

We necessarily limited this review to methods that are used in contemporary settings and have support from peer-reviewed literature. Some of the methods that were considered, but are not reviewed here, are briefly touched on below.

- **Biochar:** Proposed in several states; there are limited data to support its use for HCB prevention or intervention strategy. Biochar is believed to actively bind to minerals and nutrients. Some early reports indicate similar binding behavior of HCBs to activated charcoal.
- **Chlorine compounds in drinking water treatment:** Chlorine is a common disinfectant used as a controlling substance for cyanobacteria in finished drinking water. However, its efficacy in open water systems remains unknown. The use of chlorination in drinking water plants reveals its reactivity and, thereby, possible future use in open waters.
- **Electrochemical oxidation:** This strategy pumps lake water through an anode that is surrounded by a steel cathode, effectively oxidizing cells and cyanotoxins. Powered by onboard generators, an array of these units is deployed near the water surface. Cyanobacteria and other phytoplankton, detritus, etc., are oxidized as the water is pumped through the tubes. The higher the voltage supplied, the shorter the exposure period needed. Pilot projects are currently underway (2021) with New York State Department of Environmental Conservation sponsorship.
- **Nitrogen addition:** Proponents claim that adding nitrogen to alter the nitrogen-phosphorus ratio will disfavor the growth of cyanobacteria and favor other photosynthetic organisms. Eutrophication is a widespread problem, so adding nutrients is not considered to be a sustainable action.
- **Permanganate:** Permanganate is an oxidizing agent that has been used as an algaecide for in-water treatment of HCBs and excessive algae levels, as well as mitigating cyanotoxins, in a limited number of documented cases during the past century. Permanganate may be applied by spraying water surfaces or by feeding solid or slurry forms from a watercraft. This strategy can be effective at both physically removing or damaging cyanobacterial cells and destroying cyanotoxins. Permanganate, when used as an open-water algaecide, is typically applied as a potassium permanganate product.
- **Shade balls or floating covers:** Proponents claim that these shading strategies, originally deployed to prevent evaporation and reduce light-facilitated chemical reactions, will also shade out cyanobacteria. While these methods may have limited application, they may not be practical for widespread use, especially in multipurpose water bodies.
- **Weir curtains, barriers, and exclusion devices:** Planktonic cyanobacteria can form thick surface scums, and the accumulations can be exacerbated by wind action, wave action, and reservoir discharge hydraulics. One strategy for mitigating the effect of a bloom is simply to physically exclude it. A barrier can be placed on or near the water surface to isolate and protect a high-value location, such as a swim beach or drinking water intake. While simple in principle, the concept has been difficult to implement and has not often been tested rigorously. The solution is probably not practical on a small scale, because engineering costs are high, but there are a few promising implementations in large drinking water reservoirs. Additionally, a weir or curtain would not prevent extracellular cyanotoxins from reaching the protected area.