

## 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?

Some amount of algae is naturally present in all healthy lakes. By measuring chlorophyll *a*, we are determining the amount of food available to fuel the lake's food web. Too little chlorophyll *a* indicates that there may not be enough food to support an abundant biological community. On the other hand, too much chlorophyll *a* indicates that nutrient levels in the lake may be artificially high. This is a problem because algae sink to the bottom and decay, a process that depletes deeper water of oxygen. In severe cases, all of the lake's oxygen can be become depleted, resulting in fish kills. In addition, a nutrient-enriched lake with excessive algae is less appealing for recreational activities like boating and swimming.



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

### What affects chlorophyll?

Algae growth, and thus chlorophyll *a* levels, is 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 lakes via poorly maintained septic systems and lawn fertilizer, among other sources.

### 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 conditions that, in turn, affect chlorophyll production. 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. 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 Department of Environment Quality laboratory for analysis.

A lake is going to have an amount of variability in the 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.