WHITE LAKE PRESERVATION PROJECT

White Lake at a Glance

Assessing the health of White Lake is a complex issue which requires scientifically gathered data and expert interpretation of this data. However, nature has a clever way of summarizing all of this data and making it obvious to us when things are not going well. She does this by creating algal blooms when the nutrient content of the lake water becomes too high. Although the presence of algae in a lake is normal and beneficial to aquatic life, excess algae in the form of algal blooms can in some cases produce toxins harmful to us and can even cause serious illness if ingested. White Lake is now experiencing some of these toxic algal blooms, one of which was documented in 2014 and again in 2015. Algal blooms can also be detrimental to fish life and make the lake unattractive due to poor water colour, lack of transparency, and the sight of strings of algae clinging to rocks and vegetation. Left untended, a lake could enter a phase of decay where dangerous algal blooms occur frequently and eventually lead to the 'death' of the lake itself. Is there cause to worry about White Lake?

White Lake is a shallow lake with an average depth of 10 ft (3.1 M) and a surface area of 22.7 square kilometres. The watershed feeding water into White Lake is only 211 square kilometres, which is a relatively small area of forest and farmland providing water to the lake. As it turns out, White Lake is flushed with new water each year by only 90% of its volume. Most lakes are flushed by several lake volumes per year. This means that over the course of a year, some lake water is not flushed out of White Lake resulting in the year over year accumulation of nutrients and other materials in the lake.

Over its entire surface area, 90.7% of White Lake has been designated as littoral, which means that most of the lake is comprised of marshes or areas considered as shoreline subject to wave action and/or the dense growth of water plants. Consequently, White Lake is classified as a biologically productive lake which is one that produces large quantities of algae, phytoplankton, zooplankton, water plants and aquatic animals such as fish. This can be a good thing unless the lake becomes too productive; then it begins to fill up or, in technical terms, becomes eutrophic.

Phosphorus (P) is an element essential to aquatic life, but in excess can cause serious negative consequences for a lake ecosystem. Phosphorus concentration levels in a healthy lake should range between 5 and about 15 parts per billion (ppb). Although P measurements have been taken in White Lake for many years, up to 2014 these measurements have not been done in a systematic manner and not at locations representing the entire lake surface. The White Lake Preservation Project (WLPP) has begun a Water Quality Monitoring Program consisting of systematic monthly sampling for P. Nine separate locations spanning the entire lake are now being monitored. Other chemical parameters such as oxygen content, temperature, and chlorophyll-a (a measure of algae concentrations), plus several other parameters have also been monitored. The sampling sites monitored for P throughout the spring to fall months, showed that P concentrations continuously rise during the summer and peak in the early fall with concentrations which can exceed 20 ppb. At this P concentration, the lake is considered to be becoming eutrophic. The WLPP monitoring program will shed light on any year to year trends in P levels as well as provide insights into the sources and eventual fate of P entering White Lake.

Shortly after ice break-up in the spring, P levels measured in the lake are about 10 ppb. When taking into account the volume of White Lake (75 million cubic metres) and a concentration of 10 ppb of P, one can easily calculate that there are about 750 kg of P in White Lake waters at that time. By late summer, the total amount of P in the lake has increased by more than a factor of 2.

Phosphorous is a common element and can find its way into the lake from many sources, both natural and as a result of human activity. Natural P sources include airborne dust and pollen, the dissolution of P-containing rocks, rainwater run-off, erosion, back loading from sediments, and the occasional breach of a large beaver dam.

Humans can also contribute significant amounts of P to the lake. Domestic septic systems and most commercial sewage treatment plants do not remove P, which then leaves the treatment system and eventually migrates to the lake, especially if there are no trees or shrubs present between the septic system and the lake to absorb released P. The P in these septic systems comes from P-containing detergents and cleansers and from human waste. Other man-made sources include fertilizers, and pet and farm animal waste.

Phosphorus from all sources concentrates in the bottom sediments of lakes which can contain P levels hundreds of times higher than the water above. Release of sediment-bound P occurs when the oxygen content of water above the sediments is low and nearing zero as a result of oxygen consumption due to the decay of algae and vegetation and also when there is a low turnover from bottom to surface waters. Conditions such as these have been recently measured at the entrance to Pickerel Bay. It is also possible for P to re-enter the lake from sediments even if there is significant oxygen in the water above. Data confirms that his is the case for White Lake. The disturbance of lake sediments in shallow areas of the lake by boats, and shoreline erosion from the wakes of fast, large, and wake-boarding boats operating too close to the shoreline can also release sediment bound P into the lake water.

In 2016, the lake was invaded by zebra mussels which are now present in numbers in all parts of the lake. Our study results show that the presence of zebra mussels has altered the chemistry of the lake. Of particular interest is the significant increase in water clarity resulting from the filtering effect of zebra mussels. The total phosphorous levels measured in the lake water decreased by about 40 percent when compared to values obtained last year. There is no evidence that there was less phosphorous entering the lake in 2016 as compared to previous years. The much lower levels of total phosphorous found in the lake during the 2016 season is due to the explosion of zebra mussel populations throughout the lake. Lower phosphorous levels are entirely due to the transfer of phosphorous from the water column to the sediments by zebra mussels, a process which encourages green and blue-green algal blooms to occur. Although there were no significant algal blooms observed in 2016, the effects of zebra mussels as well as climate change are only two of the multiple stressors affecting White Lake which, taken together, make the lake more susceptible to algal blooms due to human activity.

The Lakeshore Capacity Assessment Handbook (Govt. of Ontario) provides estimates for human contributions of P to lakes based on the number of cottages, permanent residences, resorts, etc. found on lakes. White lake has over 400 cottages plus 7 resorts, campgrounds and trailer parks. Based on the estimates provided by the Handbook, we can calculate that more than 1000 kg of P enters the lake from human contributions each year. This figure illustrate that by our actions we can make the difference between having a healthy lake or a eutrophic one.

White Lake is by its very nature a sensitive lake. Many government and biological assessment reports going back to the 1970s state that White Lake is eutrophic and needs to be cared for by those who use it and enjoy it. We cannot influence natures input of P to White Lake, but there is much we can do to limit ours and thus protect its natural beauty. Restoring the natural shoreline, eliminating the use of fertilizers and P containing products, requiring septic system inspections and upgrades, preventing shoreline erosion and controlling development along the shoreline can contribute to keeping the lake in good condition. Calculating the capacity of White Lake for supporting further development as well as writing a lake plan will provide a roadmap for further action by the WLPP and all concerned citizens. In addition, all four townships which border White Lake need to collaborate and harmonize bylaws on issues related to the lake and they also need to carefully scrutinize any development plans which could threaten White Lake, which after all belongs to all of us as well as to future generations.

Note: All the data, interpretation and documentation presented in this report can be found on the WLPP website at www.WLPP.ca

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