Algal Blooms – 2020

This year two algal blooms were recorded. The first type of algal bloom which occurred was from filamentous green algae. This bloom lasted, as in previous years, from mid-June until mid-September.

The second type of bloom was from a blue-green alga which occurred in Three Mile Bay and into the main water body, especially on the western side of the lake. In September of 2018, there were two blue-green algal blooms which occurred in the same area of the lake. The first of these blooms was certified as toxin producing, the second was not tested. This year, the bloom was not intense and mostly confined to the water column. Note that the Ministry of the Environment policy towards blue-green algal blooms is: "MOE regards any cyanobacterial (blue-green algae) bloom as potentially toxic, whether or not toxins are detected in the water upon testing"[1]

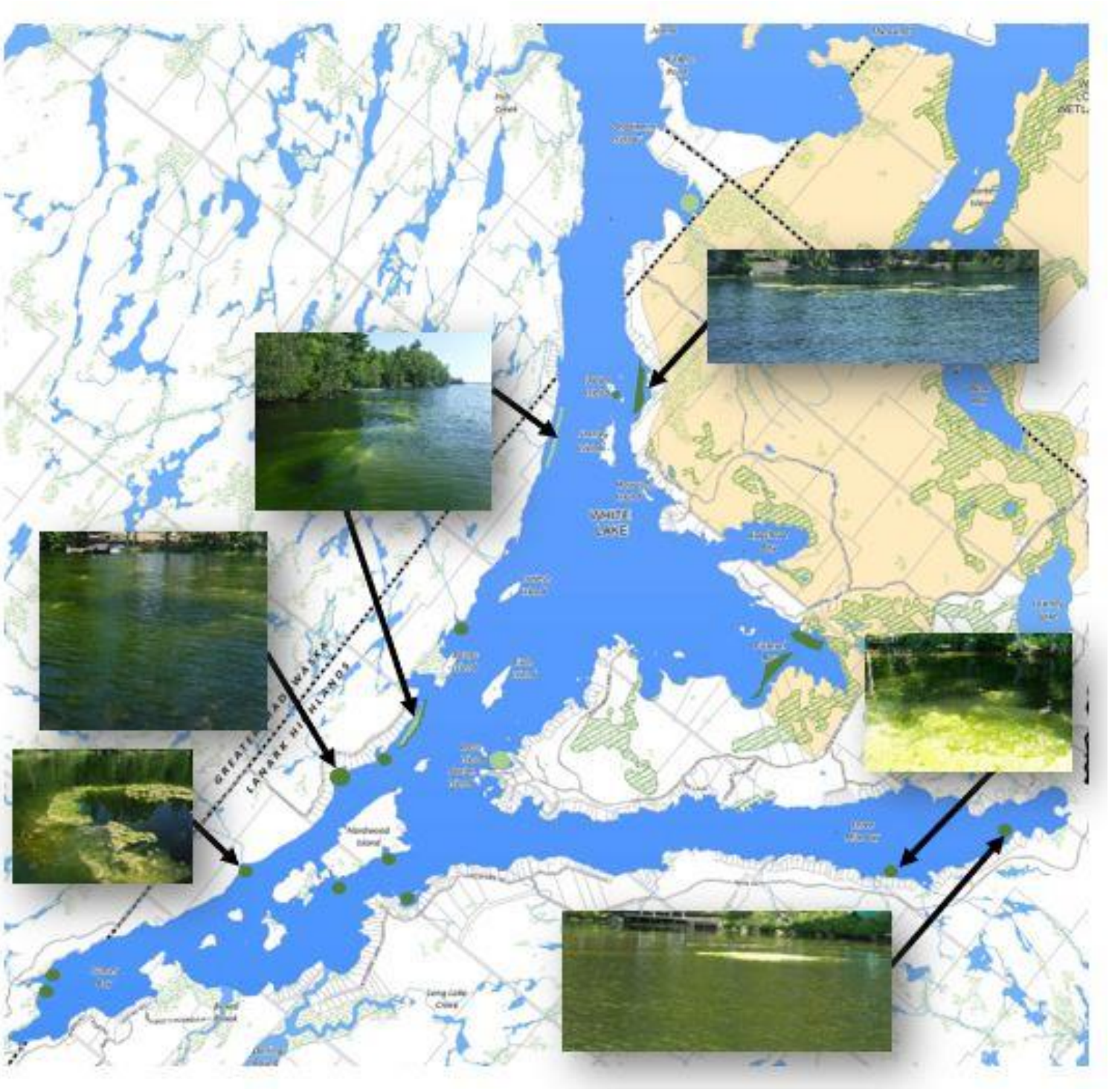
We emphasize that the algal blooms observed by our team are the minimum number for White Lake, and there may very well have been others on the lake which went undetected or unreported. Currently only two volunteers are monitoring the 22 Km^2 of White Lake, which has a shoreline stretching nearly 100 km!

Green Algal Blooms

The first algal bloom of the started in mid-June and continued until the end of September. This bloom was of a filamentous green alga, which grew in large patches along the shoreline. Nutrients, such as phosphorus, supporting this alga comes from sediments, and shoreline runoff where shorelines are disturbed, as well as dissolved in lake water.

In order to assess the extent of this bloom, we mapped the occurrences of this bloom over a large part of White Lake. We toured the entire shoreline of White Lake south of Fish Creek in order to present a 'snapshot' for June 20, 2020 of algal bloom locations. We also collected samples at each site for microscopic examination. We were not able to examine the entire shoreline of White Lake (~ 97 km) due to time constraints, and so cannot report on other areas of the lake, in particular Hayes and Bane Bays, The Canal and the White Lake Village Basin. Below is a map of the survey area which includes insets of photos of the actual blooms.

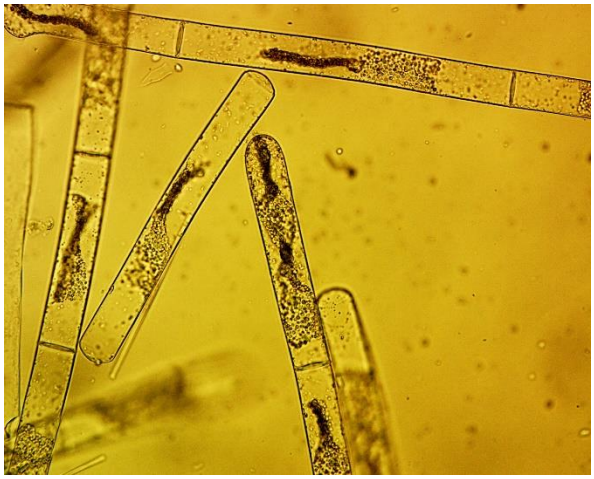
[1] Algal Blooms in Ontario, Canada: Increase in reports since 1994; J.G. Winter, A.M. DeSellas, R. Fletcher, L. Heintsch, A. Morley, L. Nakamoto, and K. Utsumi (all Ontario Ministry of the Environment scientists); *Lake and Reservoir Management*, 27:107-114, 2011.



In the map above, dark green is used to denote simultaneous surface and submerged filamentous green algae, and light green for submerged only. The size of the green dots indicates the relative size of the algal bloom area at each site, as does the length and width

of lines for affected shoreline. The attached photos provide a visual representation of the algal bloom itself.

Thirteen sites with algal blooms were sampled for purposes of identification. All sites sampled showed that the lime-green algal “clouds” forming under the surface represent just one genus of filamentous green algae- a type called Mougeotia, which is also commonly known by the unappetizing name of ‘elephant snot’. This alga does not produce toxins in the water and so the bloom is considered a nuisance bloom. The photo below shows a mass of their filaments magnified 200 times.



In addition to the blooms shown on the map, we observed numerous free-floating masses of the algae on the surface of the lake in locations where there were no visible fixed blooms. Many of the blooms occurred in bays or small embayments along the shoreline. During its lifetime, this alga produces gases which become trapped in the fine mesh of the algal mat and serve to raise the bloom from the lake floor to the surface, where it can be affected by the wind.

When large mats of algae die and decompose, the water column can become anoxic (no oxygen) causing the release of phosphorus trapped in sediments. Sediments contain about 200,000 times the concentration of phosphorus found in lake water. The released phosphorus can trigger a secondary bloom which could be larger than the original event.

Although there were large patches of this algal bloom in areas near unaltered forested shorelines, the most serious and largest blooms were found immediately adjacent to newly de-treed and landscaped cottage lots, and areas of severely altered shorelines. The occurrence and extent of these blooms have increased in recent years which may reflect the growth of zebra mussel populations, climate change and lake overuse.

Filamentous green algae of the type we are seeing in the lake has been resident in the lake for likely a good part of the existence of White Lake. Similar algal blooms have been reported recently in the news, in particular in the Rideau Canal, so the bloom in White Lake is not an isolated event.

Algae bloom when conditions are right for its rapid and uncontrolled growth. These conditions include the presence of excess nutrients (phosphorus), favourable water temperature and clarity, sunlight, and the action of wind and waves. For White Lake, the presence of zebra mussels is an additional factor promoting the growth of filamentous green algae. These mussels tend to concentrate nutrients from open waters to the

shoreline area where filamentous algal blooms occur. The severity of the algal bloom resulting from the sum of the above factors can be intensified by the runoff of nutrients from areas of shoreline which have been de-treed or altered in such a way that nutrients can enter the lake unmoderated by the presence of trees and other natural shoreline vegetation which prevent nutrients from entering the lake.

Viewed from underwater, the algae mass forms very large volumes extending from just below the surface of the lake all the way down to the lake floor. Other aquatic plants become enveloped within the growing mass. Over time, the algae die, collapses into itself and falls to the bottom of the lake.

It is interesting to note that similar algal blooms occurred in 2019 (with lower intensity), but were of another species of filamentous green algae Sirogonium, one of a large family of filamentous green algae found in White Lake.

Blue-Green Algal Blooms

Blue-green algal blooms are not benign and so warrant special attention. When these blooms occur, they can create a public health hazard and anyone using the lake should be apprised of the seriousness of this issue.

This year, White Lake hosted one blue-green algal bloom. The bloom occurred in Three Mile Bay and the main water body, especially on the Western side of the lake. The bloom was identified as he blue-green algae as *microcystis*, which is known to produce toxins.

The bloom was limited to the water column and was not intense enough to warrant testing by the MOE and because the bloom did not result in a surface scum which signals the large-scale death and decay of the algae. Microcystin toxins are usually released at this stage of the algal bloom.

However, the tell-tale surface scum of decaying *microcystis* was observed at several locations including the southern shore of Stanley Island, the eastern shore of Birch Island and the area adjacent to the entrance to Pickerel Bay.

Southern Shore of Stanley Island, September 29, 2020

Fortunately, this surface algal scum dissipated over a period of a few days and it was not necessary to call the MOE for further study. The occupants of the cottages affected were advised of the dangers associated with this type of algal bloom and were asked to treat the bloom as potentially toxic, as is recommended by the MOE.