Mississippi Valley Conservation

State of the Lake Environment Report December 2003

Kashwakamak Lake

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 twenty-eight years. Comprehensive testing in 1998 and 2003 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, (27 years ago), through the Ministry of Environment Recreational Lakes Program.

In general, the water quality in Kashwakamak Lake remains excellent**.** There are two sampling stations on the lake. One in the west basin and the second station is at the deepest point mid-lake. Each station was sampled three times for 2003. You will find graphs which follow, that water clarity, as measured by Secchi Disk readings, were observed as very good. The average for the two stations for 2003 is 6.2 metres, compared to 5 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 disk depth) was 4.67 *ug*/L. The mean for the samples taken one metre off the bottom was 5.5 *ug/*L. Five years ago, the average phosphorus level was 11.0 *ug/*L in the euphotic zone and 13.5 *ug/*L one metre off the bottom of the lake, both under the Provincial Objective. Kashwakamak Lake decreased its average phosphorus levels by more than half, moving it to an Oligotrophic lake status and putting it well below the Provincial Objective.

Chlorophyll a is a measure of the algal density in the lake. The average chlorophyll a density for the two sampling stations was 1.55 *ug/*L. Thus, indicating a low algal density for Kashwakamak Lake in 2003. In 1998, the chlorophyll a levels were slightly higher at 1.7 *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 2003, 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 late August, revealed that the DO readings in the West Basin were inadequate in the bottom two metres, for

warm water fish species, such as pike and bass, Overall, there is a noticeable improvement in DO levels from 1998.

Kashwakamak Lake was also tested for invasive species in 2003, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters (OFAH). Kashwakamak Lake tested positive for both 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 from Kashwakamak Lake to other lakes. Another recommendation is for residents to begin participation in the invasive species monitoring program through MVC.

Despite excellent water quality conditions in the lake, 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.

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 Kashwakamak Lake Measure Up?

1974 – 2003 Water Quality Results

Sample Year [Various Stations]	Secchi Disk Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/Litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/Litre]	Chlorophyll a Composite [Micrograms/Litre]
1974	6.4			2.00
1976	5.4	9	4	2.20
1980	3.1	2	4	4.30
1986	5.2			2.00
*1987	3.0			1.80
*1988	2.7			1.00
*1989	2.8			1.50
*1990	2.9			2.20
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	4.67	5.5	1.55
n	19	4	4	10
Minimum	2.7	2.0	4.0	1.0
Maximum	6.4	11.0	13.5	4.3
Mean	4.2	6.7	6.8	2.0
Standard Deviation	1.21239601	4.081938878	4.55521679	0.878524647

*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%

How to protect or restore a shoreline depends on the conditions of the site and the energy and resources of the owner.

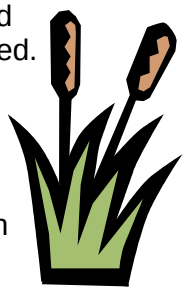
There are four main strategies to choose from:

❶ **PRESERVATION**
When purchasing a lakefront property, a natural shoreline is retained and access to the lake is designed to avoid shoreline damage.

❷ **NATURALIZATION**
Degraded shorelines are left alone to return to their natural state.

❸ **ENHANCEMENT**
Native species are planted and non-native species are removed.

❹ **RESTORATION**
Cleared areas are planted with native species.

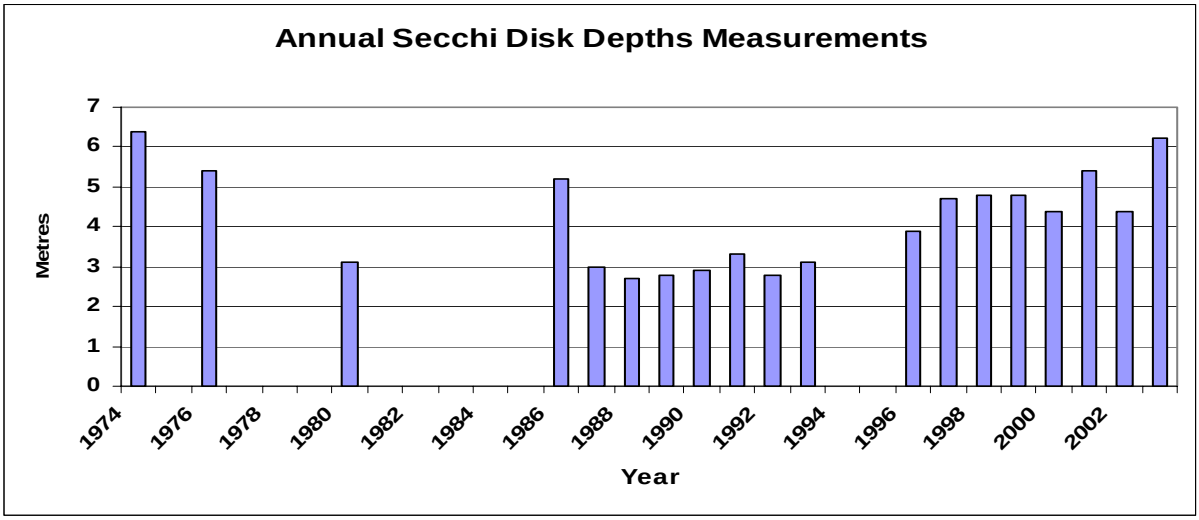


Interpreting Secchi Disc Readings:

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.

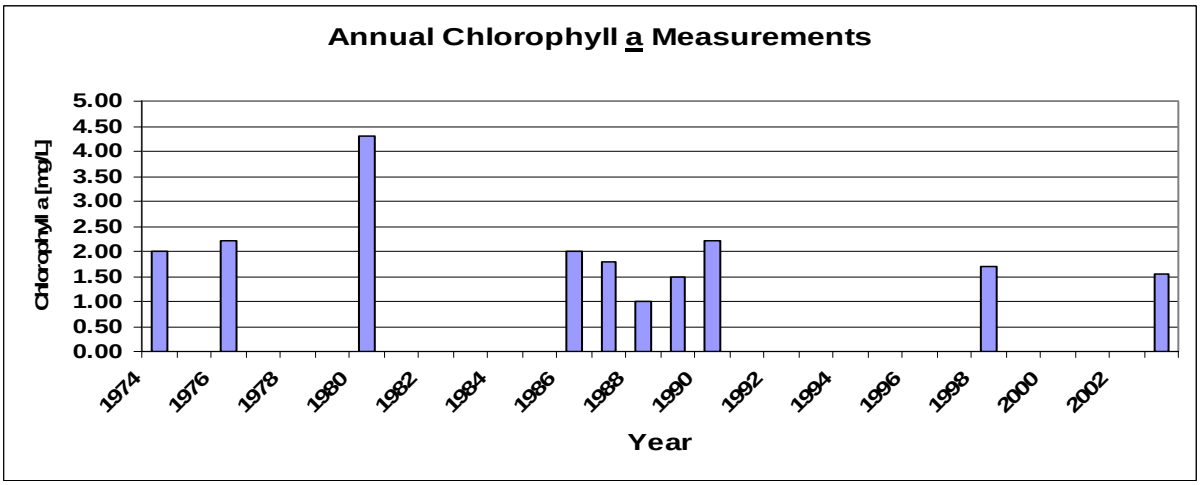
INTERPRETING YOUR SECCHI DISC RESULTS	
Secchi Reading	**Lake Nutrient Status**
Over 5 metres	Oligotrophic - unenriched, few nutrients
3.0 to 4.9 metres	Mesotrophic – moderately enriched, some nutrients
Less than 2.9 metres	Eutrophic – enriched, higher levels of nutrients



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.

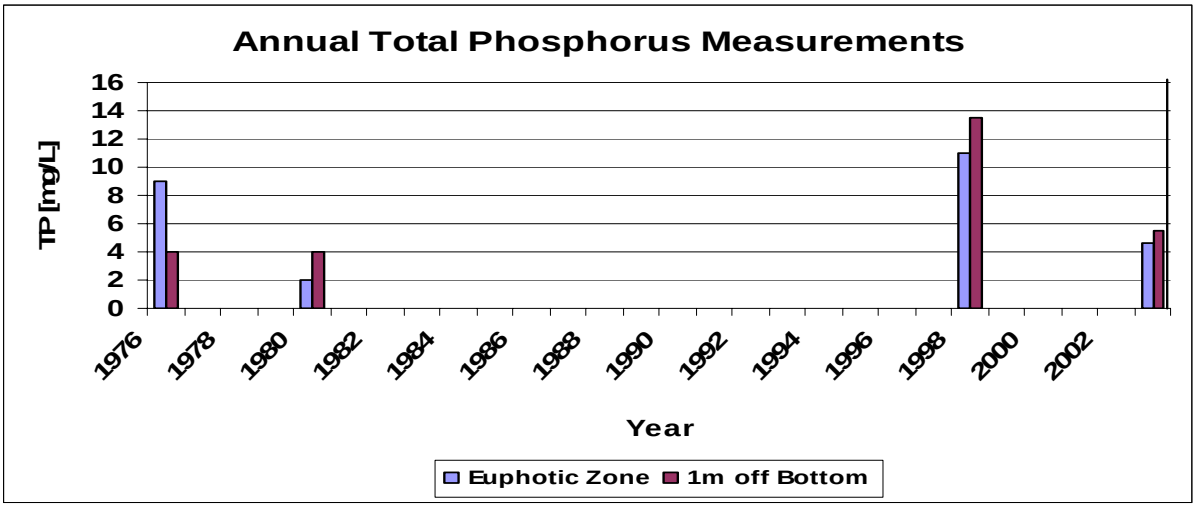
INTERPRETING YOUR CHLOROPHYLL A RESULTS	
Secchi Reading	**Lake Nutrient Status**
Up to 2 ug/L - low algal density	Oligotrophic - unenriched, few nutrients
2-4 ug/L - moderate algal density	Mesotrophic - moderately enriched, some nutrients
More than 4 ug/L- high algal density	Eutrophic - enriched, higher levels of nutrients



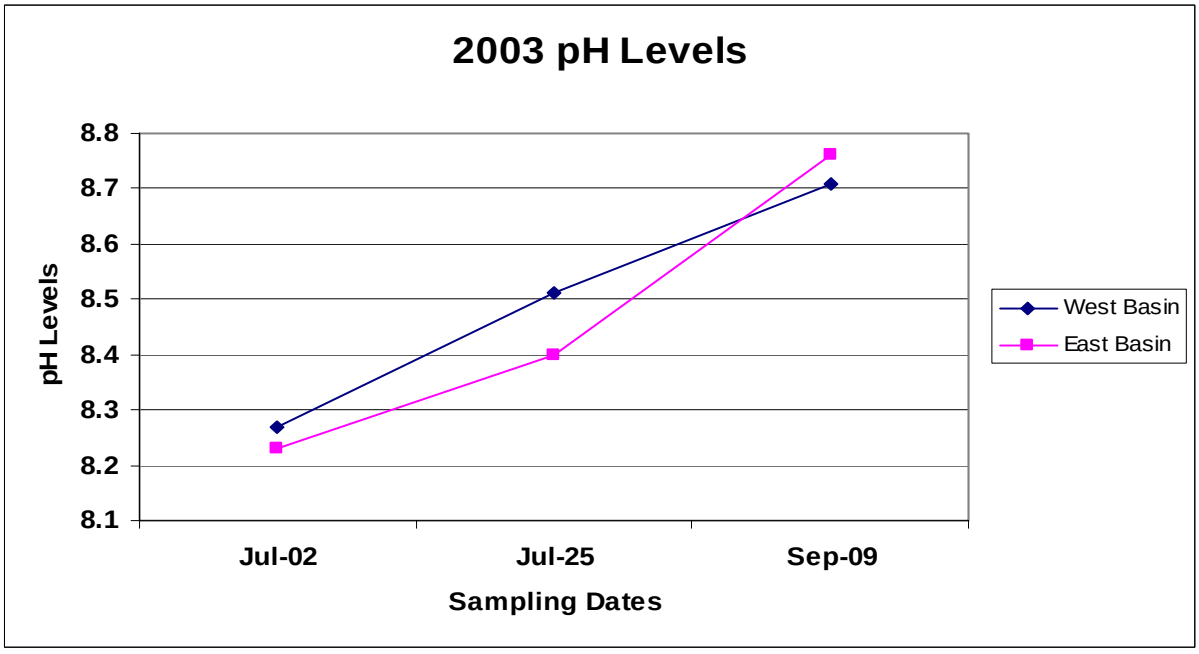
Interpreting Total Phosphorus Results:

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

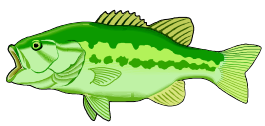


Evaluating your pH Results: Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.



KASHWAKAMAK LAKE – West Basin

DISSOLVED OXYGEN/TEMPERATURE PROFILES



MOE Rec. Lks. Station # 19-3430-738-01, MVC Station # 03-07

Date: July 4, 2003
Depth: 13.7 Metres
Euphotic Zone (Penetration of Light) = 12.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	24.5	8.1	93	
1.0	24.3	8.2	95	
2.0	24.1	8.1	94	
3.0	23.7	8.1	92	Epilimnion
4.0	22.8	8.4	93	
5.0	20.5	9.5	101	
6.0	18.9	9.2	95	
7.0	16.1	8.5	84	
8.0	14.2	7.9	75	Metalimnion
9.0	11.1	7.6	67	or Thermocline
10.0	9.0	7.1	60	
11.0	8.1	6.6	54	Hypolimnion
12.0	8.1	6.6	54	
13.0	8.0	6.5	53	Bottom

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

Date: August 6, 2003
Depth: 13.7 Metres
Euphotic Zone (Penetration of Light) = 12.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	24.0	8.1	93	
1.0	24.1	8.7	99	
2.0	24.1	8.7	99	
3.0	24.0	8.6	98	Epilimnion
4.0	23.9	8.7	98	
5.0	23.4	8.5	95	
6.0	22.2	8.6	95	
7.0	21.4	7.9	86	Metalimnion
8.0	16.1	6.7	66	or Thermocline
9.0	12.9	6.7	61	
10.0	9.8	6.3	54	
11.0	8.9	5.3	44	Hypolimnion
12.0	8.5	5.3	44	
13.0	8.3	4.1	34	Bottom

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

KASHWAKAMAK LAKE – West Basin Continued…

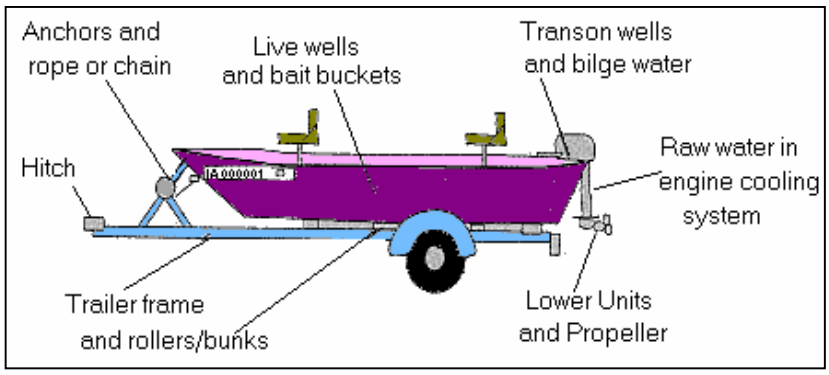
Date: August 28, 2003
Depth: 13.7 Metres
Euphotic Zone (Penetration of Light) = 12.4 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	22.6	8.3	93	
1.0	22.5	8.3	93	
2.0	22.4	8.1	90	
3.0	22.4	8.3	92	
4.0	22.3	8.2	91	Epilimnion
5.0	22.3	8.3	92	
6.0	22.2	8.1	93	
7.0	22.1	8.2	90	
8.0	18.7	6.2	64	
9.0	14.2	5.5	65	Metalimnion
10.0	11.6	4.2	37	or Thermocline
11.0	9.6	4.3	36	
12.0	9.1	3.1	26	
13.0	9.1	3.1	26	Bottom

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

MVC and O.F.A.H. need your help to Stop the Invasion!

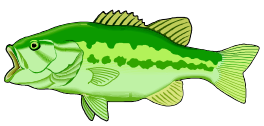
Check & clean your boat every time you change water bodies



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.

KASHWAKAMAK LAKE – East Basin
DISSOLVED OXYGEN/TEMPERATURE PROFILES



MOE Rec. Lks. Station # 19-3430-710-01, MVC Station # 03-06

Date: July 4, 2003
Depth: 24 Metres
Euphotic Zone (Penetration of Light) = 12.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	24.8	7.9	91	
1.0	24.7	8.2	95	
2.0	24.3	8.1	94	
3.0	24.0	8.1	93	Epilimnion
4.0	23.9	8.2	94	
5.0	23.6	8.4	94	
6.0	20.5	9.7	103	
7.0	18.0	10.0	101	
8.0	15.0	9.7	93	
9.0	12.2	9.6	86	Metalimnion
10.0	10.3	9.6	83	or Thermocline
11.0	8.7	8.7	72	
12.0	8.2	8.2	67	
13.0	7.9	8.2	68	
14.0	7.7	8.2	67	
15.0	7.5	8.2	67	
16.0	7.3	8.3	67	
17.0	7.2	8.4	67	Hypolimnion
18.0	7.0	8.3	66	
19.0	6.8	8.2	65	
20.0	6.6	7.8	62	
21.0	6.5	6.7	63	Bottom

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

KASHWAKAMAK LAKE – East Basin Continued…

Date: August 6, 2003
Depth: 24.0 Metres
Euphotic Zone (Penetration of Light) = 12.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	24.4	9.0	102	
1.0	24.3	9.0	102	
2.0	24.0	9.0	101	Epilimnion
3.0	23.9	8.9	101	
4.0	23.8	8.9	100	
5.0	23.7	8.9	100	
6.0	22.4	8.7	96	
7.0	21.4	8.6	93	
8.0	18.5	8.4	86	Metalimnion
9.0	12.7	9.3	85	or Thermocline
10.0	10.1	9.3	80	
11.0	9.0	8.9	74	
12.0	8.4	8.7	72	
13.0	8.2	8.2	67	
14.0	8.1	7.8	64	
15.0	7.8	7.7	63	Hypolimnion
16.0	7.6	7.6	62	
17.0	7.4	7.5	61	
18.0	7.3	7.5	60	
19.0	7.1	7.5	60	
20.0	6.9	6.2	49	
21.0	6.8	5.6	44	Bottom

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

KASHWAKAMAK LAKE – East Basin Continued…

Date: August 28, 2003
Depth: 24.0 Metres
Euphotic Zone (Penetration of Light) = 14.2 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	22.6	8.4	94	
1.0	22.6	8.4	94	
2.0	22.5	8.4	94	
3.0	22.5	8.3	94	
4.0	22.4	8.3	93	
5.0	22.4	8.3	93	Epilimnion
6.0	22.4	8.4	96	
7.0	22.3	8.1	90	
8.0	19.8	7.7	81	
9.0	14.4	7.7	73	
10.0	11.2	8.2	74	Metalimnion
11.0	10.0	8.0	69	or Thermocline
12.0	9.0	7.9	66	
13.0	8.4	7.4	61	
14.0	8.1	7.3	60	
15.0	8.0	7.0	57	Hypolimnion
16.0	7.7	7.7	57	
17.0	7.6	7.6	56	
18.0	7.3	7.3	53	
19.0	7.3	7.3	52	
20.0	7.0	7.0	45	
21.0	6.9	6.9	28	Bottom

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

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. ***Special thanks to Elma MacLachlan and the Kashwakamak Lake Association for volunteering their time and resources to this program.***

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