

CWD Source Water Protection Program Updates

9/19/2024
Fresh Pond Advisory Board

Hobbs Brook Reservoir

Photo credit: Philip Greenspun, 2015

New (and old) Staff – we've grown!



Jamie O'Connell - Watershed Protection
Supervisor



Anna Van Dreser – Watershed Technical
Supervisor



Emily Maynard – Watershed
Management Assistant

Source Water Protection Program Overview

- **Water Quality Monitoring**

- Site Monitoring and Dam Management
- Hazmat and Emergency Response
- Natural Resources Restoration
- Partnership Development

CWD Water Quality Monitoring Program



HB @ KG on February 17, 2022

CWD Water Quality Monitoring

- 12 Tributary Sites, 3 Reservoirs
- Sample 6-8x/year per site
- Analyze >20 physical, chemical, and biological parameters
- USGS JFA



New & In Development

[Source Water Quality Report \(arcgis.com\)](https://arcgis.com)

- Biological monitoring updates
 - Algae and cyanobacteria
 - Asian clam study
- Interactive Source Water Quality Report updates



Collection

Source Water Quality Report

Results from the Cambridge Water Department Source Water Quality Monitoring Program

Updated through calendar year 2023

Get started



1 Introduction



2 Standards and Guidelines



3 Land Cover



4 Reservoir Retention Time



5 Temperature and Dissolved Oxygen



6 pH



7 Bacteria



8 Salts



9 Nutrients



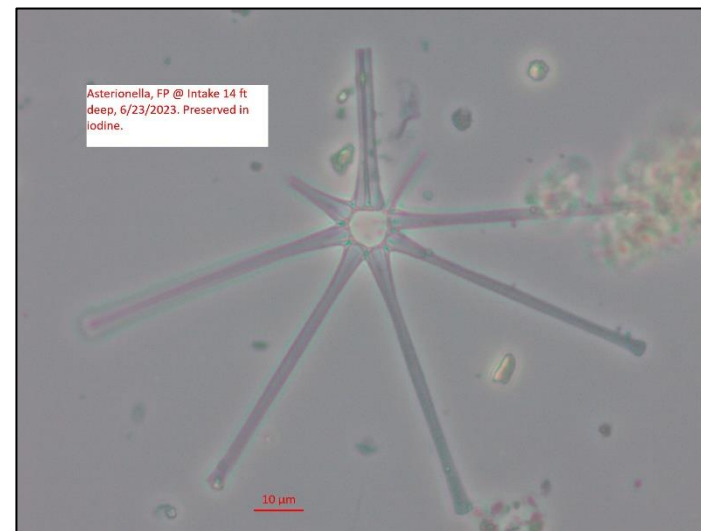
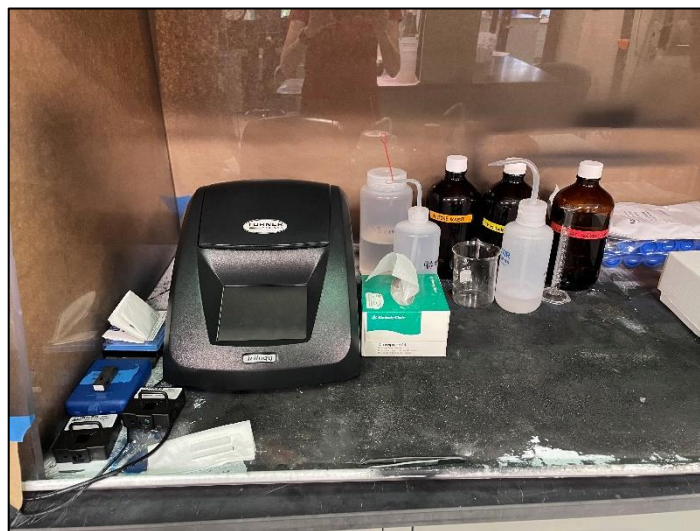
10 Metals



11 Macroinvertebrates (2019 pdf)



12 Algae (2019 pdf)



Algae and Cyanobacteria Monitoring

- Why are algae and cyanobacteria noteworthy?
 - Some algae and cyanobacteria can cause taste and odor problems
 - Cyanobacteria can also contain harmful toxins
- Are we concerned about algae/cyanobacteria in Fresh Pond (FP)?
 - Currently, no impact on water treatment operations
 - FP already has an aeration system, a tool to help to prevent blooms
 - Yet, anecdotally, bloom activity has been increasing
 - Climate change could increase the risk of serious blooms (warmer weather, more intense rainfall)
- Why develop an algae/cyanobacteria monitoring program?
 - ✓ Prepare for future conditions
 - ✓ Understand ecosystem dynamics & develop bloom risk prediction tools
 - ✓ Develop reservoir management plans w/ specific action levels



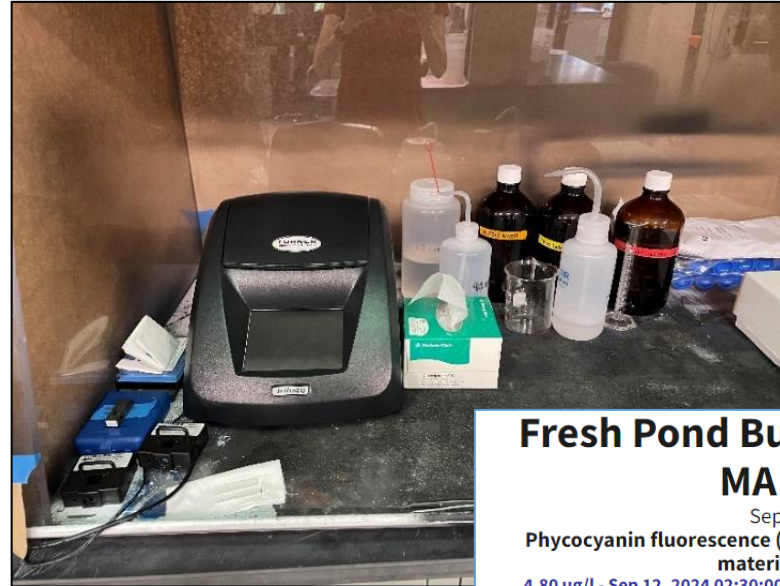
Fresh Pond with green patches of algae/cyanobacteria, October 12, 2021

Note: Cyanobacteria are sometimes called "blue-green algae." However, they are bacteria, not algae.

Algae and Cyanobacteria Monitoring

Program History

- May 2022
 - USGS phycocyanin buoy installed near FP intake
- 2023
 - In-house analysis of chl-*a* (2023)
 - Algae ID training (2023)
- ~2016 – present
 - In-house and contract lab algal ID & enumeration at various locations

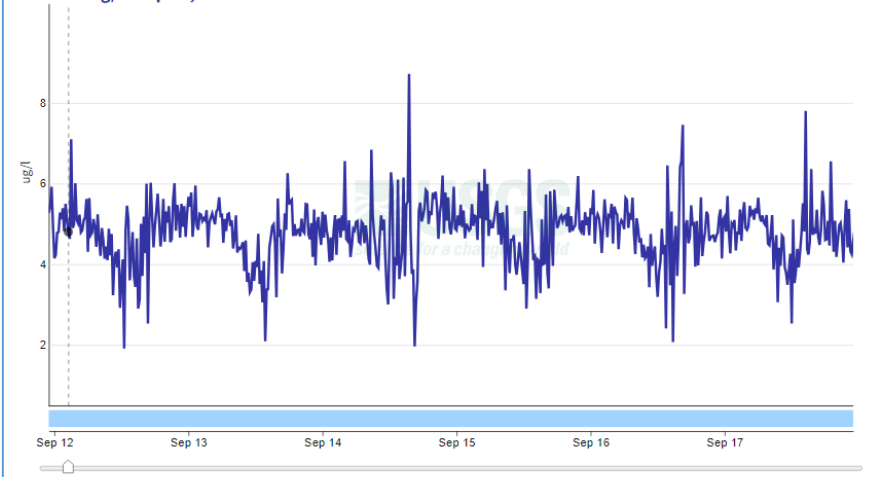


Fresh Pond Buoy, Near Intake at Cambridge, MA - 422303071084301

September 11, 2024 - September 18, 2024

Phycocyanin fluorescence (fPC), water, in situ, concentration estimated from reference material, micrograms per liter as phycocyanin

4.80 ug/l - Sep 12, 2024 02:30:00 AM EDT

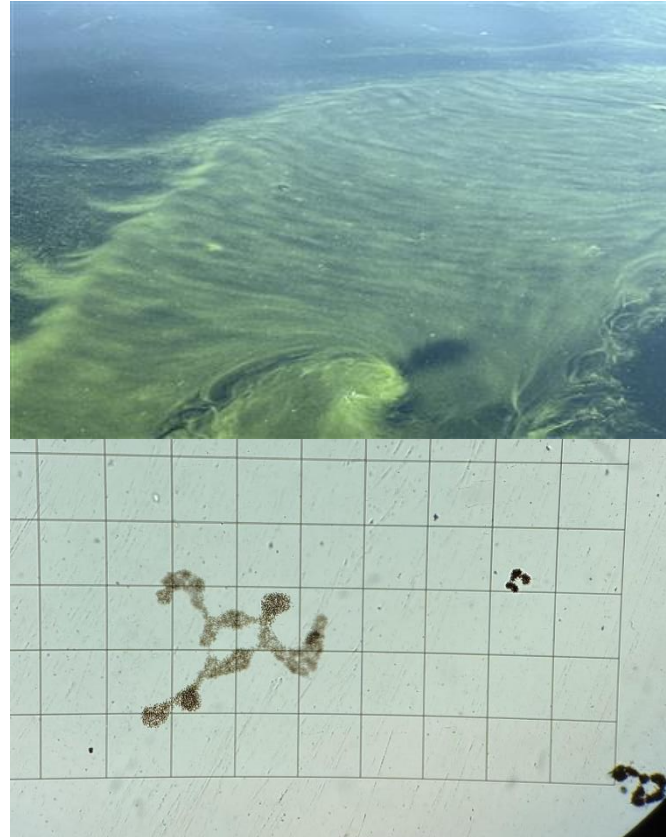


IMPORTANT Data may be provisional

Algae and Cyanobacteria Monitoring

2024 Program Development

- Focus on Fresh Pond
- Bi-weekly visual bloom surveys
- Bi-weekly monitoring at FP @ Intake:
 - ID & enumeration at surface and 4m deep (intake pipe)
 - Phycocyanin and chlorophyll-*a* (surface, 4m, integrated samples, & Bloom Forming Cyanobacteria (BFC))
 - Toxin testing (preliminary)
- Developing protocol for in-house phycocyanin analysis
- Creating guides to ID common genera of algae/cyanos under microscope



Microcystis blooming in Fresh Pond and as viewed under a microscope

9:23 AM Thu Sep 19

Fresh Pond Algae V.3

Date & Time *

Thursday, September 19, 2024

9:20 AM

Air Temperature (F)

Collect air temperature from nearest USGS weather station

Water Temperature (F) *

Collect water temperature from probe at FP@Intake

Current Weather *

Select multiple if needed

Sunny (0-20% cloud cover)

Partly Cloudy (20-80% cloud cover)

Cloudy (80-100% cloud cover)

Light Breeze

Moderate Breeze

Windy

Raining/Snowing

Last rainfall >0.1" *

24 hours

48 hours

72 hours

>72 hours

Draw polygon to capture bloom area
click the sketch button and draw directly on map

Area: 17.7 acres, Perimeter: 0.7 mi

Estimated bloom area

Enter bloom area in acres from map above

Bloom Area Sq.ft.

Location in the water column

Select multiple if needed

Suspended in water column

Surface scum

Bloom Description

Select multiple if needed

Clumpy

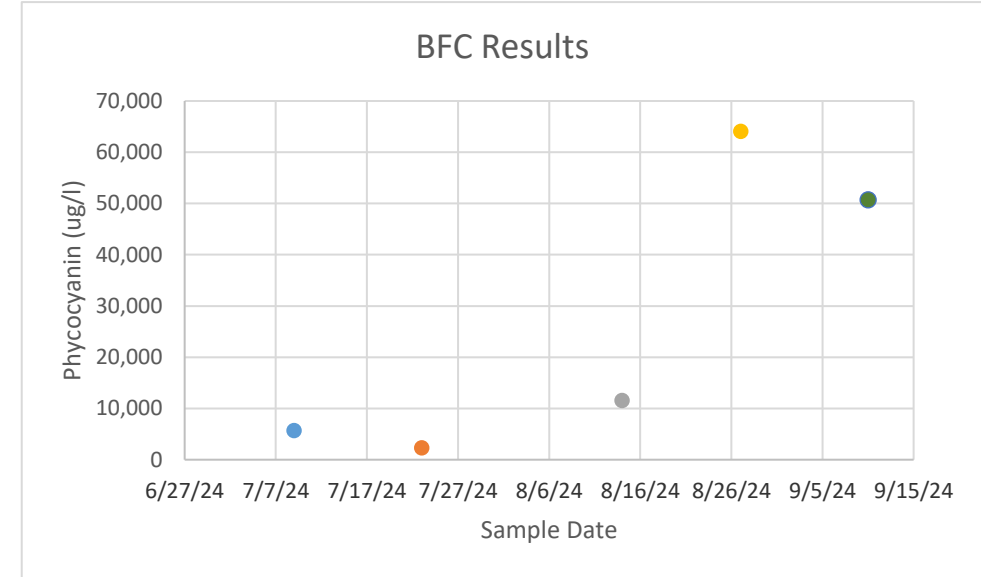
Planktonic (small particles)

Filamentous

Photos

Algae and Cyanobacteria Monitoring

- Future goals
 - Engage consultant to help us:
 - Improve monitoring and analysis protocols
 - Understand impact on water treatment
 - Predict blooms and cyanotoxin levels
 - Develop action criteria
 - Expand program to additional reservoirs
 - Continue developing in-house algae, cyanobacteria, and phycocyanin analysis capacity



Example of how BFC* samples may help predict bloom activity

*BFC = Bloom Forming Cyanobacteria. This is a highly concentrated sample and not reflective actual lake phycocyanin conditions.

Asian clam study

- What are Asian clams?
 - Invasive clams, likely present since the 1970s
 - ~2.5cm or smaller
 - Larvae easily spread through waterways by boats and birds
 - Prefer soft, sandy or silty substrate, warm and low DO water.
 - Live in water <25-30ft deep
- Why do we care about them?
 - **Ecological problem causers:**
 - Can release (instead of filter) excess phosphorus
 - Out-compete and take over the niche of native mussels
 - **Physical problem causers:**
 - Grow on and block intakes and pipes (although not common)



Asian clamshells found in Cambridge reservoirs.

Asian Clam Study

- How are we monitoring them?
 - First confirmed near Stony Brook Reservoir inlet in April 2024
 - Surveyed Fresh Pond, August 2024:
 - Visually surveyed the full shoreline to ~15 ft deep
 - Collected substrate grab samples
 - Found live and dead clams throughout
 - Highest concentrations near conduit outlet, where the substrate is the softest and the water shallow
- Future goals
 - Perform presence/absence surveys at upstream reservoirs
 - Survey tributaries to the reservoirs until we find the extent of their range in the watershed



Substrate grab sample from Fresh Pond, 8/13/2024

Interactive Source Water Quality Report

[Source Water Quality Report \(arcgis.com\)](https://arcgis.com) or
[Reports and Research - Water - City of Cambridge, Massachusetts](#)

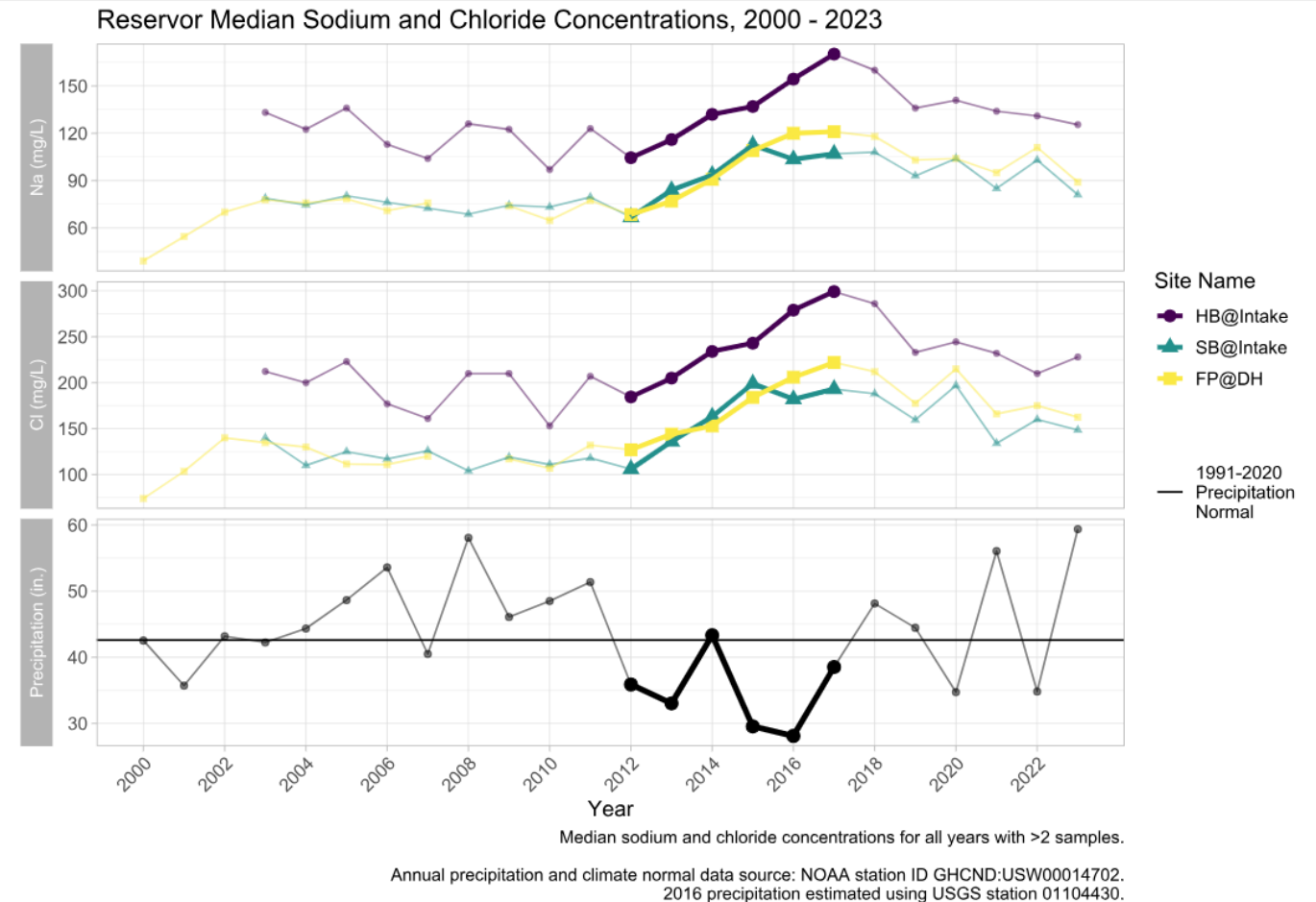
- Report updated with 2023
- Future Goals:
 - Simplify modules, focusing on plain language and accessible summaries
 - Update Macroinvertebrate and Algae modules

The screenshot displays the 'Source Water Quality Report' interface. At the top left is the City of Cambridge seal. Below it, the text reads 'Collection Source Water Quality Report'. Underneath, it states 'Results from the Cambridge Water Department Source Water Quality Monitoring Program' and 'Updated through calendar year 2023'. A blue 'Get started' button is positioned below this text. To the right, a grid of 12 report modules is shown, each with a representative image and a numbered title:

- 1 Introduction: Image of a brick building.
- 2 Standards and Guidelines: Image of two blue water bottles on a blue mat.
- 3 Land Cover: Aerial view of a residential area with a lake.
- 4 Reservoir Retention Time: Lake with a rocky shoreline.
- 5 Temperature and Dissolved Oxygen: Lake with a forested shoreline.
- 6 pH: Lake with a forested shoreline.
- 7 Bacteria: Lake with a white swan and a fence.
- 8 Salts: Stream with snow on the banks.
- 9 Nutrients: Pond with green algae.
- 10 Metals: Concrete structure in a pond.
- 11 Macroinvertebrates (2019 pdf): Close-up of a rock in water.
- 12 Algae (2019 pdf): Pond with green algae.

Interactive Source Water Quality Report

- **Trend Highlight: Na⁺ and Cl⁻**
 - Lack of rain 2012 – 2017 may have caused salt concentrations to increase
 - Recent wet years likely diluted salt in reservoirs, decreasing concentrations



A wide-angle photograph of a sunset over a large body of water. The sky is filled with dramatic, colorful clouds in shades of orange, red, and purple, with a bright yellow and orange glow from the setting sun on the horizon. The water in the foreground is dark and reflects the colors of the sky. The background shows a dark silhouette of a forested shoreline.

Questions?

Fresh Pond, 10/5/2015