



Watershed Management Document: PWS Fact Sheet Cyanobacteria and Public Drinking Water Supplies in Massachusetts September 2018, updated September 2020

What are cyanobacteria? Cyanobacteria are microscopic, photosynthetic, single-cell bacteria, once called blue-green algae, which are found naturally in low numbers in all



Cyanobacterial Bloom - photograph by Daniel Davis, MassDEP

waterbodies. When certain conditions are present, cyanobacteria may reproduce rapidly, forming “blooms” that are most commonly green or blue-green in color (but may appear as other colors). The water may look like pea soup or like green paint has been spilled. The bloom may appear as a scum that floats on the surface of the water or as mats that rest on the bottom. Their location may vary with wind direction, time of day, and depth of the waterbody; they are most common in the summer and early fall. Blooms composed of cyanobacteria may also be

referred to as Cyanobacterial Harmful Algal Blooms (CyanoHABs). CyanoHABs may occur at different depths below the surface of the waterbody.

Why are cyanobacteria a concern for public water systems? The presence of higher amounts of cyanobacteria may lead to taste and odor complaints from customers. In addition, certain cyanobacteria may produce toxins that can be harmful to public health. Known as cyanotoxins, they can cause skin irritations, diarrhea, vomiting, dizziness, and other health effects in people and animals. In severe cases, they may cause damage to the liver, kidneys, or nervous system. Exposure to cyanobacteria and their toxins occurs primarily during recreational activity through oral, dermal, and inhalation routes. Exposure may also occur through ingestion of cyanotoxin-contaminated drinking water. When cyanobacterial cells are ingested, they are destroyed by digestive juices, which release the toxin into the gastrointestinal tract. Alternatively, cyanobacteria cells can die and release their toxins into the surrounding waterbody, water from which may then be ingested. Cyanobacteria are primarily a concern at PWSs with surface water sources, specifically those using lakes, ponds, and reservoirs due to the potential conditions that may exist in those waterbodies. PWSs with groundwater or groundwater under the influence of surface water (GWUI) are not considered to be at significant risk of cyanobacteria issues at this time.

There is often visual evidence of a CyanoHAB; however, CyanoHABs can look similar to other non-harmful algae blooms, and confirmation can only be made by observing cells under a microscope. The presence of toxins can only be confirmed using analytical laboratory tests. In addition, toxins may remain or even spike in the water after a bloom is no longer visible. Identifying cyanobacteria and treating CyanoHABs may necessitate hiring a consultant, laboratory, or other professional service.

How widespread are cyanobacterial blooms? Cyanobacterial blooms are increasing in frequency in New England. Blooms usually occur during the summer and early fall when water temperatures are higher, and flow into a waterbody may be reduced. Scientists believe that warmer water temperatures and drought conditions associated with climate change may cause more blooms in the future.

How should I address cyanobacteria at my public water system? MassDEP has determined that a preventative approach, which includes source water protection, reservoir management, and emergency response planning, is the best way to address future CyanoHABs. Some water supply treatment processes may remove cyanobacteria cells or cyanotoxins; however, the effectiveness of various drinking water treatment processes in removing cyanobacteria cells and cyanotoxins varies. The evolving science behind the efficacy of various treatment systems to remove cyanobacteria cells and cyanotoxins underlines the need for source water protection to help prevent CyanoHABs. MassDEP has developed additional guidance on cyanobacteria for PWSs, which provides further detail. The MassDEP Cyanobacteria Guidance is currently available on the MassDEP website at

Source Water Protection

Cyanobacteria thrive on the nutrients nitrogen and phosphorus. Nitrogen and phosphorus enter surface water through stormwater flowing off streets, parking lots, lawns, septic systems, cultivated fields, areas containing dog, geese or livestock wastes, decaying vegetation, from septic systems, and from fertilizer associated with other land uses in a watershed. The following actions can be taken to reduce nitrogen and phosphorus loading into your water supply's watershed.

Conduct Public Outreach and Education

Examples of measures to reduce nitrogen and phosphorus in the watershed include:

- eliminating, treating, or diverting stormwater away from the reservoir and tributaries; and
- educating the public about proper lawn care; picking up dog waste in the watershed; and maintaining septic systems.

Fact sheets that address source water protection are located on MassDEP's web site at:

<https://www.mass.gov/lists/drinking-water-supply-source-protection>

Develop a Local Surface Water Supply Protection Plan

Protection plans address potential impacts from existing and future land uses and other activities. To start writing your protection plan, refer to your system's assessment report, recommendations, and Geographic Information System (GIS) maps that were provided by MassDEP's Source Water Assessment and Protection (SWAP) Program. Copies of the SWAP reports are available on MassDEP's web site at:

- <https://www.mass.gov/service-details/the-source-water-assessment-protection-swap-program>

MassDEP's guidance document titled *Surface Water Supply Protection Plan Development* is located at:

- <https://www.mass.gov/lists/groundwater-wellhead-protection-and-surface-water-supplies>

In addition, Source Water Protection staff in the Drinking Water Program can help you write or revise a surface water supply protection plan. Please send your request for assistance to:

- program.director-dwp@mass.gov or call 617-292-5770.

Monitor Water Quality

Many public water systems monitor for nutrients and water flow in the watershed, or partner with watershed organizations or other groups that perform monitoring. Building a database to maintain historic water quality information within the watershed may be helpful in supporting forecasts of potential CyanoHAB occurrence.

Apply for Grants to Purchase Water Supply Land and Conservation Restrictions

The Massachusetts Drinking Water Supply Protection Grant Program awards funds to public water systems to purchase land and conservation restrictions for water supply protection and groundwater recharge:

<https://www.mass.gov/service-details/drinking-water-supply-protection-grant-program-1>

Reservoir Management

CyanoHABs at PWS surface water sources are an emerging issue, but there are preemptive and remedial measures that may be conducted within the source before and after blooms occur. These range from physical controls like aeration and mechanical mixing, to chemical controls such as algaecide application. PWS operators are typically most familiar with the use of algaecides like copper sulfate; however, there are concerns associated with algaecide use due to the potential toxin release from ruptured cyanobacterial cells, and algaecide toxicity to other organisms. Therefore, algaecides should be used only in the early stages of a bloom. The effectiveness of biological controls, known as biomanipulation, is also being considered for in-source treatment due to fewer detrimental effects on other aquatic organisms. Biomanipulation typically requires consistent monitoring to ensure that it is effective and not causing unintentional consequences as well. Ideally, development of baseline water quality data within your source(s) will provide information to assess the risk of CyanoHAB occurrence, which will better inform management decisions. Further information on baseline data collection and in-source treatment is available in the MassDEP Cyanobacteria Guidance.

Emergency Response Planning

MassDEP has developed a "PWS Bloom Tracking Form" designed as a technical assistance tool to help PWSs identify and track all algal blooms, including potential CyanoHABs within their surface water source(s). Use of the PWS Bloom Tracking Form is voluntary; however, MassDEP encourages all PWSs with surface water sources to routinely monitor their reservoirs for changes,

and recommends recording all algal blooms or potential CyanoHABs observed. The form may be used to maintain PWS internal records regarding this emerging issue, or used by the PWS to identify and communicate potential issues to MassDEP DWP staff when technical assistance is needed. Information discovered from use of the form may also assist PWSs with identifying potential updates within their Emergency Response Plan (ERP) required pursuant to 310 CMR 22.04(13). Although the MassDEP guidance is focused on prevention of CyanoHAB occurrence, it is possible for CyanoHABs to develop and enter a water treatment plant. While various treatment processes are effective in removing both intracellular toxins (toxins within the cyanobacterial cell) and/or dissolved or extracellular cyanotoxins, the PWS should have a plan in place to respond to a CyanoHAB in their source(s). This may include monitoring efforts, actions taken within the source, treatment changes within the plant, use of other source(s) and communication steps.

Who is working on cyanobacteria in drinking water? MassDEP, Massachusetts Department of Public Health (MDPH), U.S. Environmental Protection Agency (US EPA), American Water Works Association (AWWA), New England Interstate Water Pollution Control Commission (NEIWPCC), and numerous others are working to further understand cyanobacteria, their impacts on public health, and to develop uniform standards for sampling, identification, prevention, and treatment.

There are currently no federal or state regulations for cyanobacteria or cyanotoxins; however, in 2015, the US EPA released drinking water health advisory (HA) levels for two cyanotoxins – microcystins and cylindrospermopsin. For further information on cyanobacteria and US EPA’s HA levels, please go to: <https://www.epa.gov/cyanohabs/epa-drinking-water-health-advisories-cyanotoxins>.

Ten cyanotoxins are being sampled as part of US EPA’s Unregulated Contaminant Monitoring Rule (UCMR) 4; PWSs nationwide began sampling as part of UCMR4 in 2018. Data from UCMR serves as a primary source of research information that US EPA utilizes to develop regulatory decisions.

Where can I get more information about cyanobacteria and source water protection? For more information about preventing cyanobacterial blooms, contact MassDEP’s Drinking Water Program at program.director-dwp@mass.gov or call 617-292-5770.

What should I do if I suspect a cyanobacterial bloom in my source water?

Contact the Drinking Water Program in your MassDEP Regional Office to report a suspected or confirmed bloom during normal business hours.

Northeast Regional Office	Wilmington	Amy Lachance	978-694-3260
Southeast Regional Office	Lakeville	Chuck Shurtleff	508-946-2879
Central Regional Office	Worcester	Robert Bostwick	508-849-4036
Western Regional Office	Springfield	Deirdre Doherty	413-755-2148

For emergencies outside of normal business hours, please contact the Emergency Response Hotline at 1-888-304-1133.