2016 and 2017 Mississippi Lake State of the Lake Report

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In 2016 and 2017, water sampling was carried out by the Mississippi Lakes Association (MLA), in partnership with the Mississippi Valley Conservation Authority (MVCA) and the Lake Partner Program. Water quality samples have been collected on Mississippi Lake since 1968 under a variety of programs, to examine the overall amount of biomass in the lake (trophic status). During 2017, we also conducted sampling in partnership with the Water Rangers Ontario 150 Program and we collected samples to support the Queens University and MVCA Ecological Modelling Study.

Samples were collected three times during the open water part of each year, at the following locations:

a. at two deep water locations near Burnt Island and Pretties Island to monitor the trophic status of the lake;

b. just below the Innisville rapids (the Inlet site) to measure water quality coming into the lake; and

c. 100m upstream of the Highway 7 bridge at Carleton Place (the Outlet site) to examine the water quality leaving the lake.

The MLA added the Inlet and Outlet sites in 2008.

At each of these sites, samples were collected through the euphotic zone (the upper lake level where sunlight remains sufficient for photosynthesis by plants), and 1 meter above the bottom of the lake. This sampling helps us understand annual and longer-term water quality variations in the lake and how these variations may impact aquatic vegetation and algae growth, fish, waterfowl and other species, as well as our enjoyment of the lake.

Results

The results of the 2016 and 2017 sampling program which relate to the trophic status of the lake (using the four sites described above) are provided in the table below:

	Pretties Island		Burnt Island		Inlet		Outlet		Average Total Mean	
Samples Taken	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**
Total Phosphorus - Water Column (ug per L)	17.0	15.0	13.0	13.3	17.0	13.3	11.7	13.3	**14.7**	**13.73**
Total Phosphorus - one meter off bottom (ug per L)	10.3	13.7	25.0	14.3	45.3	12.0	10.7	14.0	**22.8**	**13.49**
Secchi Disk - meters	4.0	3.2	3.7	3.2	4.3	3.5	Botto m	Botto m	**4.0**	**3.28**
Chl A - (ug per L)	0.50	0.50	0.63	0.62	0.70	0.50	0.50	0.50	**0.58**	**0.53**
pH	8.35	8.00	8.47	7.80	8.25	7.60	8.76	7.90	**8.46**	**7.83**

- Over the last 2 years, although **total phosphorus** (TP) levels were lower than in 2015, they were still within the typical range of values we have seen since 2002. Interestingly, although 2016 was exceptionally dry, and 2017 was exceedingly wet, the average TP concentrations were similar. Intuitively one might think the TP concentrations should be quite different for these two years since the amount of runoff to the lake would be very different. More intensive study of phosphorus sources and modes of introduction to the lake is needed for us to be in a better positon to predict TP loading to the lake under varying weather/climate conditions.

- appears to be good news (the 2015 level was 17.7), the reasons for the lower readings are not fully understood. 2016 was exceptionally dry, and 2017 was exceedingly wet, so further study is required to determine the relationships between rainfall, runoff, water column mixing, and other possible factors that could affect pH readings;

- **Water clarity** has <u>improved</u>, with increased Secchi disk readings from 2015 when the average was only 2.8 meters; and

- **Chlorophyll A** readings <u>dropped</u> from 2.0 in 2015 to 0.53 micrograms per litre in 2017. This was also aided by the fact that there were no blue-green algae blooms reported in 2017.

Overall, the water quality results for 2016 and 2017 categorize Mississippi Lake within the **Mesotrophic** status. This is consistent with the lake's status as observed over the past few decades of monitoring, suggesting that the water quality of the lake has remained relatively stable.

While we have seen variations annually in water quality parameters in the past, we do not fully understand the causes. Hopefully, our partnership with MVCA and Queens University will allow us to dig a bit deeper into inner workings of our Lake and see how it might respond in times of stress. Continued water quality monitoring will be crucial to determining the long-term trends of Mississippi Lake.

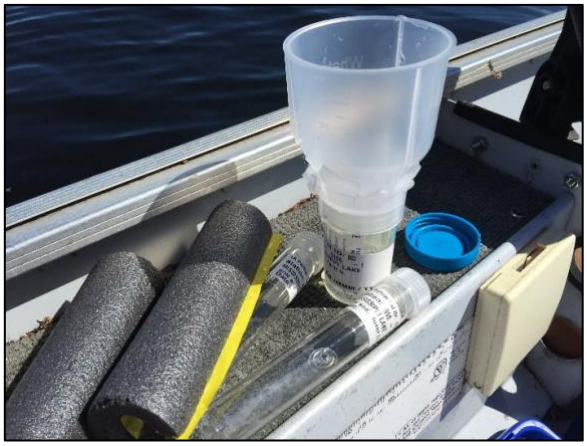
We can have a significant positive influence on these trends by minimizing our nutrient footprint. We should use phosphate-free soaps and detergents, minimize our use of lawn fertilizers, maintain a healthy shoreline, keep our septic systems in good working order, and properly deal with your grey water. If everyone does their part, Mississippi Lake can remain healthy and productive, to be enjoyed by residents and visitors for many generations to come.

TROPHIC STATUS OF A LAKE

Many factors impact the trophic status of a lake. These include the lake shape and depth, the geology of the surrounding area, and the extent of human development (both along the shoreline, and in the inland regions surrounding the lake). As the shape, depth and geology of a lake do not change quickly over time, it is expected, that under natural conditions, the lake will have a relatively stable trophic status. Development, however, can greatly influence the trophic state of the lake through the introduction of nutrients into the system, from a variety of sources.

Oligotrophic lakes have the lowest concentration of nutrients and are often characterized by low plant and algal growth. Eutrophic lakes, on the other hand, have the highest concentration of nutrients and typically have dense populations of aquatic plants and algae. Falling between these categories are Mesotrophic lakes which contain moderate levels of nutrients. While all three of these types occur naturally, a quick shift from one to another can indicate human influence.

As development on the waterfront and inland regions surrounding the lake continues, more robust water quality monitoring will be required. By monitoring regularly, and by recognizing the trends and changes in the lake's trophic status (a useful means of classifying lakes and describing lake processes in terms of the productivity of the system), we can identify issues and inform future decision making for Mississippi Lake.



Photos 1,2: Water Rangers and Lake Partner Program equipment

Photos 3-4: Equipment from Queens University - Flowmeter