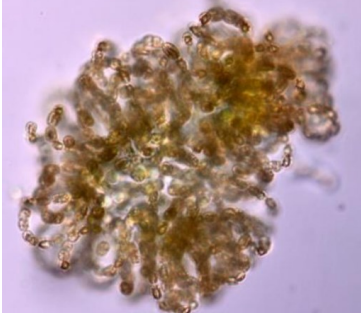


What is Cyanobacteria

Cyanobacteria, also known as blue-green algae, are a photosynthetic bacteria present in all water bodies, normally in low numbers. These bacteria, specifically *Anabaena* and *Microcystis*, produce cyanotoxins such as cylindrospermopsin and microcystins, during regular cell functions. When the bacteria cells lyse, or die, the cyanotoxins are released.



Microscopic image of *Anabaena*, From MassDEP Guidance: *Cyanobacteria and Public Water Systems*

During a Cyanobacteria Harmful Algal Bloom, or CyanoHAB, the cyanobacteria population is capable of growing from 1,000 cells/ml to over 25,000 cells/ml in 2 weeks. During a bloom, large quantities of cyanotoxins are produced by the individual bacteria.

Cyanotoxin	US EPA 10-day Health Advisory	
	Bottle fed infants and pre-school children	School-age children and adults
Microcystins	0.3 µg/L	1.6 µg/L
Cylindrospermopsin	0.7 µg/L	3 µg/L

From MassDEP Guidance: *Cyanobacteria and Public Water Systems*

In 2015, the EPA developed a 10-day health advisory for the toxins Microcystins and Cylindrospermopsin in drinking water. For school age children and adults, ingestion of 1.6 µg/L of microcystins for a 10-day period can cause adverse health effects including gastrointestinal issues, liver failure, and in some cases, death.

Factors Promoting Bloom Growth

The rapid growth of cyanobacteria which can cause a CyanoHAB is encouraged by many factors. As detailed in the “MassDEP Guidance: Cyanobacteria and Public Water Systems ” (2018). Factors include:

- Water temperature above 25°C or 77°F
- Long residency times
- Increased runoff from storms
- Excessive nutrient loading (Nitrogen and Phosphorus)
- Compromised function of proximate wetlands
- Non-existent, or compromised wooded buffer zones.

Additional information on Cyanobacteria and its growth factors can be found in the MassDEP Guidance located at: www.mass.gov/doc/massdep-guidance-cyanobacteria-and-public-water-systems



Not all CyanoHABs will have the same appearance. Some will form a blue-green surface scum. Other blooms may not be visible on the surface. Screening for cyanobacteria is important to detect all blooms.

Preventing Cyanobacteria Blooms

While a CyanoHAB can grow rapidly and cause serious health effects, there are actions which can be taken to prevent a CyanoHAB from developing. Prevention methods which can be practiced by a PWS and the public in the watershed to reduce nutrient loading include:

- Maintaining septic systems
- Reducing use of fertilizers
- Picking up and proper disposal of pet waste
- Maintaining a wooded/wetlands buffer

PWSs can implement these actions through:

- community outreach and
- protecting land through the use of conservation restrictions.

Additional information on conservation restrictions can be found at: www.mass.gov/how-to/ws-26-sale-or-acquisition-of-land-for-water-supply-purposes

Additionally, there are source actions a PWS can take for better control of CyanoHAB formation depending upon risk. These actions include:

- Development of an algal monitoring program
- Routine algacide application (Copper Sulfate (CuSO₄))
- Artificial mixing of water source
- Biological Controls (Floating wetlands)

Many activities can be included in an algal monitoring program such as routine inspection of water source, monitoring water temperature, phycocyanin levels, and turbidity levels. Additional details on monitoring techniques can be found In the MassDEP Guidance.

Responding to a CyanoHAB

There are a variety of actions and resources for responding to a potentially harmful cyanobacteria bloom. Actions which can be taken by a PWS when responding to a CyanoHAB include:

- Collecting samples for cyanobacteria identification and enumeration.
- Sampling for toxin analysis.
- Using algacides such as Copper Sulfate (CuSO₄) or Hydrogen Peroxide to kill the cyanobacteria cells.
- Aluminum Sulfate (Al₂(SO₄)₃) which can be used to reduce phosphorus levels in the water body.

Permitting requirements for herbicide and pesticide application to waterbodies can be found at: www.mass.gov/how-to/wm-04-herbicide-application. The CuSO₄ notification form can be found at: www.mass.gov/lists/source-water-protection-forms-and-templates

Additionally, MassDEP provides resources to PWSs for a CyanoHAB response. These resources include:

- Field Assessment and Support Team (FAST) a free, state-wide and state-sponsored program that has equipment used for screening CyanoHAB development.
- PWSs may contact regional MassDEP employees for assistance with CyanoHAB questions

Jurisdiction and Oversight

Jurisdiction over a water body with reports of a CyanoHAB depends on how the body is used. In general, CyanoHABs in water bodies used for drinking water are overseen by the PWS and MassDEP through the Drinking Water Program (DWP). CyanoHABs in water bodies used for recreation are overseen by the local Boards of Health in coordination with Massachusetts Department of Public Health (MDPH) which makes a health-based recommendation for the water-body. MDPH may recommend an advisory in cases where the water body is being used for both drinking water and recreational purposes, the two agencies will coordinate their response.

MassDEP Contact Information

MassDEP contacts who can assist with PWS CyanoHAB response.

FAST	State Wide	888-304-1133 or www.mass.gov/service-details/request-a-fast-vehicle-deployment
Kristin Divris	CERO	Kristin.divris@mass.gov
Amy Lachance	NERO	Amy.lachance@mass.gov
Richard Rondeau	SERO	Richard.rondeau@mass.gov
Cathy Wanat	WERO	Catherine.wanat@mass.gov
MDPH	Recreational & Mixed Usage	617-624-5757

Cyanobacteria & Surface Drinking Water Suppliers



Contact information
Kristin Divris Drinking Water Program (DWP)
kristin.divris@mass.gov

Kathleen Romero Drinking Water Program (DWP)
kathleen.romero@mass.gov



This pamphlet was developed through an Interactive Qualifying Project with Worcester Polytechnic Institute and MassDEP.
Fall 2019