

Chlorophyll *a*

What do chlorophyll measurements tell us about our lakes?

What is chlorophyll *a*?

Chlorophyll is the pigment that allows plants (including algae) to use sunlight to convert simple molecules into organic compounds via the process of photosynthesis. Of the several kinds of chlorophyll, chlorophyll *a* is the predominant type found in green plants and algae. Measuring chlorophyll *a* concentrations in water is a surrogate for actually measuring algae biomass, which is far more expensive and time consuming.

Why is chlorophyll important?

Algae are remarkably diverse and are naturally present in all lakes. They produce oxygen and form the base of the entire lake food web. By measuring chlorophyll *a*, we can better understand the biological community a lake can support and how a lake may be changing through time. For example, if chlorophyll *a* is increasing in a lake through the years, this may indicate there are serious nutrient pollution problems. Chlorophyll *a* is also the main parameter used to calculate the trophic state of a lake (Oligotrophic, Mesotrophic, and Eutrophic). Trophic state is used to classify lakes based on productivity/overall biological growth. Trophic state helps us understand many aspects of the lake from its chemical properties to the amount of fish biomass a lake can support.

What affects chlorophyll?

Algae growth, and thus chlorophyll *a* levels, are directly affected by the amount of nutrients in a lake. Phosphorus is a naturally occurring element in the sediment, water, and biota of a lake. It is the most influential nutrient in most Michigan lakes. Some lakes naturally have more phosphorus than others. However, humans often introduce extra phosphorus into a lake through poorly maintained septic systems, shoreline erosion, lawn fertilizer, and from agricultural or urban runoff. The more phosphorus inputs a lake receives, the more algae it will likely have.



Bruce Lichliter, CLMP volunteer from Big Glen Lake, prepares to lower the water column composite sampler into the lake (credit: Mike Litch).

How is it measured?

The amount of chlorophyll in an algal cell varies with algae species as well as with changing light conditions at different depths within the lake. Changing seasons also create different light and nutrient conditions that, in turn, affect the algae community. To account for some of this variability, Cooperative Lake Monitoring Program (CLMP) volunteers monitor chlorophyll *a* during five sampling events over the summer season (May through September) using a sampling technique that collects water throughout the lake's photic zone. The photic zone of the lake is the upper portion of the water column where sunlight penetrates and supports growth and reproduction of free-floating algae (aka phytoplankton). The CLMP program defines the photic zone as twice the Secchi disk transparency measurement.

Once the water sample is obtained, CLMP volunteers push a known volume of water through a filter disk, which collects the algal cells. The filter disk is frozen and delivered to the Michigan Department of Environment, Great Lakes, and Energy laboratory for analysis.

A lake is going to vary in chlorophyll *a* levels over time. Therefore, it is very important to monitor it over a long period of time to understand if levels are truly increasing, decreasing, or staying the same. Increasing chlorophyll *a* levels may indicate that management actions are needed to maintain a healthy lake.

For more information about the MiCorps Cooperative Lakes Monitoring Program, visit www.MiCorps.net
