Michigan Clean Water Corps

MiCorps Factsheet

Total Phosphorus

What do phosphorus levels tell us about a lake?

Why is phosphorus important to lake health?

Phosphorus is an essential nutrient for algae and aquatic plants (which in turn are food for micro-fauna and larger animals). Therefore, phosphorus is an important element of the food chain within a lake. Phosphorus is usually present in very small amounts in a lake and is considered a "limiting factor" for algae and plant growth. That is, even if there is plenty of nitrogen and carbonates, algae and plants growth will be limited by the low amount of phosphorus available.

Lakes with low nutrient levels are said to have a low trophic level–we could say these lakes are "lean" and not very biologically productive; a more technical term would be oligotrophic. Lakes with more, but not excessive, amount of nutrients are called mesotrophic, and lakes over-enriched with nutrients are called eutrophic. Many eutrophic lakes are healthy and have a balanced plant and animals communities. However, highly eutrophic (or "hypereutrophic") lakes can suffer from unsightly algae blooms and are at a greater risk of developing low oxygen conditions because of the decomposition of the excessive plant material.

What is "total" phosphorus?

Phosphorus in water samples can be measured in many different ways. In total phosphorus measurements, chemicals are used to break down all of the solids in the water sample. The final result is a measure of amount of phosphorus in the water and everything contained in the water.

A water sample is properly obtained by lowering the bottle upside down 1-2 feet below the surface, then pointing the bottle up, allowing the bottle to fill (credit: MiCorps staff).

Where does phosphorus come from?

Phosphorus is naturally occurring element in the sediment, water, and biota of a lake. Some lakes naturally have more phosphorus than others. However, humans often introduce extra phosphorus into a lake through poorly maintained septic systems and lawn fertilizer. Other sources in the lake's watershed, such as agriculture, can also contribute. Phosphorus stored in the sediment of a lake can also be released to the water under low oxygen conditions.

How is total phosphorus sampled in the CLMP?

Volunteers in the Cooperative Lakes Monitoring Program (CLMP) simply collect a water sample using a clean water sample bottle provided by the program. The samples are taken from just below the surface of the lake, over the lake's deepest basin. Then, the samples are frozen and delivered to the water quality laboratory of the Michigan Department of Environmental Quality for analysis. Two samples are collected each year: during spring overturn, when the lake is generally well mixed from top to bottom, and during late summer, when the lake is at maximum temperature stratification from the surface to the bottom. Spring overturn is an opportune time of the year to sample just the surface of a lake to obtain a representative sample for estimating the total amount of phosphorus in the lake. A surface sample collected during late summer represents only the upper water layer of the lake, the epilimnion, where most algal productivity occurs. The two taken samples together can help lake managers understand the production dynamics of the lakes and why it may be "behaving" the way it does in terms of algae production.

Cooperative Lakes Monitoring Program

The CLMP is the lake monitoring program of the Michigan Clean Water Corps (MiCorps). MiCorps was created through Michigan Executive Order #2003-15 to assist the Department of Environmental Quality in collecting and sharing water quality data for use in water resources management and protection programs. For more information about the MiCorps program, please visit www.micorps.net.