WHITE LAKE Property Owners Association
Environment Volunteers

# 2024 White Lake Algal Blooms

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During 2024 one algal bloom was observed. This algal bloom was a filamentous green alga. This bloom occurred in early June and lasted for about a month. Green algal blooms are unsightly, but do not produce any dangerous toxins.

Although high concentrations of blue-green algae were observed in late September and in October, we determined that these did not constitute a bloom and therefore did not pose a threat to the general population.

2014 was only the second year in eleven years of monitoring during which the were no blue-green algal blooms. During those 11 years, White Lake experienced 16 blue-green algal blooms.

The authors 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. No Provincial or local authority monitors water bodies for algal blooms. The Ministry of the Environment and local health units respond only to reports from the public at large. Currently only two volunteers are monitoring the 22 $Km^2$ of White Lake, which has a shoreline stretching nearly 100 km!

## 3.2 What Controls Algal Blooms?

Algae bloom when conditions are right for its rapid and uncontrolled growth. These conditions include the presence of excess nutrients (phosphorus) and other chemical species, 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. Zebra mussels also selectively filter out and consume green algae while at the same time rejecting blue-green algae. This promotes the growth of blue-green algae over green algae.

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 prevents or slows entry nutrients into the lake. Algal blooms are notoriously hard to predict because they result from the interactions of a number of physical and chemical parameters, some of which are very difficult to measure.

As mentioned above, algal blooms can be significantly influenced by the presence of zebra mussels (Dreissena polymorpha), an invasive species that has transformed many freshwater ecosystems across North America and Europe. These mollusks, originally from the Caspian and Black Sea regions, were introduced to the Great Lakes in the 1980s and have since spread to numerous inland lakes. Their impact on algal blooms is multifaceted, involving nutrient cycling, water clarity, and ecological interactions.

## Nutrient Dynamics

One of the primary factors influencing algal blooms is nutrient availability, particularly phosphorus and nitrogen. Zebra mussels are filter feeders that consume plankton, including phytoplankton (the microscopic algae responsible for blooms). By filtering out these algae, zebra mussels can initially reduce algal populations, leading to clearer water. However, their feeding habits also contribute to a shift in nutrient dynamics.

When zebra mussels filter water, they selectively remove smaller phytoplankton while allowing larger particles, including detritus and dissolved nutrients, to accumulate in the water column. This process can lead to a paradoxical situation where, despite the initial reduction in algal biomass, nutrient concentrations increase, particularly phosphorus. The accumulation of nutrients can promote conditions favorable for certain algal species, particularly cyanobacteria (blue-green algae) to thrive.

## Changes in Water Clarity

The filtering action of zebra mussels increases water clarity by reducing the concentration of suspended particles. While clearer water might seem beneficial, it can alter the ecosystem in ways that promote algal blooms. Increased light penetration can enhance the growth of submerged aquatic plants, which can subsequently die back and decompose, releasing additional nutrients into the water. These nutrients, combined with the right environmental conditions, can trigger harmful algal blooms.

Moreover, clearer water can change the competitive dynamics among phytoplankton species. Some algal species, particularly those that are adapted to high light conditions or those that can rapidly take advantage of nutrient spikes, may dominate the community, leading to blooms that can produce toxins harmful to aquatic life and humans.

## Ecological Interactions

The presence of zebra mussels can also disrupt established food webs. By significantly reducing the abundance of certain zooplankton species that graze on phytoplankton, zebra mussels can indirectly facilitate algal blooms. With fewer grazers in the ecosystem, phytoplankton populations can grow unchecked, leading to increased frequency and severity of blooms such as we have experienced on White Lake..

Additionally, the overall biodiversity of the ecosystem may decline as zebra mussels outcompete native species for food and habitat. This loss of biodiversity can destabilize the ecosystem, making it more susceptible to algal blooms. A less diverse community may be less resilient to environmental changes, further increasing the likelihood of bloom events.

## Conclusion

Inland lakes with zebra mussels are subject to complex interactions that can influence algal blooms. While zebra mussels initially reduce algal populations through their filter-feeding behavior, they also alter nutrient dynamics, enhance light penetration, and disrupt food webs in ways that can lead to increased algal blooms. Understanding these interactions is crucial for managing and mitigating the impacts of algal blooms in affected ecosystems. Effective management strategies must consider the role of zebra mussels and other invasive species to promote healthier aquatic environments and protect local biodiversity.