

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 invertebrates and larger animals. Therefore, phosphorus is an important component of a lake food web. 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 are plenty of other nutrients, algae and plant growth will be limited by the low amount of phosphorus available.

Lakes can be divided into categories called trophic states, which are partially determined by the amount of phosphorus present. Lakes with low nutrient levels are classified as oligotrophic and are not very biologically productive. Lakes with more nutrients, but not excessive amounts, are called mesotrophic, and lakes with an abundance of nutrients are called eutrophic. Lakes naturally occur in all three trophic states. Many eutrophic lakes are still healthy and have balanced plant and animal communities. However, if phosphorus increases in lakes due to human impacts on the shoreline and watershed, this is called cultural eutrophication. Cultural eutrophication can cause excessive algae and plant growth and oxygen depletion.

What is “total” phosphorus?

Phosphorus is divided into two main forms: dissolved (soluble) and particulate (phosphorus attached to or a part of a particle). Phosphorus can readily change between dissolved and particulate forms in a process called cycling. In order to understand all of the phosphorus in a sample, we measure “Total” Phosphorus. Total phosphorus is both the dissolved and particulate phosphorus forms combined.

Where does phosphorus come from?

Phosphorus is a naturally occurring element in the sediment, water, and biota of a lake. Some lakes

naturally have more phosphorus than others do. However, humans often introduce extra phosphorus into a lake through poorly maintained septic systems, shoreline erosion, and lawn fertilizer. Other phosphorus sources come from a lake’s watershed, for example, from agricultural or urban runoff. Phosphorus stored in the sediment of a lake can also be released into the water under zero oxygen conditions.



A phosphorus sample is collected by lowering the bottle upside down 1-2 feet below the surface, then pointing the bottle up, allowing the bottle to fill.

How is total phosphorus sampled in the CLMP?

Volunteers in the Cooperative Lakes Monitoring Program (CLMP) simply collect a surface water sample using a clean sample bottle provided by the CLMP. The samples are taken over a lake’s deepest basin. Then, the samples are frozen and delivered to the Michigan Department of Environment, Great Lakes, and Energy’s water quality laboratory for analysis. Two samples can be collected each year: one during spring overturn, when a lake is generally well mixed from top to bottom, and another sample can be taken during late summer, when a lake is at maximum temperature stratification. Spring overturn is an opportune time of year to obtain a representative sample of the total amount of phosphorus in a lake. A surface sample collected during late summer represents only the upper water layer of the lake, the epilimnion, where most algal productivity occurs. This is a great time to understand external loading. The two samples taken together can help individuals understand a lake’s algae production, trophic status, and nutrient loading.

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