



Mississippi Valley Conservation

*State of the Lake
Environment Report
December 2002*

Clayton Lake



Clayton Lake

Clayton Lake is situated in the Townships of Lanark Highlands and Mississippi Mills in Lanark County. Clayton Lake is at an elevation of 161 metres above sea level. The lake perimeter is approximately 13.5 kilometres, with a maximum depth of 10.7 metres. Clayton Lake supports a warm water fishery. Common species include Yellow Pickerel, Largemouth and Smallmouth Bass. At last count in 1965, there were 34 cottages, 1 (3) resorts, 70 campsites and 38 vacant lots on the lake.



Limited water quality data is available for Clayton Lake. Records indicate that shoreline property owners have not yet formed an active Lake Association or participated in the Ministry of Environment's Self-Help or Lake Partner Program. Comprehensive testing in 2002 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program* provides for a comparison between water quality conditions as they exist now, to results obtained 27 years ago through the MOE Recreational Lakes Program.

In general, the water quality in Clayton Lake is improving. There is one sampling station at the deepest point, in the main basin of the lake. This station was sampled eight times for 2002. You will find graphs which follow, that water clarity, as measured by Secchi Disk readings, were observed as good. The average for 2002 is 4.0 metres, indicating that Clayton Lake is a moderately enriched (some nutrients) or mesotrophic lake. Twenty-seven years ago, the average Secchi Disk depth was 3.3 metres, indicating an improvement in water clarity.

Directly related to water clarity is the amount of nutrients, in particular phosphorus, entering the lake. The Provincial Objective for phosphorus levels in shield lakes is a maximum of 20 micrograms per litre ($\mu\text{g/L}$). In 2002, the mean for the station in the euphotic zone (depth at which sunlight can penetrate or two times the secchi disk depth) was 10.5 $\mu\text{g/L}$. The mean for the sample taken one metre off the bottom was 13.4 $\mu\text{g/L}$. Twenty-seven years ago, the average phosphorus level was 29.0 $\mu\text{g/L}$ in the euphotic zone, over the Provincial Objective and 19.0 $\mu\text{g/L}$ one metre off the bottom of the lake. Clayton Lake decreased its average phosphorus level in euphotic zone by almost 20 $\mu\text{g/L}$, putting it below the Provincial Objective. Clayton Lake's trophic status remains a moderately enriched lake (some nutrients).

Chlorophyll-a is a measure of the algal density in the lake. In 2002, the average chlorophyll-a density for the sampling station was 4.36 $\mu\text{g/L}$, indicating a relatively high algal density, but an improvement from twenty-seven years ago. In 1975, the average chlorophyll-a levels for Clayton Lake were much higher, 7.5 $\mu\text{g/L}$.

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 2002, one in May and one in July, in order to generate a more concise picture of the oxygen content of the lake.

The dissolved oxygen and temperature data, measured at the deepest point in the main basin, indicate oxygen concentrations in the deep water portion are at sufficient levels from spring until autumn. Warm water fish species, have adequate habitat right to the bottom of Clayton Lake, but residents and users of Clayton Lake cannot afford to be complacent. Every effort should be made to reduce nutrient loading into the lake from land use activities, in order to sustain optimum levels.



Clayton Lake was also tested for invasive species in 2002, in particular, for zebra mussels and spiny water flea, in partnership with the Ontario Federation of Anglers and Hunters (OFAH). Clayton Lake did *not* have 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 into Clayton Lake. Another recommendation is for residents to begin participation in the invasive species monitoring program through MVC.

Residents and users of Clayton Lake need to adopt a stewardship approach to limit the amount of nutrients entering the lake. The first step to achieve this is to form an active Lake Association. It is recommended that a Lake Steward be appointed to undertake ongoing water quality testing and to join the Mississippi Valley Lake Stewardship Network. Monitoring over time is essential to determine long term trends and changes. Resources and information are readily available through the *Watershed Watch Program*. There are helpful tips throughout this report to help reduce your impact on Clayton Lake. Additional water quality data, current and historic, is available for Clayton 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. We all have a responsibility to preserve this precious natural resource for future generations.

FIVE EASY STEPS TO IMPROVE WATER QUALITY



1. Build at least 30 metres away from the shoreline.
2. Keep your lot well treed and preserve or replant native vegetation along the shoreline.
3. Pump out your septic tank every three to five years.
4. Reduce water use and use phosphate free soaps and detergents.
5. Keep the size of your lawn to a minimum; do not use fertilizers, herbicides or pesticides.

LOW PHOSPHORUS LIFESTYLE	Amount of Phosphorus (grams)	HIGH PHOSPHORUS LIFESTYLE	Amount of Phosphorus (grams)
Human waste	535	Human waste	535
No dishwasher	0	Dishwasher using powdered detergent once per day	650
No fertilizer	0	Lawn fertilized once/year	1960
Trees not cut down	20	Lot cleared of trees	30
Uses phosphate-free products	20	Uses products with phosphate	180
TOTAL	575 grams	TOTAL	3355 grams

How Does Clayton Lake Measure Up?

1975-2002 Water Quality Results

Sample Year Mean	Secchi Disk Depth [Metres]	Total Phosphorus Euphotic Zone [Micrograms/litre]	Total Phosphorus 1 Metre off Bottom [Micrograms/litre]	Chlorophyll-a Composite [Micrograms/Litre]
**1975	3.3	29.3	*19.0	7.50
2002	4	10.5	13.375	4.36
n	2	2	2	2
Minimum	3.3	10.5	13.4	4.36
Maximum	4.0	29.3	19.0	7.50
Mean	3.7	19.9	16.2	5.93
Standard Deviation	0.49497	13.29361	3.97748	2.21855

*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
filtering resulting in an increase in chla concentrations by 35%

Interpreting Secchi Disc Readings:

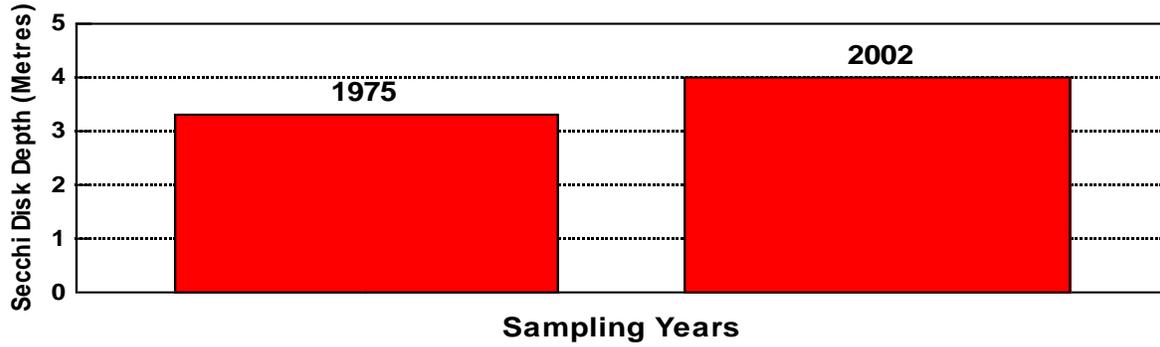
A Secchi disk is a black and white coloured disk used to determine water clarity. The disk is lowered into the water. The point, at which you can no longer distinguish the black and white, is called the Secchi depth.



The higher the Secchi 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

Clayton Lake - Main Basin Annual Mean Secchi Disk Depth

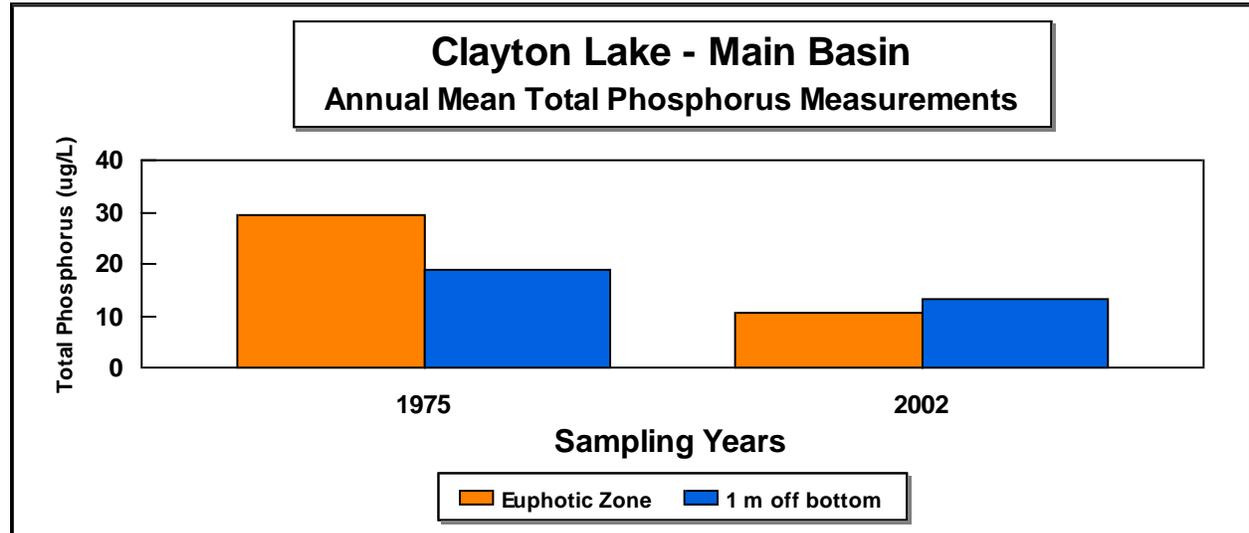


Mean = 3.65 SD = 0.494975

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



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 access to the lake is designed to avoid shoreline damage.

ENHANCEMENT

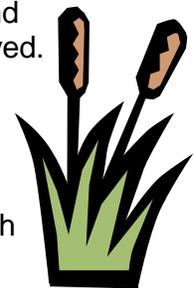
Native species are planted and non-native species are removed.

NATURALIZATION

Degraded shorelines are left alone to

RESTORATION

Cleared areas are planted with



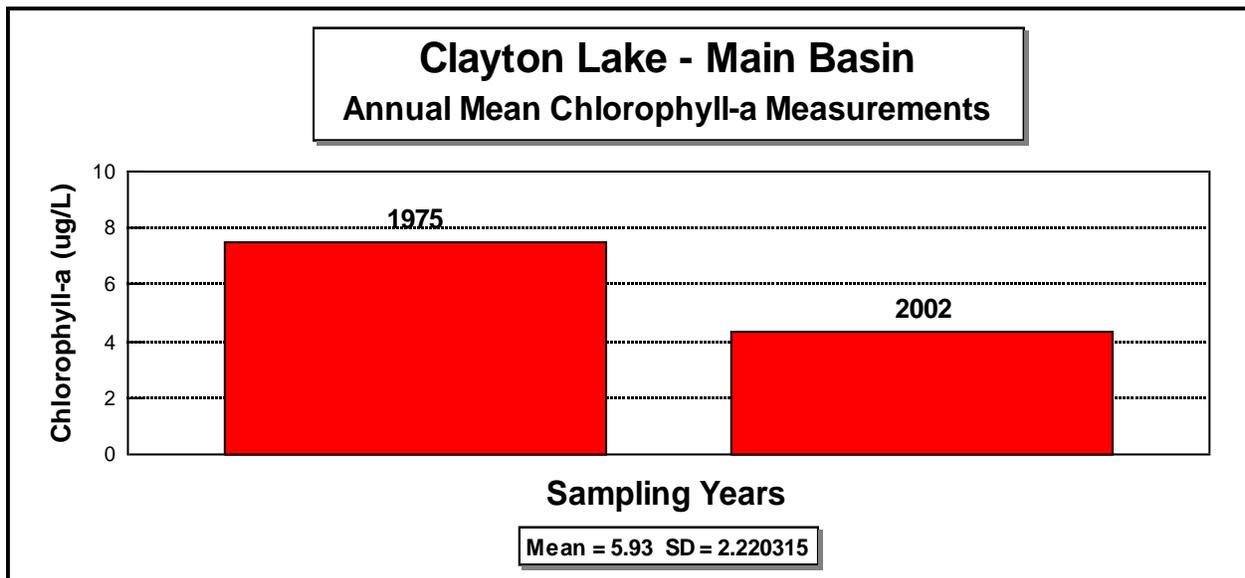
return to their natural state.

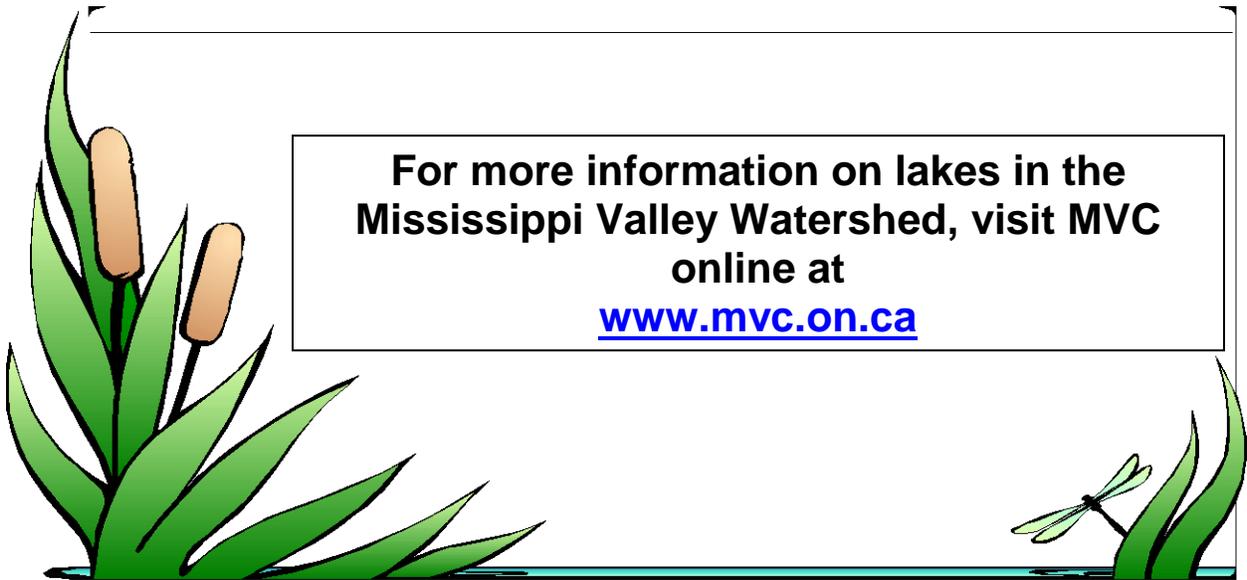
native species.

Interpreting Chlorophyll-a Results:

Chlorophyll-a, is a measure of the algal density in the lake. The lower the chlorophyll-a density in your lake, the clearer your lake is. Chlorophyll-a, is directly affected by the amount of total phosphorus in your lake. The more phosphorus there is in the water, the more algal growth will occur.

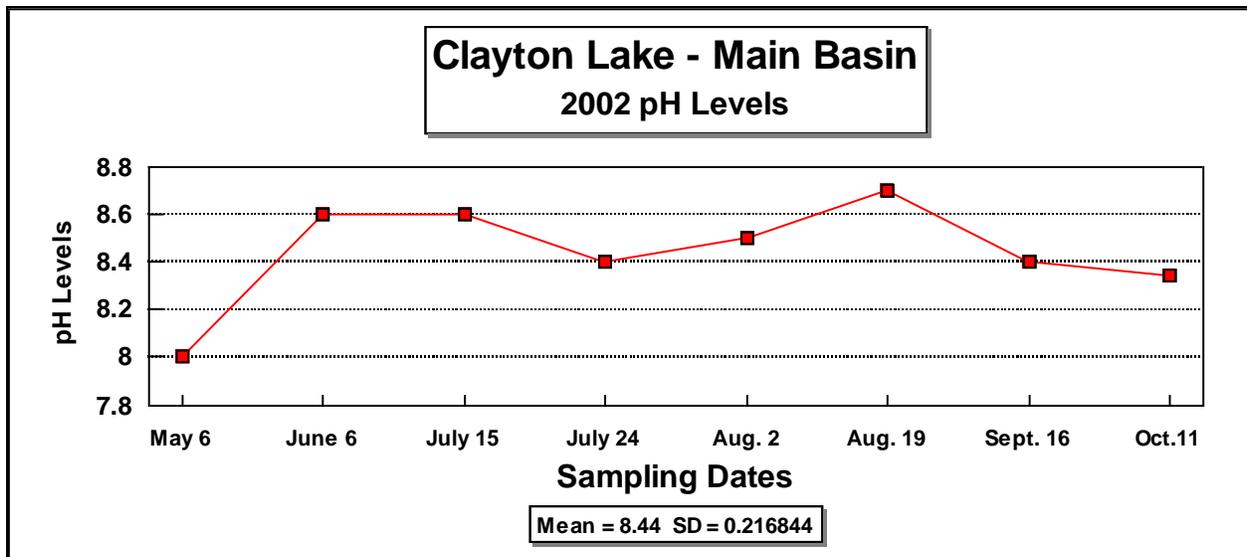
INTERPRETING YOUR CHLOROPHYLL-A RESULTS	
Chlorophyll-a Reading	Lake Nutrient Status
Up to 2 ug/L - low algal density	Oligotrophic - unenriched, few nutrients
2-4 ug/L - moderate algal density	Mesotrophic - moderately enriched, some nutrients
More than 4 ug/L - high algal density	Eutrophic - enriched,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





Interpreting pH Results:

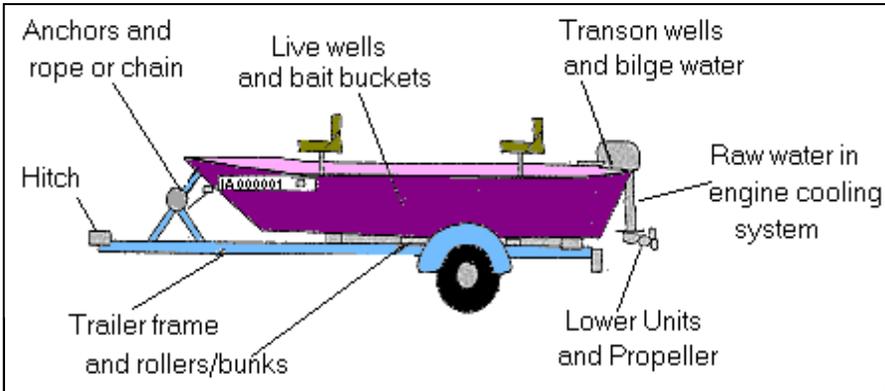
The pH value is a measure of the concentration of hydrogen ions of a substance, which ranges from very acidic (pH = 1) to very alkaline (pH = 14). At a normal to neutral acidity level, a lake supports a diversity of life. A pH of 7 is neutral and most lake waters range between 6 and 9. pH values less than 6 are considered acidic, and most life forms cannot survive at a pH of 4.0 or lower. This parameter directly influences the types of plants and animals that live in the lake. Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.



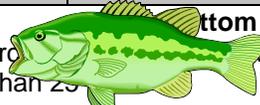
MVC and O.F.A.H. need your help to Stop the Invasion!

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



				Thermal Stratification
0.1	17.7	9.0	91	Epilimnion
1.0	17.7	9.1	92	
2.0	17.7	8.9	90	
3.0	17.5	9.0	90	
4.0	17.4	9.0	90	
5.0	17.2	8.9	89	
6.0	16.7	7.5	73	
7.0	15.6	5.8	56	
8.0	14.8	5.3	51	
9.0	14.7	5.2	50	

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch)  Bottom
 Oxygen Concentrations greater than 4 mg/L at Temp. less than 20°C

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.

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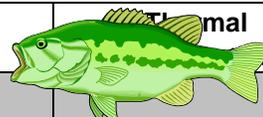
CLAYTON LAKE – Main Basin
 DISSOLVED OXYGEN/TEMPERATURE PROFILES
 MOE Rec. Lks. Station # 19-3430-731-01, MVC Station # 02-09

Date: June 6, 2002
 Depth: 10.7 Metres
 Euphotic Zone (Penetration of Light) = 8.0 Metres

Date: July 24, 2002
 Depth: 10.7 Metres
 Euphotic Zone (Penetration of Light) = 6.0 Metres

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	19.9	8.4	89	Epilimnion
1.0	19.6	8.5	90	
2.0	19.6	8.6	90	
3.0	19.5	8.6	90	
4.0	19.4	8.5	89	
5.0	19.4	8.5	89	
6.0	19.3	8.4	88	
7.0	19.1	8.0	83	
8.0	19.0	8.0	83	



Bottom

Warm Water Fisheries Habitat (Bass, Walleye, Pike and Perch) defined as Dissolved Oxygen Concentrations greater than 4 mg/L at Temp. less than 25°C

CLAYTON LAKE – Main Basin continued...

Date: September 16, 2002

Depth: 10.7 Metres

Euphotic Zone (Penetration of Light) = 7.0 Metres

Depth [Metres]	Temperature [Degrees Celsius]	Dissolved Oxygen [Milligrams/Litre]	Percent % Saturation	Thermal Stratification
0.1	23.8	8.2	94	Epilimnion
1.0	23.8	8.2	94	
2.0	23.6	8.2	93	
3.0	23.5	8.1	92	
4.0	23.5	8.0	90	
5.0	23.3	7.8	89	
6.0	18.3	1.4	14	Thermocline
7.0	18.1	1.1	10	Hypolimnion
8.0	18.1	1.1	10	
9.0	18.0	1.0	9	

Bottom



Mississippi Valley Conservation

The Watershed Watch program was made possible thanks to the generous support of the Ministry of Environment, Lake Associations, area Stewardship Councils, the Lake Stewardship Network and concerned citizens.

For more information regarding Watershed Watch or for advice on how you can help protect or enhance your lake environment, contact Melissa Dakers, Water Quality Technician, Mississippi Valley Conservation at (613) 259-2421 or mdakers@mvc.on.ca

