



Mississippi Valley Conservation

*State of the Lake
Environment Report
December 2003
McCausland Lake*



McCausland Lake

McCausland Lake is located in the Township of North Frontenac. The lakes perimeter is 3.22 kilometres, with the deepest point at about 23 metres. McCausland Lake supports a cold water fishery, in particular Splake. There are only 5 cottages on the lake.

Limited water quality data is available for McCausland Lake. Records indicate that shoreline property owners have not yet formed a McCausland Lake Association or participated in the Ministry of Environment's Self-Help or Lake Partner Program. However, the lake is part of the Ompah Conservation Association. Comprehensive testing in 1998 and 2003 through Mississippi Valley Conservation's (MVC) *Watershed Watch Program* provides for a 5 year comparison between water quality conditions as they exist now. Continuing to collect this data is extremely important and will become valuable with each year that passes; the data will provide a general picture of water quality conditions.



In general, the water quality in McCausland Lake remains excellent. There is one sampling station on the lake at the deepest point. You will find graphs which follow, that water clarity, as measured by Secchi Disk readings, were observed as excellent. The average for 2003 is 8.2 metres, compared to 5 years ago, when the average was 5.5 metres. Thus indicating that McCausland 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 cold water lakes is 10 micrograms per litre ($\mu\text{g/L}$). In 2003, the mean for the euphotic zone (depth at which sunlight can penetrate or two times the secchi disk depth) was $3.5 \mu\text{g/L}$. The mean for the samples taken one metre off the bottom was also $6.0 \mu\text{g/L}$. Five years ago, the average phosphorus level was $1.5 \mu\text{g/L}$ in the euphotic zone and $4.0 \mu\text{g/L}$ one metre off the bottom of the lake, both below the Provincial Objective. McCausland Lake slightly increased its average phosphorus levels but remains an Oligotrophic lake and is still below the Provincial Objective.

Chlorophyll \underline{a} is a measure of the algal density in the lake. The average chlorophyll \underline{a} density for the sampling stations was $1.1 \mu\text{g/L}$. Thus, indicating a low algal density for McCausland Lake in 2003. In 1998, chlorophyll \underline{a} levels were extremely high at $12.0 \mu\text{g/L}$. By dropping the chlorophyll \underline{a} levels, McCausland Lake has improved the conditions essential to sustain lake trout habitat.

Lake trout require more pristine environmental conditions than most native fish species. Therefore, lake trout can act as an environmental barometer. The dissolved oxygen and temperature profiles conducted in July of 2003 at the sampling station indicate sufficient optimal habitat is present to support lake trout in McCausland Lake. However, results obtained in September, the most critical time of year, indicates there is only a 7 metre layer of water from 9 to 15 metres in the main basin having vital conditions for the lake trout to survive. By September, the warm water fishery habitat is pushed into the upper 15 metres of the lake.

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.



Residents and users of McCausland 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 a Lake/Property 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. 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. Because lake trout are very sensitive to changes in their environment, we all have a responsibility to preserve this most precious resource for future generations, so they may catch lake trout in McCausland Lake. There are helpful tips throughout this report to help reduce your impact on McCausland Lake. Additional water quality data, current and historic, is available for McCausland 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 McCausland Lake Measure Up?

1998 – 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 <i>a</i> Composite [Micrograms/Litre] |
|-----------------------------------|----------------------------------|---|--|---|
| *1998 | 5.5 | 1.5 | 4 | 12 |
| *2003 | 8.2 | 3.5 | 6 | 1.1 |
| n | 2 | 2 | 2 | 2 |
| Minimum | 5.5 | 1.50 | 4.00 | 1.10 |
| Maximum | 8.2 | 3.5 | 6.00 | 12.0 |
| Mean | 6.9 | 2.5 | 5.0 | 6.6 |
| Standard Deviation | 1.90918831 | 1.414213562 | 1.414213562 | 7.707463915 |

*Mean based on less than 6 measurements

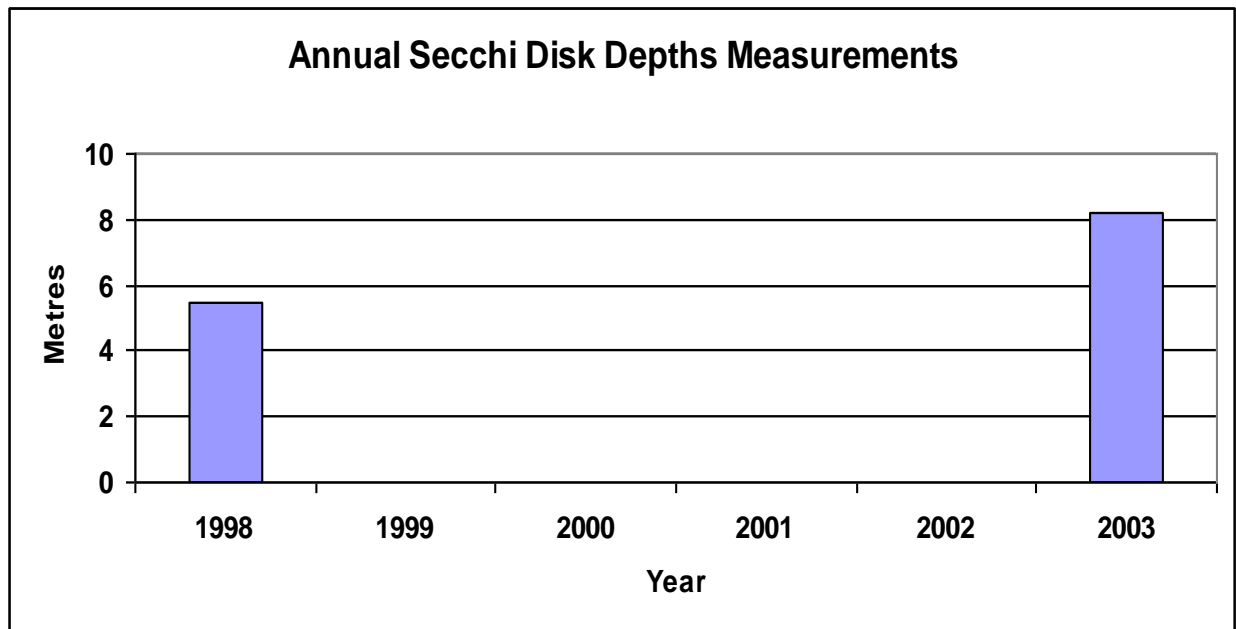
Interpreting Secchi Disc Readings:

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.

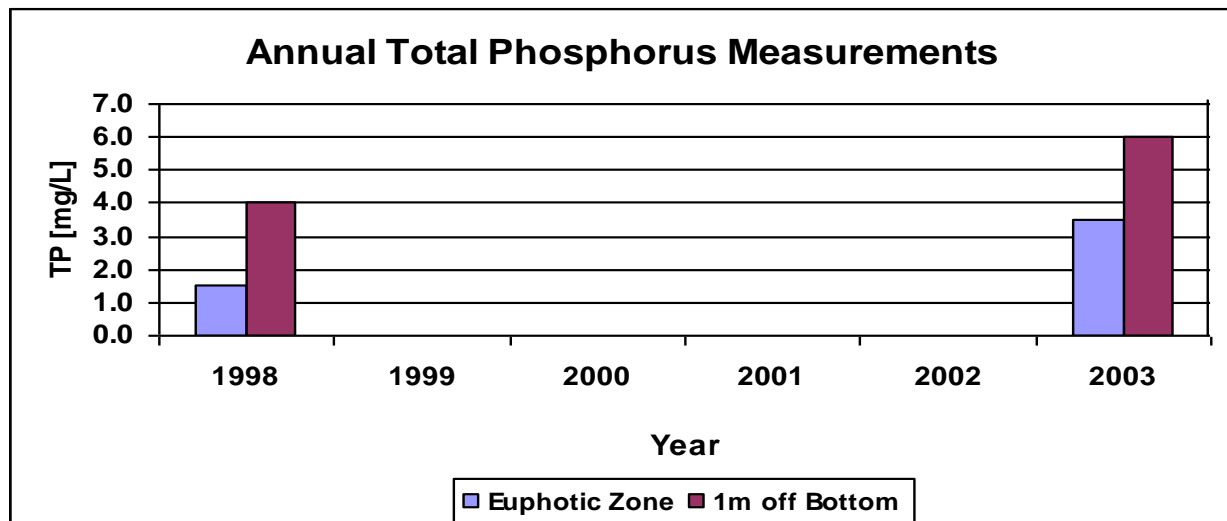
| INTERPRETING YOUR SECCHI DISK RESULTS | |
|---------------------------------------|---|
| Secchi Reading | Lake Nutrient Status |
| Over 5 metres | Oligotrophic - unenriched, few nutrients |
| 3.0 to 4.9 metres | Mesotrophic – moderately enriched, some nutrients |
| Less than 2.9 metres | Eutrophic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



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

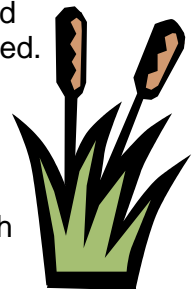
Native species are planted and non-native species are removed.

NATURALIZATION

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

RESTORATION

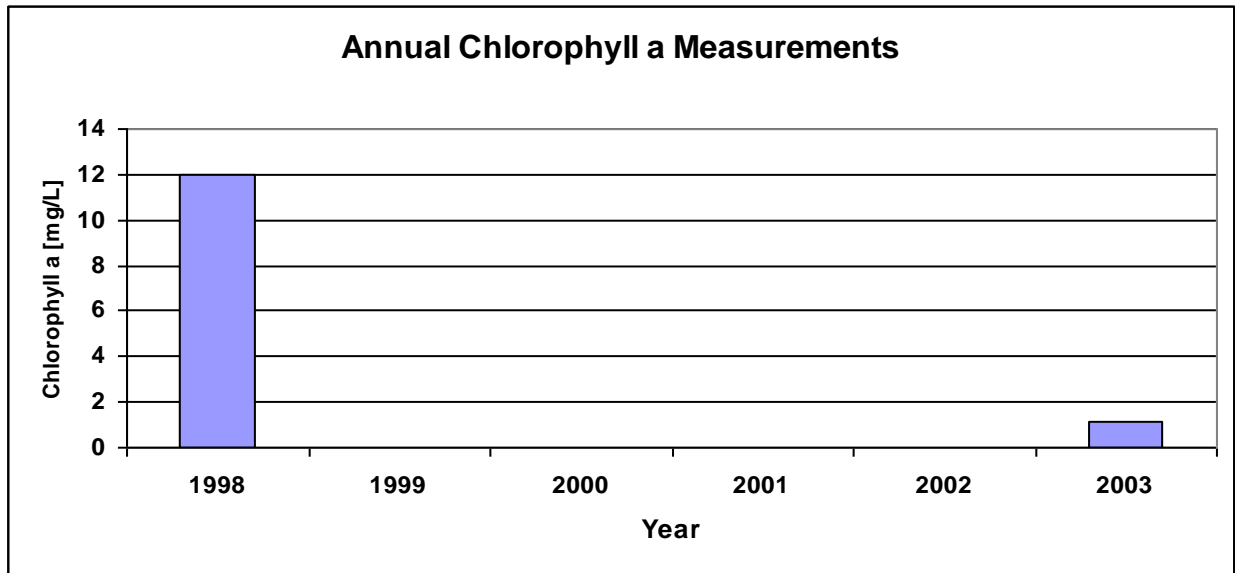
Cleared areas are planted with native species.



Evaluating your Chlorophyll a Results:

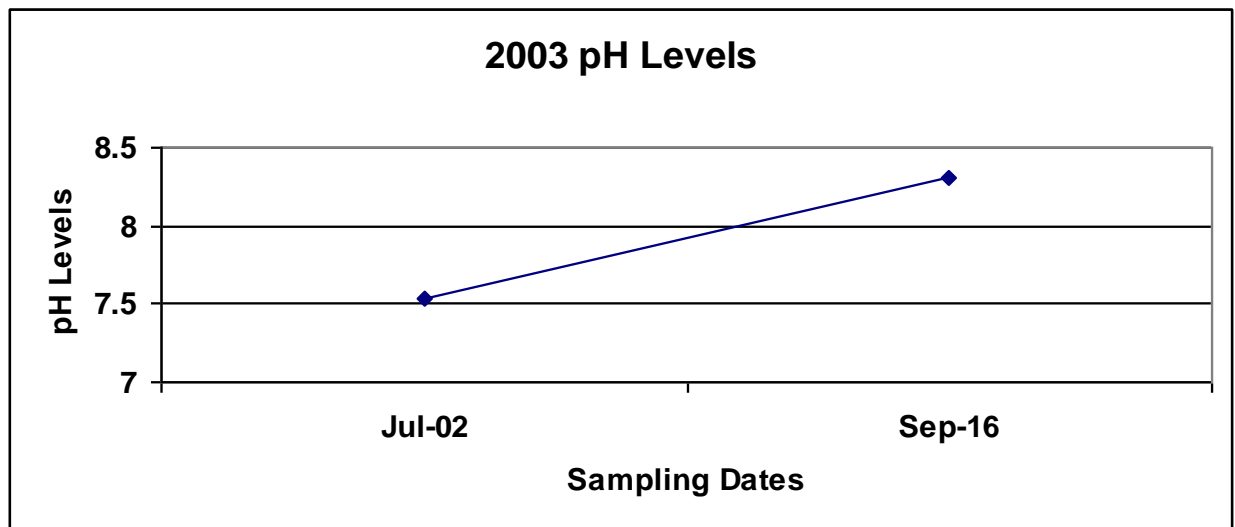
The lower the chlorophyll a density in your lake, the clearer your lake is. Chlorophyll a is directly affected by the amount of total phosphorus in your lake. The more phosphorus there is in the water, the more algal growth will occur.

| 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 |

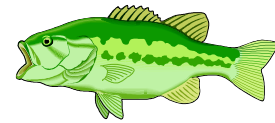


Evaluating your pH Results:

Lakes with pH levels at 7.3 or higher are vulnerable to zebra mussels invasive.




MCCAUSLAND LAKE – Main Basin
DISSOLVED OXYGEN/TEMPERATURE PROFILES
 MVC Station # 03-05



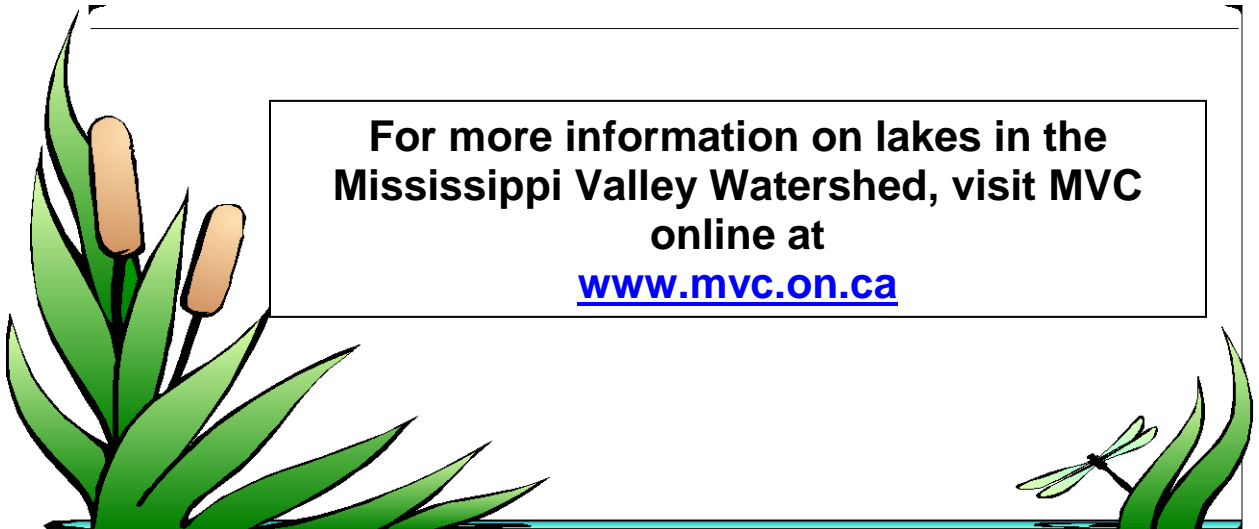
Date: July 2, 2003
 Depth: 23 Metres
 Euphotic Zone (Penetration of Light) = 14.8 Metres

| Depth [Metres] | Temperature [Degrees Celsius] | Dissolved Oxygen [Milligrams/Litre] | Percent % Saturation | Thermal Stratification |
|----------------|-------------------------------|-------------------------------------|----------------------|----------------------------|
| 0.1 | 24.1 | 8.0 | 90 | Epilimnion |
| 1.0 | 23.3 | 8.3 | 94 | |
| 2.0 | 23.0 | 8.4 | 93 | |
| 3.0 | 22.9 | 8.4 | 93 | |
| 4.0 | 22.6 | 8.4 | 92 | |
| 5.0 | 18.8 | 11.1 | 114 | |
| 6.0 | 15.7 | 12.0 | 115 | |
| 7.0 | 13.5 | 12.1 | 111 | Metalimnion or Thermocline |
| 8.0 | 11.2 | 12.1 | 106 | |
| 9.0 | 9.9 | 11.8 | 100 | |
| 10.0 | 8.6 | 11.8 | 97 | |
| 11.0 | 7.7 | 11.1 | 90 | Hypolimnion |
| 12.0 | 6.9 | 11.1 | 88 | |
| 13.0 | 6.3 | 9.7 | 75 | |
| 14.0 | 5.9 | 9.3 | 72 | |
| 15.0 | 5.6 | 8.3 | 64 | |
| 16.0 | 5.5 | 6.5 | 50 | |
| 17.0 | 5.2 | 6.0 | 46 | |
| 18.0 | 5.0 | 5.8 | 44 | |
| 19.0 | 4.9 | 5.1 | 38 | |
| 20.0 | 4.7 | 4.5 | 34 | Bottom |

 Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C.

 Vital Habitat for Cold Water Fisheries (Trout) = DO > 4 mg/L at < 15.5°C.

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



**For more information on lakes in the
Mississippi Valley Watershed, visit MVC
online at**

www.mvc.on.ca


MCCAUSLAND LAKE – Main Basin Continued...

Date: September 16, 2003

Depth: 23 Metres

Euphotic Zone (Penetration of Light) = 18.0 Metres

| Depth [Metres] | Temperature [Degrees Celsius] | Dissolved Oxygen [Milligrams/Litre] | Percent % Saturation | Thermal Stratification |
|----------------|-------------------------------|-------------------------------------|----------------------|----------------------------|
| 0.1 | 20.4 | 7.4 | 78 | Epilimnion |
| 1.0 | 20.6 | 7.3 | 77 | |
| 2.0 | 20.6 | 7.3 | 77 | |
| 3.0 | 20.6 | 7.3 | 77 | |
| 4.0 | 20.6 | 7.3 | 77 | |
| 5.0 | 20.5 | 7.3 | 77 | |
| 6.0 | 20.4 | 7.4 | 78 | |
| 7.0 | 20.2 | 7.2 | 76 | |
| 8.0 | 19.1 | 8.9 | 92 | Metalimnion or Thermocline |
| 9.0 | 14.2 | 8.9 | 84 | |
| 10.0 | 11.2 | 8.6 | 75 | |
| 11.0 | 9.9 | 8.0 | 68 | |
| 12.0 | 8.5 | 6.7 | 55 | |
| 13.0 | 7.6 | 5.7 | 46 | |
| 14.0 | 7.0 | 4.5 | 37 | |
| 15.0 | 6.6 | 4.2 | 33 | |
| 16.0 | 6.1 | 3.3 | 24 | Hypolimnion |
| 17.0 | 5.9 | 3.1 | 23 | |
| 18.0 | 5.6 | 2.6 | 19 | |
| 19.0 | 5.3 | 2.4 | 18 | |
| 20.0 | 5.1 | 1.1 | 8 | |
| 21.0 | 5.0 | 0.4 | 4 | |
| 22.0 | 4.9 | 0.2 | 2 | |
| | | | | |

 Optimal Habitat for Cold Water Fisheries (Trout) = DO > 6 mg/L at < 10°C.

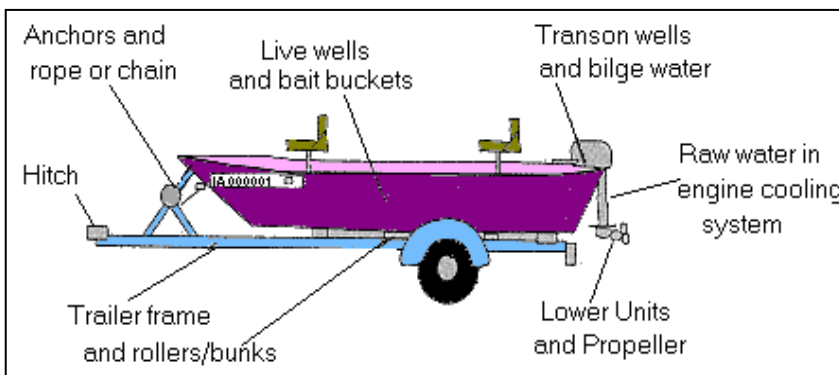
 Vital Habitat for Cold Water Fisheries (Trout) = DO > 4 mg/L at < 15.5°C.

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

ΦβΦβΦβΦβΦβΦβΦβΦβΦβΦβΦβΦβΦβ

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.

φβφβφβφβφβφβφβφβφβφβφβφβφβ



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

