

Mississippi Valley Conservation

*State of the Lake
Environment Report
2006*

Patterson Lake



“THE RIBBON OF LIFE”

Where the Land Meets the Water

Water quality is affected by many things: erosion and runoff from clearing of shorelines, the use of artificial fertilizers and leachate from sewage disposal systems resulting in too many nutrients reaching the lake. Phosphorus is the key nutrient of concern, too many nutrients can cause weed and algae growth and threatens fish habitat by reducing oxygen levels.

The shallow waters and first 10 metres of shore land form a "Ribbon of Life" around our lakes. This ribbon - where the land meets the water - is where much of the lake life is born, raised and fed. Many landowners, unaware of the importance of this area, have cleared the shorelines of native vegetation and replaced it with lawns, non-native ornamental vegetation, retaining walls and boathouses. This has had a negative affect on fish and wildlife habitat and water quality. Natural vegetation retained or restored along the shoreline helps prevent erosion and improves water quality by binding nutrients before they can enter the lake.

Mississippi Valley Conservation has long recognized the recreational and aesthetic value of lakes within the watershed and is committed to maintaining and protecting water quality and fish habitat. Mississippi Valley Conservation has joined together with volunteer Lake Stewards throughout the watershed to take steps to protect and restore water quality by launching the *Watershed Watch* program in 1998. *Watershed Watch* is an environmental monitoring and awareness program. The objectives of the program are to collect reliable environmental data to document current water quality conditions and use the data as an essential educational tool to encourage residents to adopt sound stewardship practices aimed at preserving and protecting water quality. Together we will encourage and assist shoreline residents, both seasonal and permanent, to become personal stewards of their lake by taking an active role in restoring and enhancing their shoreline to maintain water quality and a healthy lake environment.

Recreational water quality is generally expressed in terms of how clear the water appears. Water clarity is influenced by the amount of phytoplankton or microscopic algae present in the water; **chlorophyll a** is the green pigment in the phytoplankton. Water clarity is measured with a **Secchi Disc**, a 20 cm black and white disk attached to a measured line and lowered into the lake until it is no longer visible. The amount of nutrients entering the lake, in particular **phosphorus**, influences the amount of algae growing in the lake. Water clarity decreases with elevated concentrations of algae and therefore Secchi disc values are less. After the spring warming period there is a continuous supply of algae in the surface waters of the lake to the deep water areas where it decomposes and uses up the natural supply of oxygen. In severe circumstances this may eliminate habitat for fish species which require the cold, deep water portions to survive. Through *Watershed Watch* forty-two base lakes in the watershed will be monitored for these key water quality indicators; **total phosphorus, chlorophyll a, dissolved oxygen and temperature profiles and water clarity.**

Patterson Lake

Patterson Lake is a warm water lake located in the amalgamated township of Lanark Highlands. At last count in 1996 there were 11 residential houses, and 70 cottages on the lake.

Patterson Lake Facts

Elevation: 200.86m above sea level

Perimetre: 11.27 kilometres

Deepest Point: 15.8m

Fisheries Include: Northern Pike

Large/smallmouth Bass

Common White Sucker

Bluegill

Yellow Perch

Rock Bass

Pumpkin Seed



Residents of Patterson Lake have volunteered their time in the past, to provide water quality testing through the Ministry of the Environment (MOE) Self Help Program, also known as The Lake Partner Program since 1977. This data is extremely valuable, the data provides a general picture of water quality conditions over the past 29 years. Comprehensive testing in 2001 and 2006 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-six years ago through the MOE Recreational Lakes Program.

In general the water quality in Patterson Lake is good. There is one sampling station at the deepest point as indicated on the map included in this report. This station was sampled three times in 2006. Graphs will follow that show water clarity, as measured by Secchi Disc, observations were very good. The mean for 2006 is 5.0 metres indicating that Patterson 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 Patterson Lake is 20 micrograms/litre (*ug/L*). The mean for euphotic zone (penetration of light) for 2006 is 11.3 *ug/L* indicating an moderately enriched lake and the mean for the sample taken one metre off the bottom is 15.0 *ug/L*, also indicating a moderately enriched (some nutrients) or mesotrophic lake.

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a densities for the sampling station in 2006 was 3.1 micrograms/litre indicating, a moderate algal density for Patterson Lake.

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 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 poor by late summer. Warm water fish species, such as pike and bass, are squeezed into the upper seven metres of the lake by late summer. Therefore, residents and users of Patterson Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities.

Patterson Lake was also tested for invasive species in 2006, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters. Patterson Lake did *not* have zebra mussel veligers (larvae) or spiny water flea 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 Patterson Lake.

Residents and users of Patterson Lake should continue a stewardship approach to limit the amount of nutrient entering the lake. 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. Contact MVC for more information on how to become a good lake steward, we all have a responsibility to preserve this precious natural resource for future generations.

How does Patterson Lake Measure Up?

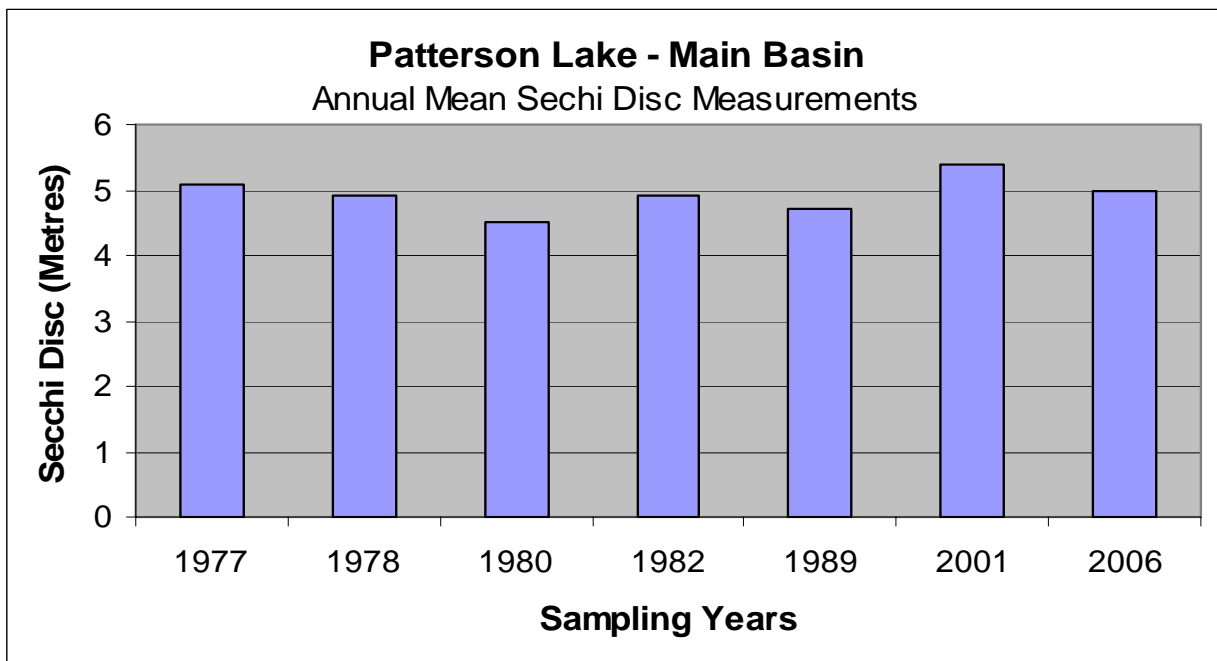
1977 – 2006 WATER QUALITY RESULTS – MAIN BASIN

| Sample Year Mean | Secchi Disc Depth (Metres) | Total Phosphorus Euphotic Zone (Micrograms/litre) | Total Phosphorus 1 Metre off Bottom (Micrograms/litre) | Chlorophyll <u>a</u> Composite (Micrograms/litre) |
|---------------------|----------------------------------|---|--|---|
| *1977 | 5.1 | | | 2.2 |
| *1978 | 4.9 | | | 2.1 |
| **1980 | 4.5 | 18.0 | 18.0 | 4.1 |
| 1982 | 4.9 | | | 2.2 |
| 1989 | 4.7 | | | 6.0 |
| 2001 | 5.4 | 8.8 | 16.3 | 2.9 |
| *2006 | 5.0 | 11.3 | 15.0 | 3.1 |
| n | 7 | 3 | 3 | 7 |
| Mean | 4.9 | 12.7 | 16.4 | 3.2 |
| Standard Deviation | 0.29 | 4.76 | 1.50 | 1.41 |

*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%

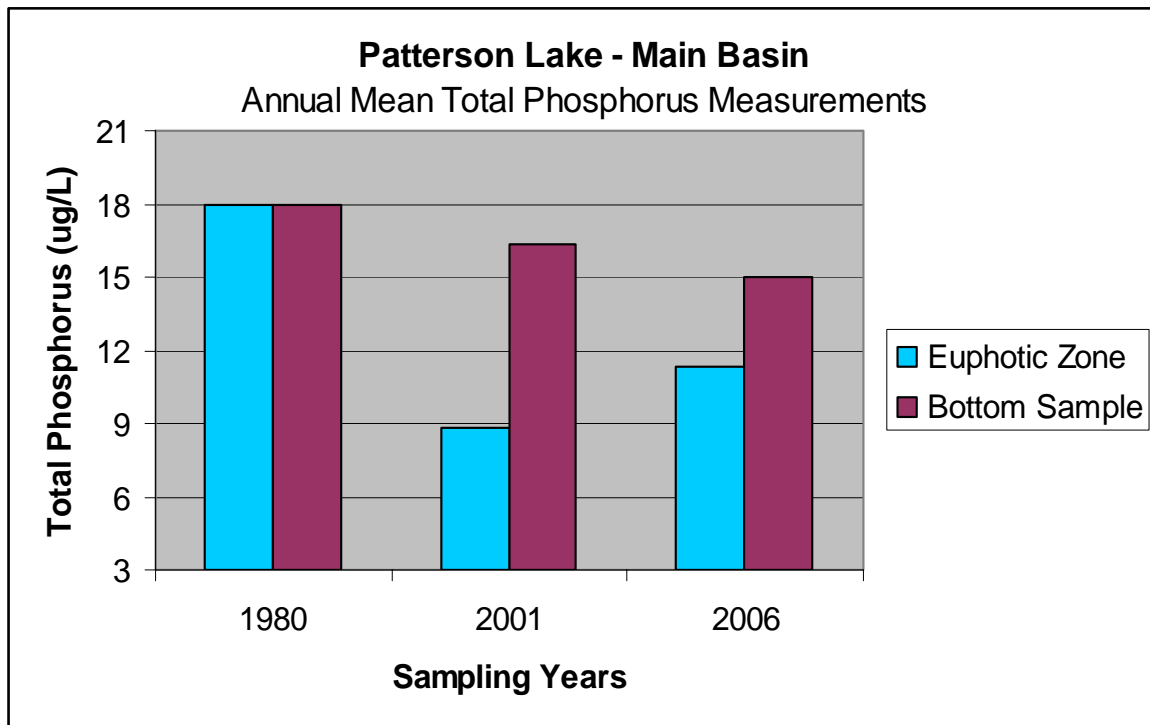
The higher the Secchi Disc reading, the clearer your lake is!

| 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 |



The lower the phosphorus reading, the clearer your lake is!

| Nutrient Loading and How to Interpret the Water Quality Result : | |
|--|---|
| If the Total Phosphorus Reading is... Your Lake is... | |
| 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 |

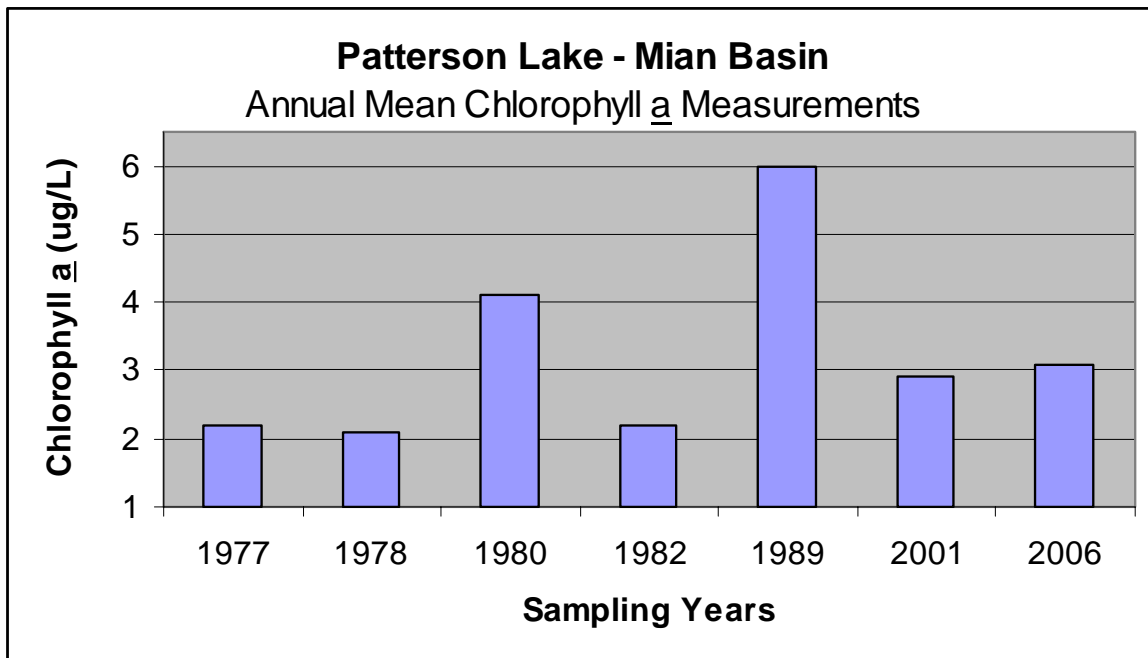


FIVE EASY STEPS TO IMPROVE WATER QUALITY

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.

The lower the Chlorophyll a density, the clearer your lake is!

| Nutrient Loading and How to Interpret the Water Quality Result : | |
|--|---|
| If the Chlorophyll <u>a</u> density is... | Your Lake is... |
| 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 |

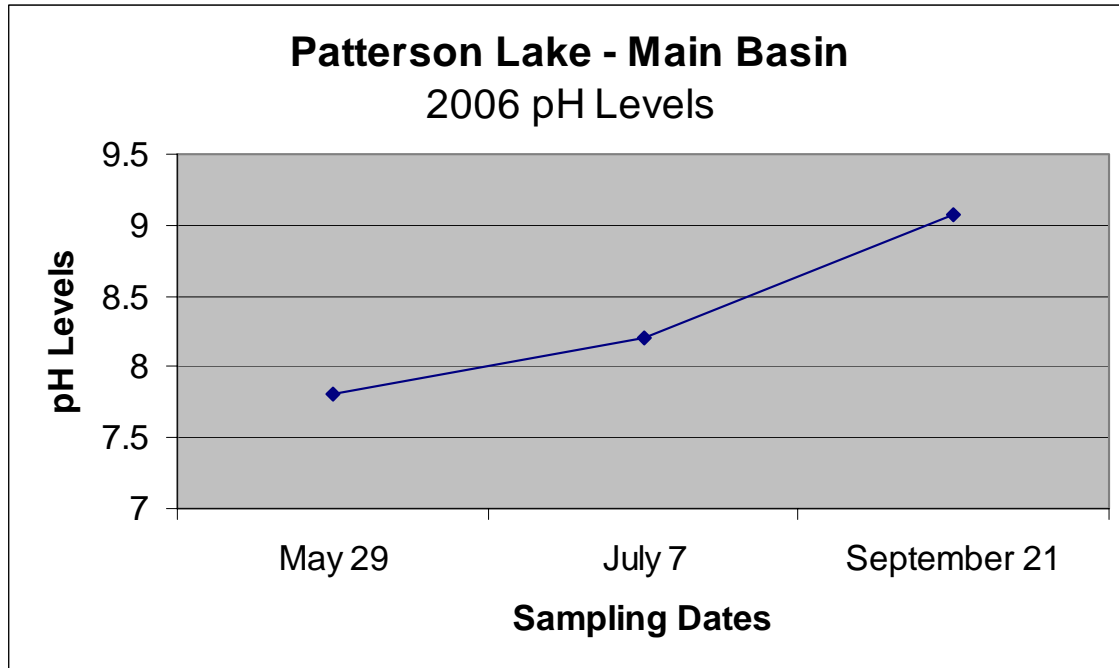


For more information on lakes in the
Mississippi Valley Watershed, visit MVC
online at

www.mvc.on.ca

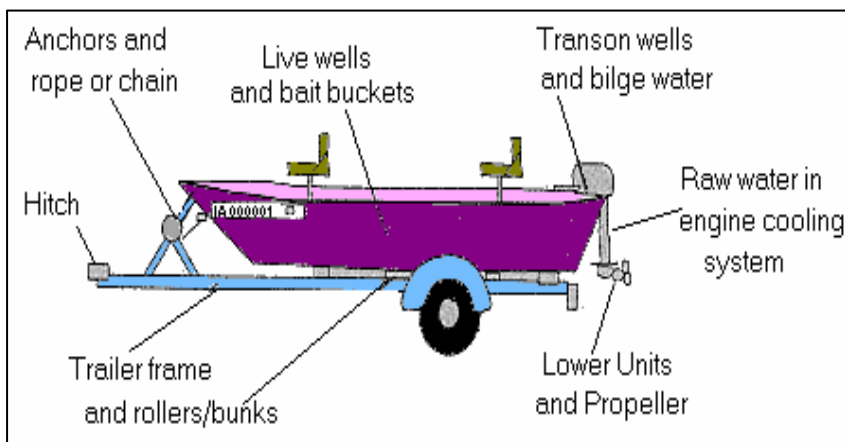


Lakes with pH levels of 7.3 or higher are vulnerable to zebra mussel invasives!



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.

PATTERSON LAKE – MAIN BASIN DISSOLVED OXYGEN / TEMPERATURE PROFILE


MOE Rec. Lks. Station # 18-3430-753-01 MVC Station # 06-07

Date: May 29, 2006

Depth: 14 Metres

Euphotic Zone (Penetration of Light) = 14 Metres

| Depth (Metres) | Temperature (Degrees Celsius) | Dissolved Oxygen (Milligrams/Litre) | Percent % Saturation | Thermal Stratification |
|----------------|-------------------------------|-------------------------------------|----------------------|------------------------|
| 0.1 | 21.4 | 9.0 | 97 | Epilimnion |
| 1.0 | 20.5 | 10.0 | 106 | |
| 2.0 | 17.8 | 10.3 | 107 | Thermocline - 1 |
| 3.0 | 16.1 | 9.3 | 90 | |
| 4.0 | 14.8 | 8.5 | 79 | |
| 5.0 | 13.9 | 8.0 | 74 | Thermocline - 2 |
| 6.0 | 12.0 | 8.0 | 72 | |
| 7.0 | 8.0 | 5.2 | 41 | |
| 8.0 | 6.8 | 3.4 | 26 | |
| 9.0 | 6.3 | 2.9 | 22 | Hypolimnion |
| 10.0 | 5.9 | 1.8 | 13 | |
| 11.0 | 5.7 | 1.9 | 14 | |
| 12.0 | 5.6 | 1.9 | 14 | |
| 13.0 | 5.4 | 1.6 | 12 | |
| 14.0 | Bottom | Bottom | Bottom | |

 Warm Water Fish Habitat (Bass, Walleye, Pike, Perch) = Dissolved Oxygen greater than 4 mg/L at less than 25 Degrees Celsius

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 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.



PATTERSON LAKE – MAIN BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE


MOE Rec. Lks. Station # 18-3430-753-01 MVC Station # 06-07

Date: July 7, 2006

Depth: 15 Metres

Euphotic Zone (Penetration of Light) = 8 Metres

| Depth (Metres) | Temperature (Degrees Celsius) | Dissolved Oxygen (Milligrams/Litre) | Percent % Saturation | Thermal Stratification |
|----------------|-------------------------------|-------------------------------------|----------------------|------------------------|
| 0.1 | 23.3 | 8.0 | 90 | Epilimnion |
| 1.0 | 22.9 | 8.1 | 90 | |
| 2.0 | 22.8 | 8.2 | 92 | |
| 3.0 | 22.8 | 8.3 | 93 | |
| 4.0 | 22.7 | 8.3 | 93 | |
| 5.0 | 19.3 | 8.1 | 85 | Thermocline |
| 6.0 | 15.5 | 8.2 | 79 | |
| 7.0 | 11.3 | 4.0 | 34 | |
| 8.0 | 9.0 | 3.7 | 30 | |
| 9.0 | 7.9 | 2.1 | 16 | |
| 10.0 | 6.8 | 1.5 | 12 | Hypolimnion |
| 11.0 | 6.2 | 1.1 | 8 | |
| 12.0 | 6.0 | 0.9 | 7 | |
| 13.0 | 5.9 | 0.7 | 4 | |
| 14.0 | 5.8 | 0.6 | 4 | |
| 15.0 | Bottom | Bottom | Bottom | |

 Warm Water Fish Habitat (Bass, Walleye, Pike, Perch) = Dissolved Oxygen greater than 4 mg/L at less than 25 Degrees Celsius

| 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 |

PATTERSON LAKE – MAIN BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE


MOE Rec. Lks. Station # 18-3430-753-01 MVC Station # 06-07

Date: September 21, 2006

Depth: 17 Metres

Euphotic Zone (Penetration of Light) = 8 Metres

| Depth (Metres) | Temperature (Degrees Celsius) | Dissolved Oxygen (Milligrams/Litre) | Percent % Saturation | Thermal Stratification |
|----------------|-------------------------------|-------------------------------------|----------------------|------------------------|
| 0.1 | 17.1 | 9.0 | 90 | Epilimnion |
| 1.0 | 17.2 | 9.0 | 90 | |
| 2.0 | 17.2 | 9.0 | 90 | |
| 3.0 | 17.2 | 9.1 | 91 | |
| 4.0 | 17.1 | 9.2 | 92 | |
| 5.0 | 17.1 | 9.0 | 92 | |
| 6.0 | 16.6 | 9.0 | 90 | |
| 7.0 | 16.0 | 6.4 | 61 | |
| 8.0 | 13.6 | 1.6 | 14 | Thermocline |
| 9.0 | 9.5 | 1.1 | 9 | |
| 10.0 | 7.5 | 0.8 | 6 | |
| 11.0 | 6.6 | 0.7 | 5 | Hypolimnion |
| 12.0 | 6.2 | 0.6 | 4 | |
| 13.0 | 6.0 | 0.5 | 4 | |
| 14.0 | 5.9 | 0.5 | 4 | |
| 15.0 | 5.8 | 0.4 | 3 | |
| 16.0 | 5.8 | 0.4 | 3 | |
| 17.0 | Bottom | Bottom | Bottom | |

 Warm Water Fish Habitat (Bass, Walleye, Pike, Perch) = Dissolved Oxygen greater than 4 mg/L 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 and enhance your lake environment, contact Susan Lee, Watershed Monitoring Supervisor at Mississippi Valley Conservation. (613) 259-2421 or slee@mvc.on.ca