



Mississippi Valley Conservation

State of the Lake Environment Report 2008

Mackavoy Lake



Mackavoy Lake

Mackavoy Lake is located in the Township of Addington Highlands. Mackavoy Lake is a headwater lake of the Mississippi River and runs in a north-south direction. The lake perimeter is 2.9 kilometres and the deepest point is 19.8 metres. Mackavoy Lake supports a warm water fishery, this includes, Walleye, Northern Pike, Smallmouth Bass, Yellow Perch, White Sucker, Brown Bullhead and Pumpkinseed (Sunfish). At last count in 1971, there were only four cottages and one resort on the lake.

A study to evaluate the status of water quality in Mackavoy Lake was conducted by the Ontario Water Resources Commission in 1971. Due to the limited number of residents on the lake, a Lake Association has not yet been formed for Mackavoy Lake. As well, residents have not participated in water quality testing available through the Ministry of Environment Self Help Program or the Lake Partner Program. Limited water quality data is available for Mackavoy Lake. Comprehensive testing in 1998, 2003 and 2008 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 1971, (37 years ago), through the Ministry of Environment Recreational Lakes Program.



There is one sampling station on the lake at the deepest point. Water clarity readings, as measured by secchi Disc, were observed as good. The average for 2008 is 3.5 metres, compared to 5 years ago, when the average was 4.47 metres. Thus indicating that Mackavoy 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 2008, the mean for the euphotic zone (depth at which sunlight can penetrate or two times the secchi disc depth) was 15.7 ug/L, a noticeable increase compared to 4.0 ug/L in 2003. The mean for the samples taken one metre off the bottom was 12.7 ug/L in 2008, slightly decreased from the 2003 reading of 14.33 ug/L

Chlorophyll a is a measure of the algal density in the lake. The 2008 average chlorophyll a density was 1.5 ug/L. Thus, indicating a unenriched, few nutrients or oligotrophic lake. Compared to 2003 mesotrophic reading of 2.13 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 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 pike and pickerel, are squeezed into the upper 10 metres of the lake by October. However, this has been a great improvement since 1998, where the fish habitat was squeezed into the upper 4 metres of the lake.



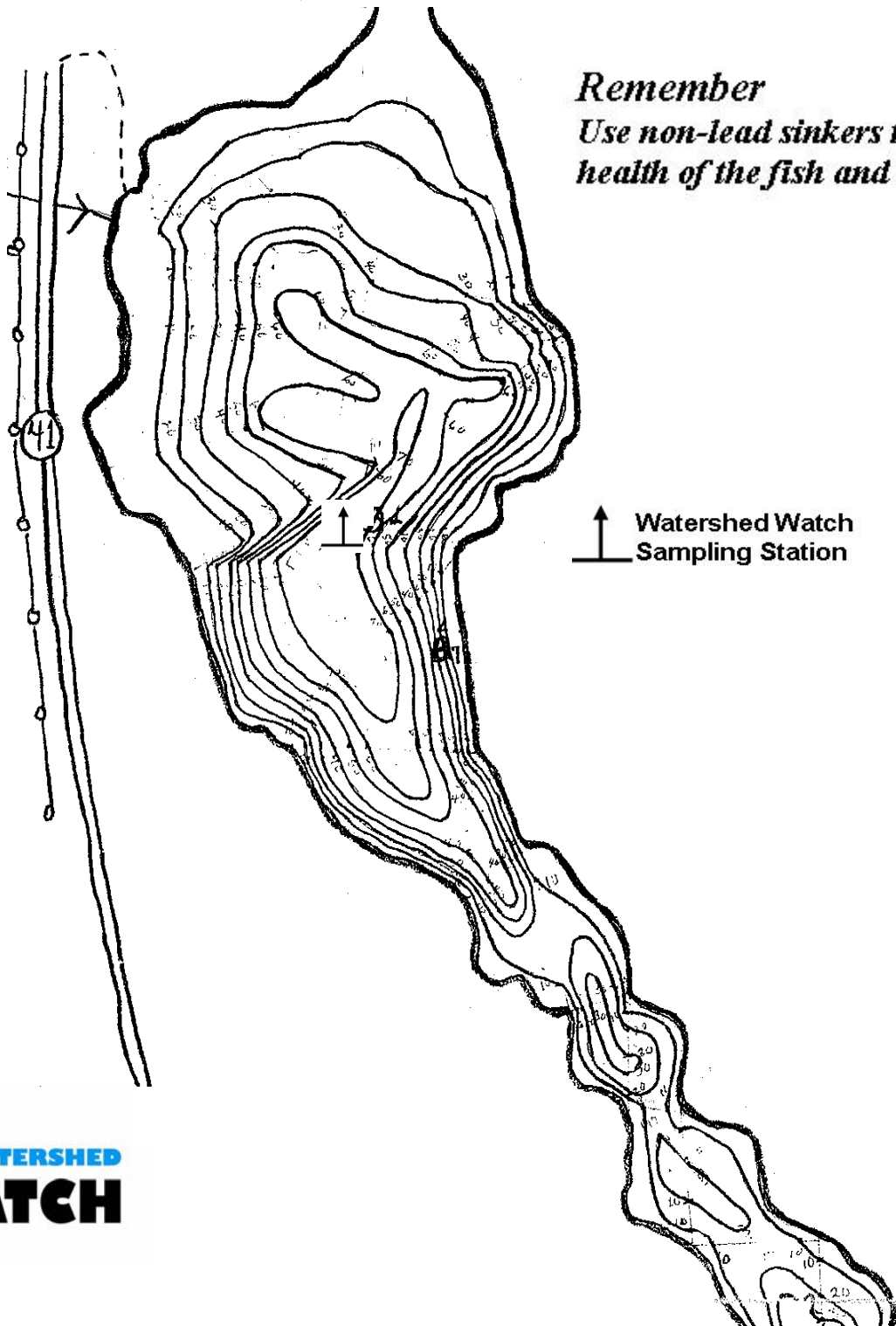
Residents and users of Mackavoy Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities. Human sources of phosphorus include leachate from sewage disposal systems, erosion from the clearing of shorelines and the use of lawn fertilizers.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



Mississippi Valley Conservation

Mackavoy Lake

The headwater of the Mississippi River.



Remember

Use non-lead sinkers to protect the health of the fish and this lake.

↑ Watershed Watch
Sampling Station

↑
N

↓ Mazinaw Lake



This map is intended for illustration only; it should not be used as a navigation guide.

MVC and OFAH need your help to Stop the Invasion!

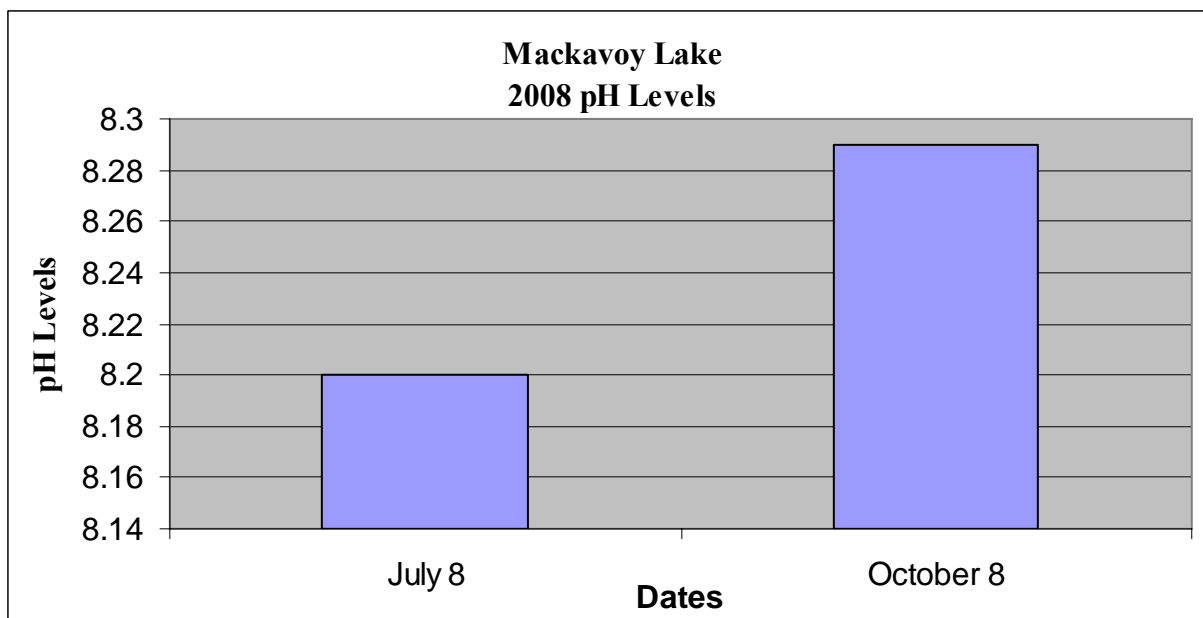
*Check & clean your boat every time
you change water bodies*

Mackavoy Lake was also tested for invasive species in 2008, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters. Mackavoy Lake did not have spiny water flea or zebra mussel veligers (larvae) present in the sample collected in 2008, however previous years have detected zebra mussel veligers present. Residents and property owners need to ensure that all access points to the lake have posted signs indicating the presence of zebra mussels and the precautions they can take to avoid the spread of invasive species to other lakes.



Evaluating your pH Results

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



How Does Mackavoy Lake Measure Up?

1971 - 2008 WATER QUALITY RESULTS - Mackavoy Lake

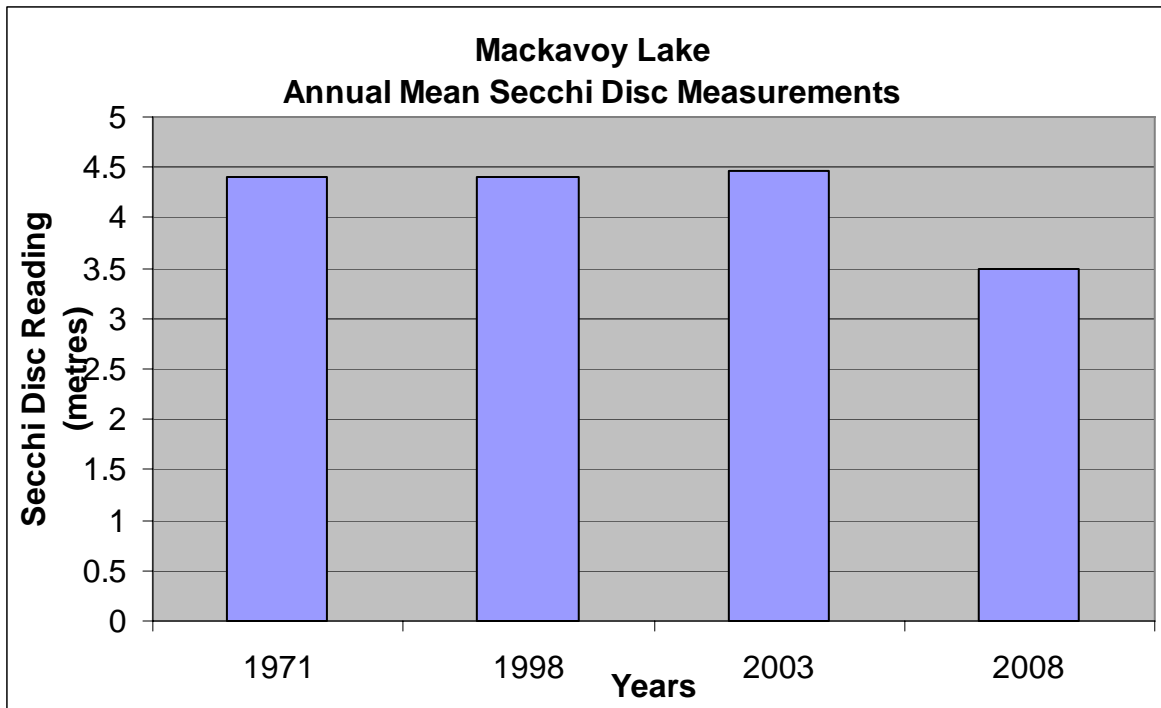
Sample Year	Secchi Disk Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
**1971	4.4			1.2
1998	4.4	6.71	7.86	1.2
*2003	4.47	4	14.33	2.13
*2008	3.5	15.7	12.7	1.5
n	4	3	3	4
Minimum	3.5	4.00	7.86	1.20
Maximum	4.5	15.7	14.33	2.1
Mean	4.2	8.8	11.6	1.5
Standard Devia-	0.46284447	6.124461881	3.365100296	0.438434716

* Mean based on less than 6 measurements ** Includes Recreational Lakes Program Data
Chlorophylla 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:



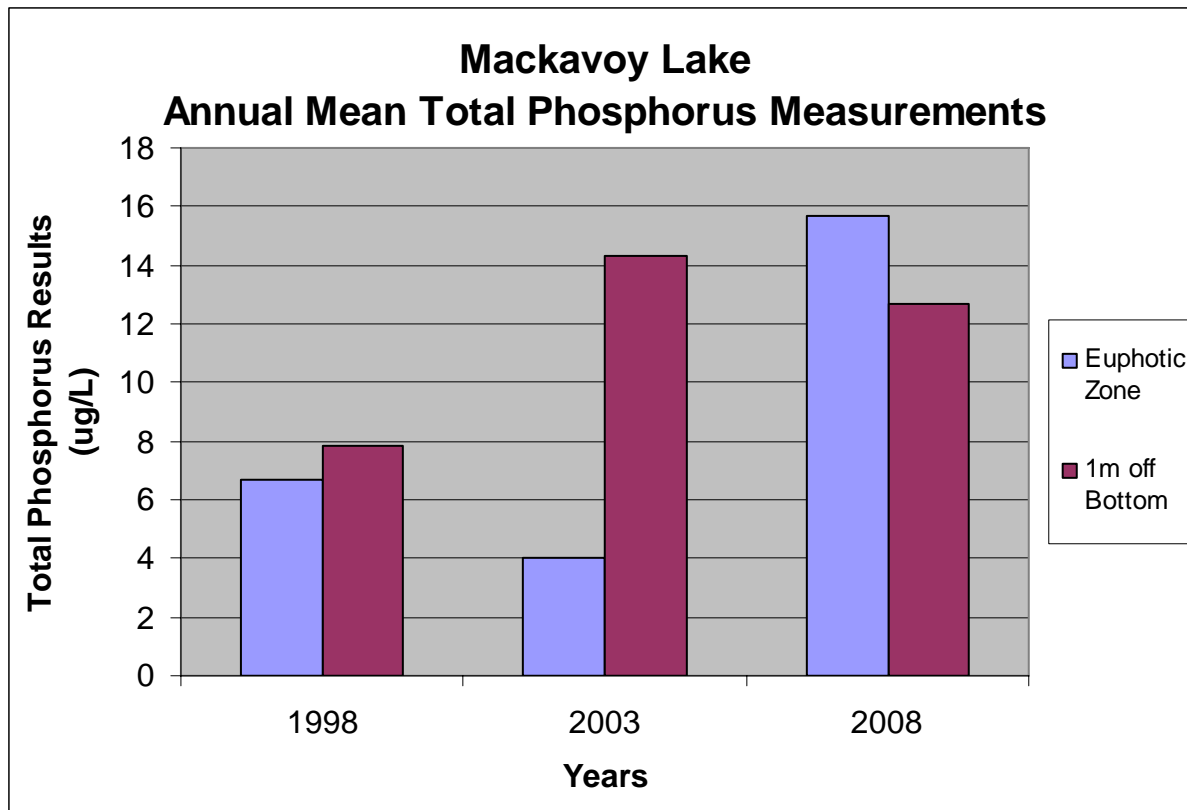
A Secchi disc is a black and white coloured disc used to determine water clarity. The disc is lowered into the water. The point, at which you can no longer distinguish the black and white, is called the Secchi depth.



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.

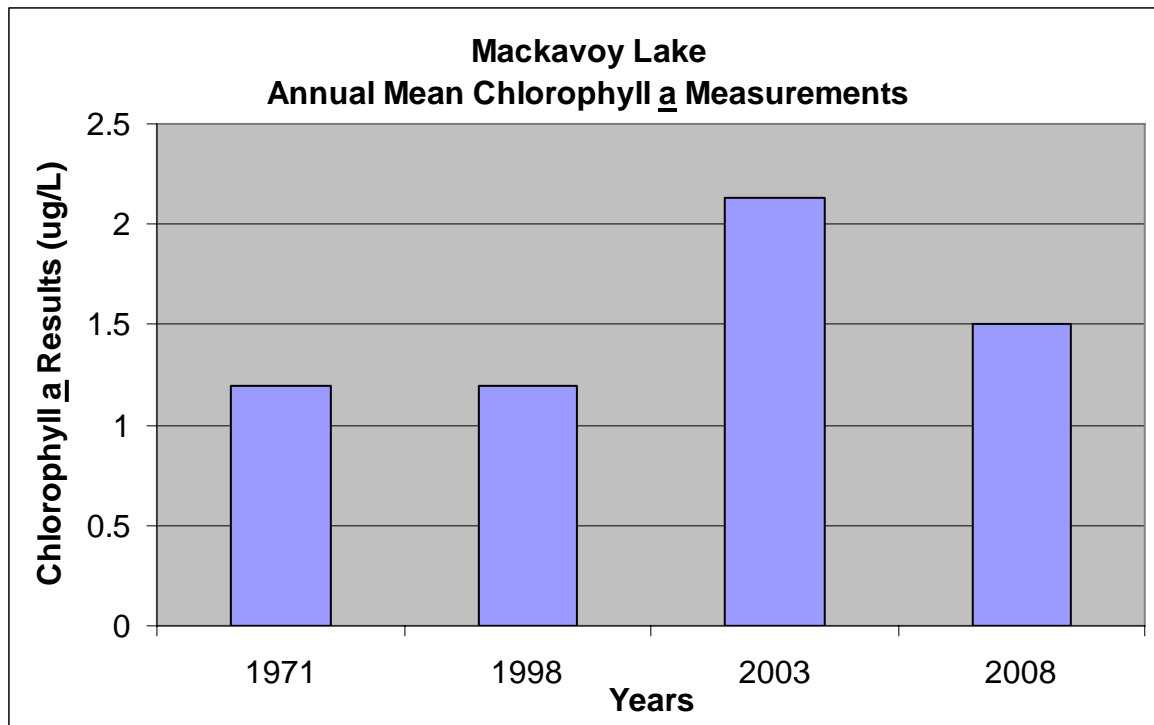
INTERPRETING YOUR TOTAL PHOSPHORUS RESULTS	
Total Phosphorus	Lake Nutrient Status
10 ug/L or less	Oligotrophic - unenriched, few nutrients
11 to 20 ug/L	Mesotrophic – moderately enriched, some nutrients
21 ug/L or more	Eutrophic – enriched, higher levels of nutrients



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



MACKAVOY LAKE - MAIN BASIN

DISSOLVED OXYGEN/TEMPERATURE PROFILE

MOE Rec.Lks. Station 18-3430-739-01 MVC Station 08-10

Date: June 03, 2008

Depth: 16.0 Metres

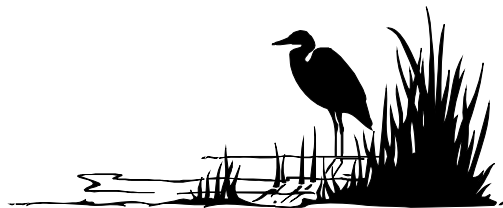
Euphotic Zone (Penetration of Light) = 8.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	17.7	9.0	90	Epilimnion
1	17.7	9.2	93	
2	16.6	9.2	90	
3	15.7	8.7	84	Metalimnion or Thermocline
4	14.2	8.3	79	
5	12.1	8.4	75	
6	9.6	8.6	72	
7	7.3	8.6	68	
8	6.3	9.4	74	
9	5.4	9.5	72	Hypolimnion
10	4.8	9.3	70	
11	4.7	9.0	67	
12	4.4	6.4	48	
13	4.1	6.1	45	
14	4.0	3.7	27	
15	3.9	3.3	24	
16	Bottom	Bottom	Bottom	

Warm Water Fisheries =
greater than 4 mg/L DO at less than 25 degrees Celsius

**For more information on lakes in the
Mississippi Valley Watershed, visit MVC
online at**

www.mvc.on.ca



MOE Rec.Lks. Station 18-3430--01 MVC Station 08-10

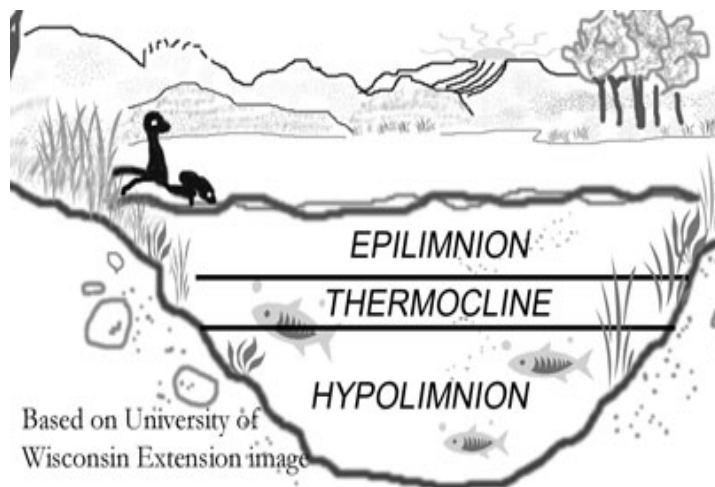
Date: July 08, 2008

Depth: 19.0 Metres

Euphotic Zone (Penetration of Light) = 6.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	24.4	9.0	103	Epilimnion
1	24.3	8.9	102	
2	21.9	8.3	92	Metalimnion or Thermocline
3	18.9	7.3	75	
4	14.8	7.0	66	
5	11.8	6.9	61	
6	9.3	7.4	63	
7	7.5	8.1	65	
8	6.2	8.3	65	
9	5.1	8.2	63	Hypolimnion
10	4.9	8.4	64	
11	4.7	6.7	50	
12	4.6	6.3	47	
13	4.2	4.0	30	
14	4.2	3.3	24	
15	4.1	2.5	18	
16	4.0	2.4	18	
17	3.9	1.4	11	
18	3.9	1.2	9	
19	Bottom	Bottom	Bottom	

Warm Water Fisheries = greater than 4 mg/L DO at less than 25 degrees Celsius



Epilimnion (warm surface layer)

Thermocline or Metalimnion (transition zone between warm and cold water, depth can change throughout the day)

Hypolimnion (cold bottom water)


MOE Rec.Lks. Station 18-3430--01 MVC Station 08-10

Date: October 10, 2008

Depth: 16.0 Metres

Euphotic Zone (Penetration of Light) = 7.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	11.5	9.0	79	Epilimnion
1	11.5	9.3	82	
2	11.4	9.3	82	
3	11.4	9.3	82	
4	11.2	9.1	80	
5	10.5	8.3	72	
6	9.7	7.3	62	Thermocline
7	6.9	5.5	43	
8	5.9	5.3	41	Hypolimnion
9	5.4	4.9	38	
10	4.9	4.3	32	
11	4.5	2.9	21	
12	4.2	2.5	18	
13	4.1	1.4	10	
14	4.0	0.9	6	
15	4.0	0.8	6	
16	Bottom	Bottom	Bottom	

 Warm Water Fisheries = greater than 4 mg/L DO at less than 25 degrees Celsius



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 or enhance your lake environment, contact Susan Lee, Watershed Monitoring Supervisor, Mississippi Valley Conservation at (613) 259-2421 or slee@mvc.on.ca

