6 and 9. pH values less than 6 are considered acidic, and most life forms cannot survive at a pH of 4.0 or lower. This parameter directly influences the types of plants and animals that live in the lake. Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.



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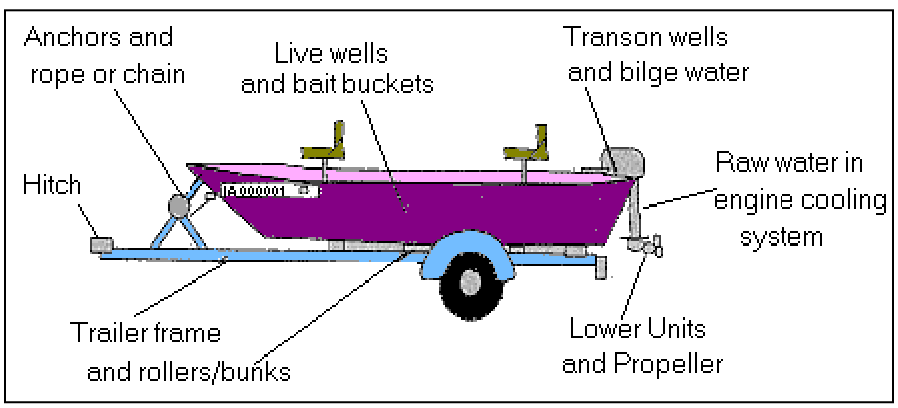
MVC and O.F.A.H. need your help to Stop the Invasion!
Check & clean your boat every time you change water bodies



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.

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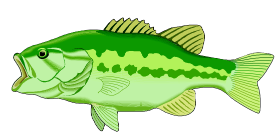
CLYDE LAKE – Main Basin
DISSOLVED OXYGEN/TEMPERATURE PROFILES
MOE Rec. Lks. Station # 19-3430-032-01, MVC Station # 02-01



Date: May 16, 2002
Depth: 12.2 Metres
Euphotic Zone (Penetration of Light) = 6.0 Metres

Date: July 17, 2002
Depth: 12.2 Metres
Euphotic Zone (Penetration of Light) = 7.0 Metres

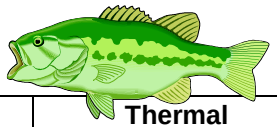
Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	10.6	10.0	106	
1.0	10.7	11.9	104	
2.0	10.7	12.0	105	
3.0	10.6	11.8	103	
4.0	10.6	10.9	95	
5.0	10.4	10.7	94	**Epilimnion**
6.0	9.8	10.2	86	
7.0	9.8	10.1	85	
8.0	9.7	10.1	85	
9.0	9.7	10.0	84	
10.0	9.6	9.9	83	
11.0	9.6	9.9	83	

Bottom

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

CLYDE LAKE – Main Basin continued…



Date: September 7, 2002

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	24.6	8.4	97	
1.0	24.1	8.5	98	**Epilimnion**
2.0	23.9	8.4	96	
3.0	20.7	6.4	69	
4.0	15.9	2.7	26	
5.0	14.1	2.0	19	**Metalimnion**
6.0	12.6	2.8	26	**or**
7.0	10.9	0.8	7	**Thermocline**
8.0	9.3	0.6	6	
9.0	7.6	0.3	3	
10.0	6.7	0.2	2	**Hypolimnion**
11.0	6.5	0.2	2	

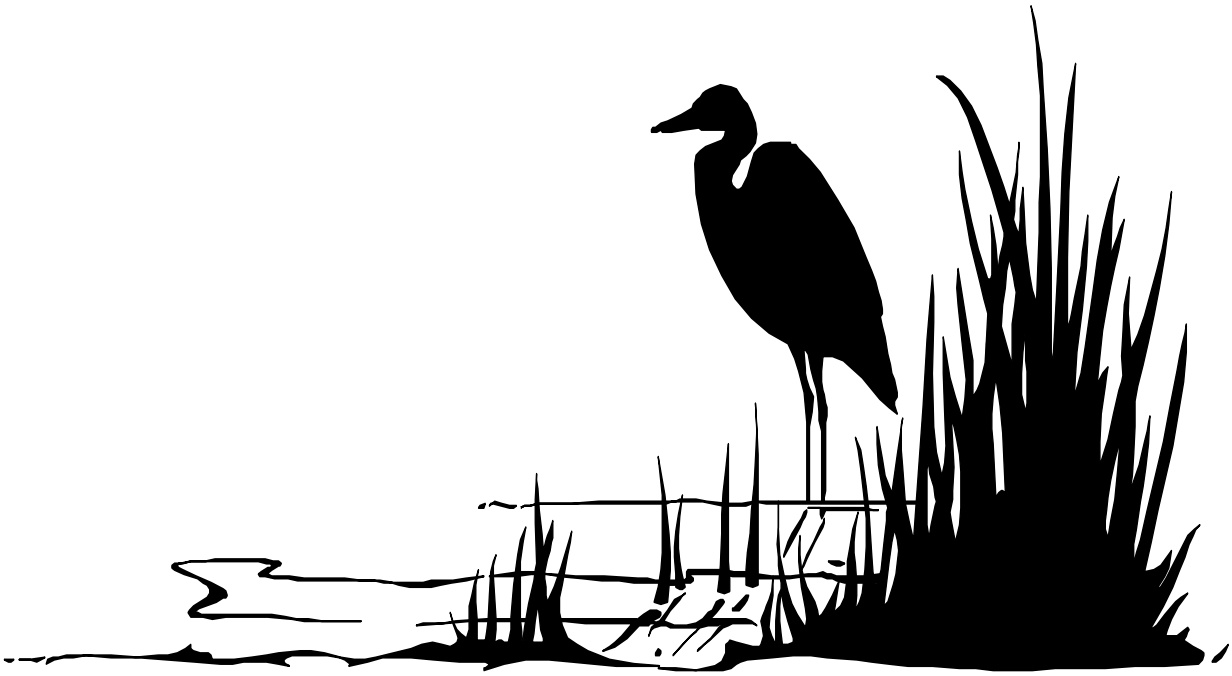
Bottom

Depth: 12.2 Metres
Euphotic Zone (Penetration of Light) = 8.0 Metres

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 or enhance your lake environment, contact Melissa Dakers, Water Quality Technician, Mississippi Valley Conservation at (613) 259-2421 or mdakers@mvc.on.ca

D [M		en e]	Percent % Saturation	Thermal Stratification
			76 79 79 79 79	Epilimnion
			34 4 3	Metalimnion or Thermocline
7.0	11.3	0.2		
8.0			2 2 2	Hypolimnion
9.0	10.1	0.1		
10.0	10.0	0.1		
				Bottom

Mississippi Valley Conservation

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C