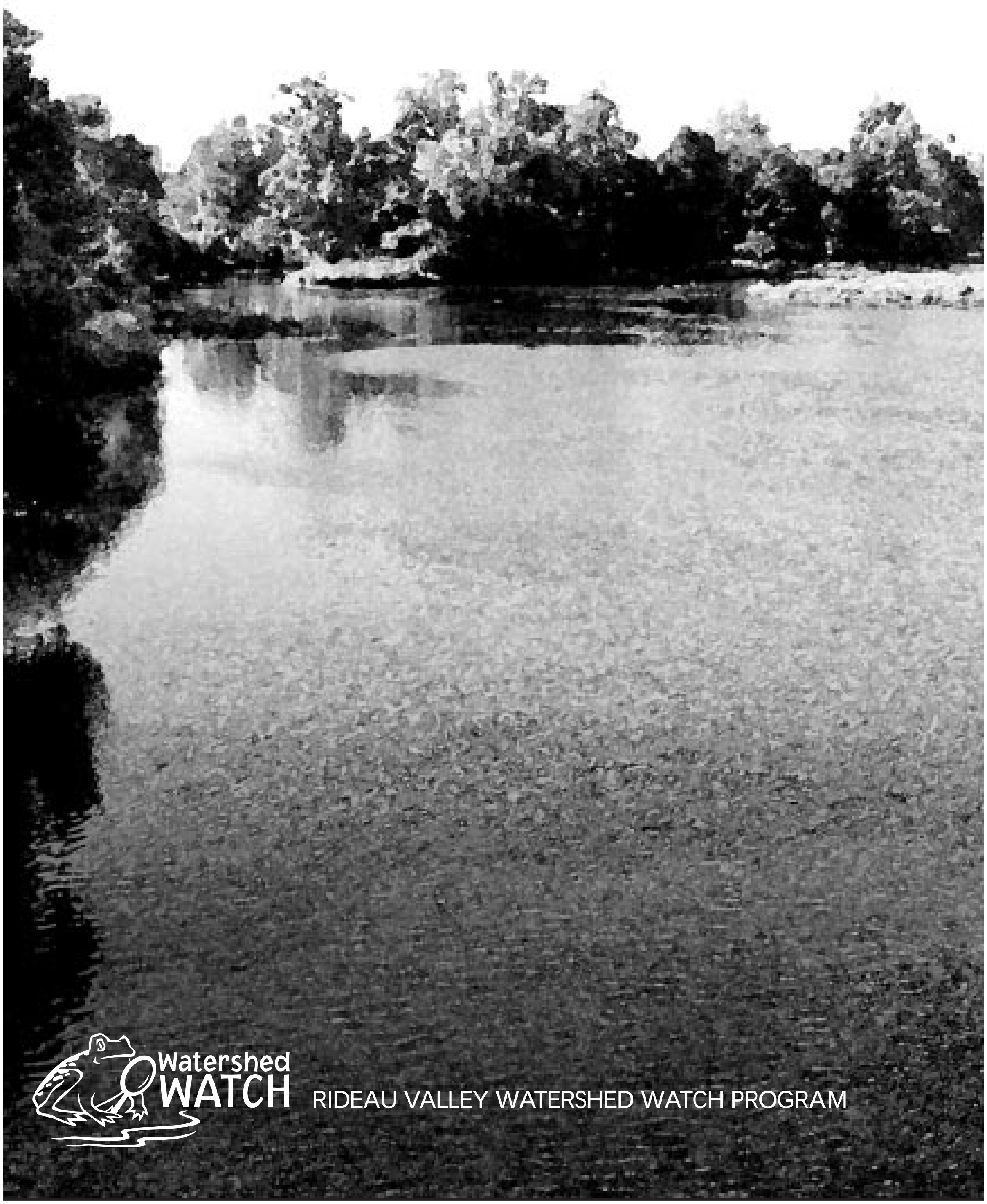
STATE OF THE

LAKE ENVIRONMENT REPORT-2001



THE ONTARIO TRILLIUM FOUNDATION
LA FONDATION TRILLIUM DE L'ONTARIO

FENDOCK

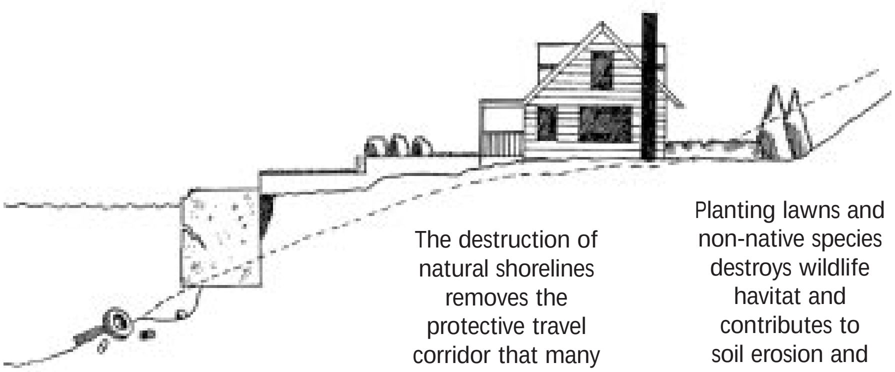
RIDEAU VALLEY
CONSERVATION AUTHORITY

COMMUNITY STEWARDSHIP COUNCIL OF LANARK COUNTY
Lanark

- Alliance of Rideau Lakes Associations
- Big Rideau Lake Association
- Farren Lake Property Owners Association
- Rideau Valley Conservation Foundation and its many donors
- Township of Bathurst Burgess Sherbrooke

"The Ribbon of Life"
Where the Land Meets the Water

Water quality is affected by many things: natural processes of erosion and runoff accelerated by clearing of shorelines, the use of artificial fertilizers and leachate from sewage disposal systems. All result in too many nutrients reaching the lake.



Retaining walls destroy littoral zones. Waves deflected off retaining walls, stir up contaminated sediments and destroy vegtation.

The destruction of natural shorelines removes the protective travel corridor that many species rely on in their journeys between land and water.

Planting lawns and non-native species destroys wildlife havitat and contributes to soil erosion and a reduction in water quality.

Too many nutrients causes profuse weed and algae growth which affects the aquatic animal species makeup by altering habitat and food sources and by reducing oxygen and light penetration.

The shallow waters and first ten metres of shoreland area form a "Ribbon of Life" around 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 a negative effect 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.

The Rideau Valley Conservation Authority 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. The Conservation Authority 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. 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 shoreline residents, both seasonal and permanent, to become personal stewards of their lake and to adopt sound stewardship practices aimed at preserving and protecting water quality. By taking an active role in restoring and enhancing their shoreline, they can help to maintain water quality and a healthy lake environment.

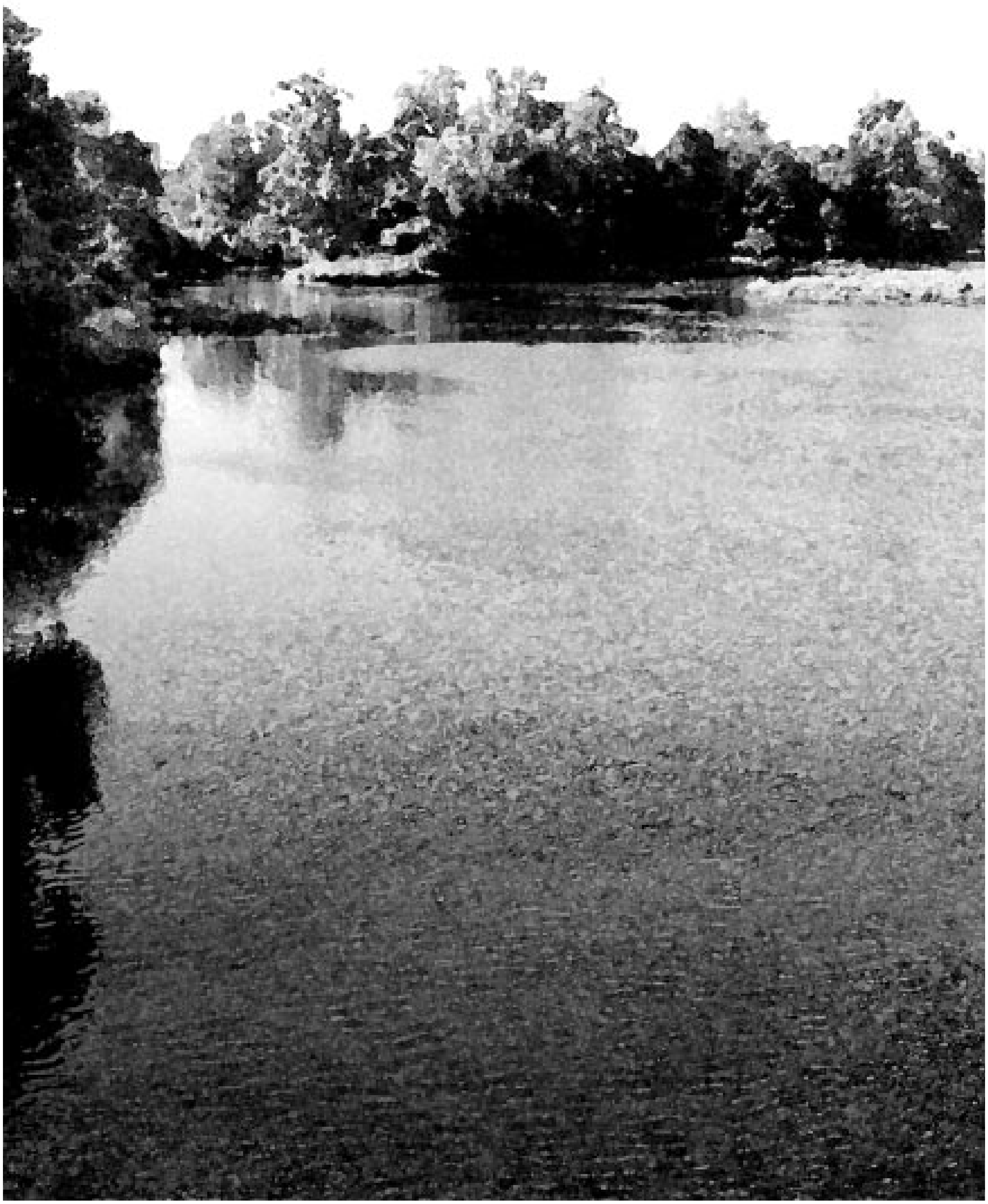
Recreational water quality can be expressed in terms of how clear the water appears. Water clarity is influenced by the amount of soil sediment and phytoplankton, or microscopic algae, present in the water. Clarity is measured by a simple visual test using a **Secchi Disk**, a 20 centimetre black and white disk attached to a measured line that is lowered into the lake until it is no longer visible. Analysis of water samples for **chlorophyll** a, which provides the green pigment in phytoplankton, gives a more specific measure of the abundance of small creatures in the water. Another perspective is gained through analysis of samples for nutrients, particularly **phosphorus** but also **nitrogen**, which tells how much food is available for the algae and aquatic plants. In the late summer when the algae drops to the bottom of the lake, its decomposition uses oxygen so, to find out how much oxygen is available for fish and other aquatic animals, **dissolved oxygen and temperature** profiles are done.

These tests combine to give an indication of the Aage@ of a lake and what can be expected. An Aold@ or **eutrophic** lake will have profuse plant growth and relatively few fish species because of the lack of open water and the competition for oxygen. A Amiddle-aged@ or mesotrophic lake will support the greatest diversity of fish species with a variety of habitats and sufficient oxygen available. AYoung@ or **oligotrophic** lakes have very little or no vegetation and are usually well oxygenated but will have relatively few fish species.

While lake users are interested in how weedy a lake is and what kind of fishing stories they can experience, they also want to know if the water is safe for drinking and swimming. Eschericia coli **(E.coli.)** are in a family of fecal coliform bacteria common to warm-blooded mammals. A few members of the family are harmful themselves but E.coli. are also a good indicator of the presence of pathogenic or other hazardous bacteria because where there is E.coli., the others will usually be present. Analysis of water samples for E.coli., which is relatively more abundant and easier to count than the other organisms, gives an indication of problems with leaking septic systems or other sources of contamination.

Through WATERSHED WATCH, lakes in the watershed will be monitored for these key water quality indicators. Knowing what is in the water will assist the lake stewards when devising a strategy to protect the Ribbon of Life which will reduce the human impact on the aging process and ensure that our lakes will endure for future generations to enjoy.

Little Crosby Lake



LITTLE CROSBY LAKE - 2001

LOCATION:	Township of Rideau Lakes (North Crosby) – between Crosby and Pike Lakes - part of the headwaters of Grants Creek, a major tributary of the Tay River
ELEVATION:	lake surface approximately 145 metres above mean sea level
DIMENSIONS:	perimeter: 4.5 kilometres; maximum depth: 11.2 metres.; area: 55.9 hectares
LAKE WATERSHED:	drainage area: 641.3 hectares
FISHERY:	warm water fishery - northern pike, walleye, bass.
DEVELOPMENT LEVEL:	13 cottages, 2 farmhouses, 4 rental cottages, 4 trailers (septic survey - 1993)
BACKGROUND DATA:	Ministry of Environment Recreational Lakes Program (1980) - total phosphorus, total Kjeldahl nitrogen, chlorophyll a, secchi disk, dissolved oxygen profiles

The sampling component of the Watershed Watch program consisted of the following:

SITES:	one site at deepest point of lake, two at the shoreline adjacent to cottage groupings, one toward the west end of the lake (see map)
TOTAL PHOSPHORUS (TP):	samples from deepest point at the surface and one metre above the bottom; at two shoreline sites at approximately half metre depth in one metre of water
TOTAL KJELDAHL NITROGEN (TKN):	samples from deepest point at the surface and one metre above the bottom; at two shoreline sites at half metre depth in one metre of water
SECCHI DISK:	at deepest point – measurement is depth where disk can no longer be seen
DISSOLVED OXYGEN/TEMPERATURE (DO/Temp):	at deepest point readings taken at intervals from surface to bottom and back up
CHLOROPHYLL a (Chl):	a composite sample taken in the euphotic zone (layer which light penetrates – twice the secchi disk depth) at deepest point
ESCHERICHIA COLI (E. coli):	at two shoreline sites at approximately half metre depth in one metre of water
INVASIVE SPECIES (IS):	at the deep point and toward the west end; samples for zebra mussel veligers and spiny water flea

How Little Crosby Lake measured up in 2001:

Table 1: Grading Scheme

TP	TKN	Secchi	DO	Chl	E.coli	IS	Score
.005 - .009	.1 - .2	> 5	> 5	0 - 0.00125	0 - 10	No	4
.009 -.013	.2 - .3	4 – 5	4 - 5	0.00125 - 0.0025	10 - 40		3
.013 - .017	.3 - .4	3 – 4	3 - 4	0.0025 - 0.00375	40 - 70		2
.017 - 0.02	.4 - .5	2 – 3	2 - 3	0.00375 - 0.005	70 - 100		1
> 0.02	< .1, > .5	< 2	< 2	> 0.005	> 100	Yes	0

Overall Grading	
Score	Grade
> 3.5	A
2.6 - 3.5	B
1.6 - 2.5	C
0.5 - 1.5	D
< 0.5	F

Note: The scores in Table 2, belowl come from Table 1: Grading Scheme, above. The result or average value of sample results for 2001 for a particular parameter is compared to the range under that parameter in Table 1. Once the appropriate range is found, move in that row horizontally to the score column. For example, a value for TKN of .36 is in the range .3 - .4 for which the score is 2. The overall grade shown at the bottom of Table 2 is found by taking the average of the scores, finding the Score Range in Table 1 to get the grade from the right hand column e.g. an average score of 2.75 is in the range 2.6 - 3.5 which yields a grade of B.

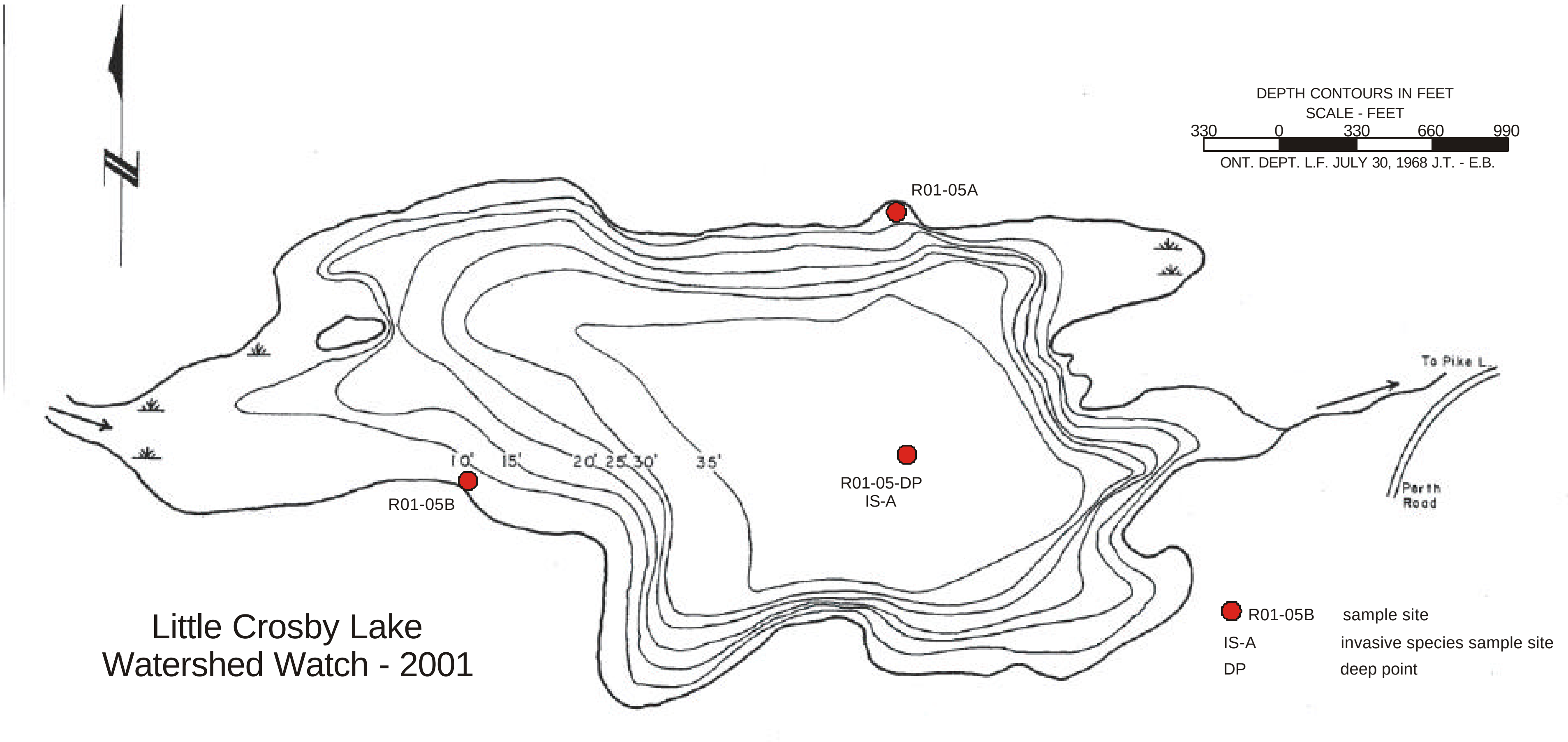
This scoring/grading is not a scientifically rigourous scheme. It is based on schemes used by others but was derived specifically for this report to provide an indication of the overall status of the lake based on all the aspects included in the Rideau Valley Watershed Watch sampling program in 2001. The elements being compared here are not all directly related e.g. the presence of spiny flea has no direct bearing on the amount of TP in the lake and vice versa. Most of the scores are related to an accepted benchmark. The failing score of zero is given for anything above or below the benchmark, depending on the particular parameter, such as 0.02 for TP which is the concentration, expressed in milligrams per litre, used as the Provincial Water Quality Objective (PWQO) above which a marked impact can be expected. In the case of Invasive Species, IS, the presence or absence is what is important and only two scores are needed.

Table 2: Scoring

Parameter	Result	Score	
TP (milligrams/ Litre (mg/L))	0.016	2	Phosphorus comes from soaps, detergents, fertilizers and pesticides and is the main nutrient contributing to the growth of algae. The PWQO for lakes is to keep total phosphorus levels below 0.02 mg per litre of water to avoid excess algae and aquatic plant growth
TKN (mg/L)	0.44	1	Nitrogen contributes to the growth of algae and aquatic plants. Some of its forms can be toxic to aquatic animals in excess quantity and/or when an imbalance occurs. Nitrogen comes from fertilizers, pesticides and human and animal waste. There is no PWQO for Total Kjeldahl Nitrogen but a generally accepted guideline is that TKN levels less than 0.1 and greater than 0.5 mg/L can have harmful effects on the aquatic environment (some nitrogen is required hence the lower limit of the range)
Secchi (metres (m))	5.1	4	The secchi disk reading is a measurement of water clarity. The greater the depth that the disk remains visible indicates correspondingly lower quantities of suspended soil, debris and micro-organisms.
DO/Temp (mg/L)	4.8	3	Result is the average of the DO >4 mg/L at <25 and >10 degrees Celsius multiplied by the percentage of the depth of the lake with those conditions e.g. a lake 30 metres deep has oxygen concentrations that meet the conditions in 10 metres or 30% of the total depth.
Chl (mg/L)	0.0033	2	Chlorophyll a is the green pigment in microscopic algae which live in water. More than 0.005 milligrams of Chl in a litre of lake water indicates an excessive quantity of algae is present which will negatively affect the clarity and oxygen content of the lake.
E.coli (coliform units/ 100 millitres (CFU/100 mL))	2.17	4	E.coli bacteria is used to indicate the presence of harmful disease-causing organisms (bacteria, pathogens). It is present in human and animal waste. The PWQO for drinking water is 0 CFU/100 mL which means that using untreated lake water as a drinking water source is not recommended. The PWQO for swimming is 100 CFU/100 mL
Invasive Species	No	4	Invasive species can significantly alter the lake character. They are typically very aggressive and tend to overwhelm native species in various ways reducing the biodiversity throughout the food chain.
	average score	2.86	**Overall Grade: B**

Little Crosby Lake had a moderate nutrient load, no significant bacteria counts and no invasive animal species in 2001 which is good for a grade of B. This grade indicates that Little Crosby Lake is in the mesotrophic (middle-aged) category. Care still needs to be taken to reduce the human impacts (nutrient loading) to slow the aging process. An obvious sign of nutrient loading is persistent algae blooms throughout the summer but the Secchi disk data suggests that wasn't a persistent problem in 2001. It appears that there is no bacterial pollution occurring, however, one potential source is septic sytems and routine pumpouts and periodic inspections will ensure that they do not become a problem. There was no evidence of the presence of zebra mussels or spiny water flea in Little Crosby Lake in 2001 but users of the lake need to continue to take preventative measures.

A special thank-you to the McFarlands for allowing the Watershed Watch crew access to Little Crosby Lake for the 2001 sampling season.


DEPTH CONTOURS IN FEET
SCALE - FEET
330 0 330 660 990
ONT. DEPT. L.F. JULY 30, 1968 J.T. - E.B.
R01-05A
To Pike L.
10' 15' 20' 25' 30' 35'
R01-05B
R01-05-DP
IS-A
Perth Road
Little Crosby Lake
Watershed Watch - 2001
R01-05B sample site
IS-A invasive species sample site
DP deep point

LITTLE CROSBY LAKE – 2001
Looking a little deeper:

The basic characteristics of a lake depend on the physical properties (dimensions and geology) and climate. Six processes or actions further define an individual lake:

- Precipitation directly onto the lake surface deposits phosphorus and other chemicals and runoff from the lake watershed carry bacteria and pathogens, plant debris and soil particles, which bear phosphorus and other chemical elements, into the water;

- Use by aquatic plants of the nutrients (phosphorus, etc.) has two impacts:
  - plant communities develop in the lake becoming profuse over time which limits the development and diversity of other plants and aquatic animals, and
  - along with plant debris and sediment from the shoreline, dead phytoplankton and other plants settle to the lake bottom where it decomposes using up oxygen and releasing nutrients;

- Each spring and fall temperature changes in the lake cause a mixing or turnover of the waters which can bring phosphorus from bottom waters to the surface to be available for aquatic plant and microorganism growth;

- A “sink” of phosphorus is created by settling of phosphorus-bearing sediment and the decay process at the bottom of all lakes with the phosphorus either held adsorbed to the lake bed soil particles when dissolved oxygen levels are high or in solution when the dissolved oxygen levels decline.

- After the spring turnover, the lake warms and stratification occurs creating a warmer surface layer (epilimnion), a transition zone (metalimnion) and colder deep waters (hypolimnion). As water warms, the ability to hold dissolved oxygen decreases. While the warm waters of the epilimnion can hold less the air/water contact and wave action ensures that there is a constant supply. As the deep waters of the hypolimnion warm, there is no mechanism to get new oxygen. The demand for oxygen for the decay process can cause the hypolimnion to become anoxic (no dissolved oxygen);

- Lakeshore development affects the shoreline runoff/erosion characteristics which usually leads to increased sediment, bacterial and nutrient loading of lake waters by changes to the vegetation composition, hardening the surface (buildings, roads, retaining walls, etc.) and installation and sometimes poor maintenance of septic facilities;

There are several methods of measuring the impacts of these processes or actions. The common ones are:
- measurement of water clarity using a Secchi disk,
- dissolved oxygen (DO)/Temperature profiles to show what the extents of the aquatic habitat are (most fish species inhabit the warmer, oxygenated surface waters),
- analysis of samples for nutrients: Total Phosphorus (TP) - the limiting nutrient for plant and microorganism growth, and/or
- presence or concentration of phytoplankton indicated by the amount of chlorophyll a, a pigment in phytoplankton

Added for the Watershed Watch program were:
- Total Kjeldahl Nitrogen (TKN), a secondary nutrient, to see if the high counts found elsewhere in the watershed occur in the lakes, and
- Eschericia Coliform (E.Coli) sampling around the lake nearshore to check for bacterial pollution problems.

An obstacle to assessing the condition of lakes is the length of the historical data record. The only previous data found for Little Crosby Lake was in a Lake Survey report done in 1980. This limited dataset and the general nature of the parameters does not allow a detailed analysis of Little Crosby Lake so what follows is a set of observations about the available data which should be of assistance in setting goals for future lake management.

Table 1: Deep Point of Lake

	TP DP-S (mg/L)	TP DP-B (mg/L)	Chl a (mg/L)	Secchi (metres)
5-Jun-01	0.014	0.053	0.0017	5.3
3-Jul-01	0.012	0.141	0.0020	3.8
18-Jul-01	0.013	0.141	0.0020	5.5
1-Aug-01	0.011	0.104	0.0017	7.0
13-Aug-01	0.011	0.109	0.0024	4.5
19-Sep-01	0.070	0.123	0.0084	5.0
2-Oct-01	0.022	0.030	0.0047	4.5
average	0.022	0.100	0.0033	5.1
1980	0.015	0.012	0.00399	3.7

Table 2: Lake Survey Summary – 1980

	Secchi (metres)	Chl a (mg/L)	TP DP-S (mg/L)	TP DP-B (mg/L)	TKN DP-S (mg/L)	TKN DP-B (mg/L)
20-May	3.6	0.0016	0.010	0.036	0.514	0.684
27-May	5.1	0.0021	0.002		0.518	
4-Jun	3.3	0.0024	0.010		0.526	
11-Jun	3.0	0.0033	0.022		0.516	
17-Jun	3.6	0.0042	0.002		0.426	
17-Jun			0.012	0.090	0.504	0.918
24-Jun	3.7	0.0029	0.010		0.466	
2-Jul	3.7	0.0032	0.018		0.564	
8-Jul	3.8	0.0034	0.016		0.642	
15-Jul	4.0	0.0044	0.012		0.392	
15-Jul			0.004	0.136	0.312	0.996
22-Jul	4.3	0.0021	0.022		0.492	
28-Jul	4.1	0.0040	0.026		0.482	
5-Aug	4.3	0.0067	0.024		0.412	
12-Aug	3.3	0.0052	0.014		0.392	
19-Aug	2.2	0.0056	0.014	0.240	0.592	1.466
27-Aug	2.7	0.0042				
23-Sep	3.6	0.0074	0.018		0.442	
23-Sep			0.018	0.088	0.522	0.702
22-Oct	5.0	0.0051	0.034		0.574	
average	**3.7**	**0.00399**	**0.015**	**0.118**	**0.489**	**0.953**

Chlorophyll a was used as the primary indicator of lake trophic state (age or nutrient level) until 1994 when it was replaced by total phosphorus because sampling and analysis for TP has been shown to be more reliable and more economical. The relationship between the two is that chlorophyll a is one of the pigments found in phytoplankton and phosphorus is the primary nutrient affecting the proliferation of phytoplankton. Measuring chlorophyll a gives an indication of what is growing at the particular time whereas a measurement of the TP concentration is an indication of the potential for plant growth. Analysis for chlorophyll a was included in the Watershed Watch sampling in 2001 for comparison with the historical data.

As can be seen in Table 2, above, the concentration of chlorophyll a in 1980 exceeded the guideline in almost 50% of the samples. Without data for the intervening years, it is not possible to say categorically that there has been an improvement in chlorophyll a concentrations. However, the concentrations were all lower and well below the guideline through August. As in 1980, the concentration increased significantly in September and remained relatively high in October. The Secchi disk data from 1980 suggests that the chlorophyll a concentrations did not cause profuse algae blooms because the water remained moderately clear throughout the year. The large increase in chlorophyll a in September, 2001 also did not affect water clarity with the water remaining relatively clear throughout the sample period (Figure 1). Bars descending from the top axis show the

Sechhi disk depths with the depth values on the left vertical axis. The chlorophyll a source data, as depicted by the vertical bars on the right of each group rising from the bottom axis, was multiplied by ten to make the graph more visually presentable (refer to the right vertical axis for the numeric values for chlorophyll a and phosphorus).

It is obvious from Figure 1 that a large increase in total phosphorus occurred in mid-September to accompany the rise in chlorophyll a. What is not obvious is what caused it and why there was no noticeable impairment of water clarity. Until September the TP concentrations were quite good in the surface waters. However, the high concentrations cannot be ignored and, therefore, the average for the year was just above the Provincial Water Quality Objective (PWQO) of 0.02 mg/L (0.022 mg/L).

TP concentrations in both 1980 and 2001 were well above the PWQO (averages of 0.118 and 0.1 mg/L respectively). This may indicate that there is typically a significant amount of phosphorus in the bottom waters and it is interesting that it remains in solution throughout the year. There is likely to be a significant amount in the bottom sediments as well available to go into solution when oxygen concentrations drop.

Figure 1

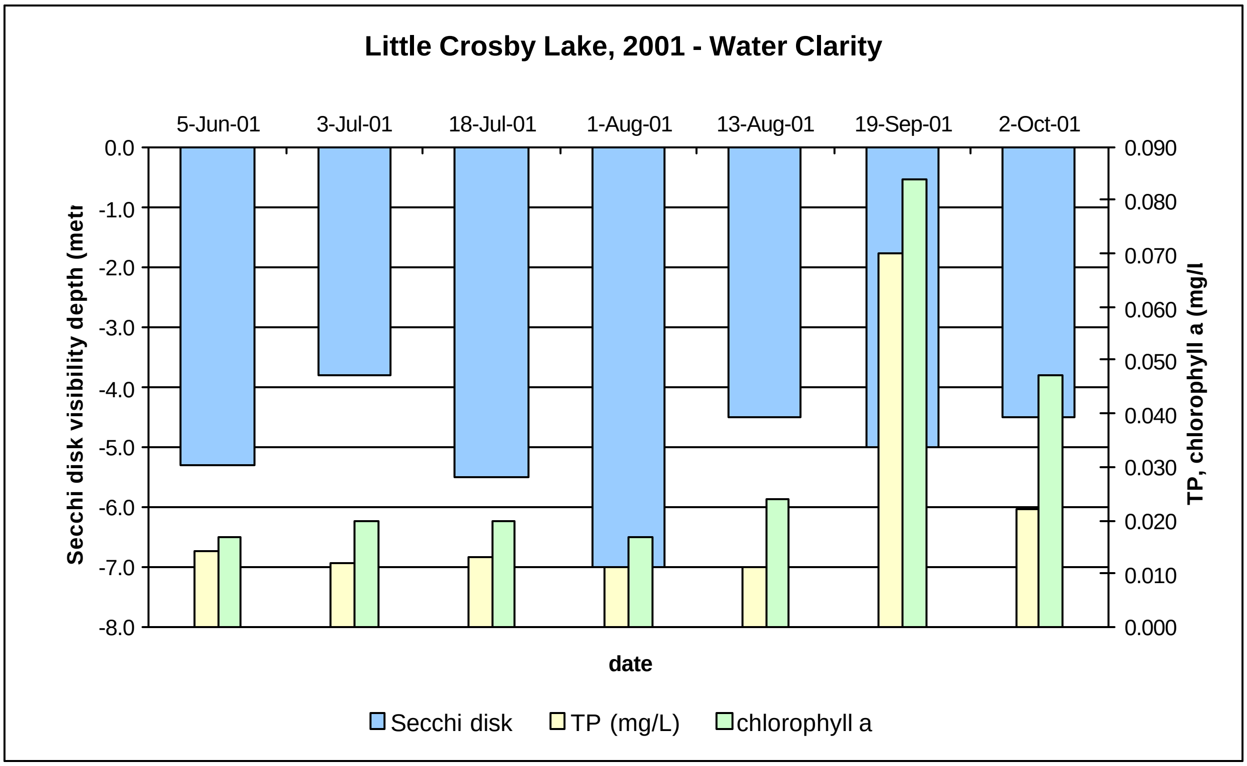
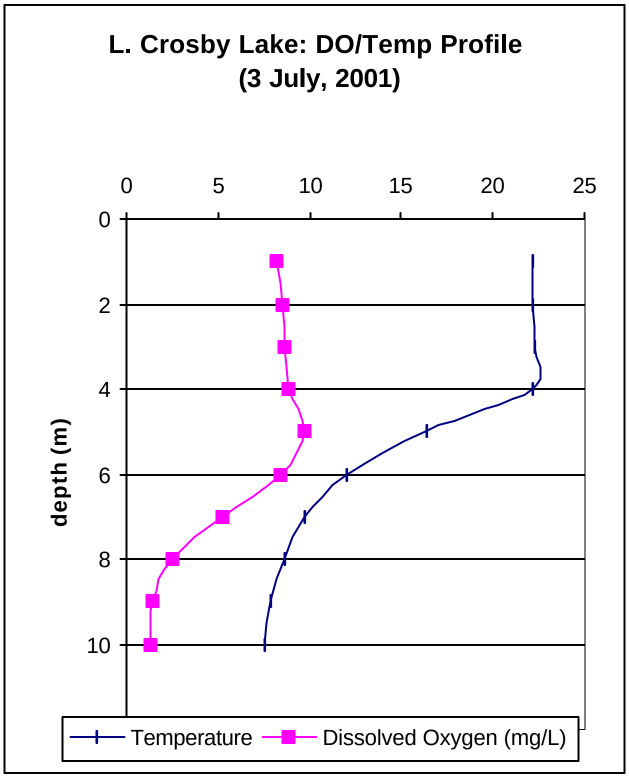
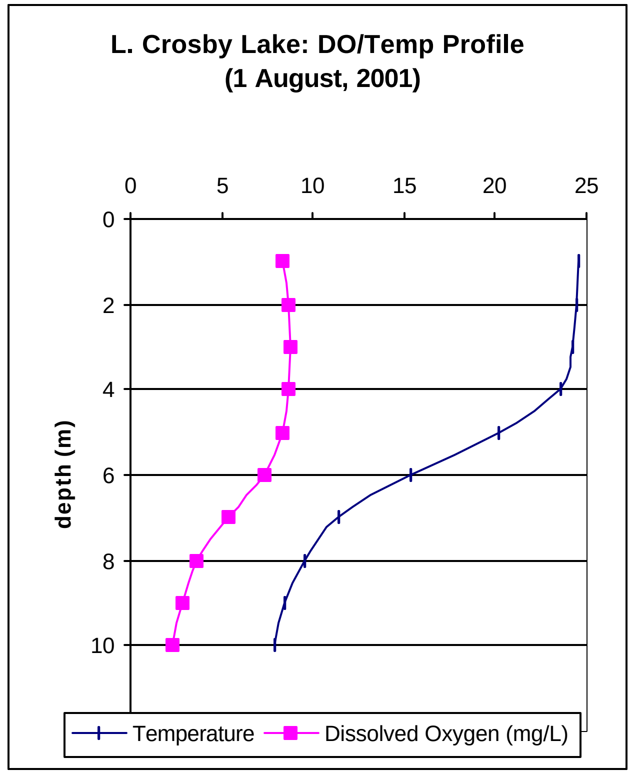


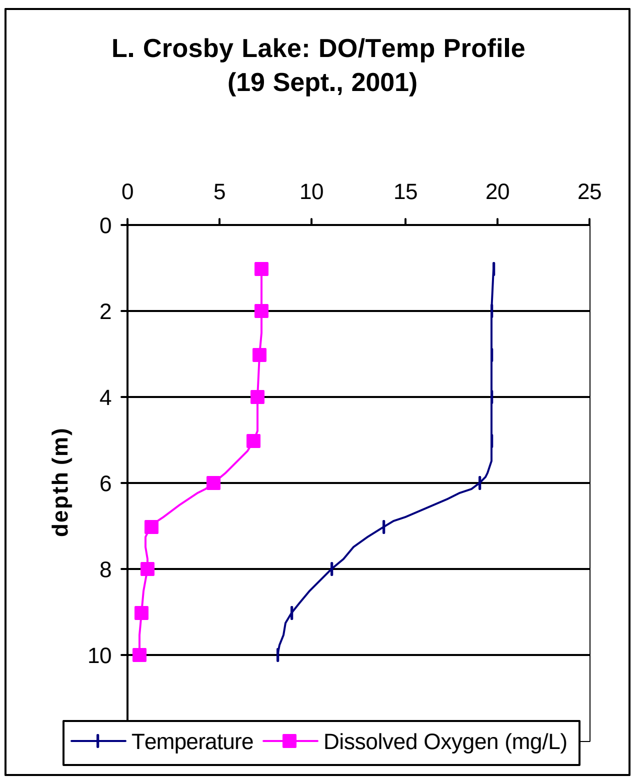
Table 3: Dissolved Oxygen/Temperature – Deep Point- Sept. 19, 2001

Depth [Metres]	Temperature [Degrees Celcius]	Dissolved Oxygen [Milligrams/Litre]	Percent Saturation [%]	Lake Stratification
1	19.8	7.3	77	Epilimnion
2	19.7	7.2	76	
3	19.7	7.1	75.5	
4	19.7	7.0	75	
5	19.7	6.8	73	
6	19.7	4.7	50.5	
7	13.8	1.3	10.5	Metalimnion or Thermocline
8	11	1.1	9	
9	8.9	0.8	7	
10	8.1	0.7	5	Hypolimnion

Figures 3, 4, 5







Dissolved oxygen and temperature profiling is important for all lakes because both parameters affect all aquatic organisms and the chemistry of the lake environment. As oxygen levels are lowered, phosphorus in the bottom sediments become more readily soluble adding to the loading available for plant growth. Profiles were done three times through the summer at the same time as water samples were collected. In June, the lake surface waters had begun to warm up and there were good oxygen concentrations in the upper six metres.

Through July, the water temperature continued to rise approaching the upper threshold of 25 degrees and the bottom waters were beginning to warm up and oxygen concentrations to decline. By September, air temperatures had dropped and the surface waters were correspondingly lower. Bottom waters had not yet begun to cool and oxygen concentrations were nearly anoxic (no oxygen). This could account for the relatively elevated concentrations of TP at the bottom and, possibly, also at the surface at that time but doesn't explain why the bottom TP was high throughout the sampling period (average 0.1 mg/L).

Near the shore:

In addition to sampling at the deep point in the lake, the Watershed Watch program included sampling at a number of sites near the shore. The objectives were:

a) to look at the phosphorus and nitrogen distribution around the lake.
b) to do general sampling for bacterial pollution (E.Coli) in proximity to the larger groupings of cottages to see if there was a problem with septic and grey water entering the lake.

Table 4: TP - Little Crosby Lake, 2001

SITE	5-Jun-01	3-Jul-01	18-Jul-01	1-Aug-01	13-Aug-01	19-Sep-01	2-Oct-01	average
DP-B	0.053	0.141	0.141	0.104	0.109	0.123	0.03	0.100
DP-S	0.014	0.012	0.013	0.011	0.011	0.07	0.022	0.022
A		0.01	0.008	0.013	0.011	0.012	0.014	0.011
B		0.01	0.009	0.013	0.011	0.02	0.017	0.013
							average	**0.016**

When the sample result from the deep point from September 19th is removed from the dataset, only three of the remaining data values are more than one standard deviation above the resultant mean. In other words, surface water total phosphorus concentrations were generally reasonably good throughout the summer months.

Inflow from upstream waters is one of the ways nutrients enter a lake. It does not appear that Crosby Lake is a major contributor because it had similar concentrations of both TP and TKN through 2001.

Table 5: TKN - Little Crosby Lake, 2001

SITE	5-Jun-01	3-Jul-01	18-Jul-01	1-Aug-01	13-Aug-01	19-Sep-01	2-Oct-01	average
DP-B	0.59	0.64	0.82	0.63	0.91	0.76	0.42	0.73
DP-S	0.39	0.39	0.43	0.32	0.43	0.51	0.45	0.42
A		0.38	0.41	0.61	0.44	0.51	0.46	0.47
B		0.38	0.46	0.37	0.45	0.48	0.47	0.43
							average	**0.44**

The upper end of the range of the provincial guideline for **Total Kjeldahl Nitrogen** is 0.50 mg/L. Three of the nineteen samples in 2001 exceeded that level (Table 5). The prevalence of high TKN values throughout the Tay River watershed has led to the conclusion that there is a naturally occurring background level. Nitrogen concentrations in Little Crosby Lake were similar to the other lakes sampled in 2001 and in keeping with concentrations measured in the Tay River. Both surface and bottom TKN concentrations were lower in 2001 than in1980 which may reflect a decreased nitrogen loading but, again, without the data from the years between, that cannot be definitively concluded.

Table 6: E.Coli - Little Crosby Lake, 2001

SITE	7-Jun-01	3-Jul-01	18-Jul-01	1-Aug-01	13-Aug-01	19-Sep-01	2-Oct-01	average
A	2	2	3	2	2	2	2	2.17
B	2	2	3	2	2	2	2	2.17
							average	**2.17**

Escherichia coliform (E.Coli) is used as an indicator of the potential presence of other harmful bacteria and pathogens in water. The main sources of bacteria are animal (decay of dead animals, defecation near and in the water) and human waste (septic systems, grey water). Levels above the PWQO of 100 counts/100 mL can mean that the water is unsafe for swimming. As a general precaution, untreated water from lakes should not be used as the primary drinking water source and use for washing and cooking should be limited.

The results for Little Crosby Lake indicate that there are very low levels of bacteria in the water. The sample sites were selected to determine if there were sources of pollution in the vicinity of the developed areas. The E.Coli results can be considered to reasonably indicate that the waters of Little Crosby Lake did not pose a health concern for cottagers and residents for swimming and other water contact recreational use in 2001.

(Note: Not all bacteria are harmful. Some can be a food source for macroscopic aquatic invertebrates. Also, what is commonly referred to as blue-green algae, is a bacteria which shares many characteristics with algae and can be toxic to aquatic species as well as cause reactions in humans).

Little Crosby Lake was also tested for **invasive species** in 2001, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters (www.invadingspecies.com for more information). Neither species was found in Little Crosby Lake or upstream in Crosby Lake. All users of the lake need to take precautions to avoid bringing in invasive species.

In conclusion:

The average concentration of total phosphorus in the surface samples at the deep point of the lake was in excess of the Provincial Water Quality Objective but this was skewed by one extreme value with the rest of the data near or below the objective. Some of the chlorophyll a concentrations exceeded the guideline but the average was below. TP concentrations at the two nearshore sites were all at or below the PWQO. TP concentrations at the bottom of the deep point were all well above the PWQO. Nitrogen concentrations were mostly slightly below the guideline at the surface but all but one sample was above the guideline in bottom samples. It is difficult to categorize Little Crosby Lake with some indicators pointing toward it being nutrient enriched and others that it is still below the threshold. Going strictly by the averages for the year for the surface waters, it would appear that the lake is still mesotrophic or moderately nutrient enriched. However, the presence of excessive amounts of nutrients at the bottom might be the telling factor that makes it reasonable to consider Little Crosby Lake to be closer to the nutrient enriched state and that every effort needs to be taken to minimize the impact from human activities around the lake.

Of the six things in the list on the first page of this section of processes and actions that affect the character of a lake, the first point has to be addressed by society as a whole. The amount of phosphorus reaching lakes by airborne deposition can be reduced by controlling the amount that gets into the air from industrial and other emissions. It is the last point in that list which is entirely the responsibility of those who own property around the lake to act on. By following the five steps listed below, those who presently enjoy Little Crosby Lake can continue to into the future.

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 and have the tank and tile field inspected periodically.
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		**HIGH PHOSPHORUS LIFESTYLE**	
HUMAN WASTE	535 g	HUMAN WASTE	535 g
NO DISHWASHER	0 g	DISHWASHER USING POWDERED DETERGENT ONCE PER DAY	650 g
NO FERTILIZER	0 g	LAWN FERTILIZED ONCE/YEAR	1,960 g
TREES NOT CUT DOWN	20 g	LOT CLEARED OF TREES	30 g
USES PHOSPHATE-FREE PRODUCTS	20 g	USES PRODUCTS WITH PHOSPHATES	180 g
TOTAL	**575 g**		**3,355 g**

For more information regarding *Watershed Watch* or for free advice on how you can help protect or enhance your lake environment, contact the Landowner Resource Centre at (613) 692-2390 or lrc@rideauvalley.on.ca