



Private Water Systems

Pond Water - Drinking Water Treatment of Blue-Green Algae

Bureau of Environmental Health
"To protect and improve the health of all Ohioans"

The Public Health Issue:

Algae growth has always been regarded as a problem for ponds. Algae in ponds can especially be a problem if the pond is used as a drinking water source or other household uses. Cyanobacteria, often called blue-green algae, are bacteria that are naturally found in Ohio lakes, ponds, and slow-moving streams. Although many species of algae do not produce toxins, some species of blue-green algae can cause Harmful Algal Blooms (HABs). HABs can produce neurotoxins (which affect the nervous system), hepatotoxins (which affect the liver) and dermatotoxins (which affect the skin). These toxins can potentially impact the health of people and pets that come into contact with water (including drinking water) where HABs are present in high numbers.

For more information about HABs and what you need to do if you own a private water body, visit the Ohio Department of Health web page at: <http://www.odh.ohio.gov/odhprograms/eh/HABs/algablooms.aspx> select the *HAB Documents – Resources* from the left side menu choice. In this section you will see several fact sheet choices. We encourage you read *HABs Campground Operators – Privately Owned Waters* to learn more about HABs in your privately-owned pond and view the *Photos of Algae Blooms* to see if your bloom is a HAB or the common, non-harmful algal bloom.



Water Treatment Systems for Private Water System Ponds:

The water treatment system for a pond is designed to work in stages to maximize the effectiveness and make the water potable and safe for drinking. During extended periods of warm weather and increased nutrient enrichment, algae blooms in ponds may overwhelm the disinfection and filtration treatment system and may not be as effective at reducing higher levels of the different types of blue-green algae toxins.

Reduction of blue-green algae and the toxins in a pond drinking water system can be accomplished using the following combination of pond management and water treatment:

- watershed management
- pond preemptive algae control
- pond intake placement
- continuous filtration
- oxidation with disinfectants such as chlorine or ozone
- granular activated carbon (GAC) or powdered activated carbon (PAC).

It is important to keep ahead of the common-type algae formations in your pond. It is the responsibility of the homeowner to control their watershed that recharges the pond (Ohio Administrative Code 3701-28-15 (B) (1)). The watershed should be covered with grass or other vegetation. Do not apply fertilizers or other chemicals on the watershed area and do not use the watershed as a pasture. Do not install on-site wastewater treatment systems in the watershed area of the pond. If the watershed is not currently under your control, you should use diversion ditches and swales to make sure the pond water recharge is not originating off of your property. Contact your local Soil and Water District for assistance with any changes you may need to make for watershed control.

A variety of algicides, including copper sulfate, can be used in private water system ponds. Algicides that meet NSF/ANSI Standard 60 must be used and can be found at <http://www.nsf.org/>. However, it is **very** important to note that using algicides to treat blue-green algal blooms once they have occurred can actually cause more harm because as the blue-green algae die, their cell walls can burst and release more toxins into the water. Therefore, use of algicides for blue-green algae blooms once they have occurred are not recommended.

Steps for reducing blue-green algae and toxins from your finished pond water:

Water Intake:

Since the levels of toxins in water usually decrease with depth, the water intake should be placed at lower depths.

- A floating filter intake should draw water in at between 18 to 36 inches below the surface in the deepest part of the pond. *If algae are still prevalent at this depth consider using another source of water.*

A cased pond intake relies on the bank to filter water and can filter out some the algae before entering the treatment system.

- If the water appears green in the cased intake, then the filtration that is taking place through the bank is inadequate.

Filtration:

A slow sand filter, pressurized rapid sand filter, or pre-coat filter is the next step in treatment to filter out as many of the blue- green algae cells as possible before the water enters the disinfection system.

- Pressurized rapid sand filters are the most common filters used for drinking water ponds. There is concern that toxins can be released during the back wash cycle as the algae cells burst. If backwashing pressurized sand filters are used in the treatment process, they should be preceded by a coagulation step with a final filter that must be an absolute 1 or 2 micron sized cyst reduction filter. The cyst reduction filter is designed to remove protozoans but can also remove some of the algae cells. (An absolute filter is capable of removing 99% of cells or particles 1 or 2 microns in size or larger)
- Slow sand filters work simply by gravity and do not have a back wash cycle.
- Pre-coat (sometimes called diatomaceous earth filters) can filter out very small particles but require extensive maintenance to ensure proper operation.

Disinfection and Oxidation:

The next step is disinfection and oxidation. Chlorine both disinfects and oxidizes. Under normal conditions chlorine residual levels for disinfection are set at 0.2 PPM after 20 minutes of contact time. Note that higher chlorine doses are required to remove many of the blue-green algae toxins.

- The recommended dose for chlorine in order to remove some of the toxins is 3 mg/l for 30 minutes of contact time with the water. Some of the remaining toxins have to be removed from the water by using granular activated carbon (GAC) or powdered activated carbon (PAC) filter units.

Ultraviolet Light (UV) for Disinfection:

If you are using ultraviolet light (UV) for disinfection it is unlikely that your UV device can provide the high doses required to remove the toxins produced by the blue-green algae. If you have a UV unit, you will need to add a chemical oxidizing stage that uses chlorine, ozone, or other strong oxidizer in order to accomplish removal of the toxins.

Granular Activated Carbon (GAC) or Powdered Activated Carbon (PAC) Filter Units:

For whole house water treatment of the water, use GAC or PAC filters with a bed depth of at least two feet.

- The three primary types of GAC and PAC filters are coal-based, coconut hull-based, and wood-based. Although all GAC and PAC filters can remove some of the blue-green algae toxins, wood-based GAC filters have been shown to be the most effective.
- The GAC or PAC filters will also remove other chemicals like tannic acids, chlorine and chlorine by-products.

Sizing the PAC or GAC filter treatment device for removing contaminants should be done by an experienced professional water treatment dealer. Remember that carbon filters only last a certain period of time and the GAC or PAC will need to be replaced. If they are not replaced in a timely manner, the GAC or PAC will cease to work and also could release toxins that had previously been removed.

Any work done on the pond and treatment system must be done by a Private Water System contractor registered with the Ohio Department of Health. You can review a list of Private Water System Contractors at: <http://www.odh.ohio.gov/odhprograms/eh/water/PrivateWaterSystems/main.aspx>

If you are unsure your pond treatment system is capable of removing the blue-green algae and the toxins from your drinking water, you should consider using an alternative drinking water source or use bottled water during times of increased algal growth. If your choices for alternative water are limited because public water is unavailable or if groundwater is insufficient for water wells, then a hauled water storage tank system should be installed.

Ponds, wells, springs, rainwater cisterns, and hauled water storage tanks used as private drinking water systems are regulated under Ohio Administrative Code Chapter 3701-28 by the local health department. The regulations for ponds include requirements for the watershed management, pond construction, and continuous disinfection and filtration systems. If you have additional questions about ponds as water supplies call your local health department or the Ohio Department of Health (614)-466-1390.