Mississippi Valley Conservation

State of the Lake Environment Report 2008

Kashwakamak Lake

WATERSHED WATCH

Kashwakamak Lake

Kashwakamak Lake is located in the newly amalgamated Township of North Frontenac. Kashwakamak Lake is at an elevation of 268 metres above sea level. The lake perimeter is 65.5 kilometres, the deepest point is 22 metres. Kashwakamak Lake supports a warm water fishery, this includes; Walleye, Northern Pike, Smallmouth Bass, Largemouth Bass, Lake Herring, Yellow Perch and White Sucker. At last count in the late 1970's, there were approximately 445 cottages on the lake and 12 resorts.

Members of the Lake Association have volunteered their time to provide water quality testing through the Ministry of Environment Self Help Program in 1980 and Lake Partner Program. This data is extremely valuable because it provides a general picture of water quality conditions over the past thirty-three years. 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 1976, (32 years ago), through the Ministry of Environment Recreational Lakes Program.

Kashwakamak Lake has two sampling stations, one in the west basin and the second station is at the deepest point mid-lake. Each station was sampled three times in 2008. Water clarity is measured by Secchi Disc, the average reading for the two stations in 2008 was 6.5 metres, compared to 10 years ago, when the average was 4.4 metres. Thus indicating that Kashwakamak 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 Objective for phosphorus levels in warm water lakes is 20 micrograms per litre (ug/L). In 2003, the mean for the two stations in the euphotic zone (depth at which sunlight can penetrate or two times the secchi disc depth) was 4.67 *ug*/L, the 2008 reading is 11.15ug/L. The mean for the samples taken one metre off the bottom in 2003 was 5.5 *ug/*L, the 2008 reading is 14.15ug/L.
The mean for both sampling stations have increased from 2003, bring both stations from oligotrophic (few nutrients) to mesotrophic (some nutrients).

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a density for the two sampling stations was 2.75 *ug/*L. Thus, indicating a moderate algal density for Kashwakamak Lake in 2008.

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 2008, in order to generate a more concise picture of the oxygen content of the lake.

The dissolved oxygen (DO) and temperature data, measured at the two sampling stations, indicate adequate levels all the way to the bottom for most of the ice-out season. However, data collected in mid September revealed that the DO readings in the East and West Basin were inadequate in the bottom two metres, for warm water fish species, such as pike and bass.

Residents and users of Kashwakamak 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. There are helpful tips throughout this report to help reduce your impact on Kashwakamak Lake. Additional water quality data, current and historic, is available for Kashwakamak 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.

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 removed. Access to the lake is designed to avoid shoreline damage.

Enhancement

Native species are planted and non-native species are removed

Naturalization

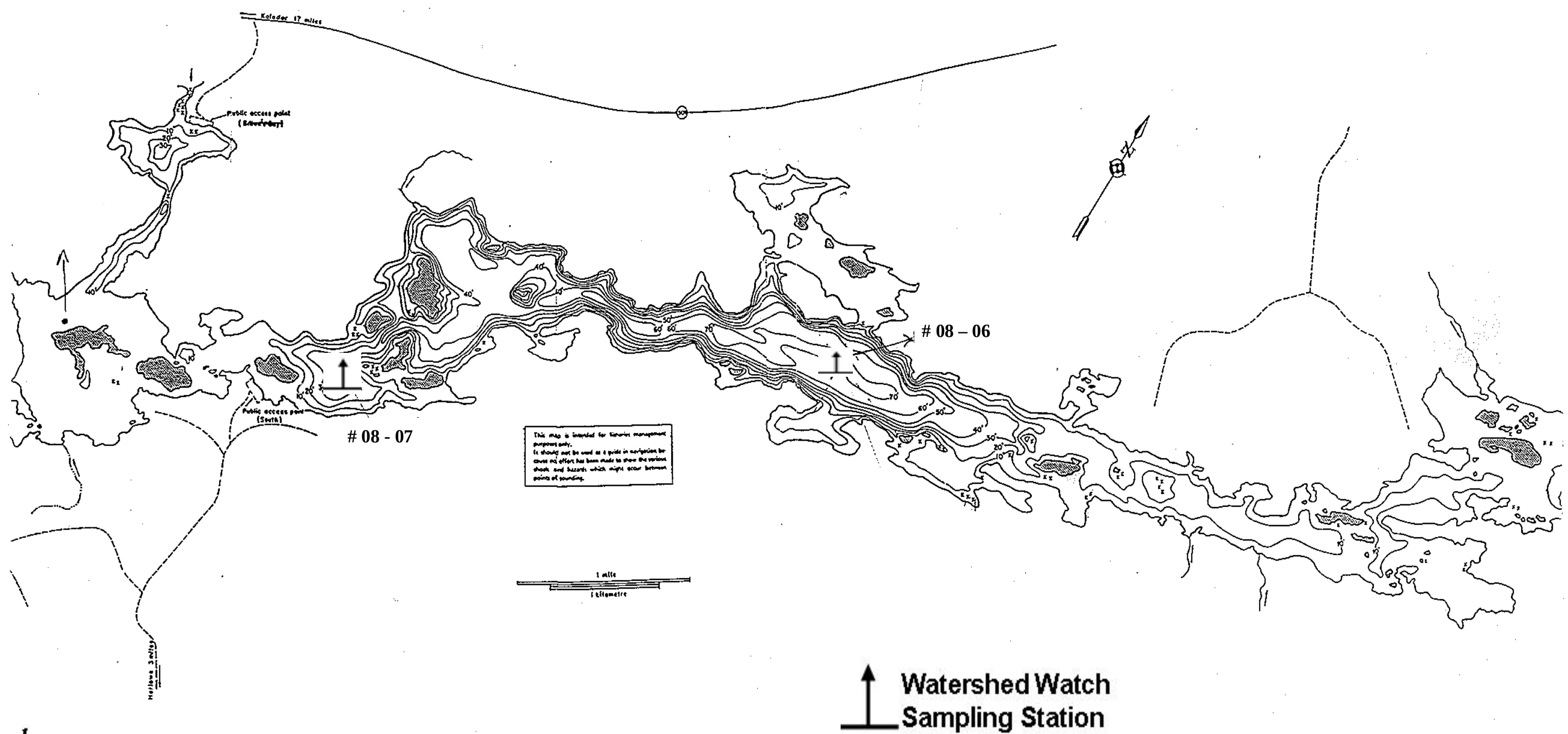
Degraded shorelines are left alone to return to their natural state.

Restoration

Clear areas are planted with native species.

Mississippi Valley Conservation

Kashwakamak Lake



Remember

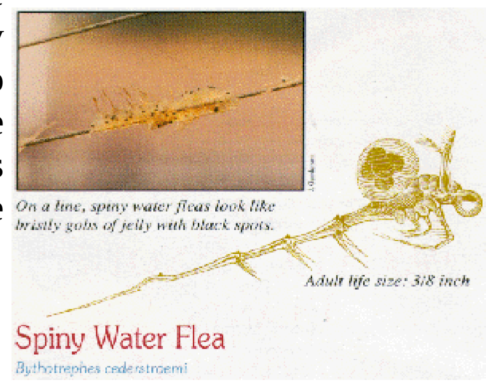
Use non-lead sinkers to protect the health of the fish and this lake.

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!

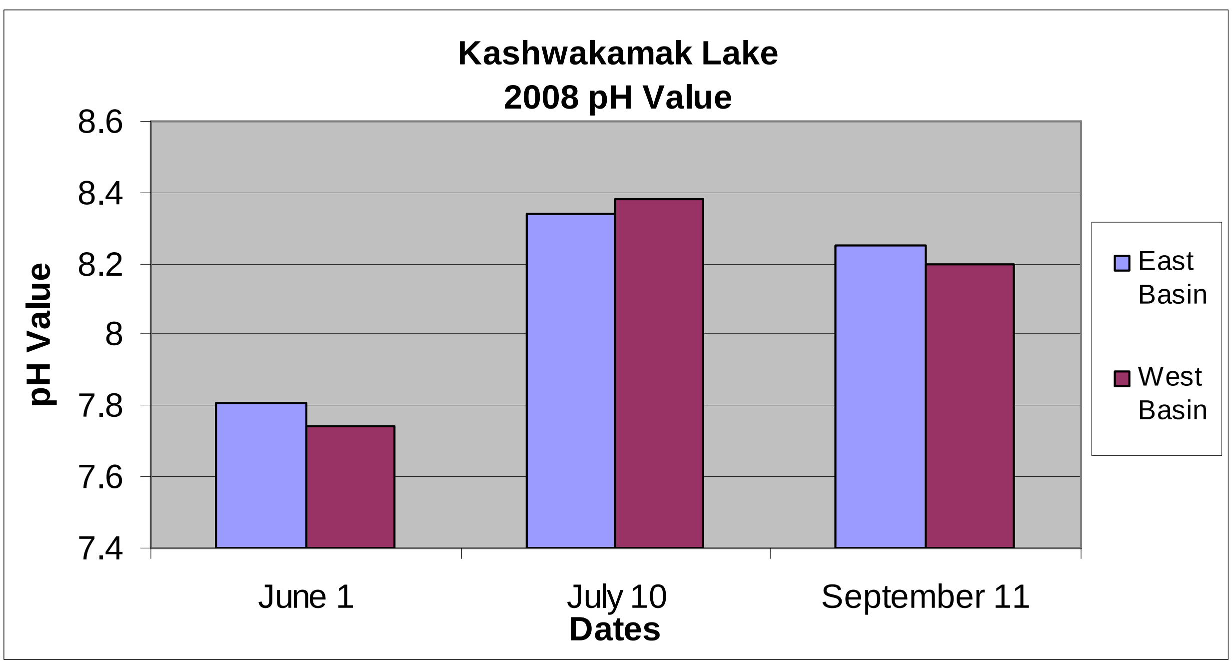
Check & clean your boat every time you change water bodies

Kashwakamak 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. Kashwakamak Lake did *not* have zebra mussel veligers (larvae) present however, spiny water flea were detected in the samples collected. 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 Kashwakamak Lake Measure Up?

1974 – 2008 Water Quality Results

Sample Year [Various Stations]	Secchi Disc Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/Litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
1974	6.4			2.0
1976	5.4	9.0	4.0	2.2
1980	3.1	2.0	4.0	4.3
1986	5.2			2.0
*1987	3.0			1.8
*1988	2.7			1.0
*1989	2.8			1.5
*1990	2.9			2.2
1991	3.3			
*1992	2.8			
1993	3.1			
1996	3.9			
1997	4.7			
1998	4.8	11.0	13.5	1.70
1999	4.8			
2000	4.4			
2001	5.4			
2002	4.4			
*2003	6.2	4.6	5.5	1.5
*2008	5.4	11.2	14.2	2.8
n	20	5	5	11
Minimum	2.7	2.0	4.0	1.0
Maximum	6.4	11.2	14.2	4.3
Mean	4.2	7.6	8.2	2.1
Standard Deviation	1.20973	4.07497	5.163623	0865579

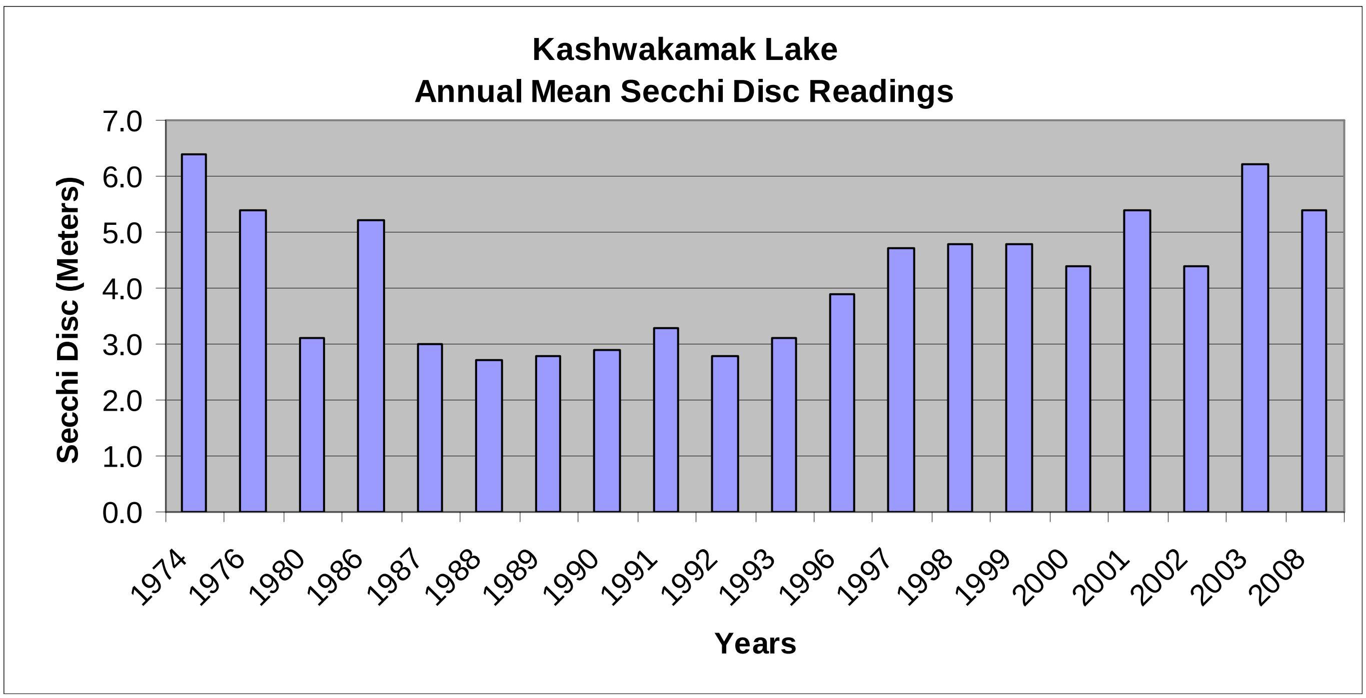
*Mean based on less than 6 measurements **Includes Recreational Lakes Program Data
Chlorophyll-a data prior to 1985 has been adjusted to reflect new lab procedures
in filtering resulting in an increase in chla concentrations by 35%

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 Disc 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



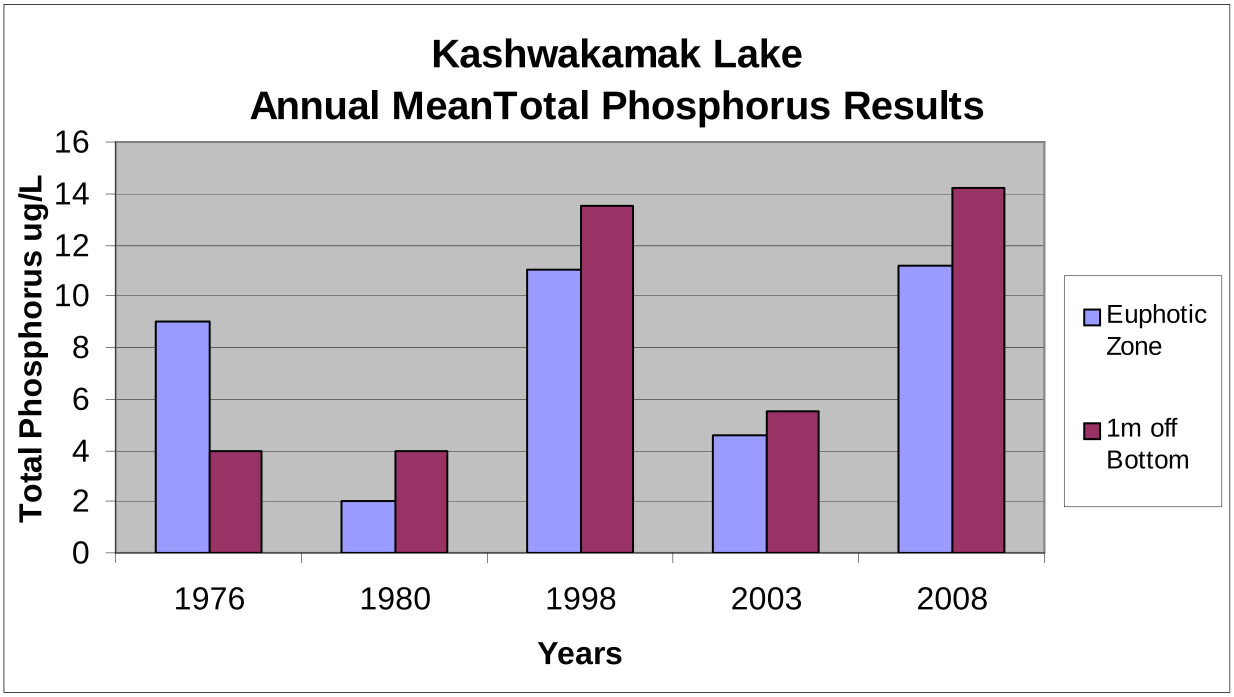
FIVE EASY STEPS TO IMPROVE WATER QUALITY

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.

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



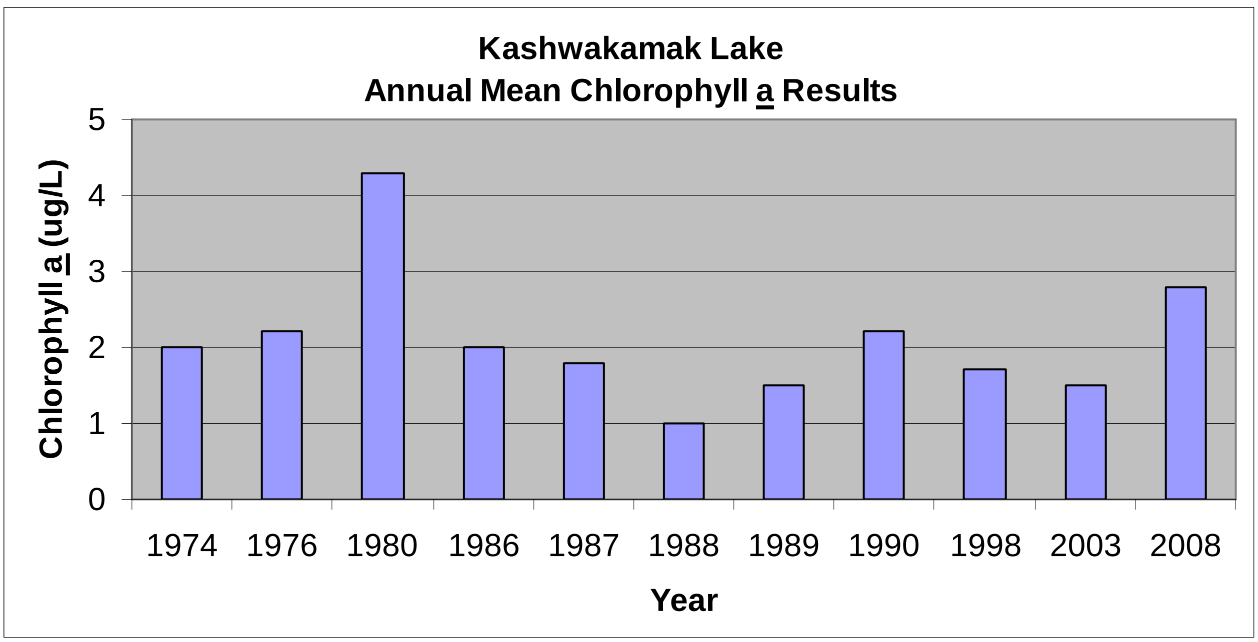
For more information on lakes in the Mississippi Valley Watershed, visit MVC online at www.mvc.on.ca

<u>Interpreting Chlorophyll a Results</u>

<u>Evaluating your Chlorophyll a Results:</u>

The lower the chlorophyll <u>a</u> density in your lake, the clearer your lake is. Chlorophyll <u>a</u> 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	
Secchi 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



KASHWAKAMAK LAKE – East Basin
DISSOLVED OXYGEN/TEMPERATURE PROFILES
MOE Rec. Lks. Station # 19-3430-710-01, MVC Station # 08-06

Date: June 1, 2008
Depth: 32 Metres - Drifting occurred
Euphotic Zone (Penetration of Light) = 9.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	15.8	8.9	85	
1.0	15.8	9.0	87	
2.0	15.8	9.0	87	
3.0	15.8	9.0	87	Epilimnion
4.0	15.7	9.0	87	
5.0	15.6	8.9	85	
6.0	15.3	8.9	85	
7.0	15.3	8.9	85	
8.0	15.3	8.9	85	
9.0	13.0	8.6	77	
10.0	10.0	8.5	72	Thermocline
11.0	7.8	8.1	66	
12.0	6.7	7.9	63	
13.0	6.4	7.6	60	
14.0	6.3	7.5	59	
15.0	6.2	7.4	58	
16.0	6.2	7.3	57	
17.0	6.2	7.3	57	
18.0	6.0	7.2	56	Hypolimnion
19.0	5.9	7.3	56	
20.0	5.7	7.2	55	
21.0	5.7	7.0	54	
22.0	5.5	6.9	54	
23.0	5.3	6.5	49	
24.0	5.5	6.4	48	
25.0	5.7	6.8	53	
26.0	5.7	6.8	53	
27.0	5.6	6.7	51	
28.0	5.3	6.6	50	
29.0	5.2	6.0	46	
30.0	5.1	5.8	43	
31.0	5.1	5.4	40	
32.0	Bottom	Bottom	Bottom	

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

KASHWAKAMAK LAKE – East Basin Continued…

Date: July 10, 2008
Depth: 23.0 Metres
Euphotic Zone (Penetration of Light) = 10.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	24.2	8.0	92	
1.0	24.2	7.9	91	
2.0	24.1	7.9	91	
3.0	24.1	7.8	89	Epilimnion
4.0	24.0	7.9	90	
5.0	23.9	7.8	89	
6.0	23.8	7.9	90	
7.0	21.5	7.7	85	
8.0	14.4	7.7	73	Thermocline
9.0	11.1	7.7	68	
10.0	8.9	7.5	63	
11.0	8.3	7.2	59	
12.0	7.9	7.0	57	
13.0	7.4	6.9	56	
14.0	7.1	6.8	54	Hypolimnion
15.0	6.9	6.5	52	
16.0	6.6	6.4	51	
17.0	6.5	6.0	47	
18.0	6.3	5.9	46	
19.0	6.2	5.8	45	
20.0	5.9	5.7	44	
21.0	5.8	3.9	30	
22.0	5.6	2.2	16	
23.0	Bottom	Bottom	Bottom	

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

Kelly Wilson, MVC Biologist sampling Kashwakamak Lake.

KASHWAKAMAK LAKE – East Basin Continued…

Date: September 11, 2008
Depth: 23.0 Metres
Euphotic Zone (Penetration of Light) = 13.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	20.5	11.3	120	Epilimnion
1.0	20.4	11.3	120	
2.0	20.2	11.3	120	
3.0	20.2	11.3	120	
4.0	20.2	11.3	120	
5.0	20.2	11.2	120	
6.0	20.1	11.2	120	
7.0	20.0	11.1	118	
8.0	17.3	8.3	82	Thermocline #1
9.0	11.9	8.0	72	
10.0	9.2	8.5	72	
11.0	9.3	6.3	53	Thermocline #2
12.0	7.5	4.9	40	Thermocline #3
13.0	7.2	5.3	42	Thermocline #4
14.0	7.0	5.2	41	
15.0	5.9	5.3	41	Thermocline #5
16.0	5.5	5.3	40	Hypolimnion
17.0	5.4	6.0	46	
18.0	5.3	5.9	45	
19.0	5.1	5.3	40	
20.0	5.1	4.7	36	
21.0	5.0	1.3	9	
22.0	5.7	0.4	3	
23.0	Bottom	Bottom	Bottom	

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

KASHWAKAMAK LAKE – West Basin

DISSOLVED OXYGEN/TEMPERATURE PROFILES
MOE Rec. Lks. Station # 19-3430-738-01, MVC Station # 08-07

Date: July 1, 2008
Depth: 11.0 Metres
Euphotic Zone (Penetration of Light) = 9.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	15.8	9.0	87	
1.0	15.8	9.0	87	
2.0	15.7	9.1	87	Epilimnion
3.0	15.4	9.0	86	
4.0	14.9	9.2	87	
5.0	13.9	9.1	84	
6.0	13.2	9.1	83	
7.0	11.2	9.0	78	Thermocline
8.0	10.3	8.9	76	
9.0	8.5	8.0	66	
10.0	7.3	7.8	63	
11.0	Bottom	Bottom	Bottom	

Kashwakamak Lake—West Basin

Date: July 10, 2008
Depth: 14.0 Metres
Euphotic Zone (Penetration of Light) = 10.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	23.0	11.0	124	
1.0	23.0	10.6	116	
2.0	23.0	10.7	120	Epilimnion
3.0	22.9	10.9	122	
4.0	22.9	10.7	120	
5.0	22.5	10.7	120	
6.0	20.5	10.7	115	
7.0	18.8	10.8	112	Thermocline
8.0	15.5	10.3	100	
9.0	11.9	8.9	79	
10.0	9.3	6.8	57	
11.0	8.2	6.0	49	
12.0	7.7	5.6	45	Hypolimnion
13.0	7.1	4.4	35	
14.0	Bottom	Bottom	Bottom	

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

KASHWAKAMAK LAKE – West Basin Continued…

Date: September 11, 2008
Depth: 13.0 Metres
Euphotic Zone (Penetration of Light) = 13.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	20.3	11.0	123	Epilimnion
1.0	20.3	11.1	125	
2.0	20.2	11.1	122	
3.0	20.2	11.1	122	
4.0	20.2	11.1	122	
5.0	20.2	11.1	122	
6.0	20.1	11.1	120	
7.0	20.1	11.1	120	
8.0	16.9	7.3	72	Thermocline
9.0	11.9	5.4	48	
10.0	9.2	5.1	43	
11.0	8.3	3.6	29	Hypolimnion
12.0	7.9	3.3	28	
13.0	Bottom	Bottom	Bottom	

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

Mississippi Valley Conservation

WATERSHED WATCH

The Watershed Watch program was made possible thanks to the generous support of the Ministry of the 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