

When we look at Honeoye Lake, the first thing we notice is of course, its beautiful blue water. In fact, it's easy to think of the lake as nothing more than a large body of water where we boat, fish, swim and have fun. But in reality, Honeoye Lake is much more - it is the aggregate of many complex and dynamic aquatic, terrestrial and atmospheric systems. To understand how these systems are responsible for lake conditions, we need to turn to the lake science known as *limnology*. Limnology is a highly integrative discipline where physics, chemistry and biology intersect and are all necessary to gain a complete understanding of lake ecosystems. A distinguishing feature of lake systems is that they are tightly coupled to their terrestrial surroundings so much so, that lakes are largely a reflection of what they receive from their surrounding lands and atmosphere.

Lakes like Honeoye Lake, that are rich in nutrients and therefore able to support large quantities of organisms, including algal blooms, are classified as *eutrophic* lakes. *Oligotrophic* lakes like Skaneateles Lake, on the other hand, are nutrient deficient and can support only very little or no aquatic vegetation and are relatively clear. It goes to reason, that the types of plants and animals in eutrophic vs oligotrophic lakes are very different. Along with its eutrophic characteristics, Honeoye Lake has a large concentration of phosphorus in its lake bottom that was deposited years ago when the adjacent land was primarily agricultural, and farming practices did not consider the negative effects that runoff and erosion would have on Honeoye Lake for years to follow. This abnormal abundance of phosphorous, often referred to as *legacy phosphorous*, acts as a fertilizer for aquatic plants and algae.

Precipitation in the lake's watershed finds its way into the lake via streams, runoff and ground water carrying with it dissolved compounds and suspended particles. The nutrient rich compounds, along with sunlight, fuel the lake's plant and animal life. Non-natural compounds, depending on what they are, can range from benign to deleterious. In any case, all compounds play a role in formulating the lake's chemistry. The suspended particles eventually drift to the lake bottom as silt but can cause cloudy or turbid water on their way. Too much silt is undesirable. Changing seasons cause the water temperature to stratify - colder water being near the bottom and warmer water near the top - the zone where the temperature changes is called the *thermocline*. Lake conditions differ above and below the thermocline. Weather, especially rain and wind, result in lake mixing which can disrupt the thermocline affecting the lake's temperature, chemistry, and nutrient profile. These fluctuations determine which plants and animals thrive at any given time. When the lake organisms die, they eventually decompose at the lake bottom contributing to the nutrient load and water chemistry. The fact is, that a variation in any of these factors - precipitation, watershed land use, compounds, sunlight,

seasons, weather, plants and animals - govern lake conditions, and is why lake conditions vary from year to year and from month to month.

There is a myriad of limnological processes that could be expanded upon. However, algal blooms is a lake dynamic of major concern to the Honeoye Lake community that warrant further discussion. Three major algal varieties dominate most New York State lakes: diatoms, green algae, and blue-green algae. All three live in Honeoye Lake however, we're going to focus on blue-green algae because it is the type of algae that plagues Honeoye Lake with algal blooms. These blooms are often referred to as *HABs* (harmful algal blooms) because of toxins that these algae sometime release.

Although they contain chlorophyll, blue-green algae are more correctly identified as bacteria and is why they are called *Cyanobacteria*. They are microscopic life forms that live in the water column of nearly every body of water on earth. Some blue-green algae species have the ability to extract needed nitrogen from the atmosphere therefore, the phosphorous levels in the lake is usually the controlling factor for their growth. Blue-green algae thrive as phosphorus levels increase in the water. Phosphorous levels increase in Honeoye Lake when certain conditions cause the legacy phosphorous at the bottom of the lake to be released into the upper lake levels where the blue-green algae live. Colder water in the lower levels of the lake hold phosphorous containing compounds in these deep waters. Summer temperatures create a state of *anoxia* (lack of oxygen) in the depths when bacteria deplete the dissolved oxygen while breaking down organic matter. Without oxygen, the phosphorous is chemically released from the compounds in the lake bottom sediments. If during this time, we experience a storm with winds 20 mph or higher, the lake mixes; phosphorous rich water from the bottom is churned up to the upper levels; sunlight shines in; and Honeoye Lake is perfect for an algal bloom.

In 2017, New York state launched an aggressive effort to protect state waters with the Clean Water Infrastructure Act to reduce the frequency of HABs. Under this initiative, the state's Water Quality Rapid Response Team focused strategic planning efforts on 12 priority lakes across New York, Honeoye Lake being one of them, that have experienced or are vulnerable to HABs. With input from national and local experts, the Water Quality Rapid Response Team identified several priority actions for Honeoye Lake. Although grants have been awarded towards these actions, the state of New York has yet to allocate funds largely due to Covid-19 effects on the state budget. The state of New York is testing the effectiveness of alum treatment and plan to release their position on this option no earlier than the later part of 2021. Although it is encouraging that HABs in Honeoye Lake have the attention of the state, it is unfortunate that state funded actions will not be seen in the near future. In

the meantime, each of us can take action to minimize HABs by avoiding impervious surfaces on our property, not using fertilizers with phosphorous, minimizing runoff, and correcting faulty septic systems or better yet, connecting to municipal sewer systems.

We welcome your feedback at the email address below and encourage you to exchange viewpoints with your neighbors, family and friends. HVA has been, and will continue to be, an active partner in the future of the Honeoye Lake watershed and is committed to communicating accurate information that leads to informed opinions regarding lake management recommendations.

Watch for more articles in the coming weeks and get to Know Your Lake!

- Want a deeper understanding of basic limnology? See:

https://www.dec.ny.gov/docs/water_pdf/dietlakech1.pdf

and <https://www.nature.com/scitable/knowledge/library/ponds-and-lakes-a-journey-through-the-25982495/>

Also, check out the article *Limnology – The Basics* in this magazine:

<https://z0ku333mvy924cayk1kta4r1-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/40-2Full.pdf>

- To learn about the state of New York's *Harmful Algae Blooms Action Plan Honeoye Lake* go here:

[https://fd57d705-f86c-4662-90ab-](https://fd57d705-f86c-4662-90ab-7627c560e9d2.filesusr.com/ugd/e6fc30_7ba726f0386c41c5ad5f410a6d31b884.pdf)

[7627c560e9d2.filesusr.com/ugd/e6fc30_7ba726f0386c41c5ad5f410a6d31b884.pdf](https://fd57d705-f86c-4662-90ab-7627c560e9d2.filesusr.com/ugd/e6fc30_7ba726f0386c41c5ad5f410a6d31b884.pdf)

- Monitor HABs in New York State at DEC's website:

<https://www.arcgis.com/apps/webappviewer/index.html?id=ae91142c812a4ab997ba739ed9723e6e>

- Here's what YOU can do to minimize HAB's:

[https://fd57d705-f86c-4662-90ab-](https://fd57d705-f86c-4662-90ab-7627c560e9d2.filesusr.com/ugd/e6fc30_e1fd7768441a4631bdc9639a67111f7d.pdf)

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