2018 Mississippi Lake
State of the Lake Report

Bob Betcher and Alyson Symon

In 2018, water sampling was again carried out by the Mississippi Lakes Association (MLA) in partnership with the Mississippi Valley Conservation Authority (MVCA) and the Lake Partner Program (LPP). Water quality samples have been collected and analysed and other water quality indicator measurements made on Mississippi Lake since 1968 under a variety of programs, to monitor the trophic status of the lake and, in particular, the concentration of phosphorus in the lake as phosphorus is considered a major factor in promoting the growth of algae and Cyanobacteria.

Samples are collected three times during the open water part of each year, at deep water locations near Burnt Island and Pretties Island, just below the Innisville rapids (the Inlet site) to monitor water quality entering the lake from the Mississippi River, and 100 m upstream of the Highway 7 bridge at Carleton Place (the Outlet site) to monitor the water quality leaving the lake.

As well, additional sampling of shallow water quality was undertaken on a bi-monthly basis in the middle (approximately) of third lake and where the Mississippi River flows under the bridge in Carleton Place. This sampling was intended to supplement the monitoring discussed above and to provide additional information to support ecological modelling of the lake being undertaken by MVCA and Queens University.

At each LPP site, 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. Samples were analysed for total phosphorus (TP) and pH. In addition, the concentration of chlorophyll a (an indicator of the abundance of phytoplankton) was measured on the shallow sample. Secchi disk measurements were also made to indicate water clarity.

At the bi-monthly sampling sites, samples were collected at a depth of approximately 30 cm and analysed for a suite of nutrients (including TP) and indicator parameters.

Results

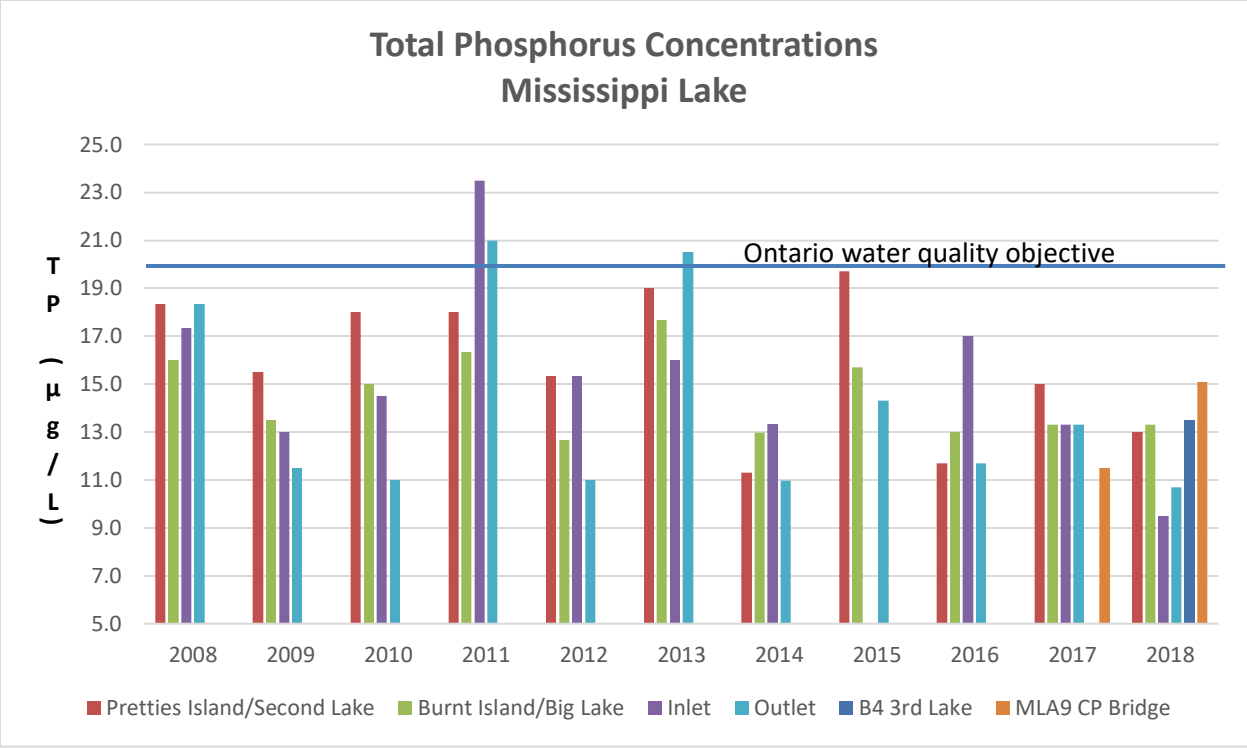
The trophic status of a lake can be characterized as oligotrophic, mesotrophic or eutrophic. Oligotrophic lakes have the lowest concentration of nutrients and are often characterized by low plant and algal growth. Eutrophic lakes, on the other hand, have the highest concentration of nutrients and typically 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.

The water quality results for 2018 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.

The total phosphorus content of the lake is a more specific indicator of lake health as elevated phosphorus concentrations may contribute to the growth of algae and Cyanobacteria. In Ontario, the water quality objective for total phosphorus in fresh water lakes is 20 micrograms per liter (µg/L) during the ice free period. Concentrations greater than this increase the risk of excessive algae growth.

The chart below shows historic average total phosphorus results for the euphotic zone samples at the 4 LPP sampling sites in Mississippi Lake, with the results from additional sampling in third lake and at the bridge in Carleton Place added for 2017 and 2018. The 2018 results appear to fall within the lower range of results for the 10 year sampling period.



Unfortunately, TP trends (is TP increasing or decreasing over time) cannot be interpreted from these data since conditions which may affect TP concentrations in the lake (wet years vs dry years for instance) vary from year to year. As well, there are concerns that sampling 3 times per year may not be sufficient to provide a statistically representative TP concentration during the ice free season. There was also a change in sampling protocol in 2016 to match Provincial protocols (samples were passed through a coarse filter to remove large particulates after 2015)

which may have an influence on concentrations.

It is interesting to note that even though TP concentrations were similar in 2017 and 2018, there were very few reports of algae blooms in 2017 while frequent and extensive blooms were present in the fall of 2018. This indicates that factors other than total phosphorus concentrations are important in determining if algae blooms will occur or not. Modeling studies carried out by MVCA and Queens University for 2018 predicted significant local algae blooms in the fall associated with late-season air temperature spikes, with the predicted bloom locations corresponding quite well to those areas of the lake where blooms were observed. It seems that the current (and historical) total phosphorus concentrations in the lake "prime" the lake for algae blooms when temperature spikes occur.