Cyanotoxins Management Plan

Insert cover photo.

[Your Water System]

Enter Public Water System Contact Information and Address.

Enter Publication Date.

Instructions for Using Template

The template is intended to assist states, tribes and water utilities in developing their own cyanotoxin management plans specific for their locations. The template includes potential steps for monitoring, treatment and communication activities. However, systems should evaluate their system-specific conditions as the most appropriate course of action will vary for each water system depending on the type of system and conditions of the source water. To support systems as they develop their plans, five system-specific cyanotoxin management plans were developed to provide examples for utilities to see as they develop system-specific plans for their utility. **Bolded language** below provides instructions for filling out the template; gray language provides prompts for systems to include their system-specific language; and *italicized* *language* offers examples of types of information that may be useful.

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Template Overview

Cyanobacteria naturally occur in surface waters. Under certain conditions, such as warmer water temperatures and increased nutrients (nitrogen and phosphorus), cyanobacteria can grow rapidly producing “blooms” referred to as harmful algal blooms or HABs. HABs can pose a significant potential threat to human and ecological health. Cyanobacteria have the potential to produce toxins (known as cyanotoxins) that can cause adverse health effects in humans and animals through the contamination of waterways used for recreational purposes and drinking water supplies.

The United States Environmental Protection Agency (USEPA) encourages public water systems to consider how likely their systems may be to encounter HABs in their source waters. Systems with source waters that are susceptible to HABs could benefit from developing a system-specific cyanotoxin management plan (CMP) prior to a HAB event. Public water systems may want to periodically evaluate and modify their CMPs as their understanding of the specific challenges related to HABs facing their system evolves.

USEPA presents a possible approach to developing a CMP for drinking water systems in the 2015 document [*Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*](https://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations)*.* The approach includes components for determining if and when a public water system is vulnerable to cyanotoxins, monitoring for cyanotoxins, treatment actions and communication strategies. The potential management steps are intended to provide a stepwise approach that allows a public water system, as it deems appropriate, to take actions to reduce the likelihood of cyanotoxin occurrence in its finished water.

Management Steps for Determining a Public Water System’s Exposure to Cyanotoxins

Monitoring, treatment and communication are key elements of a CMP and play important roles during each step. An overview of each element is provided below.

**Monitoring.** Source water and system observations can inform a water system’s decisions about if and when to start cyanotoxin monitoring in raw and finished water, when and how to adjust treatment plant operations and when to communicate with external stakeholders and the public. USEPA does not currently regulate cyanotoxins and public water systems are not required to monitor for cyanotoxins in their drinking water (unless required by their state or primacy agency). Sampling locations and frequencies are useful to include in a CMP. Water systems that monitor may want to consider maintaining their records, as historical data can be valuable to a water system (and nearby systems) for determining if and when the water system is vulnerable to cyanotoxins. Details on monitoring and related resources are discussed in each of this CMP’s steps.

**Treatment.** A water system is encouraged to identify its treatment strategies for controlling cyanotoxins, and to do so in the context of its other drinking water treatment goals (e.g., turbidity control, disinfection byproduct (DBP) control, disinfection, taste and odor control, corrosion control, etc.). A water system can evaluate its existing treatment capabilities and make any needed short- and long-term improvements before the bloom season in order to be prepared to respond when cyanotoxins are detected. Treatment adjustments have been identified and included in the description of how to proceed for each step of this CMP. USEPA’s *Water Treatment Optimization for Cyanotoxins* is an available resource describing cyanotoxin optimization techniques.

**Communication.** Communication is an integral part of each step of a CMP. Important communications to consider as part of a plan include sharing of information with the primacy agency, contract laboratories, neighboring drinking water systems utilizing the same source waters, local officials, drinking water stakeholders and the public. For public communications, communication strategies could take into consideration the media and non-English speakers, as well as segments of the public that are likely to take the greatest interest in messaging on cyanotoxins (such as parents of bottle-fed infants and other young children under the age of six years old). Partnerships to help communicate with sensitive populations, such as day care centers, pediatricians and dialysis centers, would also be helpful to identify in the plan. The plan can include contact information and instructions on when and how to communicate with stakeholders and the public. USEPA’s [Cyanotoxin Risk Communication Toolbox](https://www.epa.gov/ground-water-and-drinking-water/cyanotoxins-drinking-waterr) is an available resource to assist with communicating the risks from cyanotoxins in drinking water.

For additional information about monitoring, treatment and communications see EPA’s 2015 [*Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*](https://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations)*.*

Cyanotoxin Management Plan Executive Summary

**[Your Water System]** has developed this Cyanotoxins Management Plan (CMP) to provide an action plan to prepare for and mitigate risks from harmful algal blooms (HABs) and cyanotoxins in order to protect public drinking water from cyanotoxin contamination. This document provides steps and documents activities to prepare for and identify a potential HAB occurrence and make treatment and operational adjustments to remove cyanotoxins from the water. This document also includes steps to provide timely information and (as appropriate) an advisory to the water system’s customers, and to document information about occurrences of HABs so that information can be used to minimize the effect of HABs on the water system in the future. This plan also contains possible future activities the utility could engage in to mitigate the risks from HABs and cyanotoxins, such as long-term source water protection activities. A detailed flowchart of the CMP can be found in [Appendix A](#AppendixA).

The steps outlined in this CMP include:

Step 1: Assess Source Water

Step 2: Preparation, Monitoring for Early Warning Signs and Immediate Actions if a Bloom is Suspected

Step 3: Raw Water Cyanotoxin Monitoring and Treatment Adjustments

Step 4: Finished Water Cyanotoxin Monitoring and Treatment Adjustments

Step 5: Continued Finished Water Cyanotoxin Monitoring, Treatment Adjustments and Public Communication

## **[Your Water System]** Overview

Enter general information about your drinking water system, providing the level of detail and information necessary for the users of the plan.

### Source Water

Explain your source water options.

* Identify each source that is available (e.g., lake, reservoir, river, wells, springs)
* For each surface water source, how many intakes are available? How many depths are available to draw water from?
* Explain any interconnections you have with other systems and conditions and/or limitations when using them.

Enter information about source water options.

### Treatment Process

Describe your treatment process, in the order that the water is treated and/or include a treatment schematic. Please discuss any competing priorities.

Enter information about treatment process. Include a schematic below.

### Routine Water Quality Monitoring

For all of your available source waters, list (Table 1) any routine source water quality monitoring that your water utility and/or others that you know of (e.g., environmental agencies, U.S. Geological Survey (USGS), academic institutions, volunteer organizations) conducts or has recently conducted. Also consider contacting your state, as you deem appropriate, to determine if additional monitoring is occurring in your source waters.

If you think another group or agency may be monitoring but you do not know the details, write down what you know or you think may be true. As much as possible, provide information about:

* Which water quality parameters are/were monitored
* Monitoring locations
* Monitoring frequency
* How readily available the data is on an ongoing basis
* How reliable the results are (e.g., trained monitoring staff, QA plan, certified laboratory)
* How quickly current monitoring results can be made available to you

Enter any water quality monitoring information.

***Table 1. Source Water Quality Monitoring Information***

| **Parameter** | **Location** | **Frequency** | **Who Collects Sample?** | **Who Does Analysis?** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |

Enter Treatment Plant Schematic Heading

Enter treatment plant schematic.

# Step 1: Assess Source Water

Evaluating available data on source water supports making a weight of evidence determination about the vulnerability to cyanotoxins. If a public water system determines that its source water is vulnerable, the water system proceeds to [Step 2](#Step2). If a public water system determines its source water is not vulnerable to cyanotoxins, the water system may want to consider periodically reassessing its source water as watershed characteristics could change over time.

## 1.1 Identify Source Water Protection Areas

A source water assessment is an evaluation of a drinking water source to determine its susceptibility to contamination. The first step of any source water assessment is to delineate (map) the areas of water and land that drain into the water supply that are to be evaluated for contaminant sources. This is called the Source Water Protection Area.

Delineate your Source Water Protection Area and describe the methods and resources used to do so.

How to delineate your Source Water Protection Area:

State resources

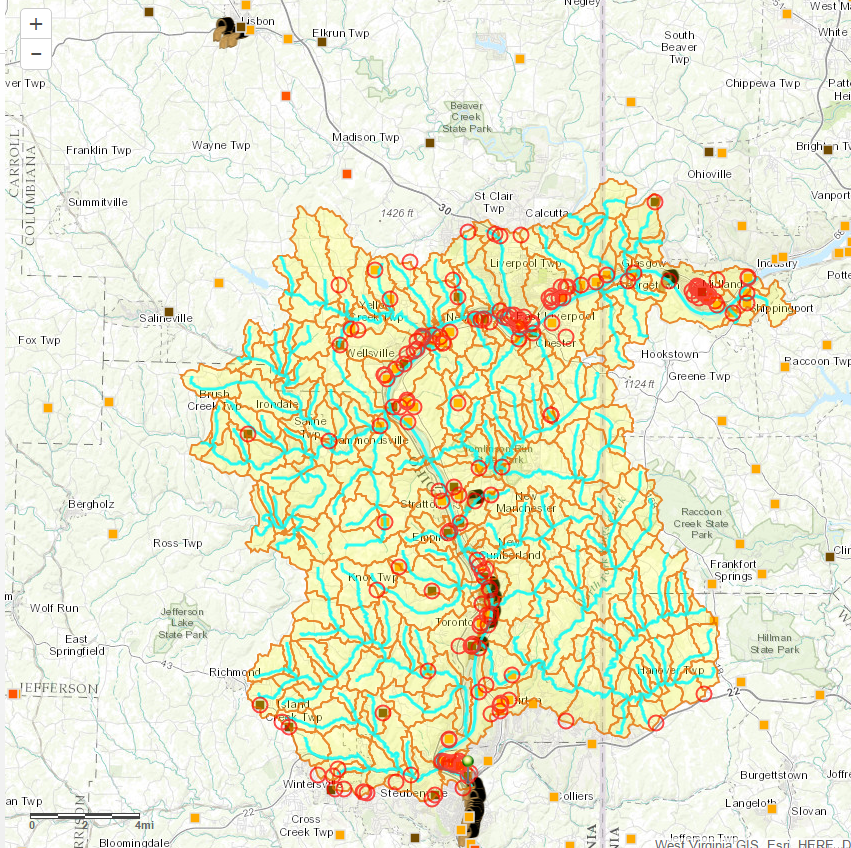
* States completed Source Water Assessments in the early 2000s, which delineate Source Water Protection Areas for each system in the state. You can access your state’s Assessment and Service Planning Area maps by [contacting your state’s source water staff](http://www.asdwa.org/index.cfm?fuseaction=Page.ViewPage&PageID=794). Please note information may have changed since their original development although some Source Water Assessments may have been updated.
* Many states have online mapping tools for Source Water Protection Areas.

Enter available state resources and source water protection area information.

Drinking Water Application to Protect Source Waters (DWMAPS)

* [DWMAPS](https://epamap37.epa.gov/dwmaps/) is a tool to help you quickly delineate a source water protection area based on mean water flow. Use the “Upstream” toolbar in DWMAPS to select your system’s location and trace catchments upstream. You can trace your Service Planning Area based on:
  + *Time of travel*, e.g., 24 hours by mean flow from the stream reach. This method is useful for timing bloom response.
  + *Fixed distance*, e.g., 15 miles along streamline, or 15 miles of setback around an intake. While not technically sophisticated, this method is easy to implement.
  + *Modeling* uses surface runoff models to estimate the pathway of pollutants during rainfall and from point source outfalls. DWMAPS does not model specific pollutants.
* Zone of Concern
  + Some states use a tiered zoning approach to map their source water protection areas. For example, water systems in the Ohio River Valley Water Sanitation Commission define multiple zones: the least critical zone is the entire Ohio River Basin and the most critical is all catchments within ¼ mile upstream of an intake. You can use DWMAPS or other modeling tools to quickly delineate zones of concern.

Map 1: Delineation of source water protection area (yellow) based on 24 hours’ time of travel, DWMAPS



Enter Source Water Protection Area delineation methods.

Enter description of map. A map can be created using DWMAPS (<https://www.epa.gov/sourcewaterprotection/dwmaps>) or other available mapping programs. For use of DWMAPS, navigate DWMAPS extent to the water systems intake location. Click Layers button in top right selection panel. Click the check box next to Catchments layer under Hydrography and Watersheds section. Click Legend button in top right selection panel. Use Snipping Tool application to extract map to JPEG file. A DWMAPS [user guide](https://epamap37.epa.gov/dwmaps/help/DWMAPS_userguide_public.pdf) is also available to assist in creating maps.

Enter Map Heading

Insert map image.

## 1.2 Create Inventory of HABs Risk Factors

The next step is to create an inventory of possible HABs risk factors within your source water protection area(s). An example of a table of risk factors created by a utility is provided following the discussion on risk factors in Table 2. Information on the following factors can help you determine if and when blooms may occur.

### Source Water Characteristics

In general, fast flowing, nutrient-poor rivers are less vulnerable to HABs than nutrient-rich lakes and reservoirs. You may also consider factors such as vertical stratification, light intensity, wind patterns and mixing (see Appendix A of [*Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*](https://www.epa.gov/sites/production/files/2015-06/documents/cyanotoxin-management-drinking-water.pdf) for more information).

* Is your source water ground or surface water?
* Is it fast-flowing, slow-moving or still water?
* Is it nutrient (phosphorus and nitrogen) rich?

To investigate source water characteristics:

*If needed, consult your state water quality office, local monitoring data from nearby utilities or federal databases for source water information.*

* *Useful resources include Source Water Assessments and Lake Management Plans, as well as Clean Water Act 303(d) and 305(b) Integrated Reports, Nonpoint Source Management Plans and 319 grant proposals, and Total Maximum Daily Load (TMDL) analyses. For example see* [*DWMAPS*](https://epamap37.epa.gov/dwmaps/) *or* [*WATERS*](https://www.epa.gov/waterdata/waters-watershed-assessment-tracking-environmental-results-system)*.*
* *National Hydrography Dataset (*[*NHDPlus*](http://www.horizon-systems.com/NHDPlus/NHDPlusV1_tools.php)*) provides information on surface water and watershed characteristics.*

For each source, identify any limitations to using that source (e.g., water quantity, water quality, operational limitations, permit restrictions, costs).

Enter general information about source water type and include any source water limitations.

Describe or map land use within the watershed.

*Evaluate land use using* [*DWMAPS*](https://epamap37.epa.gov/dwmaps/) *or another tool to view the National Land Cover Dataset (NLCD) or other land use classification tools. NLCD uses satellite data to classify land cover across the United States by 16 land use types. Use NLCD to determine where agriculture (hay/pastureland, cultivated crops) or urban development may affect your source water.*

Enter a description of land use within the watershed.

### Water Quality Parameters

Water quality parameters can help to determine if the source water has had a history of blooms. Parameters to look for include:

* Cyanobacterial cell counts (including dominant cyanobacterial species)
* Nitrogen and phosphorus levels
* Chlorophyll-*a* levels
* Phycocyanin levels
* Zebra mussel population
* Fish kills due to hypoxia
* Presence of blooms and scums on the water

*To investigate water quality:*

* *Search water quality databases, outlined here:* [*http://sourcewatercollaborative.org/assess-protect-drinking-water-sources/find-data-in-my-area/*](http://sourcewatercollaborative.org/assess-protect-drinking-water-sources/find-data-in-my-area/)*.*
* *Useful resources include Source Water Assessments and Lake Management Plans, as well as Clean Water Act 303(d) and 305(b) Integrated Reports.*
* *If needed, consult your state water quality office for more information about local monitoring data from nearby utilities, water quality volunteer or academic institutions and for additional information about federal databases for water quality data.*

Provide a brief explanation of historical algae, cyanobacteria and cyanotoxin events in your source water. Describe any information used to conduct your evaluation.

Enter information on historical algae, cyanobacteria and cyanotoxin events in source water. Include predominant species of algae and/or cyanobacteria when possible.

### Point Sources of Nutrients and Other Contaminants

It is important to inventory all potential sources of contamination discharging into your source water. This inventory can point to critical HABs contributors.

Point sources of phosphorus and nitrogen can include:

* + Permitted dischargers of nutrients under the National Pollutant Discharge Elimination System (NPDES)
  + Publically owned treatment works
  + Combined sewer overflows

*To create an inventory:*

1. *Use* [*DWMAPS*](https://epamap37.epa.gov/dwmaps/) *(Geographic Information System or GIS) layers or “Upstream” toolbar) to locate NPDES dischargers and publically owned treatment works. DWMAPS is synchronized with EPA’s* [*Enforcement and Compliance History Online*](https://echo.epa.gov/?redirect=echo)*, which tracks facilities that have violated permit limits and may discharge excessive nutrients into your source water*
2. *Use EPA’s* [*Discharge Monitoring Report*](http://cfpub.epa.gov/dmr/) *database for more detailed facility information on small and large NPDES dischargers and treatment plants*

Describe point sources of nutrients and other contaminants.

Enter any point sources of pollution, specifically sources of phosphorus and nitrogen.

### Nonpoint Sources of Nutrients and Other Contaminants

Nonpoint sources can include:

* Agricultural uses including animal and crop production (manure, pesticide and fertilizer) runoff
* Urban stormwater or domestic runoff
* Failing septic systems
* Landfills/dumps
* Atmospheric deposition

*To create an inventory:*

* *Useful state resources include Source Water Assessments and Lake Management Plans, as well as Clean Water Act 303(d) and 305(b) Integrated Reports and Total Maximum Daily Load information.*
* *EPA’s* [*Nitrogen and Phosphorus Data Access Tool*](http://gispub2.epa.gov/npdat/) *displays nutrient data by watershed across the U.S., combining metrics from USEPA and USGS research programs.*

Describe nonpoint sources of nutrients and other contaminants.

Enter any nonpoint sources of pollution, specifically sources of phosphorus and nitrogen.

### Climate and Weather

Warm ambient and source water temperatures, heavy rainfall and runoff, drought and calmer wind often favor bloom growth. The climate of your geographic location can also impact temperature, stratification and turbulence in the water column, which affects bloom timing and occurrence. Research your area’s bloom history and consult with other water systems to track climatic and temporal patterns.

Describe the climate and typical weather conditions in your area.

Include descriptions of precipitation and temperature throughout the year.

Enter climate and weather conditions.

### Other Source Water Management Activities

Describe any source water management activities such as an active watershed management program or other protection and improvement activities underway in your source waters. Include a description of how your water utility’s interests are represented by these efforts (if represented).

Briefly describe source water protection efforts being carried out in your watershed (e.g., agricultural best management practices, conservation easements, streambank restoration, storm water runoff controls, wastewater treatment plant upgrades, environmental education and outreach) and who is making those efforts.

Enter a description of watershed management program.

Describe any previously implemented (or current implementation) of source water protection activities (perhaps derived from your last source water assessment).

Explain if you have any partners in these efforts, what the expected outcomes were, how the activities were financed and if there are any additional activities planned.

Enter information about your source water protection activities.

## 1.3 Assess Vulnerability

A weight of evidence approach can be used to determine if the source water is vulnerable to HABs based on source water characteristics and HABs risk factors. Possible methods to evaluate vulnerability include*:*

* Build off of your inventory from [Step 1.1](#Step11) and [Step 1.2](#Step12) and assign risk “rankings” compared to risk-reducing “rankings” for the watershed. As an example, The California Drinking Water Source Assessment and Protection Program outlines this method for quantifying your Susceptibility [here](http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/DWSAPGuidance.shtml). Examples are shown in [Table 2](#TempTable2) below.

Enter a description of source water vulnerability including whether or not the source water has be determined to be vulnerable to HABs. See Section 1 and Appendix A of USEPA’s [*Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*](https://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations)*.*

If you have determined that your source water is vulnerable go to [Step 2](#Step2).

Table 2: Example of an Inventory of HABs Risk Factors from a Utility Evaluation

| **HABs Risk Factor** | | **Measure** | **Data Source** | **Risk Ranking** | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Source Water Characteristics | | | |  |  |
| Source Water Type | | Lake/Reservoir | USGS NHDPlus |  | | |
| Mean Surface Water Temperature (F) | | Lower Arm ~75º (24ºC) (July-August) | [CA Department of Water Resources](http://www.co.lake.ca.us/Assets/WaterResources/Clear+Lake/Clear+Lake+Average+Water+Temperature.pdf) | High | | |
| Water Body Depth (ft.) | | Lower Arm Mean: 33.8 ft.; intake depth 15-20 ft. | [Clear Lake Report (2020)](http://celake.ucanr.edu/files/132447.pdf) | High | | |
| Vertical Stratification | | Well-mixed; few occurrences of sustained stratification | Clear Lakes Report (2010) | Low | | |
| Residence Time | | 4.5 years, relatively short | Water Resources Department of the Lake County Department of Public Works | Low | | |
|  | Water Quality Parameters | | | |  |  |
| Cyanobacteria Occurrence | | *Microcystis*, *Anabaena* and *Aphanizomenon*, *Lyngbya* | Horne, 1975; Richerson et al., 1994; Mioini, 2011 | High | | |
| Cyanotoxin Levels (µ/L) | | Lower Arm: .52 anatoxin-a (2010) | Mioni, 2011 | High | | |
| CWA 303(d) Impairment Status | | Impaired, Nutrients (1986); Nutrient TMDL (2006) | USGS SPARROW (2002 model for Lower Mississippi) | Medium | | |
|  | Point Sources | | | |  |  |
| Point Sources of Nutrients | | Lake County Stormwater Permittees; California Department of Transportation (Caltrans): 2,100 kg phosphorus TMDL discharge limit | Clear Lake Nutrient TMDL (2006) | Low | | |
|  | Nonpoint Sources | | | |  |  |
| Nonpoint Sources of Nutrients | | Bureau of Land Management, the United States Department of Agriculture’s Forest Service, irrigated agricultural dischargers, and Lake County; 85,000 kg TMDL discharge limit | Clear Lake Nutrient TMDL (2006) | High | | |
|  | Climate and Weather Conditions | | | |  |  |
| Ambient temperature Fº, May-September | | Range: high average 92º, low average 45º | NOAA National Weather Service | High | | |
| Drought Risk | |  | U.S. Drought Monitor | Medium | | |

# Step 2: Preparation, Monitoring for Early Warning Signs and Immediate Actions

## 2.1 Preparation

You have determined that **[Your Water System]** is potentially vulnerable to cyanotoxins. Possible next steps include preparing for possible cyanobacterial blooms and cyanotoxin occurrence. A water system can prepare by: determining when blooms are most likely to occur, contingency planning in the event alternative sources of water are needed, evaluating the current treatment process to determine susceptibility and vulnerabilities, communication with other water utilities with the same source water, monitoring source waters, preparing for treatment adjustments and ordering necessary laboratory equipment, or establishing contracts with outside laboratories. Preparation can also involve establishing communication plans in order to be prepared for any public communication as appropriate or required by the state. Preparation can also include establishing and documenting sampling procedures, testing procedures and quality assurance procedures.

### Prepare Staff and Equipment for Monitoring

For tips on monitoring and sampling see Sections 2.2, 3.1, 4.1, 5.1 and Appendix A of USEPA’s [*Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*](https://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations)*,* USEPA’s [*Online Source Water Quality Monitoring for Water Quality Surveillance and Response Systems*](https://www.epa.gov/sites/production/files/2016-09/documents/online_source_water_monitoring_guidance.pdf)*,* and American Water Works Association (AWWA) and Water Research Foundation (WRF)’s [*Managing Cyanotoxins in Drinking Water: A Technical Guidance Manual for Drinking Water Professionals*](http://www.waterrf.org/PublicReportLibrary/4548b.pdf)*.* Preparing for monitoring can involve preparing your utility lab for monitoring, such as ordering necessary supplies. It can also involve setting up contract labs, as appropriate, prior to bloom season in order to allow for rapid monitoring response if a bloom has occurred.

[Your Water System] will carry out the following activities in order to be prepared for the monitoring steps described in this plan:

Enter monitoring preparation steps.

### Prepare Treatment Adjustments

For tips on treatment adjustments see Sections 2.4, 3.3, 4.3, 5.3 and Appendix E of USEPA’s [*Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*](https://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations)*,* USEPA’s *Water Treatment Optimization for Cyanotoxins* and Section II of AWWA and WRF’s [*Managing Cyanotoxins in Drinking Water: A Technical Guidance Manual for Drinking Water Professionals*](http://www.waterrf.org/PublicReportLibrary/4548b.pdf)*.*

[Your Water System] will carry out the following activities in order to be more prepared to treat its source water during a HAB:

Enter treatment preparation steps.

### Communications

For tips on communication see Sections 2.3, 3.2, 5.2 and Appendix D of USEPA’s [*Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*](https://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations), USEPA’s [Drinking Water Cyanotoxin Risk Communication Toolbox](https://www.epa.gov/ground-water-and-drinking-water/cyanotoxins-drinking-waterr), Section IV of AWWA and WRF’s [*Managing Cyanotoxins in Drinking Water: A Technical Guidance Manual for Drinking Water Professionals*](http://www.waterrf.org/PublicReportLibrary/4548b.pdf)and Centers for Disease Control’s [*Drinking Water Advisory Communication Toolbox*](http://www.cdc.gov/healthywater/emergency/dwa-comm-toolbox/)*.*

### Establish Communication Plan with Other Source Water Users

Describe any utilities using the same source water as your utility.

Do you communicate with one another? Do you have an organized method for communicating? Are there specific reasons or conditions when you contact one another? Explain briefly.

Enter a description of interactions with other neighboring utilities or other source water users.

### Communication with Stakeholders

[Your Water System] will carry out the following activities in order to be more prepared for the communications steps described in this plan:

*Do you have any pre-prepared public communication materials? Do you have a method for communicating with stakeholders?*

Enter communication preparation steps.

## 2.2 Monitoring for Early Warning Signs

Based on historical blooms in [insert source water source], there may be a time of year and other conditions that prompt you to watch closely for signs of blooms. Early indicators, like challenges to normal treatment schedules or changes in other water quality parameters, can serve as early warning signs of impending blooms. Early warning signs that operators can look for during the system’s normal operation are identified in this section, including routine water quality monitoring, as well as follow-up activities if any of the early warning signs are observed.

### Early Indicators of a Cyanobacterial Bloom

Describe specific conditions related to your source water or treatment system that are early indicators of a cyanobacterial bloom.

(Some examples could include: reduced Secchi disk depth in source water, increased turbidity, color change, taste and odor complaints, geosmin and/or MIB (2-methylisoborneol) occurrence, shortened filter run times, increased disinfectant demand, weakening thermocline, cyanobacteria detects, toxin-producing cyanobacterial gene detects (quantitative polymerase chain reaction (qPCR)), increased cyanobacterial biomass and/or cell counts, changes in cyanobacteria/algae community composition, cyanotoxin detects, phycocyanin and chlorophyll-a)

Enter any early indicators of a cyanobacterial bloom that you have noticed in the source water.

## 2.3 Immediate Actions if a Bloom is Suspected

### Monitoring Actions in Response to Early Warning Signs

Describe monitoring actions to take in response to early warning signs.

Enter sampling actions, if any, that will be taken.

Describe additional immediate observation/monitoring steps to take if any of the early warning signs identified above are detected.

Enter any additional sampling or monitoring actions including water type and methods. Include any language about the transition to Step 3 and/or Step 4, if applicable as an immediate action.

### Treatment Adjustments in Response to Early Warning Signs

Describe immediate treatment adjustments (if any) to make if a cyanobacterial bloom is beginning to take place in your source water.

Enter treatment adjustments, if any, that will occur. Include any language about the transition to Step 3 and/or Step 4, if applicable as an immediate action.

### Communication Actions in Response to Early Warning Signs

Describe immediate communication actions (if any) to take if cyanobacteria are identified in source water sample(s) including those that are potential cyanotoxin producers.

Enter communication actions, if any, that will be taken.

### Source Water Mitigation Actions in Response to Early Warning Signs

Describe the use, either by you or anyone else, of algaecides, coagulants or other chemicals to treat your source water before it enters your treatment plant. Include details on what treatment is used, how often and under what conditions. (Note, waterbody management strategies, such as algaecides or introduction of predator species, may have downstream unintended consequences. State regulations may also apply.)

Enter list of source water mitigation activities, if any.

# Step 3: Raw Water Cyanotoxin Monitoring and Treatment Adjustments

If a cyanobacterial bloom is observed or inferred during [Step 2](#Step2), **[Your Water System]** begins sampling.

In cases where raw water monitoring ([Step 3](#Step3)) is determined necessary by visual confirmation of blooms near the intake (for example microscopically confirmed cyanobacteria) or other indications of a bloom near the intake, the public water system may want to consider continuing raw water sampling until the bloom is no longer visually identifiable or indicators are no longer observed.

A water system may want to communicate with some of its stakeholders and adjust treatment or system operations based on raw water monitoring cyanotoxin results.

## Monitoring if Cyanobacteria are Identified or Suspected

Describe monitoring actions to take if cyanobacteria are identified or suspected in source water located near the intake.

Enter raw water monitoring actions and methods used.

## Operational Adjustments Based on Raw Water Cyanotoxin Measurements

Describe operational adjustments to make to your treatment (if any) based on source water cyanobacteria or raw water cyanotoxin measurements.

Enter a description of operational treatment adjustments, if any.

## Communications Based on Raw Water Cyanotoxin Measurements

Describe communication actions to take if cyanotoxins are detected in the raw water.

Enter communication actions, if any.

If monitoring results indicate the presence of cyanotoxins in the raw water, **[Your Water System]** continues to [Step 4](#Step4).

Enter a description of how quickly the system will move to [Step 4](#Step4).

If no cyanotoxins are found in the raw water, **[Your Water System]** intends to continue to monitor or watch closely for blooms ([Step 2](#Step2)).

# Step 4: Finished Water Cyanotoxin Monitoring and Treatment Adjustments

Detecting and positively confirming cyanotoxins in the finished water indicates that cyanotoxins have broken through the treatment barriers. It is important to evaluate the performance of individual unit processes across the treatment train to help understand what is happening in the treatment train and identify possible treatment breakdown. Public water systems likely will want to continue implementing treatment strategies described in Steps [2](#Step2) or [3](#Step3) and consider further testing and adjustments to improve treatment performance.

## Finished Water Cyanotoxin Monitoring

Describe finished water monitoring including which methods will be used.

Enter monitoring steps and methods used.

Describe what additional monitoring will occur if cyanotoxins are not found in finished water including any monitoring to occur in the source or raw water.

Enter additional monitoring your system will carry out, if any.

## Treatment Adjustments

In addition to the treatment adjustments listed in [Step 3](#Step3), describe what additional treatment steps will occur.

Enter additional treatment steps, if any.

## Communications

Describe what communications [Your Water System] will carry out if cyanotoxins are present in finished water.

Enter communication activities, if any.

If cyanotoxins were detected in any of the entry point or distribution system samples, **[Your Water System]** proceeds to [Step 5](#Step5).

# Step 5: Continued Finished Water Cyanotoxin Monitoring, Treatment Adjustments and Public Communication

[Step 5](#Step5) can contain communication actions, treatment actions and additional monitoring based on the concentrations of cyanotoxins found in the finished water. Having clearly described actions in this fifth step enables a public water system to act quickly if cyanotoxins are confirmed in its finished water.

## Continued Finished Water Cyanotoxin Monitoring

Describe what additional monitoring steps [Your Water System] will take if cyanotoxins are detected in the finished water including which methods will be used.

Enter monitoring steps and methods you intend to use.

* Include any toxin levels that [Your Water System] will use to decide whether to conduct additional cyanotoxin sampling.
* Include analytical method that [Your Water System] will use when having additional samples analyzed.

Analyses carried out by the laboratory are typically considered more reliable tests than those carried out using test strips and therefore, are useful when confirmation samples need to be taken to inform management decisions.

Enter a description of the toxin level that would indicate a need for additional sampling and describe the additional sampling and which method will be used.

Describe what monitoring steps [Your Water System] will take if the additional sampling does not detect cyanotoxins.

Enter monitoring steps.

## Treatment and Operations

Describe any treatment steps [Your Water System] will take.

Enter treatment adjustments or additions, if any.

## Communications

Describe any communication steps [Your Water System] will take if any of the distribution system samples or the entry point sample(s) tested during additional sampling are at or exceed any established toxin levels.

Enter communication steps, if any, and include with who and when communication will take place. Include communication action items based on level of cyanotoxins detected, if any.

Describe any communication steps [Your Water System] will take if the additional sample results for all the samples are below an established toxin level in the entry point to the distribution system or in the distribution system.

Enter communication steps, if any, and include communication action items based on levels of cyanotoxins detected, if any.

Describe any communication steps [Your Water System] will take if all of the additional sample results for all samples show no cyanotoxin detects.

Enter communication steps, if any.

# Long-Term Activities

Describe any long-term plans for prevention, mitigation and management of the risks to drinking water from HABs such as treatment and monitoring activities, source water protection and mitigation activities and enhanced coordination with stakeholders.

Enter any long-term activities.

Appendix A  
Cyanotoxin Management Flowchart

This is a flowchart depicting the actions to monitor cyanotoxin occurrence and minimize exposure. 

Appendix B  
Contacts and Stakeholder Information

Provide names and contact information (office and mobile phone numbers, email address, affiliation) for the most appropriate contacts. Names may be repeated if the person will serve more than one role.

## Laboratory Contact Information

Enter your laboratory’s name, phone number and any other contact information that will be needed to contact the lab in case of an occurrence of HABs.

## Stakeholders

Not all cyanotoxin management plans are the same, but the basic concepts of designing a plan are similar to those of other environmental or sustainability programs. For any plan to be successful it is important to involve utility management, the utility employees and all interested stakeholders early and often. A joint management/employee/stakeholder committee could be used to ensure the plan is implemented correctly. Examples of stakeholders include: primacy agency, local officials, emergency managers, other government agencies such as health departments, nearby public water systems and hospitals.

| Agency/Company | Position | Contact Name | Contact Phone | Contact Email |
| --- | --- | --- | --- | --- |
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Appendix C  
Notifying the Public of Cyanotoxins in their Water

At the time of publication of this document, public water systems are not currently required to notify their customers of any bloom or cyanotoxin occurrence and are not required to include detections as part of a system’s Consumer Confidence Report under any National Primary Drinking Water Regulations. Systems should consider consulting with their state or primacy agency to determine if they are subject to any state or tribal notification requirements. Although not currently required by federal regulations, water systems may want to consider communicating with their consumers if cyanotoxins in finished water are confirmed in additional samples. This communication may be received more positively if the water systems have engaged in prior communication with the public about HABs. A water system is encouraged to tailor its communications based on the cyanotoxin levels detected.

In fall 2016, the USEPA released the drinking water cyanotoxin risk communication toolbox. This toolbox is a ready-to-use, “one-stop-shop” to support public water systems, states and local governments in developing, as they deem appropriate, their own risk communication materials. It includes editable worksheets, press release templates, social media posts and other quick references. The materials focus on communicating risk and providing background information to the public prior to and during a drinking water cyanotoxin contamination event as well as general information on harmful algal blooms and cyanotoxins. For the full toolbox please see USEPA's [Cyanotoxin Risk Communication Toolbox](https://www.epa.gov/ground-water-and-drinking-water/cyanotoxins-drinking-waterr). Below are some sample templates from that toolbox that are ready-to-use for cyanotoxin Drinking Water Advisories. Brackets ( [ ] ) are included as prompts to fill in system-specific information. There are three template options available, one for each of the following scenarios, when toxin levels[[1]](#footnote-1) in finished drinking water are:

* Greater than the USEPA’s Health Advisory level for everyone, meaning levels are greater than both the Health Advisory levels for infants and young children under the age of six and those for children six years and older through adults;
* Greater than the USEPA’s Health Advisory level for infants and young children under the age of six, but less than or equal to the Health Advisory level for children six years and older through adults;
* Less than or equal to the USEPA’s Health Advisory level for everyone, meaning levels are less than or equal to Health Advisory levels for infants and young children under the age of six and therefore they are also less than the Health Advisory levels for children six years and older through adults.

As means of an example, the USEPA’s Health Advisory levels for microcystins and cylindrospermopsin are used as cyanotoxin levels that inform public communication decisions in these Drinking Water Advisories. Materials can be edited to include any information determined appropriate by states and public water systems such as different cyanotoxin levels that inform public communication decisions.

# DRINKING WATER ADVISORY

**[CYANOTOXIN NAME] is present in [WATER SYSTEM NAME]**

**DO NOT DRINK THE TAP WATER**

**[Date issued]**

**Why is there an advisory?**

* [Cyanotoxin name], a toxin produced by cyanobacteria (formerly known as blue-green algae) was detected in the drinking water from [System name] on [date].
* Elevated levels of toxins have been detected in [source name] that supplies water to [geographic area, cities, counties, distribution system segments, etc.].
* [System name] is taking the following actions to reduce [cyanotoxin name] levels: [list actions such as: adjusting treatment, changing source, etc.].
* Samples collected on [dates] show [cyanotoxin name] in the drinking water at [levels and/or ranges], which are above the U.S. Environmental Protection Agency’s [cyanotoxin name] national drinking water Health Advisory of [level].

**What should I do?**

* **Do Not Drink the tap water.**
* **[Alternative sources of water] should be used for drinking, making infant formula, making ice and preparing food and beverages.**
* **Do Not Boil the tap water.** Boiling the water will not destroy cyanotoxins and may increase the toxin levels.
* Everyone may use tap water for showering, bathing, washing hands, washing dishes, flushing toilets, cleaning and doing laundry. However, infants and young children under the age of six should be supervised while bathing and during other tap water-related activities to prevent accidental ingestion of water.
* Drinking water containing [cyanotoxin name] at levels exceeding the national drinking water Health Advisories can put you at risk of various adverse health effects including upset stomach, vomiting and diarrhea as well as liver and kidney damage. Seek medical attention if you or family members are experiencing illness.
* Animals may be vulnerable to adverse health effects of [cyanotoxin name] at the detected levels indicated above; consider providing animals alternative sources of water. Contact a veterinarian if animals show signs of illness.
* If you, your family members or your animals have experienced adverse cyanotoxin-related health effects, please contact [State or local Health Department] to report the illness.

**What is being done?**

* [System name] is working closely with local and state public health and emergency response agencies to address the situation and to quickly to reduce [cyanotoxin name] levels in tap water.
* [System name] will post an updated advisory when: the [cyanotoxin] levels are less than or equal to the national drinking water Health Advisories, this Do Not Drink Advisory is lifted and/or if there are any changes to the conditions of this Do Not Drink Advisory.
* For more information please contact [contact information] or visit [website].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools and businesses). You can do this by posting this notice in a public place or distributing copies by hand.

This notice is being sent to you by [system]. State Water System ID#: \_\_\_\_\_\_\_\_\_\_\_ Date distributed: \_\_\_\_\_\_

# DRINKING WATER ADVISORY

**[CYANOTOXIN NAME] is present in [WATER SYSTEM NAME]**

**INFANTS, YOUNG CHILDREN AND OTHER VULNERABLE POPULATIONS: DO NOT DRINK THE TAP WATER**

**[Date issued]**

**Why is there an advisory?**

* [Cyanotoxin name], a toxin produced by cyanobacteria (formerly known as blue-green algae), was detected in the drinking water from [System name] on [date].
* Elevated levels of toxins have been detected in [source name] that supplies water to [geographic area: cities, counties, distribution system segments, etc.].
* [System name] is taking the following actions to reduce [cyanotoxin name] levels: [list actions such as adjusting treatment, changing source, etc.].
* Samples collected on [dates] show [cyanotoxin name] in the drinking water at [levels and/or ranges], which are above the U.S. Environmental Protection Agency’s [cyanotoxin name] national drinking water Health Advisory for vulnerable populations (listed below) of [level].

**What should I do?**

* **The following vulnerable populations should Not Drink the tap water because they may be vulnerable to the effects of [cyanotoxin name]:** 
  + Infants,
  + Young children under the age of six,
  + Pregnant women and nursing mothers,
  + Those with pre-existing liver conditions,
  + Those receiving dialysis treatment, and
  + As a precautionary measure, the elderly and other sensitive populations should consider following these advisory instructions.
* **Vulnerable populations, listed above, should use [alternative sources of water] for drinking, making infant formula, making ice and preparing food and beverages.**
* **Do Not Boil the tap water.** Boiling the water will not destroy toxins and may increase the toxin levels.
* Individuals not considered to be in the vulnerable category, as listed above, may drink the water.
* Everyone may use tap water for showering, bathing, washing hands, washing dishes, flushing toilets, cleaning and doing laundry. However, infants and young children under the age of six should be supervised while bathing and during other tap water-related activities to prevent accidental ingestion of water.
* Vulnerable populations, as listed above, who drink water containing [cyanotoxin name] at levels exceeding the national drinking water Health Advisories are at risk of various adverse health effects including upset stomach, vomiting and diarrhea as well as liver and kidney damage. Seek medical attention if you or family members are experiencing illness.
* Animals may be vulnerable to adverse health effects of [cyanotoxin name] at the detected levels indicated above; consider providing animals alternative sources of water. Contact a veterinarian if animals show signs of illness.
* If you, your family members, or your animals have experienced adverse cyanotoxin-related health effects, please contact [State or local Health Department] to report the illness.

**What is being done?**

* [System name] is working closely with local and state public health and emergency response agencies to address the situation and quickly reduce [cyanotoxin name] levels in tap water.
* [System name] will post an updated advisory when: the [cyanotoxin] levels are less than or equal to the national drinking water Health Advisories, this Do Not Drink Advisory is lifted and/or if there are any changes to the conditions of this Do Not Drink Advisory.
* For more information please contact [contact information] or visit [website].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools and businesses). You can do this by posting this notice in a public place or distributing copies by hand.

This notice is being sent to you by [system]. State Water System ID#: \_\_\_\_\_\_\_\_\_\_\_ Date distributed: \_\_\_\_\_\_

# DRINKING WATER ADVISORY LIFTED

**for [WATER SYSTEM NAME]**

**Everyone May Drink the Tap Water**

**[Date issued]**

**Why is the advisory lifted?**

* Drinking water advisory issued on [date] for [System name] that supplies water to [geographic area: cities, counties, distribution system segments, etc.] has been lifted.
* Samples collected on [dates] shows [cyanotoxin name] in the drinking water at [levels and/or ranges], which are [less than or equal to] the U.S. Environmental Protection Agency’s [cyanotoxin name] national drinking water Health Advisory of [level].
* [System name] took the following actions to reduce [cyanotoxin name] levels: [list actions such as adjusting treatment, changing source, etc.].

**What should I do?**

* **Everyone may resume using the tap water for all uses.**
* [Insert any suggested activities for customers when resuming consumption of their tap water].
* [Insert any actions taken by public water supply to reduce risks of cyanotoxins in drinking water in the future].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools and businesses). You can do this by posting this notice in a public place or distributing copies by hand.

This notice is being sent to you by [system]. State Water System ID#: \_\_\_\_\_\_\_\_\_\_\_ Date distributed: \_\_\_\_\_\_

1. The U.S. Environmental Protection Agency’s Health Advisory levels are the following: less than or equal to 0.3 micrograms per liter for microcystins and less than or equal 0.7 micrograms per liter for cylindrospermopsin in drinking water for children under the age of six years old. Children six years and older through adults, the recommended Health Advisory levels for drinking water is less than or equal to 1.6 micrograms per liter for microcystins and less than or equal 3.0 micrograms per liter for cylindrospermopsin. [↑](#footnote-ref-1)