

## **As the leaves change, so can water quality, and so should the way we monitor.**

In the Lakes Region of New Hampshire, we are fortunate to have access to many freshwater systems with typically higher water quality in comparison to urban systems and those outside of our state. As the busyness of summer slows down into fall and lake activity dissipates including most monitoring programs, it is easy to forget about the quality of our greatest asset, freshwater.

As time passes, a lake will slowly degrade in a natural process called eutrophication. Eutrophication is characterized by an excessive amount of nutrients (nitrogen and phosphorus) and phytoplankton (algae) productivity. Nitrogen (N) and phosphorus (P) are freshwater limiting nutrients that primary producers, algae, need to photosynthesize. As a lake moves towards eutrophic status, the increase in nutrients and algal productivity can lead to common and concerning water quality issues, like cyanobacterial harmful algal blooms (cHAB).

For most lakes throughout New Hampshire, either the NH Department of Environmental Services (NHDES) or a local conservation group organizes a volunteer monitoring program that collects various samples and measurements to track water quality and eutrophication. Traditionally, these monitoring programs run from June to August or September because freshwater systems have long been thought to be most productive and susceptible to excessive nutrient loading in the summer. However, this does not mean that water quality issues cannot arise as the weather cools and visible lake productivity seemingly dissipates.

As fall sets in, leaves start exhibiting beautiful colors of reds, oranges, and yellows. When leaves fall, masses can gather along roadside run-off ditches, in streams, and in lakes to eventually decay. Leaf litter breaking down is a natural phenomenon reliant on microorganisms like bacteria and fungi. As the leaves are broken down, N and P can be released into the soil or the freshwater system where the decaying is occurring, while the microorganisms consume oxygen. Most research on leaf decay and nutrient release in freshwater systems has been conducted on streams. The impact leaf decay has on the water quality of lakes, would seem to be intuitive, but it is not fully understood as most lake monitoring and academic research stops before the leaves fall. However, it could have an impact on nutrient loading and oxygen availability at a lake given the research on streams and known processes of leaf biodegradation.

In NH and the Northeastern US, cHABs are an increasing water quality concern that seemingly are impacting most freshwater systems. It has traditionally been thought that the most cHABs occur in the summer, but this is not always the case. A trend throughout our region is an increasing amount of cHABs in the fall, specifically October and November. It can be speculated why those blooms occur and are producing greater concentrations of harmful chemicals instead of the summer, but quantifying those conclusions is not possible in most cases because we have no data from those months.

Water quality conditions in the fall are not understood, and that is because it is a time when field work most often stops. As we continuously see longer periods of drought, warmer weather, and cHABs occurring after the traditional field season, we need to start quantifying water quality conditions in the fall to make better informed management decisions.



White Oak Pond cHAB from October 6, 2022 with surface and submerged leaf litter.

# Eutrophication

