Mississippi Valley Conservation

State of the Lake Environment Report December 2005

Palmerston Lake

Watershed Watch

PALMERSTON LAKE

Palmerston Lake is a cold water lake located in the newly amalgamated Township of North Frontenac. A public boat launch is located at the Palmerston Canonto Conservation Area, beside the Palmerston Lake dam, at the north end of the lake. As of 1995, there were 141 cottages and 4 (123) resorts.

Palmerston Lake Facts

Elevation: 271 meters above sea level
Perimeter: 29 kilometers
Maximum depth: 56.4 meters
Fisheries include: Lake Trout
Lake Herring
Yellow Perch
Smallmouth Bass

Individuals have volunteered their time to provide water quality testing through the Ministry of Environment (MOE) Self Help Program since 1973. This data is extremely valuable and provides a general picture of water quality conditions over the past 32 years. 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 25 years ago through the MOE Recreational Lakes Program.

In general the water quality in Palmerston Lake is very good. There are two sampling station located in the north basin (58.4 meters) and at the south basin (26 meters). Each station was sampled three times for 2005. You will find graphs which show water clarity, as measured by Secchi Disk readings, observations were good. The mean for 2005 is 5.6 metres indicating that Palmerston 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 Palmerston Lake is 10 micrograms/litre (*ug*/L). The average total phosphorus results for 2005 for the euphotic zone (penetration of light) and the bottom sample were both 2.7 *ug*/L, indicating an unenriched lake or oligotrophic lake.

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a densities for the sampling stations in 2005 was 1.31 micrograms/litre indicating, a low algal density for Palmerston 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 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. Lake trout require more pristine environmental conditions than most native fish species. Therefore, lake trout can act as an environmental barometer. The dissolved oxygen and temperature profiles conducted in May of 2005 at both sampling stations indicate sufficient optimal habitat is present to support lake trout in Palmerston Lake. Results obtained in September, the most critical time of year, indicates there is only a 13 metre layer of water from 9 to 21 metres in the north basin having vital conditions for the lake trout to survive. While the south basin has a 36 metre layer of water from 10 to 15 metres. Residents and users of Palmerston Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities, in order to protect this cold water resource.

Palmerston 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. Zebra mussel veligers (larvae) and spiny water flea were not 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 for boaters to take, in order to avoid the spread of invasive species into Palmerston Lake.

Residents and users of Palmerston Lake should continue a stewardship approach to limit the amount of nutrients entering the lake and form a Lake Association. A lake steward should be chosen to continue the water quality monitoring and to join the 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

---

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 Palmerston Lake Measure Up?

1973 – 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)
1995	8.2			1.00
2000	6.7	*10.2	*45.0	0.73
*2005	*5.6	*3.33	*4.0	*1.5
n	3	2	2	3
Minimum	5.6	3.33	4.0	0.73
Maximum	8.2	10.2	45.0	1.5
Mean	6.8	6.7	24.5	1.07
Standard Deviation	1.30	4.85	28.99	0.38

1973 – 2005 WATER QUALITY RESULTS – SOUTH BASIN

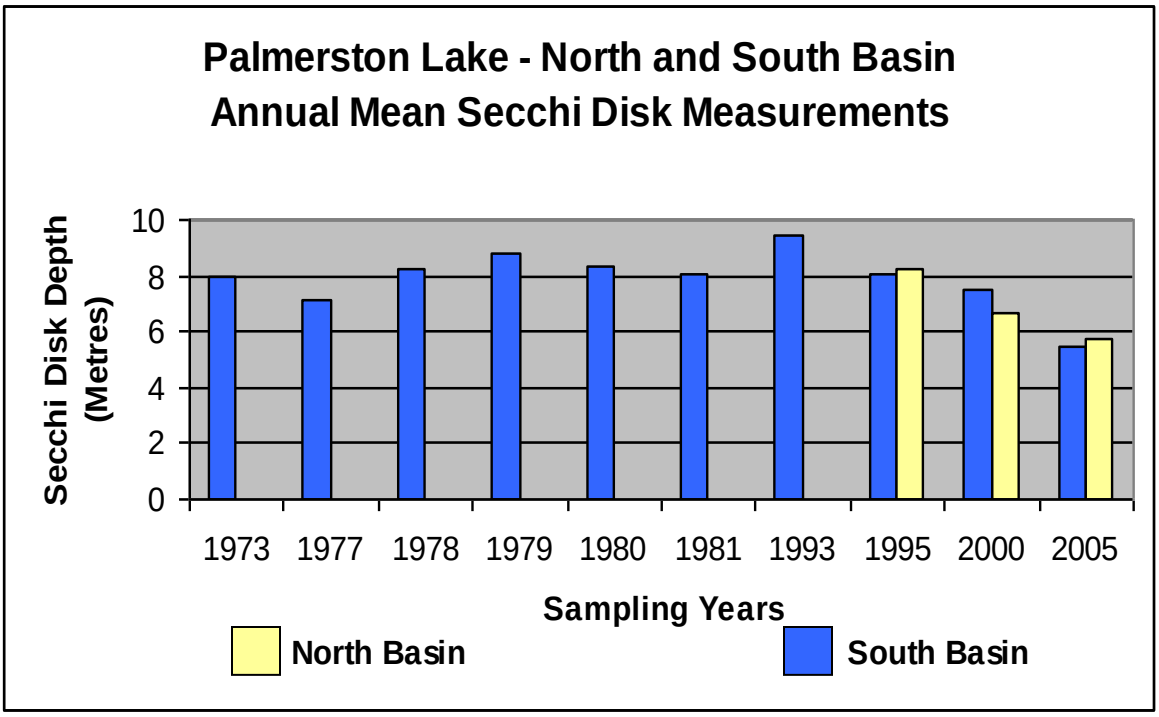
Sample Year Mean	Secchi Disk Depth (Metres)	Total Phosphorus Euphotic Zone (Micrograms/litre)	Total Phosphorus 1 Metre off Bottom (Micrograms/litre)	Chlorophyll a Composite (Micrograms/litre)
**1973	8.0	9.0		1.50
1977	7.1			2.40
1978	8.2			2.10
1979	8.8			2.40
**1980	8.3	*3.6	*11.0	2.20
1981	8.1			1.80
1993	9.4			1.10
1995	*8.1			*1.07
2000	7.5	9.5	*2.0	0.68
*2005	*5.5	*2.0	*1.3	*1.13
n	10	4	3	10
Minimum	5.5	2.0	1.3	0.68
Maximum	9.4	9.5	11.0	2.40
Mean	7.9	6.0	4.7	1.63
Standard Deviation	1.05	3.78	5.41	0.62

*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%

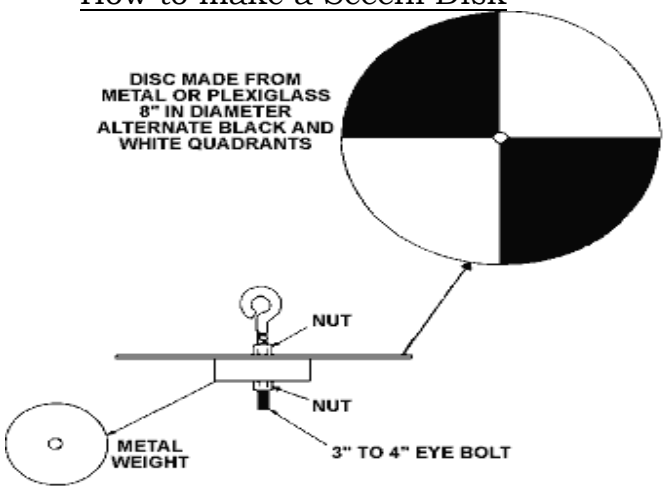
For more information on lakes in the Mississippi Valley Watershed, visit MVC online at
www.mvc.on.ca

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



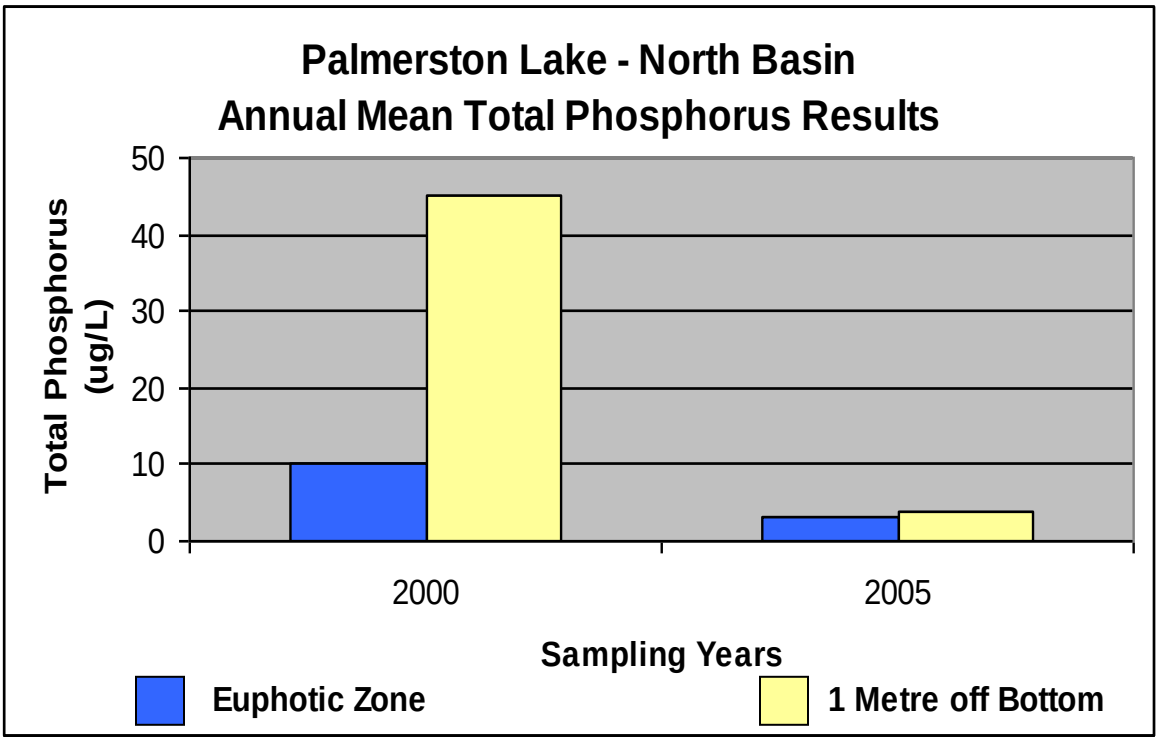
How to make a Secchi Disk

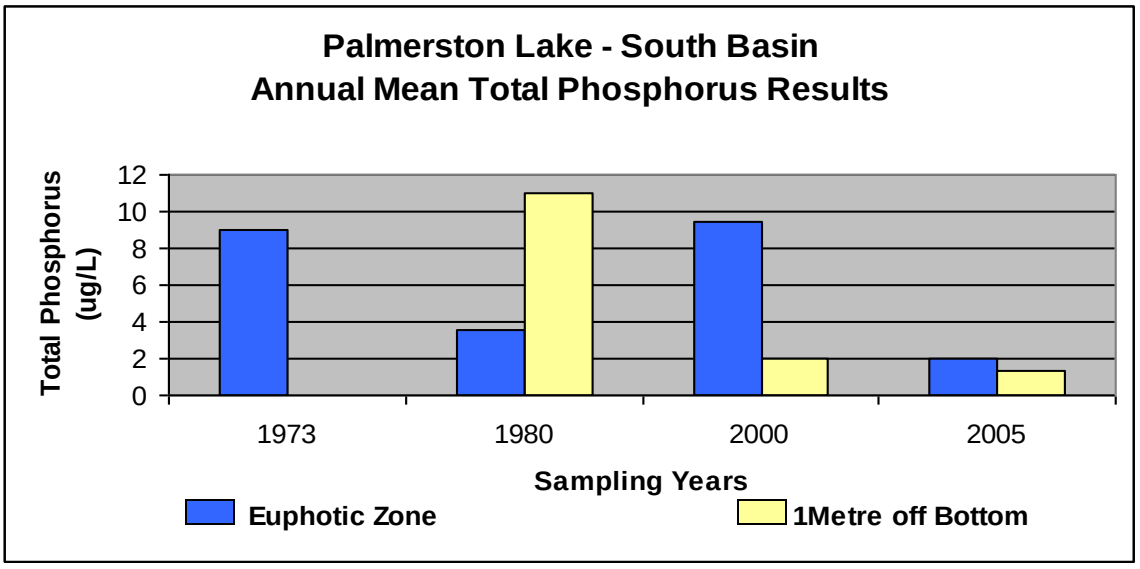


Interpreting Total Phosphorus Results:

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

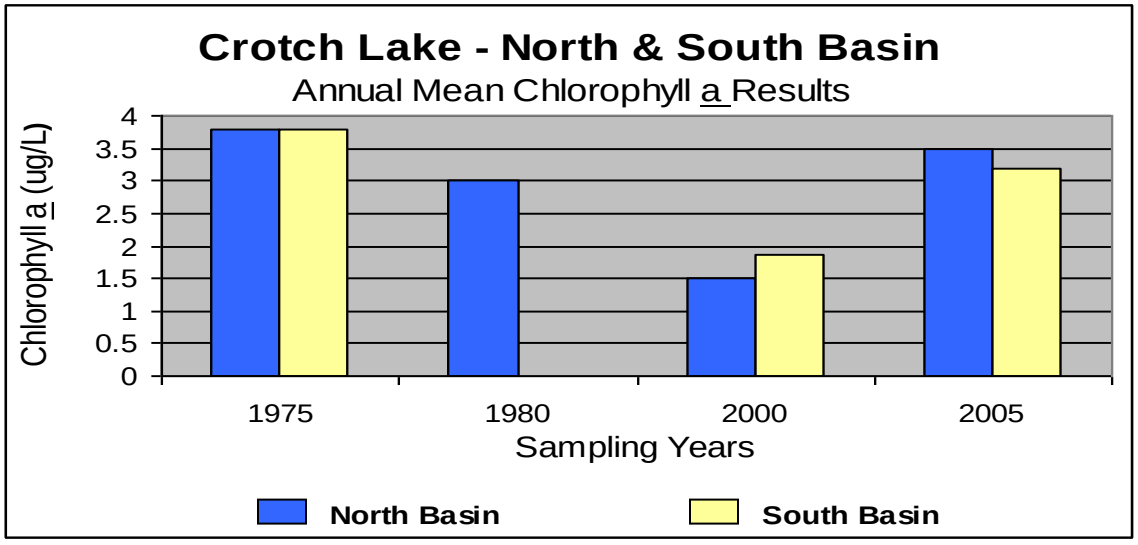




Evaluating your Chlorophyll a Results:

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



PALMERSTON LAKE – NORTH BASIN

DISSOLVED OXYGEN / TEMPERATURE PROFILE

MOE Rec. Lks. Station 18-3430-742-01 MVC # 05-10

Date: May 18, 2005

Euphotic Zone (Penetration of Light) = 8 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	10.7	12.9	111	
1.0	10.7	13.3	115	
2.0	10.2	13.2	114	
3.0	9.8	13.4	114	
4.0	9.6	13.4	114	
5.0	9.2	13.5	114	
6.0	9.0	13.5	113	
7.0	8.8	13.5	111	
8.0	8.0	13.6	110	
9.0	7.0	13.5	106	
10.0	6.8	13.2	104	Epilimnion
11.0	6.4	13.1	102	
12.0	6.3	13.0	101	
13.0	6.3	13.0	101	
14.0	6.2	12.9	100	
15.0	6.2	12.4	100	
16.0	6.1	12.4	100	
17.0	6.1	12.4	100	
18.0	6.0	12.4	99	
19.0	5.9	12.3	98	
20.0	5.9	12.2	97	
21.0	5.8	12.2	97	
22.0	5.7	12.1	96	
23.0	5.7	12.1	96	
24.0	Bottom	Bottom	Bottom	

Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C.

Vital Habitat for Cold Water Fisheries (Trout) = DO > 4 mg/L at < 15.5°C.

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

PALMERSTON LAKE – NORTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-742-01 MVC # 05-10
Date: July 15, 2005
Euphotic Zone (Penetration of Light) = 14 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	26.1	8.0	95	
1.0	25.9	8.2	97	Epilimnion
2.0	25.8	8.1	95	
3.0	25.7	8.2	97	
4.0	23.5	9.2	104	Thermocline
5.0	22.7	9.3	102	
6.0	21.2	10.0	107	
7.0	15.8	12.1	117	
8.0	12.3	13.1	117	
9.0	10.7	13.0	112	
10.0	9.9	12.7	107	
11.0	8.6	12.4	102	Hypolimnion
12.0	8.2	11.9	97	
13.0	7.6	11.6	94	
14.0	7.2	10.8	87	
15.0	6.9	10.6	84	
16.0	6.8	10.3	81	
17.0	6.6	10.2	80	
18.0	Bottom	Bottom	Bottom	

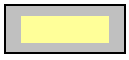
PALMERSTON LAKE – NORTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-742-01 MVC # 05-10
Date: September 16, 2005
Euphotic Zone (Penetration of Light) = 12 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	21.0	6.0	65	
1.0	21.1	6.0	65	
2.0	21.1	6.1	65	
3.0	21.1	5.9	63	Epilimnion
4.0	21.0	5.9	63	
5.0	20.9	6.0	64	
6.0	20.8	6.0	64	
7.0	19.9	6.3	67	
8.0	18.1	7.0	72	
9.0	14.5	8.7	81	Metalimnion
10.0	11.1	8.8	77	or Thermocline
11.0	9.1	7.8	61	
12.0	8.8	7.5	62	
13.0	7.8	6.7	54	
14.0	7.5	6.4	52	
15.0	7.2	6.0	48	Hypolimnion
16.0	7.0	5.9	47	
17.0	6.8	5.8	46	
18.0	6.6	5.7	45	
19.0	6.6	5.7	45	
20.0	6.5	5.5	43	
21.0	Bottom	Bottom	Bottom	

PALMERSTON LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-743-01 MVC # 05-11
Date: May 18, 2005
Euphotic Zone (Penetration of Light) = 8 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	10.3	13.0	111	
1.0	9.9	13.4	114	
2.0	9.6	13.5	115	
3.0	9.5	13.5	115	
4.0	9.5	13.6	115	
5.0	9.4	13.6	115	
6.0	9.2	13.4	112	
7.0	9.0	13.7	114	
8.0	8.8	13.6	112	
9.0	8.7	13.6	112	
10.0	8.5	13.6	111	
11.0	7.0	13.5	106	
12.0	6.6	13.5	105	
13.0	6.5	13.4	104	
14.0	6.3	13.3	103	
15.0	6.2	13.2	102	
16.0	6.0	13.2	101	
17.0	5.9	13.1	100	
18.0	5.7	13.1	100	Epilimnion
19.0	5.7	13.0	99	
20.0	5.6	13.0	99	
21.0	5.5	12.9	98	
22.0	5.5	12.8	97	
23.0	5.4	12.8	97	
24.0	5.4	12.7	96	
25.0	5.3	12.6	96	
26.0	5.3	12.6	96	
27.0	5.3	12.7	96	
28.0	5.2	12.6	95	
29.0	5.2	12.6	95	
30.0	5.2	12.5	95	
31.0	5.2	12.4	95	
32.0	5.1	12.4	94	
33.0	5.1	12.5	94	
34.0	5.0	12.4	93	
35.0	5.0	12.4	93	
36.0	5.0	12.4	93	
37.0	5.0	12.4	93	
38.0	5.0	12.3	92	
39.0	4.9	12.3	92	
40.0	4.9	12.2	91	
41.0	4.9	12.2	91	
42.0	4.9	12.1	90	
43.0	4.8	12.0	90	
44.0	4.8	11.9	89	
45.0	Bottom	Bottom	Bottom	

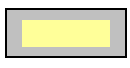

Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C.


Vital Habitat for Cold Water Fisheries (Trout) = DO > 4 mg/L at < 15.5°C.

PALMERSTON LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-743-01 MVC # 05-11
Date: July 15, 2005
Euphotic Zone (Penetration of Light) = 13 Meters

Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	25.6	8.0	94	
1.0	25.6	8.0	94	
2.0	25.5	8.3	97	Epilimnion
3.0	25.3	8.3	97	
4.0	24.5	8.9	101	
5.0	23.5	9.1	101	
6.0	20.7	10.8	116	
7.0	17.3	12.6	226	Metalimnion
8.0	13.0	13.7	225	or Thermocline
9.0	9.9	13.5	115	
10.0	9.4	13.1	110	
11.0	8.5	12.6	103	
12.0	8.0	12.3	110	
13.0	7.7	12.1	97	
14.0	7.2	11.7	93	
15.0	6.9	11.5	91	
16.0	6.7	11.4	90	
17.0	6.7	11.2	87	
18.0	6.4	10.9	85	
19.0	6.3	10.7	84	
20.0	6.2	10.6	82	
21.0	6.2	10.4	81	
22.0	6.0	10.4	80	
23.0	5.8	10.5	81	
24.0	5.8	10.4	80	
25.0	5.7	10.3	79	Hypolimnion
26.0	5.6	10.5	81	
27.0	5.5	10.5	81	
28.0	5.5	10.3	79	
29.0	5.4	10.3	79	
30.0	5.4	10.2	78	
31.0	5.3	10.3	78	
32.0	5.3	10.4	79	
33.0	5.2	10.4	79	
34.0	5.2	10.4	79	
35.0	5.1	10.3	78	
36.0	5.1	10.1	76	
37.0	5.1	10.1	76	
38.0	5.0	10.1	76	
39.0	5.1	10.0	76	
40.0	5.0	10.0	75	
41.0	5.0	9.9	75	
42.0	5.0	9.7	73	
43.0	5.0	9.7	73	
44.0	5.0	9.7	73	
45.0	5.0	9.6	73	

Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C.

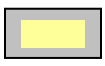


Vital Habitat for Cold Water Fisheries (Trout) = DO > 4 mg/L at < 15.5°C.

PALMERSTON LAKE – SOUTH BASIN
DISSOLVED OXYGEN / TEMPERATURE PROFILE
MOE Rec. Lks. Station 18-3430-743-01 MVC # 05-11
Date: September 16, 2005
Euphotic Zone (Penetration of Light) = 12 Meters

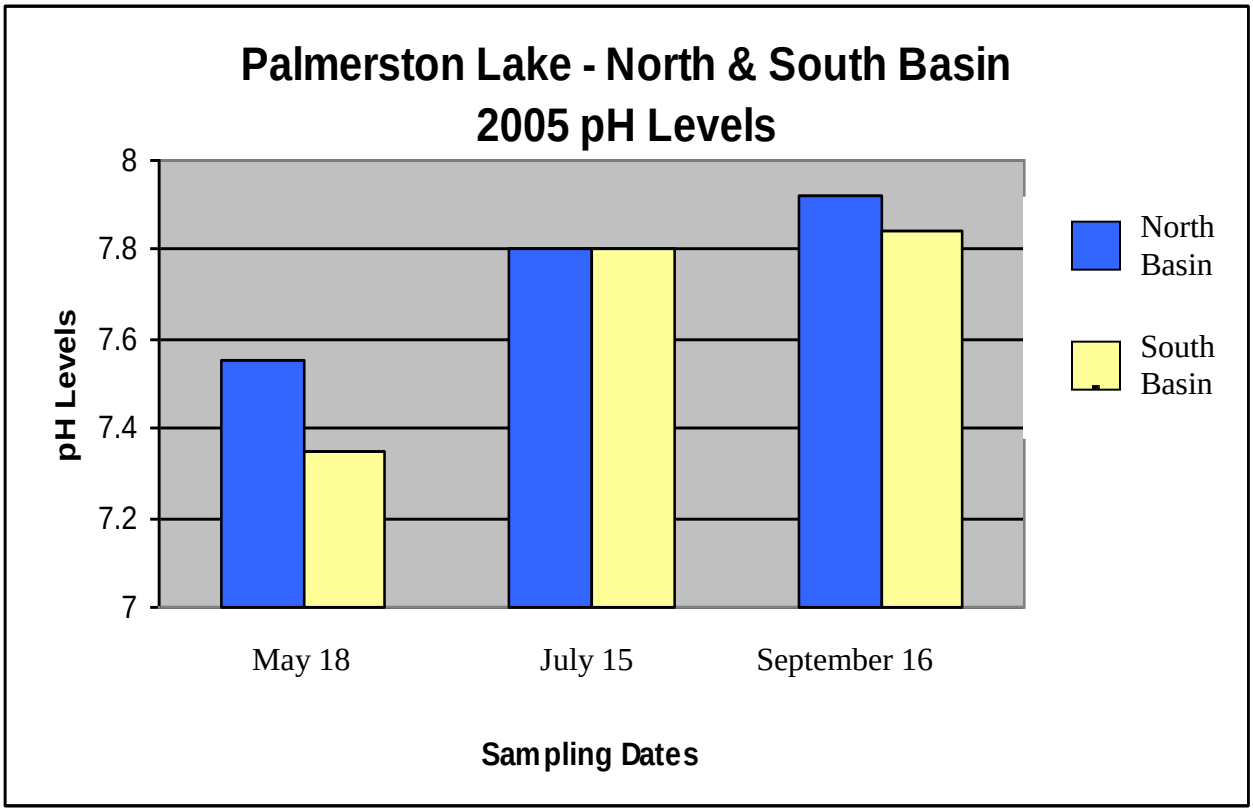
Depth (Metres)	Temperature (Degrees Celsius)	Dissolved Oxygen (Milligram/Litre)	Percent % Saturation	Thermal Stratification
0.1	20.8	6.0	63	
1.0	20.8	6.0	63	
2.0	20.8	6.1	64	
3.0	20.8	6.1	64	Epilimnion
4.0	20.8	6.1	64	
5.0	20.8	6.1	64	
6.0	20.8	6.1	64	
7.0	20.8	6.0	63	
8.0	20.7	6.0	63	
9.0	19.3	6.8	70	
10.0	13.2	9.2	84	Metalimnion
11.0	10.4	8.9	77	or Thermocline
12.0	9.0	8.6	72	
13.0	8.5	8.3	70	
14.0	8.1	8.3	69	
15.0	7.4	7.1	57	
16.0	7.1	6.8	54	
17.0	6.9	6.5	51	
18.0	9.6	6.4	51	
19.0	6.7	6.3	50	
20.0	6.6	6.2	49	
21.0	6.5	6.0	47	
22.0	6.4	6.0	47	
23.0	6.4	6.0	47	Hypolimnion
24.0	6.3	6.0	47	
25.0	6.2	6.0	47	
26.0	6.1	5.9	46	
27.0	6.0	5.9	46	
28.0	5.6	6.1	47	
29.0	5.6	6.0	46	
30.0	5.5	6.0	46	
31.0	5.5	6.1	47	
32.0	5.4	6.1	47	
33.0	5.4	6.2	48	
34.0	5.4	6.0	46	
35.0	5.3	6.0	46	
36.0	5.3	6.0	46	
37.0	5.3	6.0	46	
38.0	5.2	6.0	45	
39.0	5.1	5.9	45	
40.0	5.1	5.9	45	
41.0	5.1	5.9	45	
42.0	5.1	5.7	43	
43.0	5.1	5.7	43	
44.0	5.0	5.6	42	
45.0	5.0	5.3	40	

Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C.



Vital Habitat for Cold Water Fisheries (Trout) = DO > 4 mg/L at < 15.5°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.

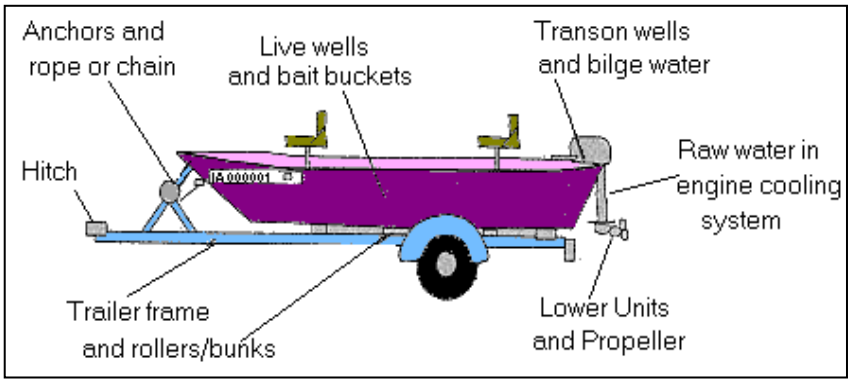
3.) **ENHANCEMENT –** Native species are planted non-native species are removed

4.) **RESTORATION –** Cleared areas are planted with native species.

ϕβϕβϕβϕβϕβϕβϕβϕβϕβϕβϕβϕ

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.

ϕβϕβϕβϕβϕβϕβϕβϕβϕβϕβϕβϕ

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