WHITE LAKE PRESERVATION PROJECT

Water Quality Monitoring Program
2019 Summary Report

Highlights

2019 marked the sixth year of systematic sampling of White Lake for water quality parameters. During that time, many changes occurred in the lake and these changes are documented in our annual reports. These reports can be found on our website: http://www.wlpp.ca.

Among the changes which have occurred is the proliferation of two invasive species: zebra mussels and the non-native reed Phragmites. Zebra mussels have spread throughout the lake and several cells of invasive phragmites now occur on Three Mile Bay. Also, beds of

aquatic plants have grown denser along the shoreline extending to depths beyond the end of most docks.

Of greater significance, since 2016, are the annual green algal blooms, especially of filamentous algae. Since 2018, three blue-green algal blooms were documented in Three Mile Bay alone; one of these was tested and shown to be toxic.

These changes indicate that the water quality in White Lake is not improving.

The complete 2019 Water Quality Report contains the usual presentation and analysis of chemical data, including total phosphorus. Also included are a number of interesting articles on zebra mussels, microplastics, algal bloom measurement, and a cormorant and loon count. Some important points made in this report are:

- That the quality or quantity of pre-2014 total phosphorus data is inadequate to be used to identify long-term trends in phosphorus concentrations in an off-shield lake like White Lake.
- Only data obtained since 2014 can be used to clearly identify trends in total phosphorus concentrations in White Lake.
- The Provincial total phosphorus limit of 20 ppb no longer applies to White Lake since the arrival of zebra mussels in 2016. After that time, the cycling of phosphorus in White Lake was permanently changed.
- Algal blooms, both green and blue-green now occur at total phosphorus concentrations far below (less than 10 ppb) the Provincial limit of 20 ppb.
- We now need to focus on our observations beginning in 2016 and their consequences relative to lake health and management.
- Cottagers, property owners, and business concerns on White Lake must take action to preserve White Lake and to minimize stressors affecting the health of the lake.

White Lake Q & A

Every year we receive questions from cottagers and others about White Lake. In this section, we answer some of these questions and solicit readers to forward to us any questions they may have. We are happy to answer them.

1. **What kind of lake is White Lake?** White Lake is a very shallow warm water lake. Scientists refer to lakes like White Lake as wetland lakes because they have so many very shallow bays and lots of marshes. The average depth of White Lake is 3.1 metres or about 10 feet. The deepest spot is 9.1 metres or about 30 feet.

   One of the most important characteristics of White Lake is the chemistry of its waters. The lake sits on top of calcium rich limestone and its entire eastern shore watershed is largely made of the same material. The high calcium and associated high pH values means that there are almost no acid conditions to be found in White

Lake. The rocks on the western side of the lake are acidic Precambrian rocks that have little or no influence on the chemistry of White Lake.

All of this makes White Lake a very productive lake which is good for fish, loons and all of the other creatures that live in and around the lake.

2. **What about the surrounding land (watershed) which supplies water to the lake?** White Lake has a watershed which is about 10 times the surface area of the lake, which is relatively small. We are very lucky that most of the area draining into White Lake is made up of mainly undisturbed forest and small lakes. There is very little agricultural input. Thus, whatever enters the lake, in the form of any excess nutrients or pollutants, comes from cottagers and lake residents and not from upstream.

3. **What is water quality?……is it the same as the 'health of the lake'?** There are many definitions of water quality, but a good one is: "a measure of the condition of water relative to the requirements of one or more biotic species [fish, etc.] and or to any human need or purpose".

   The health of the lake generally refers to a number of biological, physical, and aesthetic parameters as well as value considerations. To assess the health of White Lake, a multidisciplinary approach is required to collect data and observations so that changes occurring in the lake can be tracked over time.

   This means that it is possible to have acceptable water quality for fishing and swimming, while at the same time the health of the lake is deteriorating or becoming more sensitive to stresses imposed on it.

4. **Can we assign a single word or letter grade to characterize White Lake water quality?** The Ontario Ministry of the Environment uses 20 separate parameters which have to be measured several times during the year in order to assess lake water quality. The final results are obtained using a complex calculation. Conservation Ontario, the body which oversees Conservation Authorities, produce watershed report cards based on at least five measured parameters. The Mississippi Valley Conservation Authority samples 60 of its more than 200 lakes. Individual lakes are not graded, only their host watershed.

   A simplified version of Conservation Ontario's approach has reduced the number of parameters to three: total phosphorus, e-coli and a calculated factor reflecting the diversity and health of invertebrates in stream and lake waters in a watershed. There is no information available on invertebrate species living in the White Lake watershed and no e-coli data has been recorded since 2015. This means that it is not possible to apply this approach to White Lake for two reasons: 1) required data is not available; 2) the scheme can only be applied to a watershed and not a single lake.

White Lake is not part of any conservation authority, so it is not assessed or graded by any certified body or organization.

5. **What is Total Phosphorus?** There are many types of phosphorus in White Lake, which can be divided into two categories: phosphorus contained in suspended particles like pollen and plankton, and phosphorus dissolved in the water much like sugar is dissolved in a cup of tea. Total phosphorus is the sum of the two. In White Lake, as in many other lakes, about half of the phosphorus is found in each type. Phosphorus is essential to all life, but too much can cause algal blooms and other problems.

6. **Why are we measuring Total Phosphorus in the lake every month rather than just once a year in the spring as is done for most Ontario lakes?** Most Ontario lakes are located on Precambrian Shield rocks, and, for those acidic lakes, the highest total phosphorus levels occur in the spring. Levels usually decrease slightly and remain relatively constant through the summer. For these lakes it is appropriate to take average values for interpretation.

   White Lake is not a shield lake, and spring values for total phosphorus are at their lowest annual levels. After that, the total phosphorus can increase by about 300% during the summer and decline again in the fall. For this reason, Provincial and other scientists do not use averages or individual values, but use the ***maximum values*** for interpretation.

   For the past 7 years, the Ministry of the Environment's Lake Partner Program has been supporting our work on White Lake by providing the equipment and the chemical analysis of 126 separate water samples for a number of parameters such as total phosphorus, calcium, chloride, etc. Because White Lake is an off-shield lake (see Q1), the Lake Partner Program requires that the lake be sampled monthly so that the maximum value for total phosphorus can be determined. An annual report is submitted to the Ministry as part of the agreement.

7. **Is White Lake changing? Is it getting better or worse?** White Lake is changing and not for the better. Starting abruptly in 2016, total phosphorus levels dropped by about 50%. This reduction was not because less phosphorus was reaching the lake, but because zebra mussels, which are mostly located along the shoreline, transfer particulate phosphorus (which they eat) from the lake in general to the shoreline zone. Rather than the particulate phosphorus eventually sinking and reaching the bottom of the lake, or being flushed out during the year, now it is now being concentrated via zebra mussel activity in the near shore environment.

   The net result of the action of zebra mussels is to promote the growth of aquatic plants near docks and along shorelines, and at the same time encourages the growth of a specific blue-green algae (*microcystis*) which blooms at total

phosphorus levels of less than 10 parts per billion. Another effect is to encourage the growth of filament-like green algae, which is not dangerous but unsightly.

In the rest of the lake, the amount of the second type of total phosphorus, the dissolved type, remains the same as before the arrival of zebra mussels. Because this is the phosphorus which algae feed on, we still have the possibility, as before, of a lake-wide algal bloom.

8. **According to historical records, White Lake has had algal blooms before in the 1940s and 1970s. Why are we concerned about them now?** In the past, algal blooms in White Lake were the result of logging activities or water levels being kept artificially too high.

   From 1980 and up to 2013, there are no official records of algal blooms occurring on White Lake. In 2013 White Lake experienced its first ever *documented* blue-green algal bloom. Since that time, there have been several more blooms. Some of these were toxic. Before the arrival of zebra mussels, maximum total phosphorus levels frequently exceeded the Provincially recommended limit of 20 parts per billion.

9. **Should we worry about a blue-green algal bloom even if no toxins were found when analyzed?** The official Provincial policy on this subject is stated in this way: 'The Ministry of the Environment regards any cyanobacterial [blue-green algae] bloom as potentially toxic, whether or not toxins are detected in the water upon testing'. This policy prompted the Peterborough Health Unit to say: 'Even experts cannot tell which blooms are harmful just by looking at them, *so waterfront residents will have to be cautious anytime that they have any dense algal bloom.'*

10. **What can we do to help?** One of the main things we can do to maintain or even improve the health of White Lake is to preserve or restore our shorelines to as close to natural conditions as possible. We can ensure that our septic systems are functioning properly. We can work together to demand that the four responsible municipalities enforce their by-laws and encourage the use of well-established best practices when any development projects affect shorelines and nutrient inputs to the lake.

White Lake: Ours to Protect

The Lake

- White Lake is a wetlands lake. Significant portions of the lake are surrounded by extensive fens and marshes that until 2018 were designated by the Ontario Government as candidate Areas of Scientific Interest.
- White Lake is a headwaters lake. The residents on the lake bear responsibility for the quality of its waters. There is no one upstream to blame!
- White Lake is very shallow. The average depth of White Lake is only 3.1 metres.

- There are many bays, such as Three Mile and Hayes Bays, which have very limited flushing during the year as does the lake in general.
- A significant amount of phosphorous is released from sediments (internal loading).
- These elements make White Lake very sensitive to changes in human use, climate and invasive species.

The People

- White Lake has been a popular tourist destination for generations.
- White Lake supports a lucrative sport fishing industry.
- There are now over 500 cottages on White Lake.
- There are now about 1000 trailer and tent sites on White Lake.
- Cottage conversions and expansions to year-round residences are increasingly popular.
- Power boats are getting larger, faster and more numerous than in previous years.

The Science

- Water quality has slowly been degrading over recent years.
- After a long period with no reported algal blooms, White Lake is now experiencing annual green and blue-green algal blooms. Some of these are toxic.
- Zebra mussels have invaded all parts of White Lake.
- Zebra mussels concentrate harmful nutrients to the near shore; the area around our docks.
- Zebra mussels promote harmful algal blooms at very low total phosphorus concentrations of less than 10 ppb.
- The quality of the near-shore area of White Lake could now be seriously degrading.

The Solution

- Respect approved setbacks and well-known best practices for shoreline development.
- Restore, regenerate or preserve shorelines to their natural state.
- Consider naturalizing lawn areas and avoid the use fertilizers, herbicides, or pesticides.
- Partner with municipal and provincial governments to enforce by-laws and create new laws to protect the lake, such as septic inspections and prevention of the spread of invasive species coming in or out of White Lake.
- Support your local lake organizations and volunteer to help preserve White Lake.
- The solution is US.