STATE OF THE

LAKE ENVIRONMENT REPORT 2005

Watershed WATCH

RIDEAU VALLEY WATERSHED WATCH PROGRAM

THE ONTARIO TRILLIUM FOUNDATION
LA FONDATION TRILLIUM DE L'ONTARIO

FENDOCK

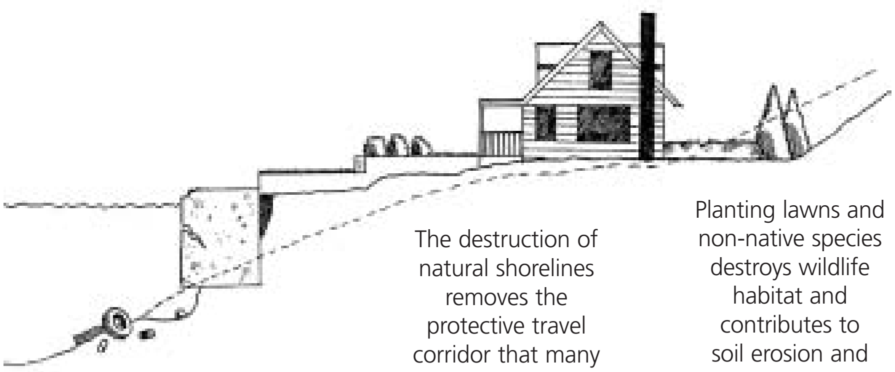
RIDEAU VALLEY
CONSERVATION AUTHORITY

Community Stewardship Council of Lanark County
Lanark

- Alliance of Rideau Lakes Associations
- Big Rideau Lake Association
- Eagle Lake Property Owners 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 vegetation.

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 habitat 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 age of a lake and what can be expected. An old 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 middle-aged or **mesotrophic** lake will support the greatest diversity of fish species with a variety of habitats and sufficient oxygen available. Young or **oligotrophic** lakes have very little or no vegetation and are usually well oxygenated but 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.

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 and do not use fertilizers, herbicides or pesticides.

Low Phosphorus Lifestyle	
Human Waste	535 g
No Dishwasher	0 g
No fertilizer	0 g
Uses phosphate-free products	20 g

High Phosphorus Lifestyle	
Human Waste	535 g
Dishwasher using powdered detergent once per day	650 g
Lawn fertilized once/year	1,960 g
Uses products with phosphates	180 g

In a Bit More Detail:

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);

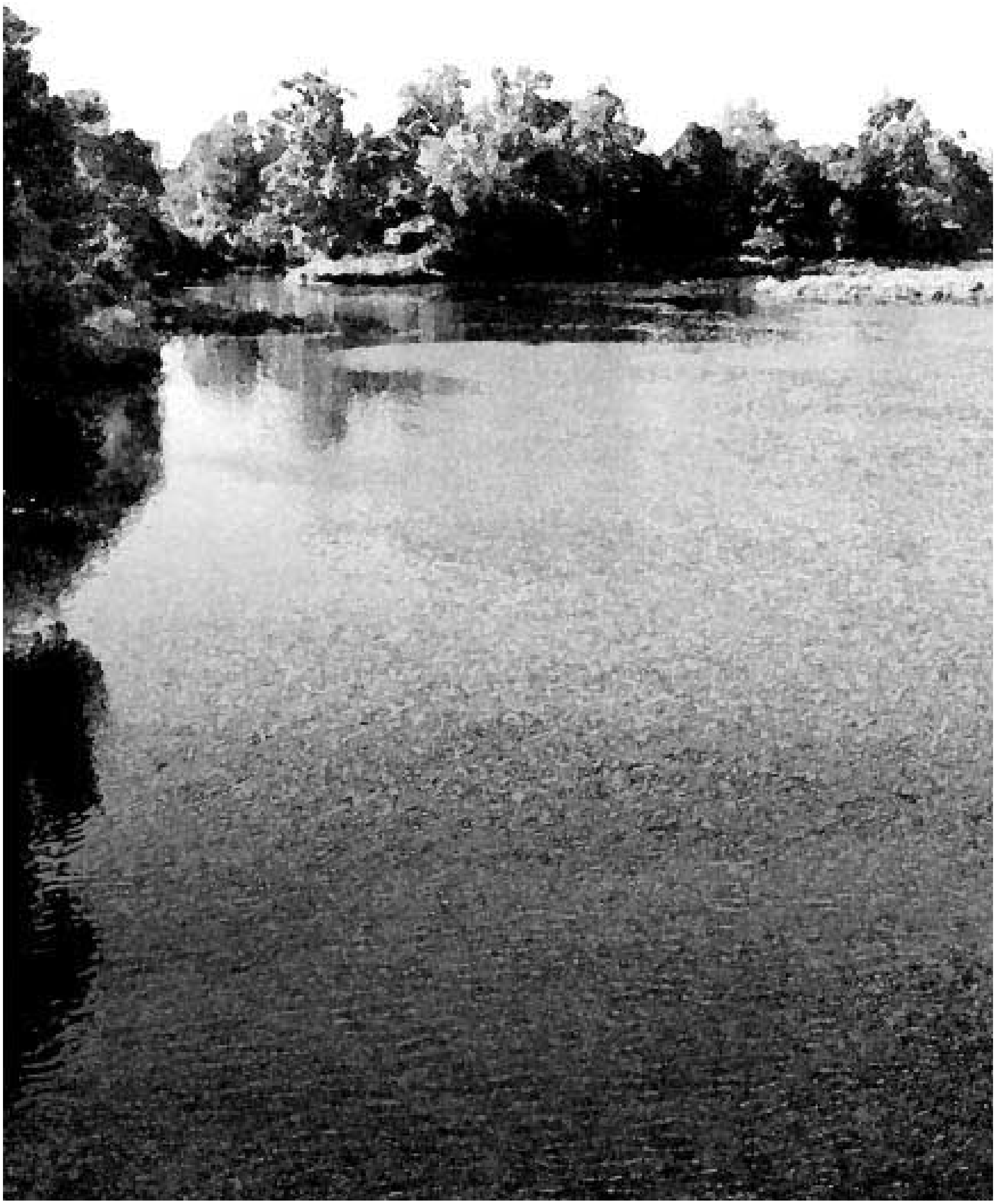
- Lakeshore development affects the shoreline runoff/erosion characteristics which usually leads to increased sediment, bacterial and nutrient loading of lake waters by changes to the vegetation composition, hardening the surface (buildings, roads, retaining walls, etc.) and installation and operation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

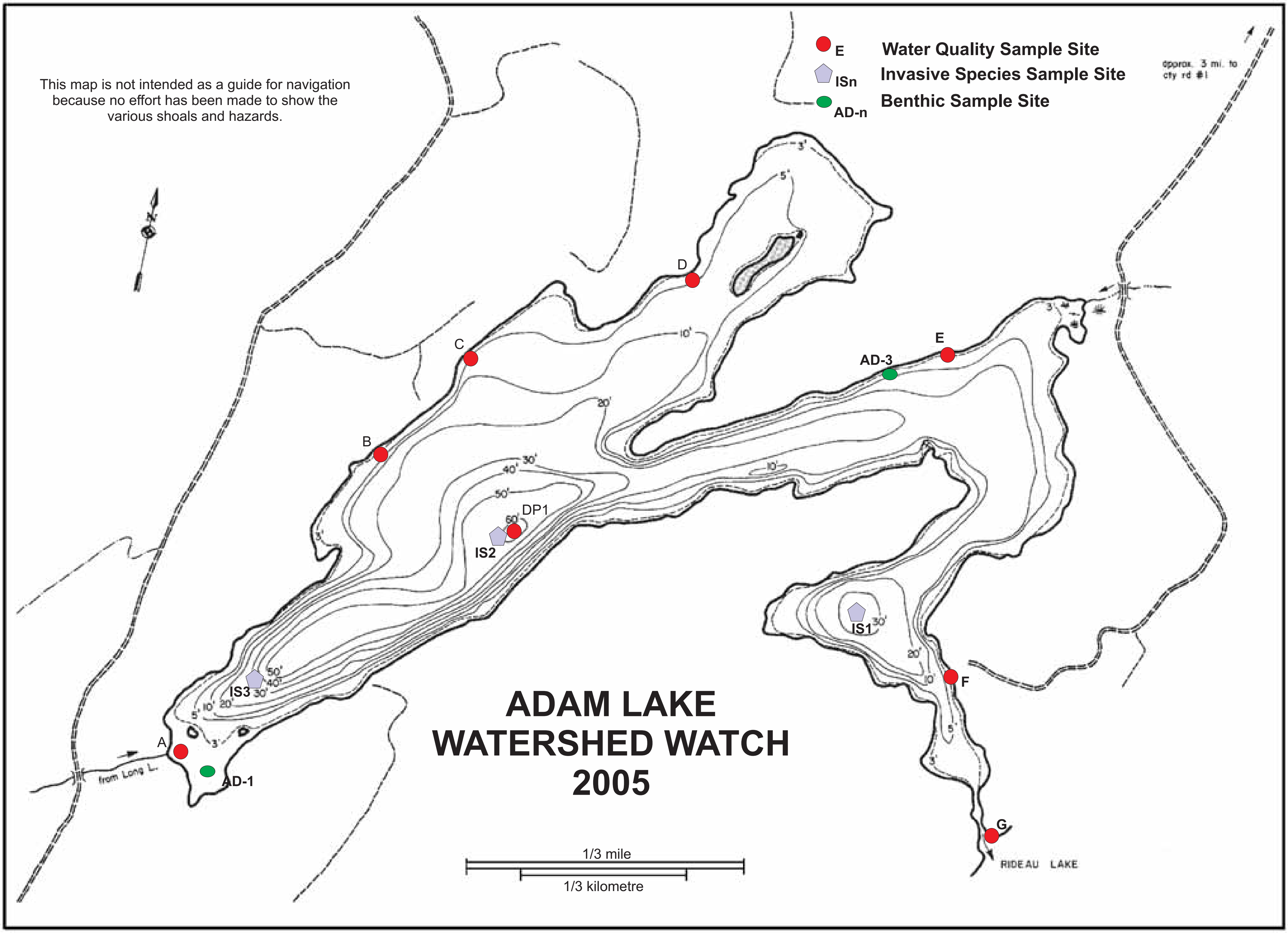
There are several methods of measuring the impacts of these processes or actions. The common ones are:
- measurement of **water clarity** or the presence of suspended material using a **Secchi disk**,
- dissolved oxygen (DO)/Temperature profiles to show what the extents of the habitable waters are (most 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 <u>a</u>**, a pigment in phytoplankton (aquatic plants) – Chlorophyll <u>a</u> 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 was shown to be more reliable and more economical. The relationship between the two is that chlorophyll <u>a</u> is one of the pigments found in phytoplankton giving it a green colour and phosphorus is the primary nutrient for the phytoplankton. In other words, the higher the concentration of TP, the greater the potential for growth of phytoplankton would be which, in turn, would mean that there would be a correspondingly high concentration of chlorophyll present. In such a case, the water clarity could be poor from the abundance of suspended plant material.

Added for the Watershed Watch program were:
- Total Kjeldahl Nitrogen (TKN), a secondary nutrient, to see what is available to work with the phosphorus and to see if the high counts found elsewhere in the watershed occur in the lakes;
- Eschericia Coliform (E.Coli) sampling around the lake nearshore to check for bacterial pollution problems, and
- Dissolved Organic Carbon (DOC) that comes typically from wetlands and can have a limiting effect on the nutrient uptake process.

Adam Lake 2005

published June 2006




This map is not intended as a guide for navigation because no effort has been made to show the various shoals and hazards.
E Water Quality Sample Site
ISn Invasive Species Sample Site
AD-n Benthic Sample Site
approx. 3 mi. to cty rd #1
from Long L.
A
B
C
D
E
F
G
DP1
IS1
IS2
IS3
AD-1
AD-3
RIDEAU LAKE
ADAM LAKE
WATERSHED WATCH
2005
1/3 mile
1/3 kilometre

ADAM LAKE - 2005

LOCATION:	Tay Valley Township. Inflow from Long Lake and outlet to Big Rideau Lake.
ELEVATION:	lake surface elevation target range 123.1 to 123.9 metres above mean sea level
DIMENSIONS:	perimeter: 8.6 kilometres; maximum depth: 23 metres.; area: 73 hectares; volume: 360 hectare-metres
LAKE WATERSHED:	drainage area: 377 ha (not including lake surface); 86% wooded-sandy, 14% pasture on sandy soil
FISHERY:	warm water fishery - bass, pike
BACKGROUND DATA:	Ministry of Environment Lake Partner Program

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

SITES:	sites at the deepest point of lake, eleven around shoreline adjacent to cottage groupings (see map)
TOTAL PHOSPHORUS (TP):	a composite sample taken in the euphotic zone (layer which light penetrates – twice the secchi disk depth) at the deepest point (where there is least point source input) and one metre above the bottom; at five 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 eleven shoreline sites at half metre depth in one metre of water
SECCHI DISK (SD):	at deepest point – measurement is depth where disk can no longer be seen
DISSOLVED OXYGEN/TEMPERATURE (DO):	at deepest point readings taken at intervals from surface to bottom and back to the surface
***ESCHERICHIA COLI (E. Coli*):**	at eleven shoreline sites at approximately half metre depth in one metre of water
INVASIVE SPECIES (IS):	sampling for Zebra Mussel veligers and Spiny Water Flea completed during July sampling
BENTHIC MACRO INVERTEBRATES:	a total of three shoreline sites. One site in a pristine location and two samples in locations representative of development levels on the lake. Three replicates are completed at each site.

Looking a little deeper:

Water quality monitoring of Adam Lake has been done sporadically over many years under various programs. Most recently, there has been participation in the Lake Partner Program (LPP) that will be combined with the Watershed Watch data in a discussion of the "health" of Adam Lake through 2005. The report will be comprised of text discussion of the parameters of the water quality monitoring program in a best to worst progression with the related tabular presentation of various data following. Reference will be made to **Provincial Water Quality Objectives**

(PWQO) or, in the absence of a PWQO, **guidelines** which are thresholds for the various parameters above which (or below in some cases) conditions would be hazardous or have negative impacts on the aquatic environment.

***ESCHERICHIA COLIFORM* (EC)**

In an effort to detect sources of bacterial contamination, analysis was done on samples taken around the shoreline at a half metre depth in one metre of water. Of the 63 samples taken, there was one exceedance of the PWQO (100 counts per 100 millilitres of sample) for recreational water contact activities. While not a comprehensive survey of the lake for bacterial pollution, the results do indicate that there were no significant active sources of bacteria and the single exceedance was likely to have been from an animal in the vicinity of the sample site. It should be noted that there was some bacteria detected and, therefore, lake water should not be used as the drinking water source without some form of treatment.

DISSOLVED OXYGEN/TEMPERATURE PROFILES

Both water temperature and oxygen content affect all aquatic organisms and the chemistry of the lake environment Warm water species prefer oxygen concentrations no less than 4 milligrams per litre (mg/L) and temperatures below 25^{o} Celsius. Typically in lakes, oxygen concentrations are more or less uniform through the winter. Once the ice goes, the water warms and stratifies into the surface **epilimnion** and the **hypolimnion** below with the **metalimnion** the transition zone between. Through the summer, the oxygen in the hypolimnion is depleted by the various biological and chemical processes. Because there are no means of adding oxygen to the hypolimnion through the summer, often a state of no oxygen, referred to as anoxia, is reached at least by late August. In anoxic conditions, phosphorus that was held in the bottom sediments are returned to solution.

2005 had an extended period of hot, dry weather that had a significant effect on lake levels (as much as 40 centimetres below target in late summer) and likely on the fish population. By mid-July, the temperature in the surface waters was over 25 degrees and the oxygen supply had been depleted below 6 metres depth so that good conditions for fish were limited to a 3 metre band (the grey shaded area in the tables). That was reduced to only a metre by the August 9th profile.. While fish can survive such conditions, the population would have suffered severe stress. By the September profile date, the water had cooled sufficiently that the fish community would have been comfortable in the upper 6 metres.

TOTAL KJELDAHL NITROGEN

Nitrogen occurs in several forms in lake water. It is typically the secondary nutrient in lakes and, in the Watershed Watch program, is measured as Total Kjeldahl Nitrogen (TKN). With no PWQO presently set for TKN, RVCA has adopted 500 micrograms per litre (µg/L) of TKN as the threshold above which excessive aquatic plant growth can occur (based on the document Water Quality Sourcebook, A Guide to Water Quality Parameters, Inland Waters Directorate, Water Quality Branch, Ottawa, 1979).

Of the 9 exceedances of the guideline, 3 were at site “A” and 2 at the deep point, site “DP1”. Possibly there is movement from site “A” at the inflow from Long Lake to DP1 although the exceedances do not obviously correspond. Persistently high concentrations of TKN were found in the bottom waters of the lake (deep point – bottom, “DP2”). The significance of such concentrations is that such material can be re-distributed through the water column in the fall and particularly in the spring as the lake thermally stratifies to be available for plant consumption.

BENTHIC INVERTEBRATES:

In addition to chemical testing, the Watershed Watch program included sampling for benthic invertebrates which, in simple terms, are the bugs that live in the water. The analysis of what actually lives in the lake is an excellent complement to chemical analysis of the shore waters because it gives a longer term look at what creatures the lake can support. The more varied and numerous the macro invertebrates, the better the water quality. Three sites were sampled in 2005 on Adam Lake. The method requires that three replicate samples are collected at each site. Taxa Richness indicates the health of the community. The greater the number of taxa found within the community, the healthier the community. Generally, a taxa count above 10 can be considered to have excellent family diversity and means that communities are very stable. Anything below 5 indicates that families have low diversity and communities are unstable. The Tolerance Index (FBI) is based on a scale from 1 to 10 with 1 being good and 10 poor. A sample site with a FBI closer to 1 has a benthic population consisting predominantly of organisms very sensitive to pollution.as per the chart below.

Taxa Richness and Tolerance Index- Adam Lake, 2005

	REPLICATE 1		REPLICATE 2		REPLICATE 3	
SITE	TR	FBI	TR	FBI	TR	FBI
AD-1	20	6.97	17	6.31	13	6.72
AD-2	6	6.16	10	6.40	12	6.12
AD-3	17	5.90	19	6.20	22	5.78

*Site AD-2 was sampled in a location minimally impacted by development

Taxa Tolerance

SENSITIVE	SOMEWHAT SENSITIVE	TOLERANT
Pollution sensitive organisms found in good water quality	Somewhat pollution tolerant organisms that can be found in good or fair water quality	Pollution tolerant organisms can be found in any quality of water
Caddisfly larvae Hellgrammite Mayfly nymphs Gilled snails Riffle beetle adult Stonefly nymphs Water penny larvae	Beetle larvae Clams Crane fly larvae Crayfish Damselfly/dragonfly nymphs Scuds Sowbugs Fishfly/alderfly larvae	Aquatic worms Blackfly larvae (simuliidae) Leeches (hirudinae) Midge larvae Pouch (and other) snails

Further information on benthic invertebrate testing, including complete data sets, graphs and site photos, are available at **http://www.rideauvalley.on.ca**, within the surface water quality section or by contacting Mark Scott at the RVCA.

INVASIVE SPECIES

In 2004, RVCA entered a partnership with the Ontario Federation of Anglers and Hunters (OFAH) to sample lakes for Zebra Mussels and Spiny Water Fleas, invasive species which typically have significant impacts on native species of both flora and fauna in lakes. Samples in 2005 indicated what prior samples had shown, that Zebra Mussels were present in Adam Lake but not so the Water Flea. In addition to the sampling, signs were posted to inform boaters of precautions to take to prevent the spread of these invasives from waterbody to waterbody.

OFAH, in co-operation with the Ministry of Natural Resources, have published "ZEBRA MUSSELS: A Guide for Boaters and Cottagers". This publication, along with fact sheets, brochures, watchcards, signs and stickers, are available free of charge. OFAH also have videos and slide presentations available for purchase or loan, perfect for lake association meetings and information sessions. Visit **http://www.invadingspecies.com** or call the Invading Species Hotline (1-800-563-7711) for more information.

WATER CLARITY

Water clarity, measured with a Secchi disk, is another indicator of lake health. In the data from previous years, the Secchi measurements varied considerably but none were less than the guideline of 2.5 metres depth. The 2005 data ranged from 2 metres to 4.5 m but were generally similar to the older measurements.. The two low measurements, 2 and 2.5 m, indicate that there were sufficient algae to reduce the clarity to a significant degree.

TOTAL PHOSPHORUS

The PWQO for Total Phosphorus (TP) is 20 µg/L. In 2005, there was one exceedance in the Watershed Watch sampling of Adam Lake. The average deep point concentration was, more or less, in keeping with results from previous years. Of note is that the previous most recent "drought" year, 2001, had the TP sample result of 22 µg/L which simply indicates how significant the weather pattern, or how the drought evolved, is to the impact on a lake. In 2001, dry, warmer conditions started in March so that the lake may have stratified faster than normal putting a significant load of phosphorus from the bottom into surface waters. In 2005, the hot and dry conditions came later with less impact on the turnover. As with TKN, there was a significant "sink" of TP at the bottom of the lake with concentrations well above the PWQO that could be re-distributed throughout the lake during the thermal stratification process.

IN CONCLUSION

Concentrations of nitrogen were relatively high in 2005 but phosphorus has been in generally moderate concentrations over the years which, as the primary nutrient, limited aquatic plant growth. The wildcard was the high concentrations of both TP and TKN at the bottom of the lake. The TP concentrations would likely have been because nearly half the depth of the lake was anoxic by mid-May. Previous data are not available to show whether or not that is the normal condition.

The benthic invertebrate monitoring results were in keeping with the chemistry data indicating that the lake waters supported species moderately sensitive to pollution. How significant an impact the Zebra Mussels will have remains to be seen. That there can be fairly significant algae concentrations and the maximum Secchi disk reading was 4.5 m, which is good but not in lakes where Zebra Mussels are well-established, that may indicate that the impact might not turn out to be as severe as in other locations.

If Zebra Mussels do cause greater water clarity, there will be an impact on water temperature. With improved clarity, sunlight can penetrate into the water further causing deeper and greater warming. Therefore, it may be that the average water temperature will be slightly higher than in the past. That and would be exacerbated if weather conditions like in 2005 become more common and, if anoxia in so much of the depth so early in the year is typical, there could be serious consequences for the fish population of the lake.

Bacterial counts were not significant and the indication is that the lake was generally suitable for water-based recreational activities.

Generally, 2005 Watershed Watch sampling indicated that Adam Lake was in moderately good condition and in the mesotrophic, or middle-aged, stage. Continued stewardship efforts are necessary to keep Adam Lake, along with all other watershed lakes, the valued resources they are.

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 info@lrconline.com or connect to the Rideau Valley Conservation Authority website at www.rideauvalley.on.ca.

Total Phosphorus (µg/L) – Adam Lake (RVL-32), 2005

SITE	A	B	C	D	E	F	G	DP1	average	DP2
18-May	11	12	14	14	14	13	12	14	13	94
17-Jun	15	13	12	13	12	15	12	18	14	70
30-Jun	12	12	12	13	13	11	13	12	12	39
12-Jul	17	13	13	13	12	13	15	18	14	380
26-Jul	32	14	12	13	13	13	14	15	16	65
9-Aug	16	11	11	11	11	11	13	12	12	80
26-Aug	10	9	9	10	9	9	12	12	10	69
13-Sep	10	9	8	10	16	9	10	11	10	147
13-Oct	16	12	11	10	9	10	11	11	11	106
average	15	12	11	12	12	12	12	14	**13**	117

Total Kjeldahl Nitrogen (µg/L) – Adam Lake (RVL-32), 2005

SITE	A	B	C	D	E	F	G	DP1	average	DP2
18-May	410	410	410	410	470	410	410	450	423	1050
17-Jun	480	420	520	420	510	490	430	670	493	900
30-Jun	460	450	450	510	450	420	380	450	446	790
12-Jul	520	460	470	490	470	460	450	530	481	5300
26-Jul	710	480	470	470	490	470	510	500	513	1000
9-Aug	500	430	440	450	440	490	450	460	458	1300
26-Aug	420	420	420	440	430	420	450	460	433	1100
13-Sep	440	410	420	440	430	420	440	410	426	1730
13-Oct	600	420	400	390	390	400	390	410	425	1420
average	504	433	444	447	453	442	434	482	**455**	1621

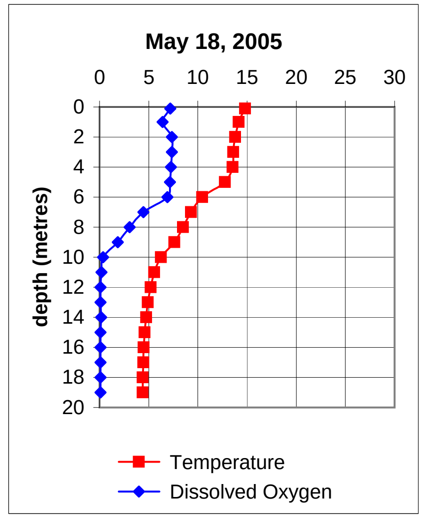
***Eschericia Coliform* (counts/100 mL) – Adam Lake (RVL-32), 2005**

SITE	A	B	C	D	E	F	G	average
18-May	5	3	2	22	2	2	2	5
17-Jun	4	2	2	2	8	6	4	4
30-Jun	2	14	28	6	2	2	4	8
12-Jul	16	2	16	2	2	2	2	6
26-Jul	4	12	2	2	8	4	2	5
9-Aug	4	2	2	2	2	2	2	2
26-Aug	4	2	2	2	2	2	4	3
13-Sep	2	4	106	16	2	2	2	19
13-Oct	2	4	2	2	2	4	4	3
average	5	5	18	6	3	3	3	**6**

	Warm Water Fisheries Habitat (e.g. bass, walleye, pike) defined as Dissolved Oxygen concentrations > 4 mg/L at temperature < 25 degrees Celsius.

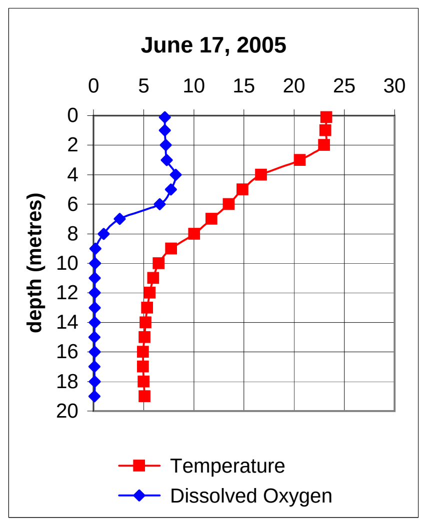
May 18, 2005

Depth (metres)	Temperature (deg. C.)	Dissolved Oxygen (mg/L)	Saturation (%)	Lake Stratification
0.1	14.8	7.2	72.45	
1	14.2	6.4	72.45	
2	13.8	7.4	71.80	Epilimnion
3	13.6	7.4	71.85	
4	13.6	7.3	70.75	
5	12.8	7.2	68.10	
6	10.5	6.9	62.70	
7	9.3	4.5	38.90	
8	8.5	3.1	26.00	Metalimnion
9	7.6	1.9	16.15	
10	6.3	0.4	3.05	
11	5.6	0.2	1.55	
12	5.2	0.1	1.35	
13	4.9	0.1	1.00	
14	4.8	0.2	1.10	
15	4.6	0.1	1.05	Hypolimnion
16	4.5	0.1	0.95	
17	4.5	0.1	0.95	
18	4.4	0.1	0.90	
19	4.4	0.1	1.00	



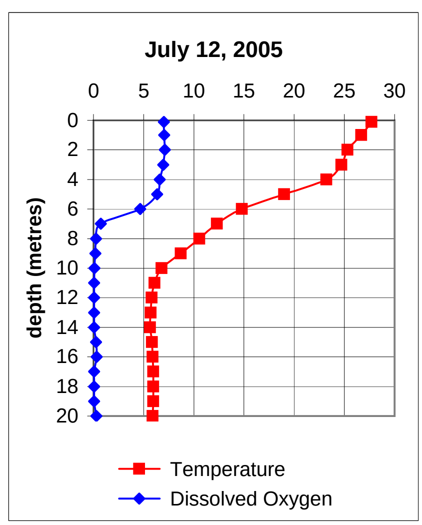
June 17, 2005

Depth (metres)	Temperature (deg. C.)	Dissolved Oxygen (mg/L)	Saturation (%)	Lake Stratification
0.1	23.2	7.1	83.9	
1	23.1	7.1	83.8	Epilimnion
2	23.0	7.2	84.4	
3	20.6	7.3	86.0	
4	16.7	8.2	88.2	
5	14.9	7.7	80.2	
6	13.5	6.6	59.5	Metalimnion
7	11.8	2.6	24.5	
8	10.1	1.0	7.5	
9	7.8	0.2	1.8	
10	6.5	0.1	1.2	
11	6.0	0.1	1.1	
12	5.6	0.1	1.0	
13	5.4	0.1	0.9	
14	5.2	0.1	0.9	
15	5.1	0.1	0.7	Hypolimnion
16	5.0	0.1	0.8	
17	5.0	0.1	0.8	
18	5.0	0.1	0.8	
19	5.1	0.1	0.8	



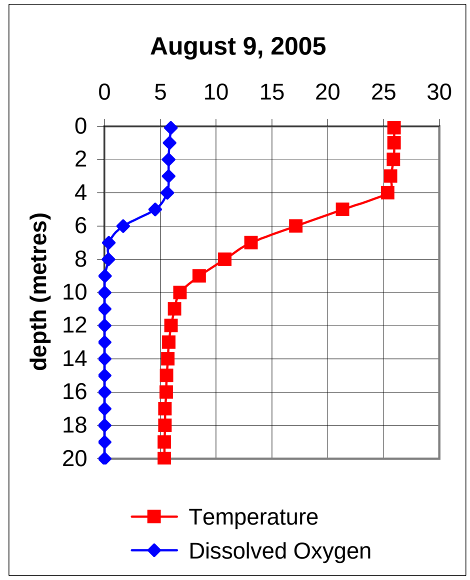
July 12, 2005

Depth (metres)	Temperature (deg. C.)	Dissolved Oxygen (mg/L)	Saturation (%)	Lake Stratification
0.1	27.7	7.0	89.8	
1	26.7	7.1	88.7	
2	25.3	7.1	87.2	Epilimnion
3	24.7	7.0	84.7	
4	23.2	6.6	78.0	
5	19.0	6.4	69.2	
6	14.8	4.7	27.2	
7	12.3	0.7	7.4	Metalimnion
8	10.6	0.3	2.5	
9	8.7	0.2	2.1	
10	6.8	0.1	0.6	
11	6.1	0.1	0.5	
12	5.8	0.1	0.5	
13	5.7	0.1	0.4	
14	5.7	0.1	0.4	
15	5.9	0.3	0.4	Hypolimnion
16	5.9	0.3	0.4	
17	6.0	0.1	0.4	
18	6.0	0.1	0.4	
19	6.0	0.1	0.4	
20	5.9	0.3	0.4	



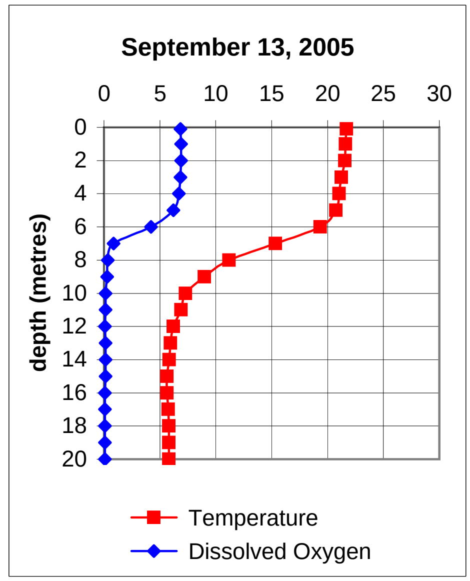
August 9, 2005

Depth (metres)	Temperature (deg. C.)	Dissolved Oxygen (mg/L)	Saturation (%)	Lake Stratification
0.1	26.0	6.0	73.3	Epilimnion
1	26.0	5.9	73.0	
2	25.9	5.8	71.6	
3	25.7	5.8	71.2	
4	25.4	5.7	69.2	
5	21.4	4.6	51.8	Metalimnion
6	17.2	1.7	18.1	
7	13.2	0.4	3.9	
8	10.8	0.4	3.4	
9	8.5	0.1	0.6	
10	6.8	0.0	0.4	
11	6.3	0.0	0.3	Hypolimnion
12	6.0	0.0	0.3	
13	5.8	0.0	0.3	
14	5.7	0.0	0.3	
15	5.6	0.0	0.3	
16	5.6	0.0	0.3	
17	5.5	0.0	0.2	
18	5.5	0.0	0.2	
19	5.4	0.0	0.3	
20	5.4	0.0	0.3	



September 13, 2005

Depth (metres)	Temperature (deg. C.)	Dissolved Oxygen (mg/L)	Saturation (%)	Lake Stratification
0.1	21.7	6.9	80.1	Epilimnion
1	21.6	6.9	65.1	
2	21.6	6.9	80.0	
3	21.3	6.9	79.5	
4	21.1	6.7	78.2	
5	20.8	6.2	74.2	
6	19.4	4.2	47.6	Metalimnion
7	15.4	0.9	5.9	
8	11.2	0.4	4.2	
9	9.0	0.3	2.3	
10	7.3	0.2	1.6	
11	6.9	0.2	1.4	Hypolimnion
12	6.2	0.1	1.2	
13	6.0	0.2	1.5	
14	5.9	0.2	1.4	
15	5.7	0.2	1.3	
16	5.7	0.1	1.1	
17	5.8	0.1	1.1	
18	5.8	0.1	1.0	
19	5.8	0.1	1.1	
20	5.8	0.1	1.0	



Deep Point – Adam Lake (RVL-32)

Date	TP DP1 (µg/L)	TP, DP2 (µg/L)	TKN, DP1 surface (µg/L)	TKN, DP2 (µg/L)	Secchi disk (metres)
1978					4.3
1990					3.7
1991					3.4
1999	12				3.6
2000	14				3.6
2001	22				2.7
2003	16				2.9
2004	16				4.2
18-May	14	94	450	1050	2.0
17-Jun	18	70	670	900	4.3
30-Jun	12	39	450	790	4.0
12-Jul	18	380	530	5300	3.0
26-Jul	15	65	500	1000	2.5
9-Aug	12	80	460	1300	4.0
26-Aug	12	69	460	1100	3.3
13-Sep	11	147	410	1730	4.5
13-Oct	11	106	410	1420	4.5
05 average	14	117	482	1621	3.6

DP1: deep point, surface

DP2: deep pont, bottom