2024 Data Snapshot: Big Twin Lake

Water Clarity

While there is no statistically significant trend in Secchi depth, **Big Lake has been generally less clear since 2021.**

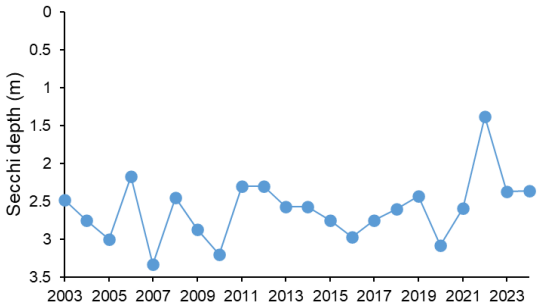

FIGURE 1: SECCHI DEPTH OVER TIME

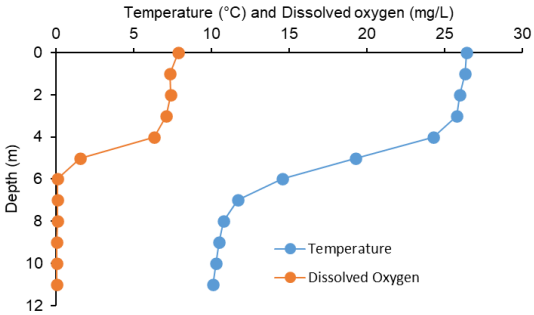

FIGURE 2: JULY 2024 PROFILES

Temperature & Dissolved Oxygen

Big Twin is typically stratified during the summer, with warm surface waters and cold bottom waters, and lacks oxygen in deep waters. **The depth of oxygen depletion has become significantly shallower since 2008.**

Algae

While variable year to year, average summer **algal abundance** (measured as chlorophyll a concentration) **has significantly decreased since 2003.** Big Twin has generally been mesoeutrophic, or of intermediate algal productivity, over this time.

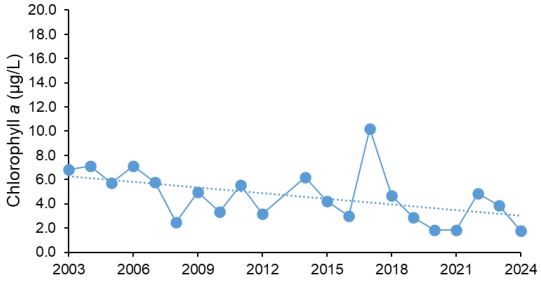

FIGURE 3: SUMMER ALGAE ABUNDANCE OVER TIME

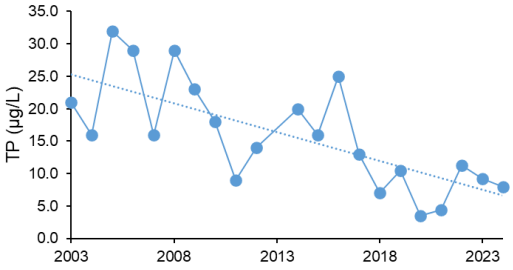

FIGURE 4: SURFACE SUMMER TP OVER TIME

Nutrients

Summer average total phosphorus (TP) concentration in surface waters has significantly decreased since 2003. **Phosphorus concentration in the deep waters was more than 2x that of the surface** in July and August of 2024 (the only year of deep-water monitoring).

Cyanobacteria

Cyanobacteria blooms occur on Big Twin. Screening for potentially toxic cyanobacteria is not conducted routinely. The relative abundance of cyanobacteria within the summer algal community varies considerably year to year but has been up to 97%.

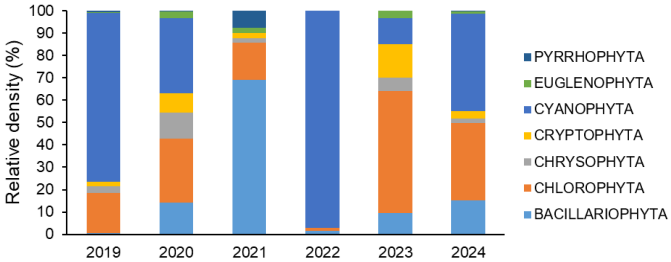

FIGURE 5: ALGAL COMMUNITY OVER TIME

Data presented here represent PLEON's monitoring of Big Twin Lake. A comprehensive presentation and explanation of the data can be found in the 2024 PLEON report. Contact PLEON Liaison for more information.

2024 TAKE HOMES: BIG TWIN LAKE

1. Although average summer algal abundance in Big Twin Lake has been declining, it varies from year to year. Therefore, water clarity and the way users visually experience the lake will also differ year to year.
2. Internal phosphorus loading is the release of phosphorus from lake sediments when oxygen is absent. The lack of oxygen at the bottom Big Twin and the elevated concentration of phosphorus in deep water samples suggest that internal phosphorus loading may be occurring. So although surface phosphorus has been declining, deep water phosphorus may fuel growth of algae, particularly cyanobacteria.
3. Cyanobacteria blooms remain a risk in Big Twin. Infrequent cyanobacteria screens have contained cyanobacteria groups capable of producing cyanotoxins and cyanobacteria are up to 97% of the algal community depending on the year.

HOW TO EVALUATE THESE DATA

This document provides a snapshot of foundational water quality parameters monitored in Big Twin Lake. Think of these data as a "medical checkup" for the lake. The strength of these data lies in their ability to show trends over time which can be used to (1) evaluate risk factors, (2) target stewardship efforts, and (3) guide management strategies.

Water Clarity: Secchi depth is the depth at which a black and white disk lowered into the water disappears. The deeper the Secchi depth, the clearer the lake. Suspended particles, algae, and dissolved compounds can decrease water clarity.

Temperature & Dissolved Oxygen: Deep temperate lakes have distinct temperature layers during the summer because surface water is warmed by the sun while deep water remains cold. The layers mix in the fall, helping to spread nutrients and oxygen throughout the lake. Oxygen gas dissolved in lake water is generated by surface turbulence and photosynthesis by algae and is removed by the process of decomposition. Low oxygen concentrations can be stressful to lake organisms and can promote nutrient release from lake sediments.

Algae: Algae are photosynthetic, plant-like organisms forming the base of lake food webs. Chlorophyll is a pigment in algal cells that we use to quantify algal abundance. A rapid increase in the amount of chlorophyll to a high level in your lake is an indication of an algal bloom.

Nutrients: Phosphorus and nitrogen are necessary components for the growth of the algae that support lake food webs. Too much nitrogen and phosphorus can fuel algal blooms. These nutrients come from the watershed as well as from lake sediments.

Cyanobacteria: Cyanobacteria (sometimes called blue-green algae) are photosynthetic bacteria often classified as algae. Cyanobacteria are most commonly responsible for harmful algal blooms, or HABs, in lakes. Some cyanobacteria can produce toxins that are harmful to wildlife, pets, and humans.