

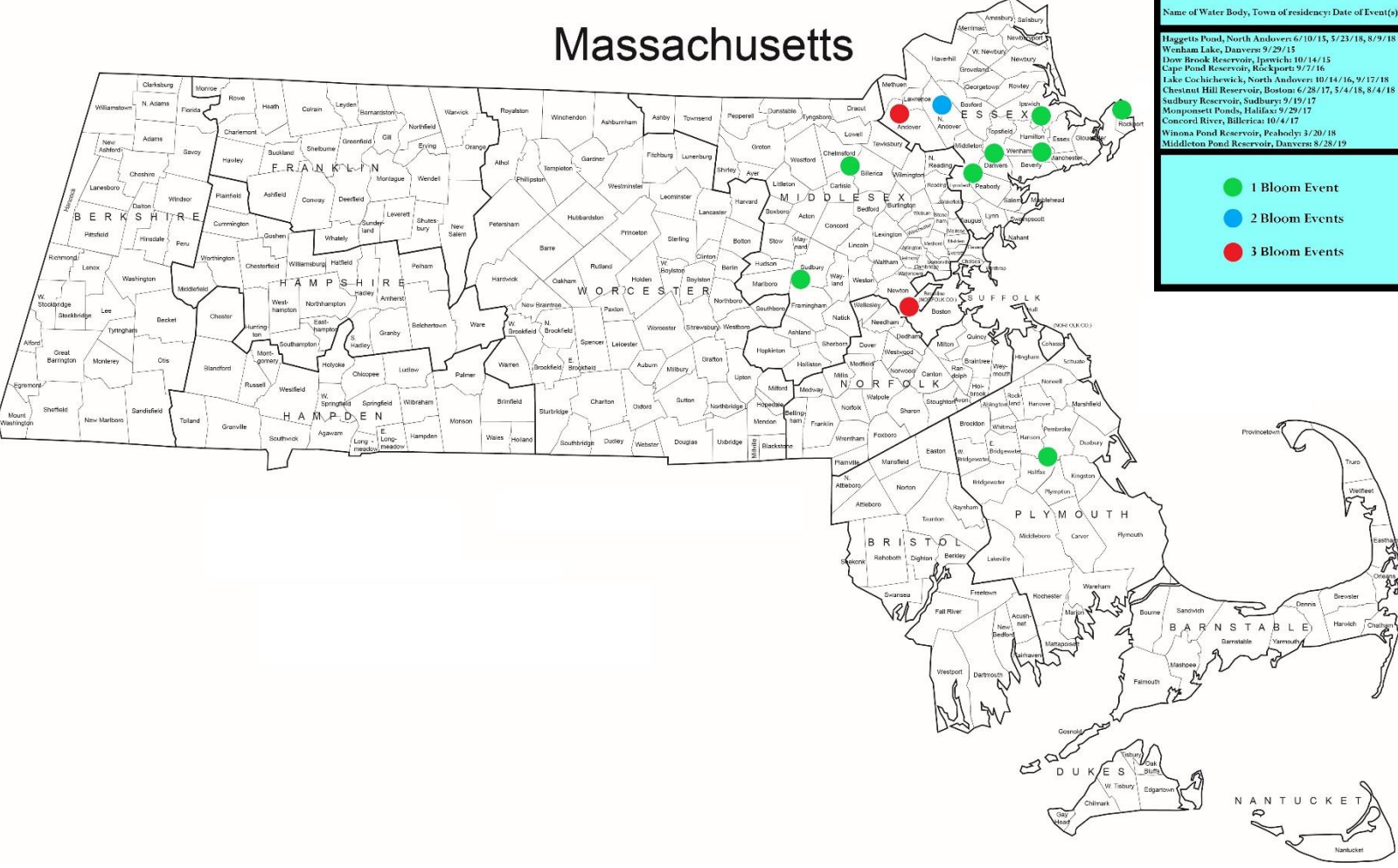
A History of Cyanobacteria Events in Massachusetts

Massachusetts

Name of Water Body, Town of residency: Date of Event(s)

Haggets Pond, North Andover: 6/10/15, 5/23/16, 8/9/18
 Wenham Lake, Danvers: 9/29/15
 Dow Brook Reservoir, Ipswich: 10/14/15
 Cape Pond Reservoir, Rockport: 9/7/16
 Lake Cochichewick, North Andover: 10/14/16, 9/17/18
 Chestnut Hill Reservoir, Boston: 6/28/17, 5/4/18, 8/4/18
 Sudbury Reservoir, Sudbury: 9/19/17
 Monponsett Ponds, Halifax: 9/29/17
 Concord River, Billerica: 10/4/17
 Winona Pond Reservoir, Peabody: 3/20/18
 Middleton Pond Reservoir, Danvers: 8/28/19

- 1 Bloom Event
- 2 Bloom Events
- 3 Bloom Events



Introduction to Bloom Events in Massachusetts

During the 2014 cyanobacteria bloom in Lake Erie, the water supplier for Toledo, Ohio was forced to cut off the city's water supply. This incident left the city's 400,000 citizens without drinking water for the weekend. This event prompted the Environmental Protection Agency (EPA) to include cyanotoxins in its Fourth Unregulated Contaminant Monitoring Rule (UCMR4) which required PWSs in the US to monitor for cyanotoxins from 2018 to 2020 (EPA, 2018). Additionally, the Massachusetts Department of Environmental Protection (MassDEP), and the Massachusetts Department of Public Health (MDPH) developed recommendations and guidance regarding cyanobacteria and the cyanotoxins that they produce. Starting in 2015 in Massachusetts, employees at MassDEP started to track and identify cyanobacteria events in public water suppliers (PWS) surface drinking water sources.

This tracking effort has resulted in a total of 16 recorded bloom events as of 10/2/19. In this overview, a bloom event is classified solely as a bloom response/discovery that was recorded through the MassDEP channels. A full bloom event is qualified as a growth of cyanobacteria that grows to either exceed 70,000 cells/mL or requires cyanotoxin testing due to the visible size. The 70,000 cells/mL qualifier is part of the MDPH guidance, where recreational bodies of water with cyanobacteria concentrations in excess of 70,000 cells/mL must have health advisories posted around the perimeter of the water body (Beaton, et al. 2018). This is independent of any MassDEP regulations or requirements, but for the sake of communicating the severity of blooms this value is a practical tool for this paper.

Cell concentration is a useful indicator for the threat of a bloom as there is a relation between cell count and toxins produced. While there is no direct conversion rate between the two values, the higher the cell concentration in a location the higher the cyanotoxin concentration. The EPA released information about the quantity of cyanotoxins that, if consumed over a 10-day period, can cause adverse health (EPA, 2019). A school-age child or adult will begin to develop illness after consuming water with microcystin levels at or above 1.6 µg/L for a 10-day period. Illness from cyanotoxin ingestion can include abdominal pain, nausea and vomiting, diarrhea, pneumonia, and, in some cases, death (EPA, 2019). The most common measurement for cyanotoxin analysis of water samples involves PPB, which is a roughly 1:1 ratio from PPB to µg/L.

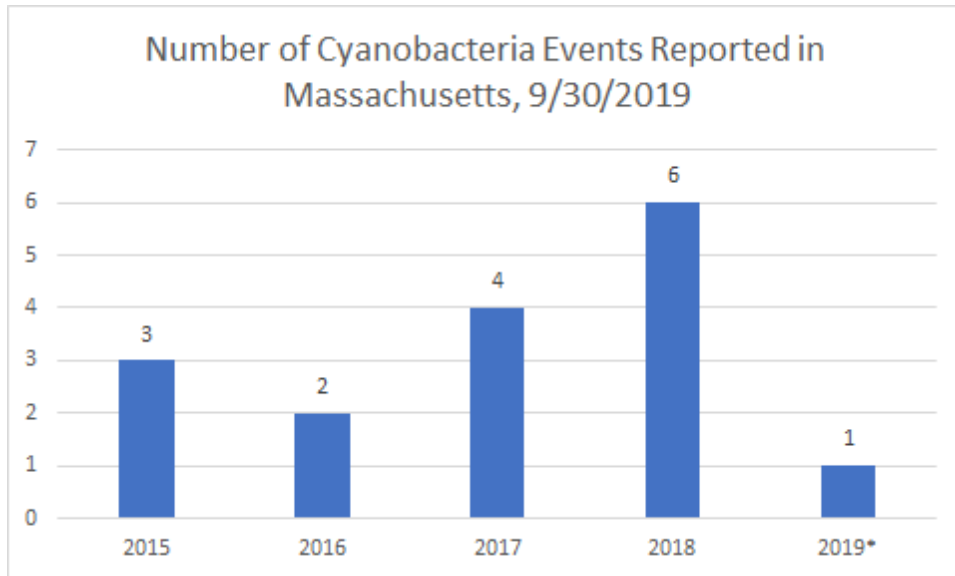


Figure 1. A Chart of Reported Cyanobacteria Events in Massachusetts since 2015

The annual distribution of reported bloom events in drinking water sources in Massachusetts, as seen in Figure 1, does not show any trends that indicate an increase in reports year over year. The statistical variance isn't significant enough, nor are there enough data points to make a claim that they are becoming more frequent in the commonwealth of Massachusetts. This does not support or contrast the common belief that cyanobacteria blooms are becoming more common due to changing environmental factors, as no strong conclusions can be drawn from this data set.

Jurisdiction Overview

Jurisdiction over a water body with reports of a cyanobacteria harmful algal bloom (CyanoHAB) depends on how the body is used. In general, CyanoHABs in water bodies which are used for drinking water are overseen by the PWS and MassDEP through the Drinking Water Program (DWP). Meanwhile, CyanoHABs in water bodies on or within state land which are used for recreation are overseen by the MDPH who will make a health-based recommendation. If the recreational water body is not on or within state property, the MDPH will also coordinate with local Boards of Health and Health Departments to determine if a health-based recommendation is necessary. In the case of the water body being used for both drinking water and recreational purposes, the two agencies will coordinate their response, and will conduct their duties as if the site was only a recreational or drinking water body.

The Story of Bloom Events in Massachusetts

2015: Haggetts Pond, Wenham Lake, Dow Brook Reservoir

The first recorded cyanobacteria incident in the Commonwealth occurred in Haggetts Pond. This event was not a CyanoHAB, but simply an act of prevention. The PWS applied copper sulfate to the water body at the start of the season in order to stymie the cyanobacteria population low throughout the summer.

The first cyanobacteria bloom event occurred in Wenham Lake and was reported on 9/29/15. Although Wenham Lake is a drinking water source, and enumeration is not required, cell counts gathered on site were found to be between 62,000 and 234,000 cells/mL. The cell counts were well above the 70,000 cell/mL level used by the Massachusetts Department of Public Health to determine the posting of health advisories. However, Wenham Lake did not have to comply with this standard as it is not a recreational body of water. While the bloom had elevated cell counts, it was concentrated in a location away from the water intake. Additional testing around the water intake showed no concerning levels of cyanobacteria. The PWS continued to draw water from the site, ensuring it was safe after being treated by the treatment plant by completing toxin analysis tests on the finished water. The PWS choose not to engage in any active response as the cyanobacterial bloom was far enough from the intake to not be a concern, toxin results were below detectable values, and heavy rainfall dispersed the bloom.

The final cyanobacteria even in 2015 was at the Dow Brook Reservoir. This bloom event was the first to feature assistance from the state-sponsored Field Assessment & Support Team (FAST) which is trained to respond to environmental emergencies in Massachusetts, including CyanoHABs. Pictorial data did not suggest that there was cause for concern, as the size of the bloom was very small. A shutdown did not occur as the toxin analysis came back with levels of Microcystis below 0.5 PPB, far below dangerous levels.

2016: Cape Pond Reservoir, Lake Cochichewick

The Rockport Water Department initially discovered the algal bloom problem in the Cape Pond Reservoir due to heightened total suspended solids (TSS) levels. This shutdown lasted for approximately a week before it was reported and responded to by FAST. No cell enumeration was completed for this site, but toxin analyses for Anatoxin-A, Microcystis, and Cylindrospermopsins all resulted in non-detect (ND) results, meaning the concentrations were too low to be detected. During the time span from the initial shutdown to the restoration on 9/20/16, the PWS shifted to another site in its system, Carlson Quarry, and drew water solely from that site. Because they were reliant on one source instead of the normal two, the PWS requested that their request to draw additional water from Carlson quarry be expedited. Additionally, the PWS banned all non-essential water usage in their service region. The practice of relying on a backup site during a cyanobacteria event in the main site is common for water suppliers with multiple locations available. Access to an alternate water source is an important component in a PWS' Emergency Response Plan (ERP).

Lake Cochichewick, on the other hand, is the only supplier of water for the North Andover Water Department. For this reason, North Andover takes a more aggressive approach to monitoring and treating a cyanobacteria event. When Lake Cochichewick experienced a cyanobacteria bloom event in 2016, the PWS was able to prevent a CyanoHAB from developing through the routine testing that they

conduct on the water body. The North Andover Water Department (NAWD) routinely measures phycocyanin (PC), a pigment unique to cyanobacteria. Through this measurement, NAWD was able to track the cyanobacteria biomass in their water sources. When they detected an increase in the PC concentration in the water body, they immediately responded by starting the copper sulfate application process and took samples for enumeration, even though no visible bloom was present. Cell count results never exceeded 53,000 cells/mL, and toxin analyses showed levels of toxins below 0.33 PPB, at safe levels during the event. The response and prevention showed in this site is beyond what is legally required. However, it proved essential in stopping a bloom event from becoming a problem while it was not visible.

2017: Chestnut Hill Reservoir, Sudbury Reservoir, Monponsett Ponds, Concord River

The Chestnut Hill Reservoir incident in 2017 highlights the interplay between water bodies where recreational use is not permitted but may still occur. Upon discovery of the bloom event, the Massachusetts Water Resource Authority (MWRA) took samples of the water for enumeration and toxin analysis purposes and informed MDPH of the event due to the stated recreational usage on the site. The results of the enumeration revealed counts between 69,000-128,000 cells/mL, and toxin analysis showed level of Microcystis <1 PPB. This location is not a primary source of water for the MWRA, but instead a backup emergency source. For these reasons, the DEP recommended against active chemical treatment and instead recommended a health advisory along with the MDPH. If active treatment was done and the toxins were exposed to the water body in higher concentrations, any recreational usage at all would become very dangerous, so their choice to both not actively treat it and to post advisories against using the water in any capacity were important in protecting the population. Following over 5 enumerations, including counts well below the 70,000 cells/mL threshold separated by a week in time, the MWRA determined that the CyanoHAB was no longer a credible threat and the health advisory could be withdrawn.

The Sudbury Reservoir bloom was first detected as part of routine monitoring of the drinking water source on 9/14/17. The MWRA directly reported this event to the DEP, going directly to the proper channel of communication. Cell counts and toxin analysis revealed levels that were not concerning. The bloom was declared resolved on 9/20/17 following additional testing of the water source.

The incident in the twin Monponsett Ponds on 9/29/17 was another example of recreational bodies with drinking water applications. The ponds are surrounded by residential areas and has route 58, a state highway, running directly between the two ponds. For this reason, when a bloom was detected, the MDPH responded quickly with a health advisory to not enter the water, as it is highly visible and an easily accessible water body. Meanwhile, the East Monponsett Pond is used as part of Brockton's water supply system as it has a release valve that flows into Silver Lake. Because of the bloom in the West Pond, the Brockton Water Commission (BWC) conducted enumeration in both ponds. The cell counts for West Monponsett pond were at 69,000 cells/mL while East Monponsett pond had cell counts of 42,000 cells/mL, below the MDPH 70,000 cells/ml. Because BWC did not want the cyanobacteria bloom to spread into Silver Lake, they postponed water diversion from East Monponsett, and applied aluminum sulfate to both ponds to treat the blooms. On 10/26/17 samples were taken from East Monponsett and came back negative for toxins, so the health advisories were withdrawn, and normal activities continued at each pond.

The Concord River bloom was discovered when a resident that lived along the river noticed an accumulation of, what he identified to be, cyanobacteria cells. This resident was an EPA scientist knowledgeable on cyanobacteria, which allowed the individual to better communicate the information to the proper authorities and take his own samples from the water. FAST was then contacted to investigate the bloom event, as well as the MDPH as the Concord River is also a recreational water body. Upon arrival, FAST tested the water using in-vivo fluorometry (IVF) and detected levels of phycocyanin that were not indicative of a cyanobacterial bloom. Later scans of samples taken in the main cluster revealed concentrations of phycocyanin 100x the size of the original sample. FAST conducted Abraxis tests on the samples to test for Microcystis and cylindrospermopsins which came in negative. However, there were concerns pertaining to the accuracy of the tests due to the expiration date having passed on the kits and a known production defect. Later toxin analysis produced results that were not sufficient enough to inform MassDEP of, so these results are not recorded, but usual operations continued following these tests. This case demonstrates how an informed populace can be extremely helpful to any bloom control effort. Due to the fact that he was so knowledgeable, he was able to provide useful information and contact the proper departments to handle the situation.

2018: Winona Pond Reservoir, Chestnut Hill, Haggetts Pond, Chestnut Hill, Haggetts Pond, Lake Cochichewick

The initial reporting of the Winona Pond Reservoir occurred when FAST was informed of “fishy and musty” odors by people in the area. Within two days, samples were submitted for enumeration which revealed cryptophytes, a form of golden-brown algae, not the blue-green cyanobacteria genre. This specific form of algae does not produce cyanotoxins and is not a health hazard for the people drinking the water, but the scent and aesthetic is unpleasant. Despite this knowledge, cyanotoxin assessment was recommended and the PWS complied. This toxin analysis was expected to come up as non-detects, due to the lack of toxin producing bacteria detected, but the test was done more so for the public’s conscience, and so they could be certain the water was safe.

The Chestnut Hill Reservoir’s bloom event in 2018 was first reported to the DEP by MWRA themselves. During routine water monitoring, the MWRA discovered the growing bloom and took samples for enumeration. At certain parts of Chestnut Hill, the cyanobacteria count reached 270,000 cells /mL. Due to the known recreational usage of the region, the MWRA posted signage at five locations around the reservoir. After conducting enumeration, the MWRA conducted toxin analysis which had levels of toxins below dangerous levels. Nevertheless, MWRA responded with an aluminum sulfate application to the water source. This treatment led to an improvement in water quality, but cell counts still showed levels of Oscillatoria in excess of 70,000 cells/mL. Phosphorous levels tested before and after the application of aluminum sulfate also indicated that there were increased levels of Oscillatoria in the lower levels of the reservoir. There is no specified ending event for this case.

The Haggetts pond bloom in May, similar to the Chestnut Hill reservoir’s bloom, was discovered due to the algal monitoring plan in place on-site. Following the discovery, the Andover Water Department took samples of raw water and of finished water at the entry point of their distribution center. Toxin analysis of these samples revealed levels of Anatoxin A, cylindrospermopsins, and nodularin's below the 0.3 PPB, well below the threshold of danger. Due to this, the site continued to operate in its full capacity.

In August of 2018, the Chestnut Hill event was continued with further updates, but there was no additional action taken. The MWRA had already identified the situation as under control, so public

response and concerns about the topic were responded to with explanations about the state of the MWRA system, and that they could afford to have this site non-operational for the time period. The reservoir, according to email correspondence during the event, appeared to contain more cyanobacteria than the event earlier in the year. However, the status of Chestnut Hill as an emergency backup reservoir was still the same.

The second event at Haggetts Pond in 2018 was first declared when the Andover Water Department informed the DEP that they were hiring an independent contractor to apply copper sulfate to Haggetts pond in order to mitigate a growing anabaena population. This response is outlined as part of the PWS' prevention and response plan. When amounts of cyanobacteria are found as they were in this case, the immediate response of the Andover Water Department is application of sulfate. The cyanobacteria was discovered when doing phycocyanin analysis and finding ratios of PC:Chl-A that were far above normal values (PC:Chl-A ratio of 46:1). Samples taken for toxin analysis yielded levels of toxins that were below detectable levels, and the site was deemed still safe for consumption.

As part of their standard monitoring program where they frequently measure the PC:Chl-A ratio, the North Andover Water Department discovered a growing cyanobacteria population in September of 2018. After this discovery, they informed the DEP of the development, and collected samples for enumeration. The highest recorded cell counts were 11,000, a level that is far below one which would cause concern. Cyanotoxin analysis also yielded values that were far below dangerous levels, so the site was able to safely continue delivering water to its community. As mentioned earlier, Lake Cochichewick is the sole source for this PWS, so ensuring its health is essential for the NAWD. This factor explains why their monitoring is robust enough to detect these slight changes in PC level, which allowed them to find and stop the bloom before it became a credible threat to the quality of the water.

2019: Middleton Pond Reservoir

This bloom was first discovered when a citizen was walking dogs around the water body and noticed a growing bloom on the perimeter of parts of the pond. Upon reporting, the Danvers Water Department took action to increase their monitoring of the bloom event, but the bloom increased in size when the same citizen returned a week later to walk dogs again. Pictorial data suggests this was a full bloom event, but the Danvers Water Department noted that the bloom was far from the intake, so they continued to monitor the situation and draw water. The DWP also has an on-site laboratory, so they were able to test for toxins and enumeration without sending samples away to an outside contractor. The aforementioned citizen continued to express concern and request visible signage be posted to protect people from the bloom event, but due to the fact that the Middleton Pond Reservoir is a private location and recreational use of the surrounding area is not permitted, people should not even be in that location in the first place. For that reason, no public warnings were posted around the water body.

Through the years, there was an increase in bloom event frequency, but the sample size is far too small to assert it is representative of anything other than natural variance. This increase also did not carry into 2019, as so far there has only been one serious bloom event reported to the DEP, which was discovered by a citizen who stumbled upon the site.

Insight from Case Studies

We have found some general trends relating to preparedness of PWS for bloom events. Sites that have never had bloom events (Ipswich, Billerica, Rockport, Peabody) are more likely to contact FAST than sites that have more extensive experience (Monponsett, Chestnut Hill, North Andover, Haggetts pond). This indicates that sites that have experienced blooms are more likely to handle the situation independently and need less guidance from MassDEP. This also indicates that experience matters when presented with a cyanobacteria event as many suppliers do not know their level of preparedness until they experience a bloom event. In our research, we found that certain regions, such as the Western Region (WERO) and Central Region (CERO) have never had any bloom events, but the DEP employees think they are adequately prepared for responding to a bloom event. It is impossible to truly know their level of preparedness without testing their emergency response plans, though.

Another discovery through these case studies is that sites with experience handling bloom events do a better job of discovering the event themselves and reporting it to DEP. This means that there is a more streamlined communication process, making the response efforts clearer and more communicable. This experience contributing positively can be seen in the Massachusetts Water Resource Authority, North Andover Water Department, Brockton Water Commission, and the Andover Water Department.

The MWRA doesn't actively monitor Chestnut Hill, but they were proactive in responding to the Sudbury Reservoir bloom, and the Chestnut Hill blooms in 2017/2018 despite the lack of active monitoring. North Andover might have more experience in managing bloom events solely due to the fact that they are monitoring the water in such a thorough way that they detect small blooms that might just subside naturally if they weren't paying any attention. Their Secchi readings to measure turbidity, phycocyanin counts, and frequent visual monitoring are essential, particularly since Lake Cochichewick is their sole water source. The BWC has experience with blooms in Monponsett, even though only one is officially recorded as a drinking water source bloom in East Monponsett. Their experience in West Monponsett informed their decisions to post health advisories and keep the drain between Silver Lake and East Monponsett closed during the bloom. The Andover Water Department, like the NAWD, also frequently monitors their water body and is very diligent about reporting information to the DEP whenever anything serious arises.

Specific Case Study Insight

Most PWS that have experienced bloom events demonstrated unique characteristics that relate to cyanobacteria management. These experiences can be very beneficial in informing future decision making processes when experiencing blooms, even for other PWS that simply share characteristics with the PWS that experienced the blooms.

The Wenham lake bloom event showed that even if there is a large event in the water, sometimes waiting it out can be sufficient if the proper conditions are present (low toxin count, proximity from intake, incoming strong weather patterns)

The Cape Pond Reservoir event showed that having multiple sources capable of supplying your whole water supply is extremely helpful in ensuring your PWS can deliver safe water. Because they were able to use Carlson Quarry, they didn't rush the return of Cape Pond Reservoir, and they were able to manage the bloom before returning it to operation

The first Lake Cochichewick event, on the other hand, showed how seriously you have to take a credible bloom threat, especially when it is occurring in your only drinking water source. In this event, they showed proactive response and preventive measures that were above and beyond what was expected of them, a large part of why they were able to handle the bloom

The Chestnut Hill reservoir incidences show how large water suppliers, such as MWRA, may choose to handle a visible bloom event in an area with significant recreational use. Even though it is a drinking water supplier and not a recreational body, they still had the level of awareness to treat it as if it were a recreational source, posting health advisories around the water body telling people not to enter or use the water. The blooms also show the inherent value of having emergency backup sources. Of course, they would like these locations to be usable if an emergency occurs, but they made the value assessment that using their resources on this source would not be necessary for their water supply purposes, and they were right.

The Monponsett ponds highlighted the way that water bodies in close proximity affect each other. First and foremost, the Brockton Water Commission had to be aware of the condition of their water supply's feeder streams, in order to ensure that no derelict water enters their system. They also have to make sure that the West Monponsett Pond isn't negatively impacting the East pond, as the West has historically suffered more extensively from bloom events than the East. Overall, this event shows how complicated the problem becomes when multiple water bodies are being used to provide water to a main source, and the level of care a PWS must take in protecting their water.

The Concord River bloom event showed the importance and value of having an educated populace. Because the citizen who discovered the bloom was knowledgeable, he responded in the appropriate ways, not overreacting or misinterpreting what he saw in the water. This helped the DEP and the PWS work effectively to stop the bloom event, and having an informed populace is a valuable tool in a PWS toolbox.

The Winona Pond Reservoir event showed the importance of ensuring public safety to the public. There was not a real need for the responses taken such as cyanotoxin analysis, but the tests were taken anyway in the interest of the public that the water supplier surfaced.

The Middleton Pond Reservoir event highlights the way that some PWS can choose to handle recreational use around their private water source. Because they don't allow people on their premises, any request for public health postings warning people from entering the raw water body is unnecessary.

Specific Case Study Insight Organized

Specific Finding	Cases that demonstrate this	Justification
Waiting for the bloom to dissipate can be sufficient	Chestnut Hill, Wenham Lake,	When environmental factors align and you have other sources to draw from, it may be most resource efficient to simply allow a bloom to handle itself
Utilizing backup sources is an important part of an ERP	Sudbury Reservoir, Chestnut Hill Reservoir (all 3), Cape Pond Reservoir	The ability to rely on other sources in the event of a serious bloom can be important in saving resources that can be used elsewhere
Strong preventive and proactive measures are important in stopping blooms before they can become threats	Lake Cochichewick (both), Haggetts Pond (both)	The best way to combat a bloom is to make sure it doesn't happen. Sites with strong preventive plans can more adequately manage blooms.
If you only have one water source, ensuring the water quality is paramount	Lake Cochichewick	If you have no backup available, you must ensure the one you can use is always operational
Awareness of recreational use, even if unpermitted, is important in ensuring the public is safe in or around your water body	Chestnut Hill Reservoir (all 3 entries)	Protecting the populace can include things that technically do not have to be done, but it is in the best interest of the public to act in their interest
Understanding and addressing the tributaries into your final water source is important in protecting your water source	Monponsett Ponds	Water source protection involves ensuring the water that feeds into your source is also safe and of good quality.
An informed populace can be extremely helpful in managing cyanobacteria events	Concord River	Informed citizens can discover bloom events and react to them appropriately.
Some PWS may choose to stay firm on their "unpermitted recreational usage is not allowed" policies	Middleton Pond Reservoir	PWS own the land surrounding their sources for a reason. If they choose to enforce their trespassing orders, they do not need to post public signage

Table 1. Main Findings from Each Case Study

Table 2 organizes the main findings from the case studies into the three sections. The first section is the finding, the second section is a list of case studies which support the finding. The final section provides a justification for the finding.

Appendix: Case Studies

Andover Water Department – 6/10/15

MassDEP contact affiliated with event: Melissa Privetera

Andover Water Department contact affiliated with event: Alan Carifio

Location of Bloom

Haggetts pond, Andover, Massachusetts.

Reporting

The Andover Water Department noticed the start of blue-green algae in the water and took samples that were identified as such. As part of their local prevention plan, the PWS applied copper sulfate to the water body. The PWS then reported this application to the DEP directly, and there were no other parties involved in the process.

Event Type

This was not a full CyanoHAB event. The only hint of cyanobacteria was in the blue-green algae that was observed, but the density and count of cells was too small to be considered an issue. The Andover Water Department responded with routing Copper Sulfate treatment. This response was preventative, as there was no significant bloom to mitigate. No public notice was posted

Site's preventive protection plan

On an annual basis, the Andover Water Department applies copper sulfate to Haggetts pond. This annual treatment intends to inhibit the growth of cyanobacteria in large volumes before they can begin.

Method of response

Copper sulfate application

Site's Emergency Response Plan

The Andover Water Department maintains all their necessary permits to apply sulfate and algicide. They also have a discharge plan, which details how Andover will investigate the presence of algae in the pond and measures that will be taken for treatment.

Resolution

Due to the fact that this was an act of prevention, there was no end date to the event.

Salem-Beverly Water Supply Board (SBWSB) – 9/30/15 – 10/19/2015

MassDEP contact affiliated with event: Rebecca Weidman

Salem-Beverly Water Supply Board contact affiliated with event: Peter S. Smyrnios

Location of Bloom

Wenham Lake, Beverly, Massachusetts

Reporting

A citizen emailed pictures of the potential HAB to the DCR who then forwarded the emails to the DPH who notified MassDEP. DEP NERO contacted the PWS which identified the bloom had been present for 1-1.5 weeks at the time of the correspondence.

Event Type

Enumeration revealed values of 62,017 cells/mL and 234,570 cells/mL at varying depths. No public notice was posted for the event.

Site's preventive protection plan

None

Method of response

There was no active response taken by the PWS, aside from active monitoring of the site conditions and the bloom state. Environmental conditions, such as heavy rainfall and wind mixed the water body and dispersed the bloom

Site's Emergency Response Plan

On 9/28, the PWS collected two sources of samples that were sent to Phycotech and on 9/29/15 the PWS sent raw and finished water samples that were sent to Beagle Bioproducts for "Toxin related" analysis. On 9/30/15, NERO performed a site visit to Wenham Lake during heavy rainfall and obtained a sample at the eastern shore. The water there was a "dye green" color and was analyzed via IVF with results indicating approximately 1000 µg/L of PC. Samples taken on 10/5/2015 showed elevated levels of cyanobacteria, but levels of cyanotoxins that were less than MDLs.

Resolution

On 10/6/2015, NERO decided that, due to toxin results, heavy rainfall in the area which would disperse the remaining bloom, and the bloom proximity being distant from the intake, that no further actions need be taken beyond the SBWSB notifying NERO if any further issues arise. On 10/16/2015 another sample from the lake was taken and analyzed, which was identified as still experiencing an intense bloom of Anabaena while having Microcystis in lower amounts. After this point, no further tests with concerning results were conducted.

Ipswich Water Department - 10/14/15-10/19/15

MassDEP contact affiliated with event: Joan Beskenis

Ipswich Water Department contact affiliated with event: Vicki Halmen

Location of Bloom

Dow Brook Reservoir, Ipswich, Massachusetts. This site is surrounded by woodlands, but there is not much woodland separating the body from developed land on the northern side.

Reporting

On 10/16/15 NERO-FAST submitted images of a potential bloom taken on 10/14/15 to WPP-Beskenis requesting identification. NERO-FAST requested microcystin analysis as well, which was delivered to Beskenis on 10/16/15. No identification/enumeration was documented. On 10/19/15 WPP completed microcystin analysis and did not find sufficient information to warrant a health advisory posting.

Event Type

Visual and pictorial data identifies that a cyanobacteria event did occur, but testing did not find that the results were harmful, and no toxin analysis is available. No public notice was posted for the event, nor did a shutdown occur.

Site's preventive protection plan

No preventive plans stipulated aside from visual monitoring of the location.

Method of response

No chemical response occurred.

Site's Emergency Response Plan

The site contacted FAST for guidance on bloom response. FAST arrived on the scene and took control of the situation, advising the PWS on their options as well as taking samples and submitting them for testing.

Resolution

After testing results from 10/19/15 showed that there was no cause for concern, standard activities continued

Rockport Water Department – 9/7/16

MassDEP contact affiliated with event: NERO DWP

Rockport Water Department contact affiliated with event: Joseph P. Parisi Jr.

Location of Bloom

Cape Pond Reservoir, Rockport, Massachusetts

Reporting

On 9/7/2016 the PWS reported to NERO DWP that they shut down one of their two water treatment plants due to high Total suspended solids reading (TSS) which appeared to be the result of algae in the pond reservoir.

Event Type

This event was sufficient for the PWS to stop pulling water from the site. No specific cell counts were recorded, but the bloom was visibly large enough to cause concern. Field tests conducted on 9/7/16 using ABRAXIS strips indicated a “slight difference in control and test strips”. Toxin analysis of samples from 9/8/16, 9/12/16, and 9/20/16 indicated levels of Anatoxin-A, Microcystis, and cylindrospermopsin that were below detection levels in both raw and finished water

Site’s preventive maintenance for cyanobacteria

The site had basic algal monitoring in place.

Method of response

The site did not specify a specific response.

Site’s Emergency Response Plan

At the time of the report and event, the PWS had been safely operating using an alternate water source for approximately a week. The second site available, Carlson’s Quarry, was unaffected by the bloom event. NERO’s FAST reported to the Cape Pond Reservoir and collected samples from the source, raw water, and finished water. Cyanobacteria was detected in both the source and raw water samples, and cyanotoxin ABRAXIS test strips were used on the samples. DEP-NERO directed PWS to collect samples of both raw and finished water of cape pond for microcystin and cylindrospermopsin analysis with their preferred Liquid Chromatography Mass Spectrometry (LC-MS) method. DEP-NERO then requested additional sampling on 9/8/16, 9/10/16, and 9/12/16

Resolution

The PWS submitted samples on 9/8/16, 9/12/16, and 9/16/16. The toxins were all toxin non-detects. During the shut down of the Cape Pond reservoir, the Rockport Water Department was reliant solely on Carlson’s Quarry. Due to this, DEP-NERO directed the PWS to implement a full ban on non-essential outdoor water use to maximize conservation efforts. The DEP also provided the PWS with instructions to petition MassDEP for a Declaration of Water Supply Emergency if necessary. NERO-DEP also identified that it would review and expedite a current permit application to allow increase pumping capacity from Flat Ledge Quarry into Carlson’s Quarry to ensure the town could continue to meet its water demands.

North Andover Water Department - 10/14/16-10/27/16

MassDEP contact affiliated with event: Kristin Divris

North Andover Water Department contact affiliated with event: Glen Alt

Location of Bloom

Lake Cochichewick, North Andover, Massachusetts

Reporting

In late September 2016, phycocyanin (PC) levels started increasing while no visible blooms were present. PWS collected 3 samples each on 9/29/16, 10/12/16, and 10/18/16 for cyanobacteria ID/counts.

Event Type

This event was managed properly and never exceeded the requirements for dangerous levels. At its highest measured cell count, there were 52,170 cells/mL in the raw water samples. Microcystis and Anatoxin-a were both below 0.33 PPB, at safe levels. No public notice was posted for the event

Site's preventive protection plan

The PWS routinely monitors chlorophyll-A and phycocyanin as per the EPA region 1 Cyano Monitoring Collaborative. This allows them to be aware of any sudden changes to the ratio of chlorophyll-A : phycocyanin, an indicator of increased cyanobacteria populations. They also routinely test the turbidity of the water with Secchi disk measurements.

Method of response

Copper sulfate application to the afflicted body.

Site's Emergency Response Plan

Upon the discovery of the heightened PC levels, they immediately began testing for signs of cyanobacteria in the water. Contracted Solitude Lake Management for copper sulfate application

Resolution

On 10/20/16, DEP-WURP collected raw and finished water samples for cyanotoxin analysis by WES prior to treatment; NERO-DEP then approved copper sulfate treatment to the lake. On 10/21/16 DEP-WES provided preliminary toxin results for total MC/Nodularins (Abraxis ELISA method) and Anatoxin-A were all found to be at levels below the mandatory reporting levels. Enumeration counts from samples taken on 10/20/16 were 10,283 cells, and enumeration from samples taken on 10/18/16 had values between 690-2,300 cells/mL, well below any levels that can call for concern. Source was treated with copper sulfate on 10/26/16.

Massachusetts Water Resources Authority (MWRA) - 6/27/2017

MassDEP contact affiliated with event: Kristin Divris

MWRA contacts affiliated with event: Stephen Estes-Smargiassi, Betsy Reilley, Dave Coppes

Location of Bloom

Chestnut Hill Reservoir, Newton/Boston, Massachusetts. This location is an emergency source

Reporting

MWRA responded to a known algal bloom problem by taking samples for identification and microcystin analysis. MWRA initially contacted MDPH due to known (but not permitted) recreational use at the source which is not currently active for drinking water.

Event Type

Full CyanoHAB event that took the reservoir out of use. The cell counts were sufficiently high, 129,000 cells/mL at maximum and 68,000 cells/mL at minimum, that the DEP recommended against treatment of the water, instead suggesting continued monitoring along with a health advisory posting. The microcystin concentration was <1 PPB and never exceeded this value.

Site's preventive protection plan

The MWRA routinely monitors the water bodies using visual inspection.

Method of response

MWRA contacted Solitude to manage the event for them. They completed enumeration 5 times from 6/27-7/10, and the populations declined following results received 6/29. No report of any algaecide application was recorded.

Site's Emergency Response Plan

Contacted the MDPH and MassDEP for advice on resolving the bloom and were told not to treat. Bloom was dense enough that treatment would not have been sufficiently effective to warrant its use. This PWS has extensive water sites and this is an emergency backup source, so the Massachusetts Water Resource Authority simply chose the appropriate response of simply not drawing water from this site during the event. Due to the known recreational use, the MWRA posted a health advisory around the perimeter of Chestnut Hill Reservoir

Resolution

MWRA had concerns that they may require Chestnut Hill Reservoir in case of an emergency, but no active response methods were employed, nevertheless. Instead, they continued monitoring the response from the DEP advising against applications. MWRA took samples to monitor until cell counts fell below 70,000 cells/mL and these samples were taken 6/27, 6/28, 6/29, 7/2, 7/3, 7/5, and 7/6. Once two consecutive measurements, conducted a week apart, showed enumeration below 70,000 cells/mL, MWRA decided to withdraw the health advisory and return the site to use.

Massachusetts Water Resource Authority (MWRA) - 9/15/2017-9/26/2017

MassDEP contact affiliated with event: Dan Davis to Joan Beskenis

MWRA contacts affiliated with event: John Gregoire, Kimberly Lebeau, Todd Earle, Betsy Reilley

Location of Bloom

Sudbury Reservoir, Sudbury, Massachusetts. Sudbury Reservoir is an emergency backup reservoir

Reporting

DEP-WPP (Water Protection Plan) were in the field for routine monitoring beginning on 9/14/17 and observed a potential cyanobacterial bloom and collected a grab sample 6-9" in depth on 9/15/17 for ID and enumeration by Joan Beskenis. Beskenis observed the sample on 9/19/17 and identified microcystis flos-aquae. Davis alerted DCR staff Jamie Carr of the possible bloom on 9/15/17, while Beskenis submitted the results to additional WPP staff on 9/19/17. Beskenis forwarded email information to Kristin Divris on 9/19/17 as well. DEP informed MDPH on 9/20/17 as there is recreational use in the Sudbury reservoir.

Event Type

The detected cyanobacteria were Microcystis flos-aquae which is a potentially dangerous cyanobacteria. No toxin analyses were made available for documentation. No shutdown of the site occurred due to cyanobacteria, but it is unclear whether the MWRA was drawing water from the reservoir anyways, due to the fact that it is a backup reservoir.

Method of response

No method of response was stipulated, copper sulfate application did not occur.

Site's Emergency Response Plan

The site had a strong reporting process, going through all the proper channels. They went directly to the DEP, the correct first step given that it the Sudbury Reservoir is a drinking water source. They received guidance from the DEP to help with managing the bloom.

Resolution

Following the discovery and reporting, the MDPH and DEP had a conference call on 9/21 to discuss the state of the bloom. At this point, DEP-WPP relayed to Department of Conservation and Recreation that no further evidence of a bloom was visible as of 9/20/17. On 9/26/17 DEP-WPP staff went to Sudbury Reservoir to do final sampling where they found significantly reduced bloom visibility. As Dan Davis said, "(we) sampled five separate areas that had cyanobacteria blooms but none of them were really as bad as a week ago".

Brockton Water Commission - 9/29/2017-10/31/2017

MassDEP contact affiliated with event: John Hobill to Rebecca Weidman

Brockton Water Commission contacts affiliated with event: N/A

Location of Bloom

East and West Monponsett Ponds, Halifax, Massachusetts. East Monponsett is a tributary for Silver Lake, which the Brockton Water Commission draws water from

Reporting

On 9/25/17, MassDEP collected water samples from both East and West Monponsett Ponds as part of routine monitoring. East Monponsett had cell counts of 42,938 cells/mL while West Monponsett had counts of 18,828 cells/mL and 69,181 cells/mL at varying locations. There were also reports of visible scum along the surface of the water

Event Type

Although the cell counts were below the 70,000 cells/mL threshold, the visible scum on the surface is one guideline for recommending an advisory. For this reason, the current advisory in place for West Monponsett was recommended to remain by the MDPH. This event is categorized as a CyanoHAB event for that reason. The MDPH posted an advisory due to known recreational usage of the Monponsett Ponds, meaning they fall partially under MDPH jurisdiction.

Site's preventive protection plan

The Monponsett ponds have ongoing monitoring plans to detect algae. This is due to the site's experience with algal blooms in the past, frequently suffering from bloom events. In June of 2017, aluminum sulfate was applied to the site to aid in the prevention of cyanobacteria.

Method of response

Due to the fact that aluminum sulfate had already been applied 3-4 months prior, the Brockton Water Commission chose not to apply any chemical response to the ponds.

Site's Emergency Response Plan

The Brockton Water Commission intended to divert flow from East Monponsett into Silver Lake but postponed this due to the health advisory on West Monponsett. Due to the proximity of the lakes and the geography of the region, it is very easy for the two ponds to exchange water, which could lead to East Monponsett becoming infected with cyanobacteria. Due to cyanobacteria concerns, the Brockton Water Commission opted to not use the potentially contaminated water in the Monponsett ponds as a part of their emergency response plan.

Resolution

SERO requested three water samples to be analyzed for microcystin and cylindrospermopsin. They drew two samples on 10/26/17 from the two sampling locations that were consistent with the routine monitoring locations used by SERO staff. These samples were delivered to WES to be tested for Anatoxin a, Microcystins, and Nodularin by the testing method of Abraxis ELISA (enzyme-linked immunosorbent assay). These tests came back negative; no cyanotoxins were detected

Billerica Water Works - 10/4/17-11/10/17

MassDEP contact affiliated with event: Joan Beskenis

Billerica Water Works contact affiliated with event: John McGovern

Location of Bloom

Concord River, Billerica, Massachusetts. Concord river is both a PWS and a recreational water body

Reporting

On 10/4/2017, EPA wetlands scientist and resident of Billerica contacted Joan Beskenis of MassDEP's WPP and Michael Celona of MDPH to report a possible cyanobacteria bloom on the Concord River near his riverfront property.

Event Type

This event was never confirmed to be a legitimate cyanobacteria bloom. All toxin counts came in at very safe levels, far below minimum reporting levels (MRLs), the smallest concentration of a substance that can be measured using the tool in question. Hence no public posting was required

Site's preventive protection plan

The site has basic monitoring in place, but a citizen was the entity that contacted FAST and the DEP.

Method of response

No chemical response was taken to handle this event.

Site's Emergency Response Plan

No information relating to their ERP is available. Much of the work on the ground that is available comes from FAST reporting.

Resolution

The PWS collected raw water samples to be tested for microcystins, cylindrospermopsins, anatoxin and saxitoxin for two rounds (1-2 weeks apart). PWS sampled raw water on 10/26/17 and analyzed cyanotoxins noted under UCMR4. No further actions were reported.

Peabody Water Department - 3/20/2018-3/29/2018

MassDEP contact affiliated with event: John J. Fitzgerald to J. Beskenis, A. Clark, T. Mahin, E. Worrall, K. Divris

Peabody Water Department contacts affiliated with event: Davis Scribner

Location of Bloom

Winona Pond Reservoir, Peabody, Massachusetts. This location is a PWS Source.

Reporting

On 3/20/2018 NERO-FAST reported that DEP was receiving complaints about “fishy” or “musty” smells in the drinking water.

Event Type

This event was **NOT** a blue-green algae event, but instead an event with golden-brown algae. These algae do not create cyanotoxins, and is only problematic, as far as human’s are concerned, due to the taste and odor they create. Toxin analysis came back negative.

Site’s preventive protection plan

Because this event did not actually contain cyanobacteria, the information regarding cyanobacteria monitoring was unavailable.

Method of response

No CyanoHAB response occurred because this was not a CyanoHAB.

Site’s Emergency Response Plan

Emergency plan involved informing FAST of the problem and allowing them to handle the sample gathering and testing processes. Further tests and analysis were advised by the DEP and FAST and were completed in order to acquiesce the public’s concerns.

Resolution

On 3/20/18 FAST reported to Peabody and obtained two samples; one source water sample near the intake to the WTP and one on the raw water tap within the WTP. FAST tested both samples on IVF meter, viewed samples on PCM and submitted the images to J. Beskenis for identification. The cells were identified as chrysophytes (golden-brown algae) which often cause odor and taste issues. Field samples from the MWRA’s Kim Lebeau also identified the chrysophytes from samples taken from the raw water tap, finished water tap, middle of the Winona Pond Reservoir, and from the distribution system at Burke school. On 3/23/18, Peabody Water Department collected a finished water sample for cyanotoxin analysis by Eurofins Laboratory. They found that MC, Anatoxin-a, Nodularin, and Cylindrospermopsin were all below the MRLs.

Massachusetts Water Resources Authority (MWRA) - 5/4/2018-5/30/2018

MassDEP contact affiliated with event: Kristin Divris

MWRA contact affiliated with event: Betsy Reilley

Location of Bloom

Chestnut Hill Reservoir, Boston/Newton, Massachusetts. This location is an emergency PWS.

Reporting

MWRA called Kristin Divris to report the bloom event in progress. Samples had been sent out and were awaiting results.

Event Type

Significant CyanoHAB event. Cell counts exceeded 250,000 cells/mL in certain locations.

Site's preventive protection plan

The MWRA routinely monitors this water body. It is in a very public space, so information about the status of the site is easy to come by both through employees that work on Chestnut Hill, and through citizen reporting.

Method of response

Aluminum sulfate treatment that resulted in improved water quality.

Site's Emergency Response Plan

MWRA continued to leave the site as non-operational for water drawing purposes. Used one of the many other locations available to provide water to their PWS consumers.

Resolution

Testing conducted by Northeast Laboratories identified cyanobacteria (*Oscillatoria*) present at levels ~ 270,000 cells/mL. In response, MWRA immediately posted signage at five locations around the reservoir. *Oscillatoria* is a toxin producer, so MWRA sent a sample for toxin analysis to Northeast Laboratories. MWRA also used the Abraxis Microcystins strip test and AbraScan Test Strip Reader that provided results of approximately 1 ppb. Microcystin –LR was non-detect from any results. After these results, they moved to Aluminum sulfate treatment which improved the water quality, but *oscillatoria* cell counts were still in excess of 70,000 cells/mL. Phosphorous tests conducted pre and post application of aluminum sulfate showed increased levels of *oscillatoria* deeper in the reservoir. It is speculated that this is due to cell settling and internal recycling, as DO levels are also very low.

Andover Water Department - 5/23/2018-6/12/2018

MassDEP contact affiliated with event: Tom Mahin

Andover Water Department contact affiliated with event: Alan Carifio

Location of Bloom

Haggetts Pond, Andover, Massachusetts. Haggetts Pond is a primary PWS source

Reporting

The actual reporting of this event is undocumented. Discovery is unknown. Database suggests that through Andover's monitoring program, they studied the algae with fluorometry and that is how it was discovered.

Event Type

Toxins were found in incredibly small amounts, Anatoxin-A <0.03 PPB, Cylindrospermopsin <0.09 PPB, Microcystin & Nodularins <0.3 PPB. These toxin levels are within the safe range, and the study was conducted by Eurofins Eaton Analytical on 6/12/18. No public notice was required.

Site's preventive protection plan

Site conducts active monitoring of the site. This includes visual monitoring as well as phycocyanin measurements, which help them track the trends in cyanobacteria mass in the water in a cost-effective and time-effective way. Andover also routinely applies copper sulfate to the water body at the start of the spring/summer seasons in order to proactively inhibit cyanobacteria growth.

Method of response

No chemical response was applied. Sampling was conducted to track the populations, but toxin concentrations never broached levels of concern.

Site's Emergency Response Plan

This site is well prepared to respond to bloom events, should they occur. They are prepared to respond via chemical treatment, as well as changing their intake.

Resolution

PWS sampled finished water at the entry point to their distribution center for cyanotoxin analysis on 5/22/18. These results were submitted to NERO DWP Tom Mahin on 6/12/18 and forwarded to Kristin Divris on 8/16/18. No further information regarding source treatment was furnished.

Massachusetts Water Resources Authority (MWRA) - 8/4/18

MassDEP contact affiliated with event: Yvette Depeiza to Kristin Divris and Stephen Estes Smargiassi

MWRA contact affiliated with event: Betsy Reilley

Location of Bloom

Chestnut Hill Reservoir, Boston/Newton, Massachusetts. This location is an emergency PWS.

Reporting

On 8/4/18 an email was submitted through the general DWP Program Director email indicating "All fish are dead and many birds! Aug 4, 2018! The water is peach (pitch) black! Is this for drinking?"

Event Type

This is a known bloom event that had been underway for a long time. No extra testing was conducted.

Site's preventive protection plan

This site is not used in any active water program, so it can remain in its state. The MWRA identified that it would be more prudent to leave the site as it is.

Method of response

No response was taken.

Site's Emergency Response Plan

The site is not used actively, so no emergency response plan is in effect. It can remain in its state. This entry is also a continuation of a previous entry, and the policy taken therein is continued in this case.

Resolution

On 8/6/18, the DWP Program Director responded to the email answering that the source was an emergency backup reservoir and not a part of the active water supply system and provided a contact number to the complainant for the MWRA. DWP Program Director also forwarded response to MWRA representative and Kristin Divris. Complainant was nonplussed at the idea of contacting the MWRA, citing it as "extra work" and indicated he should have sent the pictures to the Boston Globe instead.

Andover Water Department - 8/9/18 - 9/5/18

MassDEP contact affiliated with event: Tom Mahin

Andover Water Department contact affiliated with event: Alan Carifio

Location of Bloom

Haggetts Pond, Andover, Massachusetts. Haggetts Pond is a primary PWS source.

Reporting

The PWS informed the DEP that they would be contracting Solitude Lake Management to apply copper sulfate to the lake in order to mitigate a growing Anabaena population.

Event Type

Toxins were found in incredibly small amounts, Anatoxin-A <0.03 PPB, Cylindrospermopsin <0.09 PPB, Microcystin, Nodularin <0.3 PPB. These toxin levels are within the safe range, and the study was conducted by Eurofins Eaton Analytical on 6/12/18. No public notice was required. This bloom event was mild in nature, with only moderate levels of anabaena being discovered.

Site's preventive protection plan

The PWS was monitoring the state of Haggetts pond when they noticed a developing bloom of anabaena. Their prevention plan involves sulfate application to discovered bloom events, so they contracted Solitude Lake Management, as per their recent protocol regarding cyanobacteria bloom management.

Method of response

Copper sulfate application

Site's Emergency Response Plan

Because this was not a legitimate bloom event, and only an act of prevention, the only response plan necessary was their prevention plan, which proved effective for this case.

Resolution

The decision to apply copper sulfate came in response to readings of PC at 65.1 PPB and chlorophyll-a at 1.41 PPB, a ratio of P/A = 46. Due to inclement weather conditions, this was sufficient to arouse concern, leading to a request from the DEP asking what testing should be performed. The DEP directed the PWS to conduct and analyze the same tests that they had used in May of that year for an earlier cyanobacteria concern.

North Andover Water Department - 9/15/18-10/10/18

MassDEP contact affiliated with event: Kristin Divris

North Andover Water Department contact affiliated with event: Glen Alt

Location of Bloom

Lake Cochichewick, North Andover, Massachusetts. This is a Primary PWS source, the only source for the entire PWS.

Reporting

On 9/17/18 the PWS reported to the DEP that a potential bloom was starting, and they were planning to take samples on the same day and requested direction from the DEP.

Event Type

The highest recorded cell counts were 11,000 cells/mL at a depth of 9' at the water intake and the lowest cell counts were 7800 cells/mL at a depth of 3' at the water intake. Analysis for cyanotoxins resulted in Microcystins, anatoxin A, and cylindrospermopsin all reporting **below** detectable levels.

Site's preventive protection plan

The PWS routinely monitors Chlorophyll-A and phycocyanin as per the EPA region 1 Cyanobacteria Monitoring Collaborative (CMC). For this event specifically, they detected the developing bloom through their standard monitoring processes.

Method of response

Copper sulfate application to the afflicted body.

Site's Emergency Response Plan

Upon the discovery of the heightened PC levels, they immediately began testing for signs of cyanobacteria in the water. Contracted Solitude Lake Management for copper sulfate application.

Resolution

The initial grab-samples from 9/17 revealed chlorophyll-A to phycocyanin ratios of 8.56:0.47 (18.21:1) for the laboratory grab sample and 4.76:0.54 (8.85:1) on the boat ramp surface grab. On 10/20/16, DEP-WURP collected raw and finished water samples for cyanotoxin analysis by WES prior to treatment; NERO-DEP then approved copper sulfate treatment to the lake. On 10/21/16 DEP-WES provided preliminary toxin results for total MC/Nodularins (Abraxis ELISA method) and ANA(a) were all found to be at levels below the MRL. Enumeration counts from samples taken on 10/20/16 were 10,283 cells, and enumeration from samples taken on 10/18/16 had values between 690-2,300 cells/mL. Source was treated with copper sulfate on 10/26/16.

Danvers Water Department – 8/28/19

MassDEP contact affiliated with event: Kristin Divris

Danvers Water Department contact affiliated with event: N/A

Location of Bloom

Middleton Pond Reservoir, Middleton/Danvers, Massachusetts. This is a primary drinking water source.

Reporting

This bloom was discovered through citizen reporting. A citizen was walking dogs around the perimeter of the Middleton Pond Reservoir and noticed the start of a bloom on 8/28. He reported to both the MDPH and to DEP. He returned 9/4/19 and noticed the bloom had increased in size.

Event Type

Toxin analysis and enumeration values are not available for this event, but imagery suggests there was a full bloom event in effect. Tracking of the event indicates that it was taken seriously as a credible threat to health. While the initial reporter requested a health advisory, no such posting was made because this is a drinking water source, not a recreational source.

Site's preventive protection plan

This site's preventive protection plan was not detailed.

Method of response

No active chemical application was mentioned, only increased monitoring of the toxin levels and bloom location.

Site's Emergency Response Plan

The Danvers Water Department immediately took action to increase their monitoring of the site when the bloom was reported. This includes "daily visual monitoring of waterbody and overhead drone footage to track bloom movement". As of 9/4, the bloom was not near the water intake, so the PWS did not choose to adjust their water withdrawal from the site. The site also used an internal laboratory to monitor the status of the raw and finished water, to make sure that the water was safe.

Resolution

This event is currently ongoing as of the creation of this case study, and no resolution has occurred.