

US EPA ARCHIVE DOCUMENT

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The Cyanobacteria Monitoring Collaborative

An Approach to Educating, Monitoring, and Managing Harmful Cyanobacteria

USEPA REGION 9 HABs SWAMP MEETING
APRIL 26, 2017

Today's Talk

- ▶ CMC Program Overview
- ▶ Three Tiered Approach
 - ▶ bloomWatch
 - ▶ CyanoScope
 - ▶ Cyanomonitoring
 - ▶ QA/Lessons learned/Coordination/Funding
- ▶ Remote Monitoring Buoys

Program Conception

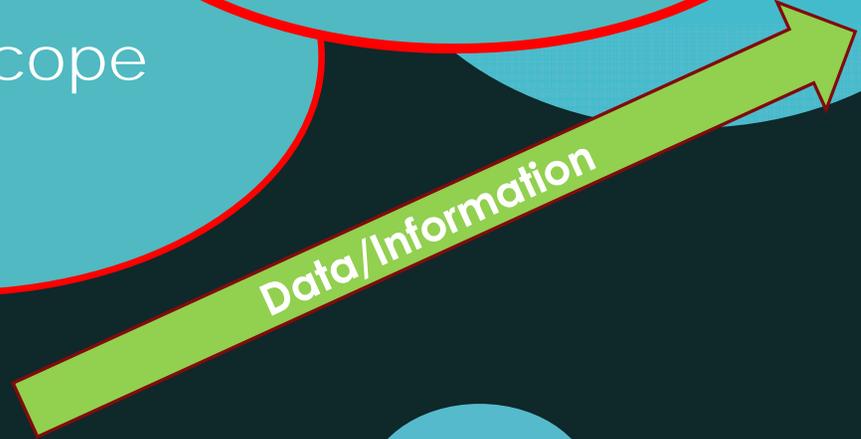
- ▶ State Request/Timing
- ▶ Open Collaborative Approach
- ▶ Architecture
 - ▶ Fill a niche
 - ▶ Inexpensive
 - ▶ Informative (solid useful data!)
 - ▶ Educational
 - ▶ Scaleable



Quality Assurance



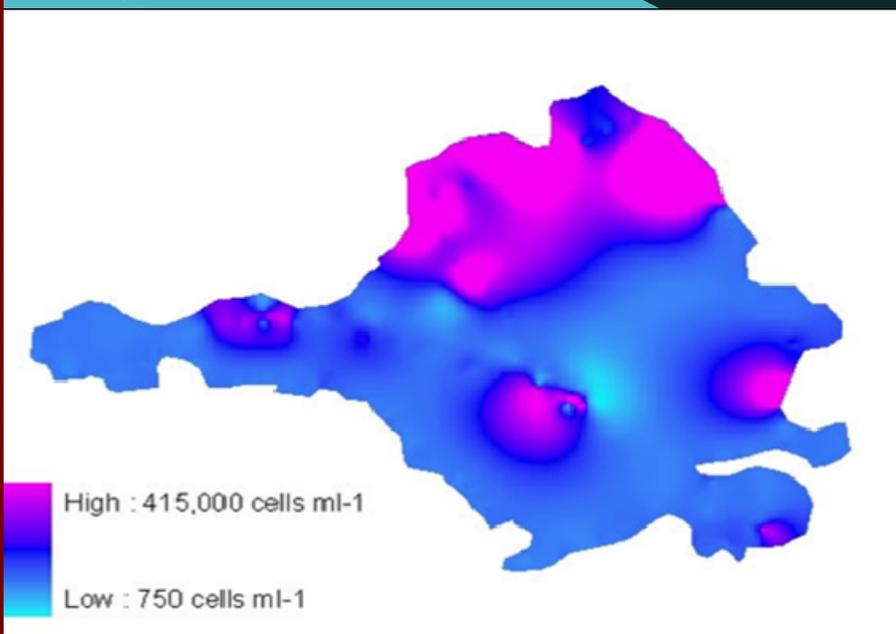
Waterbody management



Educational/Informative

BloomWatch!

To determine the spatial and temporal patterns of bloom occurrence



- Readily Available Tool (Smartphone)
- Phone App- Embedded QA
- Educational
- Scalable Crowdsourced information
- Data in public domain – real time data – public domain

CYANOS OVERVIEW

BLOOMWATCH APP

CYANOSCOPE

CYANOMONITORING

PROJECT OVERVIEW

HOW IT WORKS

DATA AND RESULTS

WAYS TO GET MORE INVOLVED



BLOOMWATCH APP

CROWDSOURCING TO FIND AND REPORT POTENTIAL CYANOBACTERIA BLOOMS

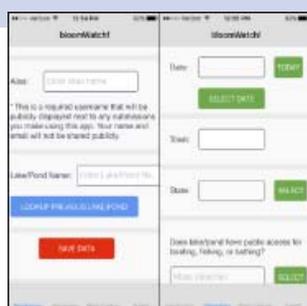


“Crowdsourcing to find and report blooms”

Use your smartphone to help track cyanoblooms

<http://cyanos.org/bloomwatch>

The App: Four Screens



File Edit View Favorites Tools Help

http://www.citsci.org/cwis436/websites/citsci/home.php?webSiteID=7

CitSci.org - Comprehensive...

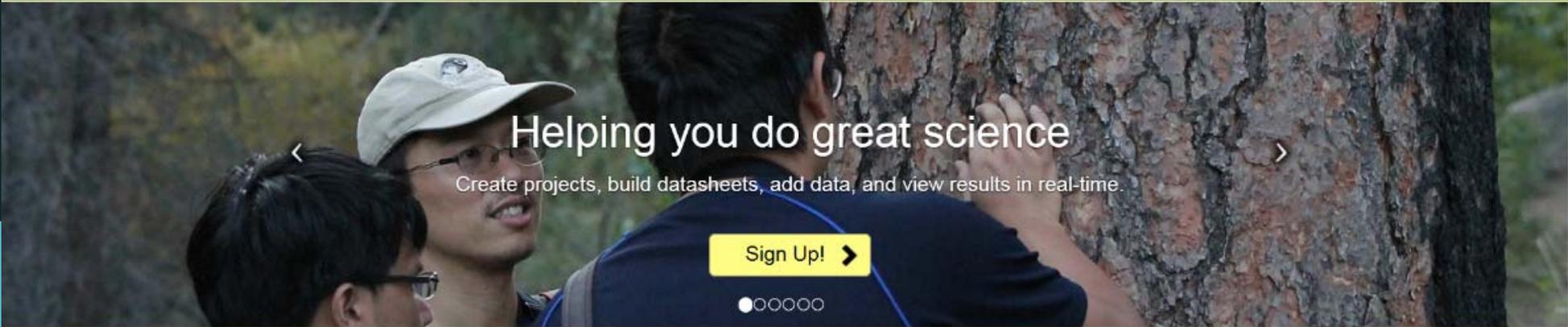
(115) New Emails XFINITY... BioSonics Webinar - A... Cholesterol Conundrum - ... google maps driving dire... JAMA Statin research Lesley University - Cambri...

Page Safety Tools

CitSci.org

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Helping you do great science

Create projects, build datasheets, add data, and view results in real-time.

Sign Up!

● ○ ○ ○ ○ ○

326 projects

590,718 measurements

2,432 members

61,678 locations

1,185 protocols

Start a Project

Benefits

- Configurable**
Build your own datasheets and protocols ~ Make It your own
- Community-Driven**
We're community driven ~ you make us better
- Free**
Free data management, storage,

Featured Project

Trout Unlimited Coldwater Conservation ...



Monitor the impact of Marcellus Shale gas development on the statewide water resources

168 Participants 5736 Observations 1306 Photos

New Observations

- Observation at COFFCR...**
Tom Varrassa
July 6th, 2016
- Observation at BROKCR...**
Tom Varrassa
July 6th, 2016
- Observation at COSPBO...**
Tom Varrassa
July 6th, 2016

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Home About Projects Protocols Maps Data Services Blog

bloomWatch

46 members | 11 observations | 11 locations | 139 measurements 



Project Manager: Jasper Hobbs

Description: Help track

Are you se...
pea soup d...
which has...
ecosystem...

State and l...
and your s...
understand...
causing iss...

Submit dat...
CitSci.org
<http://cyan...>

Project Details Team Members

Join Statistics Download

View Data Submit Data Resources Media Feedback Questions Analyses Forum Wiki

Observations Map Locations

Search:

Date	Location	Latitude	Longitude	Photo
September 10, 2016				
September 1, 2016				
September 1, 2016				
August 28, 2016	Lake Lillinonah	41.49150672	-73.32369806	
August 19, 2016	Sudbury River	42.42854981	-71.35500919	

Instant Access

tails Twitter Facebook Share



Observation Details

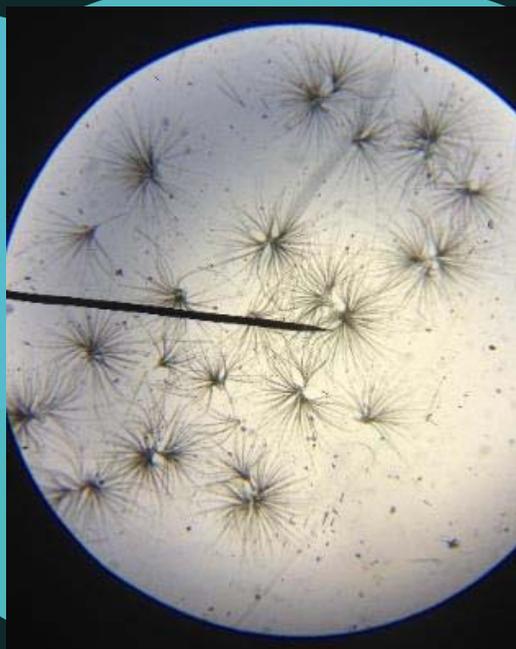
Date: September 1st, 2016
Recorder: [Bill lover](#)
Location Details: [bloomWatch lake](#)
Latitude: 41.48477895
Longitude: -73.32497454
Accuracy: 5.0
Survey Type: Point
Project: [bloomWatch](#)
Data Source: [Bill lover](#)
Comments: surface scum visible around the dock, algal clumps all through the column in open water.

Photos



CyanoScope

To determine the occurrence and distribution of cyanobacteria genus/species (mapping of potentially toxin producing waterbodies)



Anabaena / Anabaenopsis

General Description

- *Anabaena* cells are usually arranged in filaments or chains and can be straight, spiralled, coiled or spring-like and often described as "beaded"
- Filaments also have specialized cells called heterocysts and akinetes, used for fixing nitrogen and regenerating cells for future colonies
- A mucilagenous sheath surrounds the cells of the filament

Anabaena cells

granulation in cells

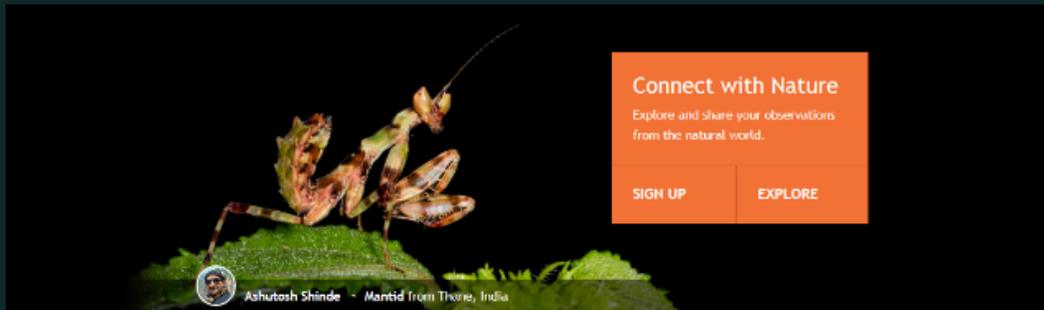
—Large Akinete

mucilagenous sheath encases filament

—small heterocysts

10 µm





Connect with Nature

Explore and share your observations from the natural world.

SIGN UP

EXPLORE



Ashutosh Shinde - Mantid from Thane, India

How It Works



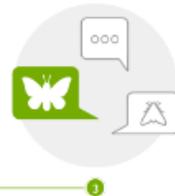
1

Record your observations



2

Share with fellow naturalists



3

Discuss your findings

Contribute to Science

Every observation can contribute to biodiversity science, from the rarest butterfly to the most common backyard weed. We share your findings with scientific data repositories like the Global Biodiversity Information Facility to help scientists find and use



← Projects
Home > Home > Edit Project > Leave this Project



cyanoScope

MAPPING CYANOBACTERIA ONE SLIDE AT A TIME

ADD OBSERVATIONS


cyanoScope

Stats

Totals	Most Observations	Most Species	Most Observed Species
98 Observations -	 wilmbriet 37 observations	 karolita 4 species	 cibocentris 8 observations
17 Species -	 richidna 10 observations	 wilmbriet 1 species	 occlanorla 3 observations
19 People -	 karolita 9 observations	 richidna 9 species	 platinu 1 observations
	 harja 0 observations		 microcytis 2 observations
	 wincresearch 6 observations		 aphenocapa 3 observations



Members

19 members

View all members -

Your membership 2 observations

Add from your observations

Download template for use in the bulk uploader

Export observations

ADMIN / HTML / CSV

Usage stats

Project curator tools

Find suitable observations

Add an observation to cyanoScope

Add: [Batch](#) · [From list](#) · [Import](#) · [From photos](#)

What did you see?

[Search](#)

Was it captive / cultivated?

Where were you?

lake attitash, ma



[clear](#)

Lon: -70.982914

[Edit](#)

Acc (m): 1560

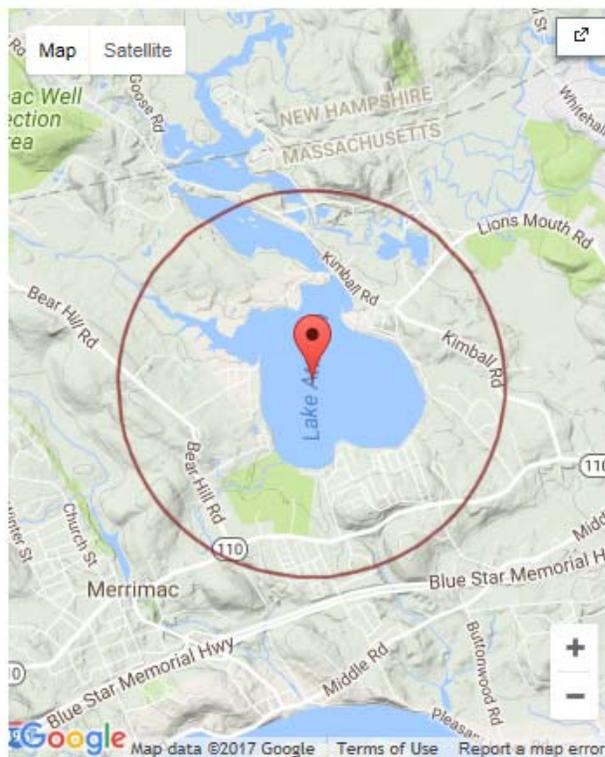
Src: google

When did you see it?

(GMT-05:00) Eastern Time (U: [v](#))

e.g. "2017-04-14 12:41:39", yesterday at 4pm

Description



Tags *Comma-separated, please*

Change geoprivacy [open](#)

Add media

[Add photos](#)

[Add sounds](#)

Select one or more photos

[Browse...](#)

Sync obs. w/ photo metadata?

[clear](#)

We also support [Flickr](#), [Picasa](#), and [Facebook](#) for image hosting.

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[Link your Picasa account](#)

[Link your Facebook account](#)

Recent observations [View all »](#)

Grid List



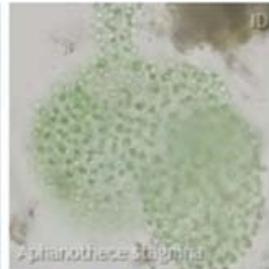
Gomosphaeria



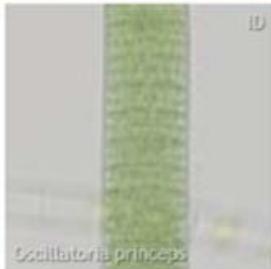
Something...



Class Cyanophyceae



Aphanizotese stagnina



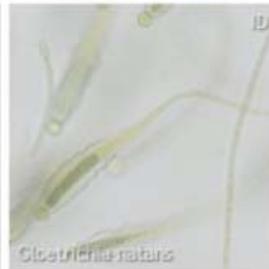
Oscillatoria princeps



Phormidium tergestinum



Oscillatoria tenuis



Gloeotrichia raistrans



Calothrix stagnale



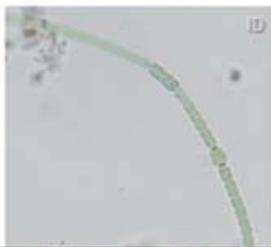
Nostoc pulidosum



Anabaena oscillarioides



Nostoc inaequalis



CyanoMonitoring

Tracking of cyanobacteria concentrations with efforts to forecast bloom occurrences, determine risk, and assess waterbody/human health vulnerability.

- Standardized methods/kits
- Temporal component
 - Tracking dynamics
- Minimum Seasonal Commitment
- Minimum Sampling Commitment
- Centralized Data
- Data Visualization tools (in development)

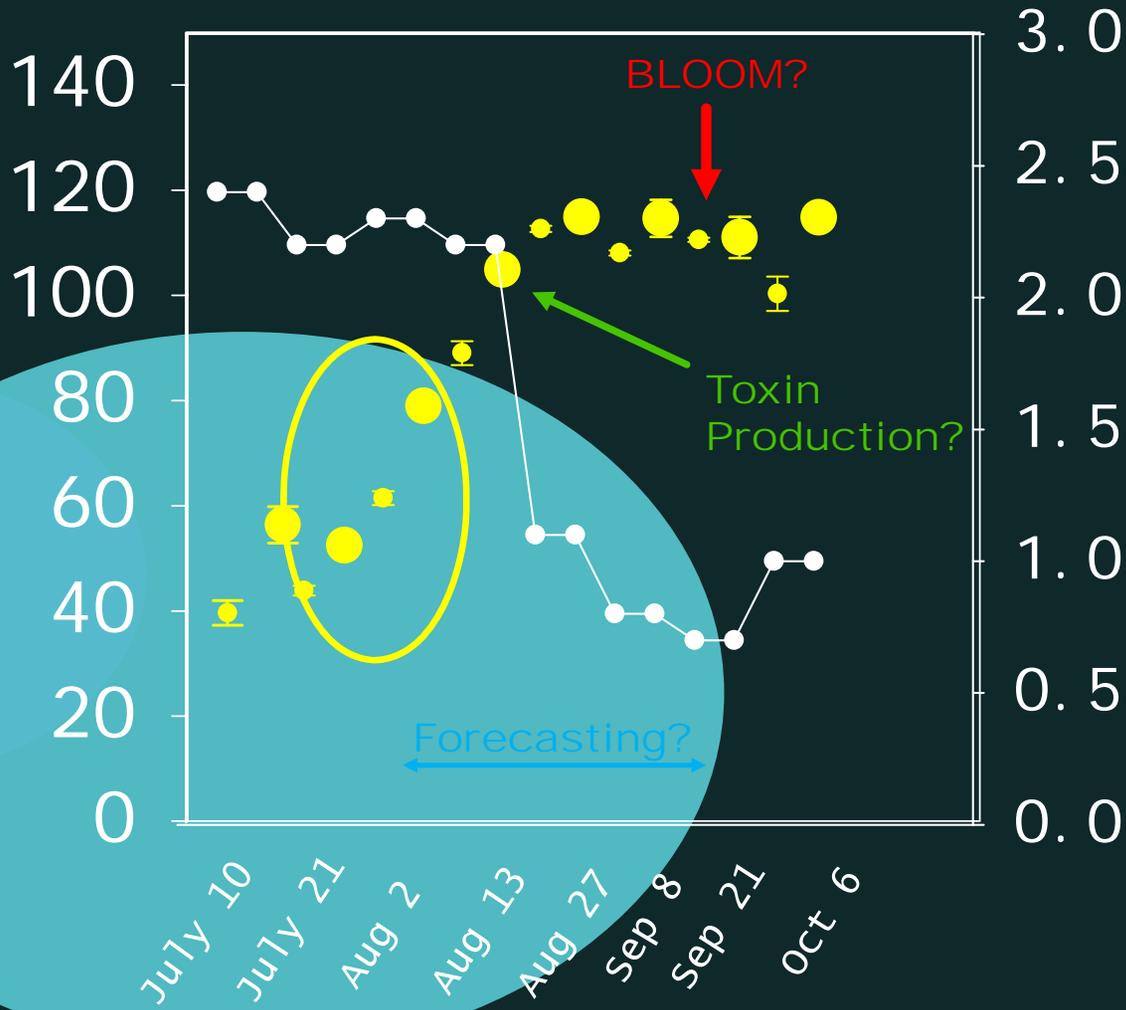


Handheld 2-Channel Fluorometer



- ▶ Channel 1 - Chlorophyll
 - ▶ .25 - 2,500 ppb
- ▶ Channel 2 - Phycocyanin
 - ▶ 4 - 100,000 ppb
- ▶ \$1,500 - \$2,500
- ▶ Primary Standards \$200 each
- ▶ Secondary Standards \$150 (2 year shelf)

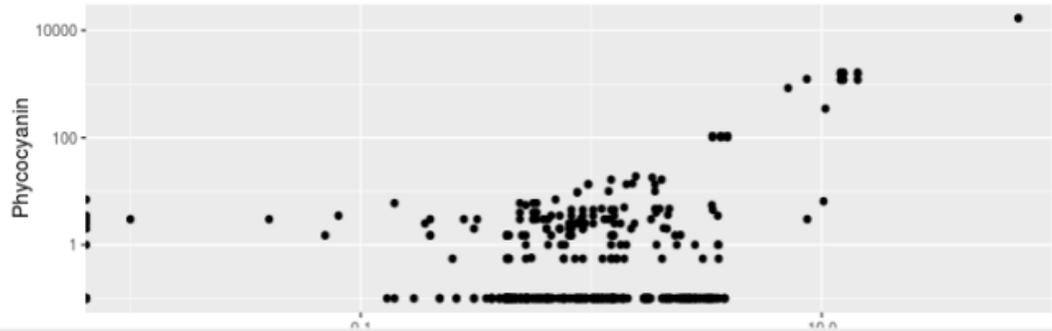
PC/Chl a Ratio



PC/Chl a Ratio precedes Secchi Disk depth and is most sensitive metric

Chlorophyll *a* and Phycocyanin Scatterplot

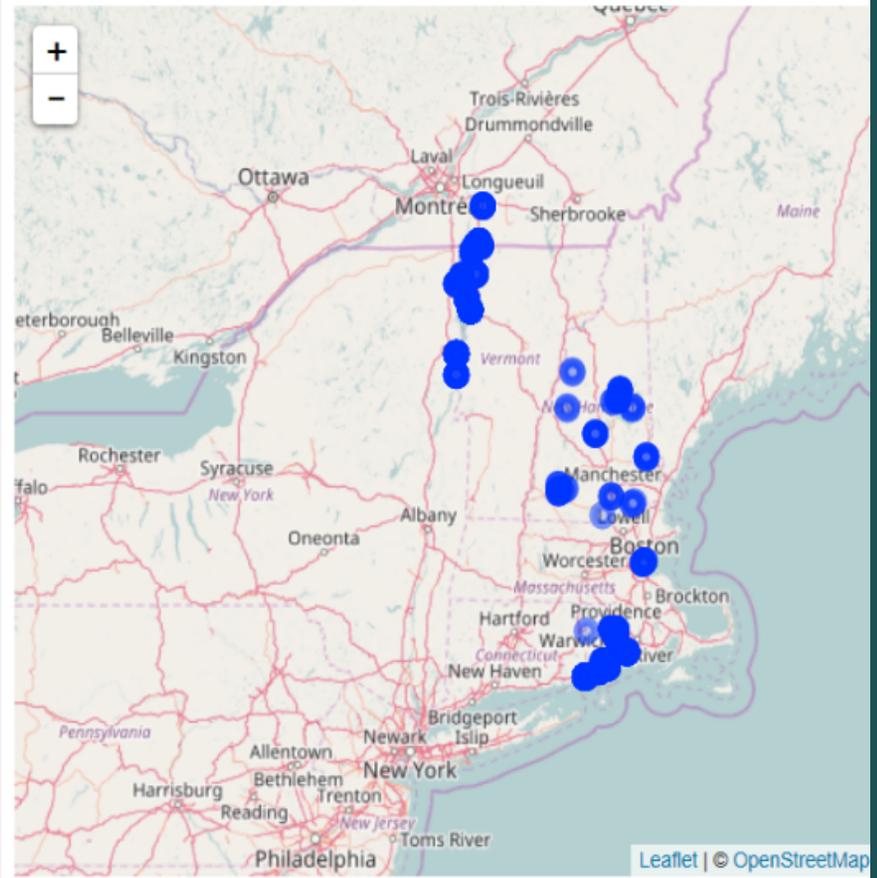
drag to select points



Data

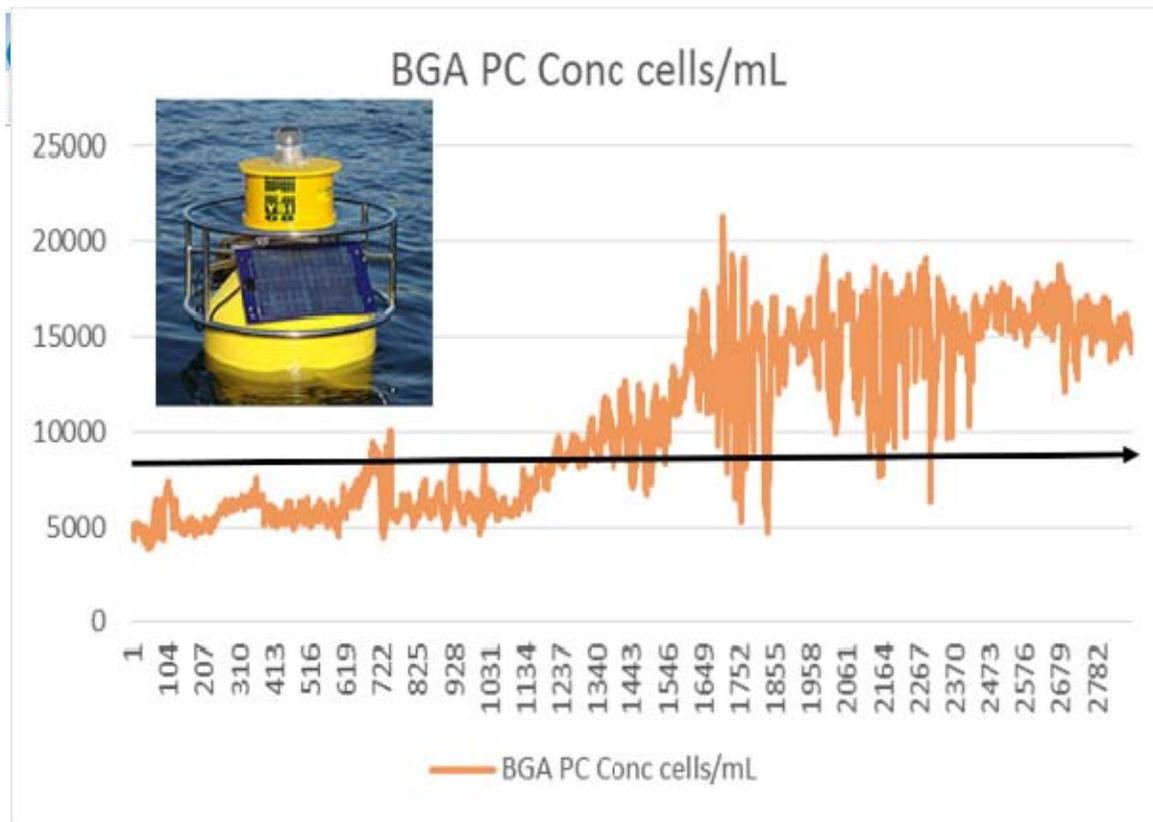
ID	State	Date	Chlorophyll	Phycocyanin
1 100:2014-09-03:Other	NH	2014-09-03	71.37	16998.17
3 10:2014-07-10:SS1	MA	2014-07-10	2.18	0.10
4 10:2014-07-17:SS1	MA	2014-07-17	2.44	1.52
8 102:2014-08-08:WL1	RI	2014-08-08	3.17	0.10
9 102:2014-08-08:WL2	RI	2014-08-08	3.57	0.10
10 102:2014-08-08:WL3	RI	2014-08-08	3.22	0.10

2014 Sampling Locations

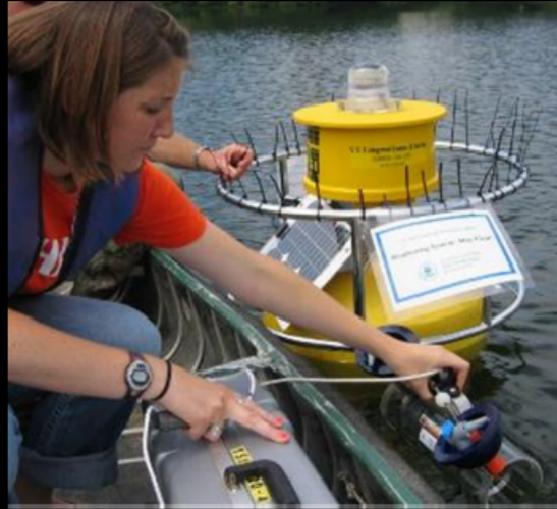




Real-time monitoring data



<https://www.epa.gov/lowermerrimackriver/live-water-quality-data-lower-merrimack-river>



CYANOS.ORG

<http://cfb.unh.edu/CyanoKey/indexCyanoQuickGuide.html>

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