

An aerial photograph of a large, winding lake. The water is a mix of dark blue and greenish-brown. A road runs along the shoreline, and there are several houses and buildings scattered throughout the surrounding forested area. The text is overlaid on the center of the image.

The Cyanobacteria Monitoring Collaborative

An Approach to Educating, Monitoring, and Managing Harmful Cyanobacteria Blooms

INLAND HABS DISCUSSION GROUP WEBINAR

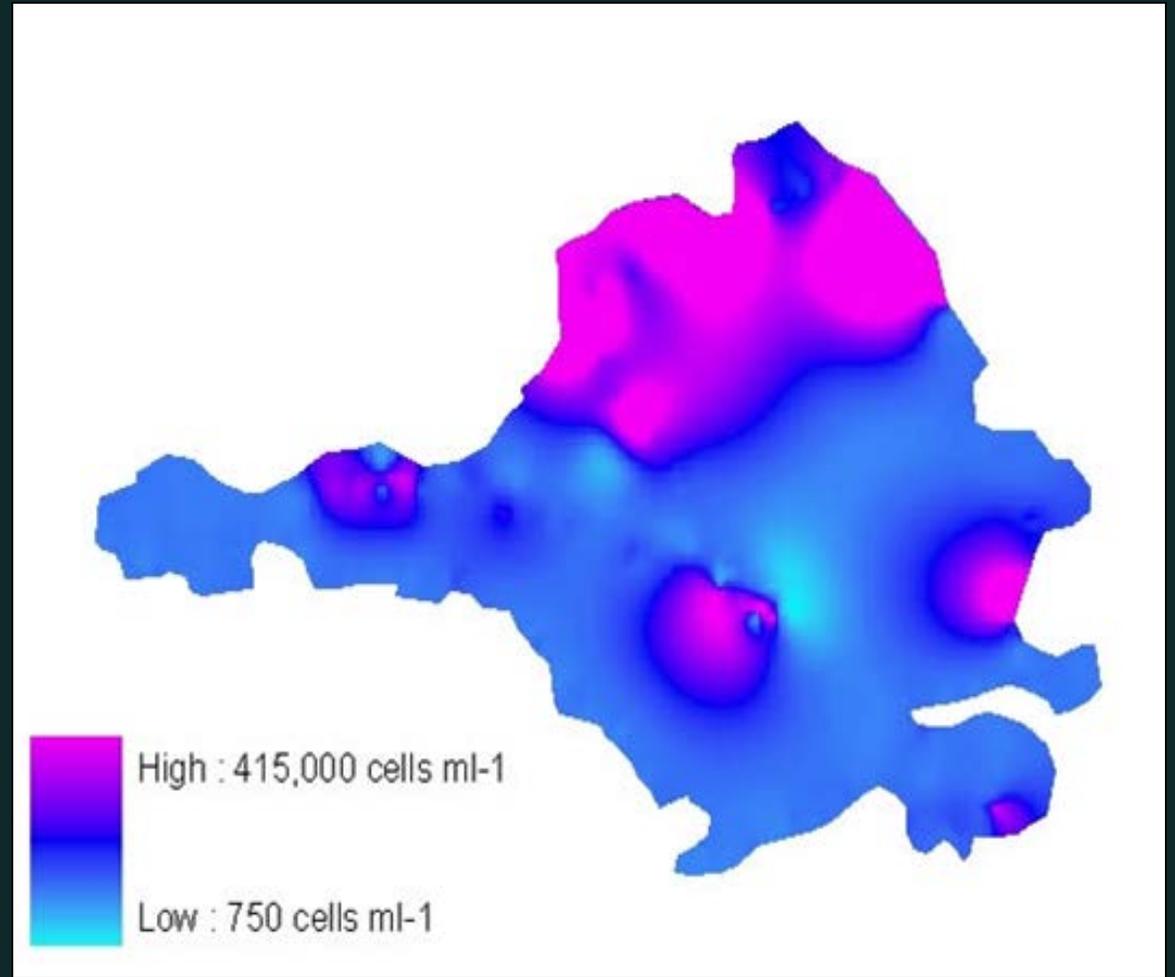
FEBRUARY 14, 2017

Today's Talk

- ▶ Program Background
- ▶ Overview of Methods and tools
- ▶ Data

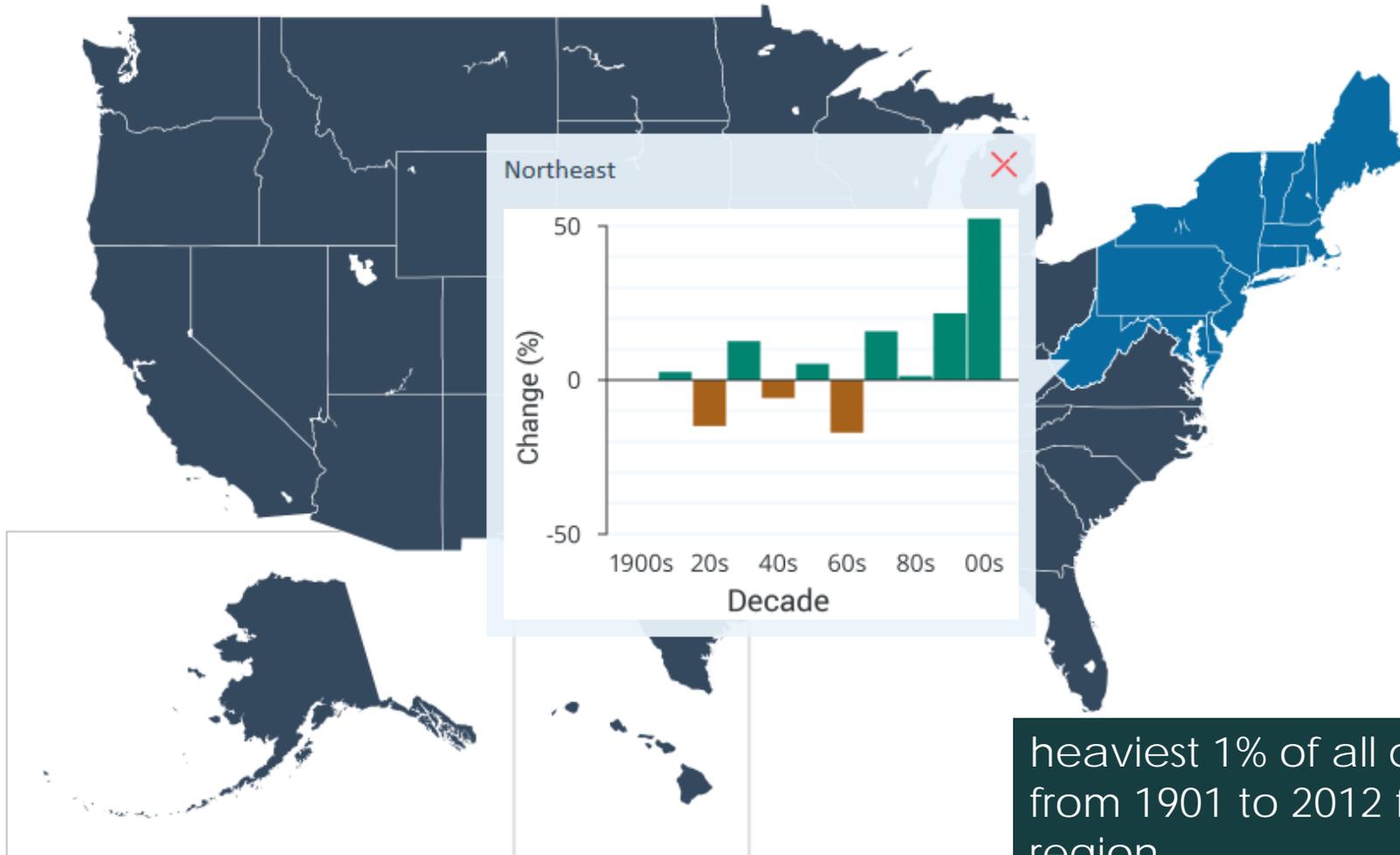
Why the Need?

- ▶ A request from states & constituents
- ▶ No clear picture at any spatial scale
- ▶ A moving target
- ▶ Lack of local knowledge
- ▶ Public Lack of knowledge on health risk
- ▶ Lack of overall data
 - ▶ Risk/vulnerability
 - ▶ Toxin associated genera
 - ▶ Management applications



Fig

- U.S. AVERAGE
- ALASKA
- NORTHWEST
- SOUTHWEST
- HAWAII
- GREAT PLAINS NORTH
- GREAT PLAINS SOUTH
- MIDWEST
- NORTHEAST**
- SOUTHEAST



heaviest 1% of all daily events from 1901 to 2012 for each region

What Must it Encompass?

- ▶ Low cost
- ▶ Easy implementation
- ▶ Established baseline (standardized methods/consistency)
- ▶ New *useful* information & connectivity to existing programs
 - ▶ Educational/Informative
 - ▶ Utility for resource management applications (PWS/beach programs)
- ▶ Address ambient waters (preemptive) and bloom conditions
- ▶ Commensurate QA

Training and Expertise

Waterbody management

Quality Assurance

COST \$\$

BloomWatch!

CyanoScope

CyanoMonitoring

Data/Information

Educational/Informative

CYANOBACTERIA MONITORING COLLABORATIVE

THREE COORDINATED MONITORING PROJECTS TO LOCATE AND UNDERSTAND
HARMFUL CYANOBACTERIA

[GET INFORMED](#)

[GET INVOLVED](#)

[GET IN TOUCH](#)

We work with citizen scientists, trained water professionals, and the general public to find and study cyanobacteria in waterbodies.

BloomWatch!

To determine the spatial and temporal patterns of bloom occurrence anywhere

- Bare bones
- Smartphone App
- Embedded QA
- Educational & Informative
- Crowdsourced information
- Data Visualization – public domain



CYANOS OVERVIEW

BLOOMWATCH APP

CYANOSCOPE

CYANOMONITORING

PROJECT OVERVIEW

HOW IT WORKS

DATA AND RESULTS

WAYS TO GET MORE INVOLVED

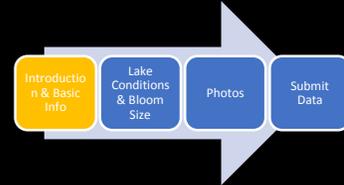


BLOOMWATCH APP

CROWDSOURCING TO FIND AND REPORT POTENTIAL CYANOBACTERIA BLOOMS



Lake Conditions & Bloom Size Screen



Verizon LTE 7:03 AM

bloomWatch!

Date: TODAY

Town:

State:

Does lake/pond have public access for boating, fishing, or bathing?

Weather conditions:

Introduction Information Photo Capture Submit

Verizon LTE 7:04 AM

bloomWatch!

Weather conditions:

Surface conditions:

Bloom size or extent:

General Comments:

Introduction Information Photo Capture Submit

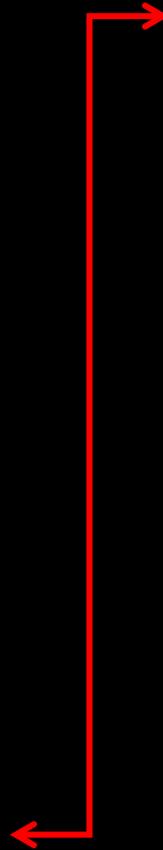
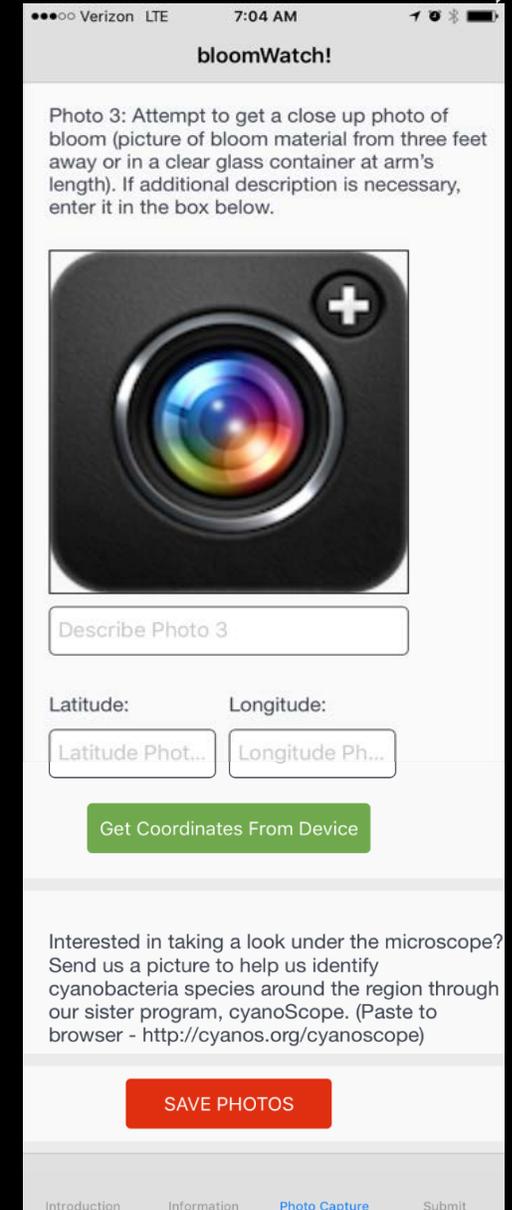




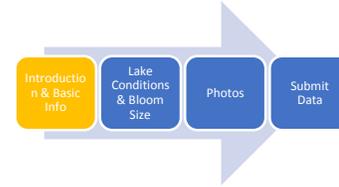
Photo Screen







Submit Data Screen



Verizon LTE 7:05 AM

Submit

Lake/Pond Name:

Date:

On Android devices, select EMAIL as the choice for your submissions.

SUBMIT DATA

Interested in being more involved and learning more about cyanobacteria? Take a look at some of them under the microscope and report your findings through our sister project, cyanoScope(hyperlink to "http://cyanos.org/cyanoscope")!

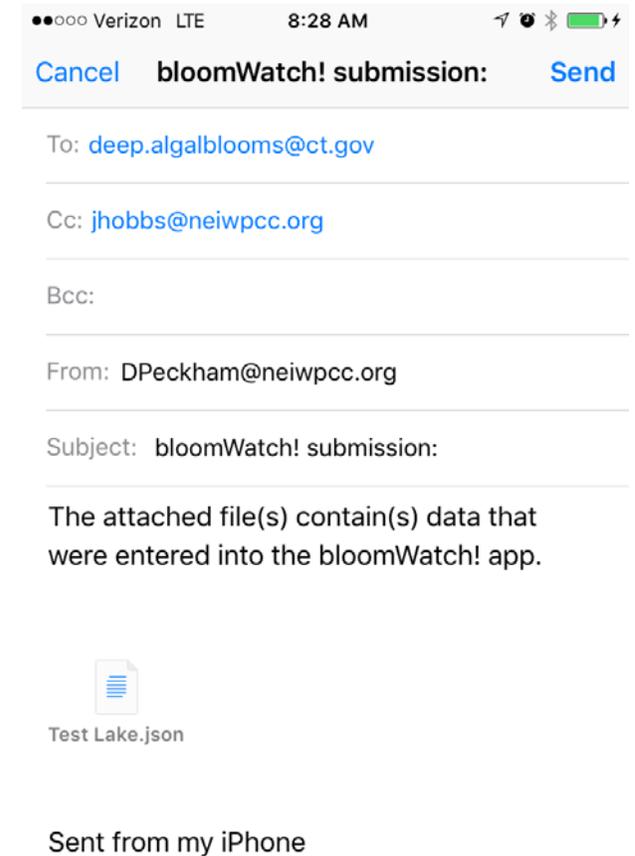
Once the waterbody information and pictures have been submitted, you can delete the waterbody from your device to save space. Simply select the waterbody you wish to delete from the list below and click the "DELETE WATERBODY" button.

Lake/Pond Name:

Introduction Information Photo Capture **Submit**



Pressing *Submit Data* will send data directly to CitSci.org, and will also open an email to send data to your state and regional cyanobacteria experts.

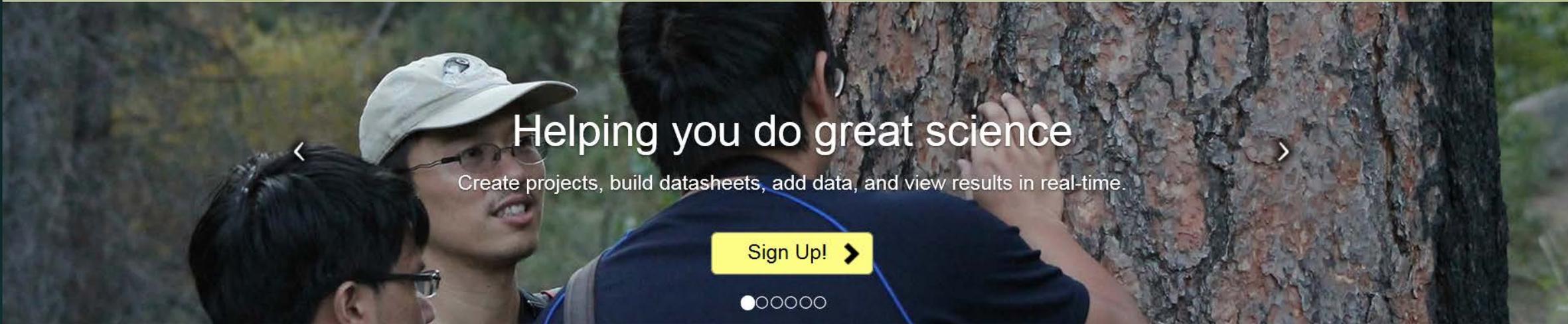




Login

Donate!

Home About Projects Protocols Maps Data Services



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

158 Participants 5735 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



Login

Donate!

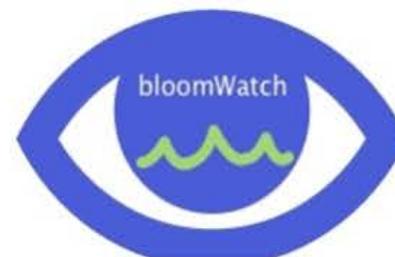
bloomWatch

47 members

11 observations

11 locations

139 measurements



Manager
Description

Jasper Hobbs
Help track cyanobacteria blooms using your smartphone!

Are you seeing a normally-clear lake that has suddenly turned the color of pea soup or a blue-green paint spill? It may be a bloom of cyanobacteria, which has the potential to produce toxins that affect humans, pets, and our ecosystems.

State and local officials can't be watching every lake at all times. With you and your smartphone helping us out, we want to improve our ability to understand where, how, and when these blooms are appearing and are causing issues.

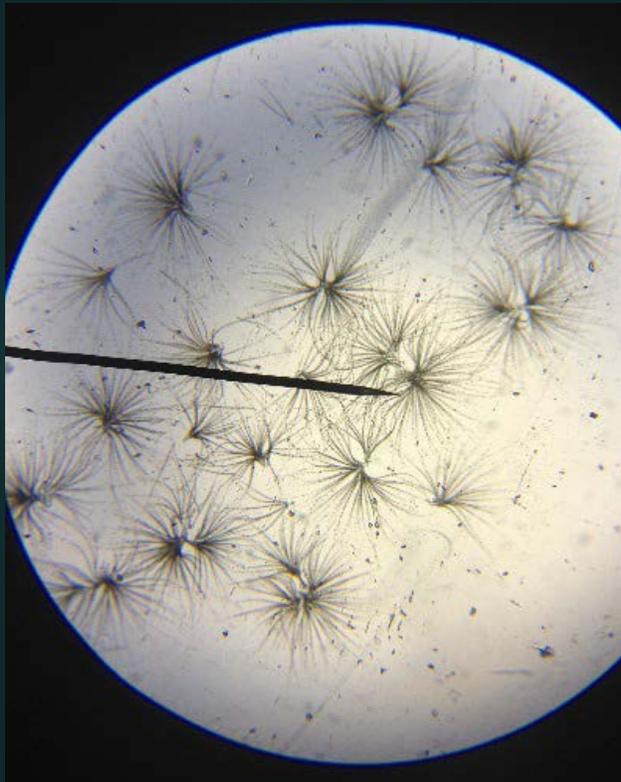
Submit data for bloomWatch using our app, which connects directly to this CitSci.org webpage! Download the app from our project website:
<http://cyanos.org/bloomwatch#Project-Overview>.

Goals



CyanoScope

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





Toxic Cyanobacteria of New England

"The Dirty Dozen"

| Purpose & Background | | Genus List |
|----------------------|--|------------|
| | | |
| | | |
| | | |
| | | |

University of New Hampshire, Center for Freshwater Biology: cfb.unh.edu

Please contact [Alexand.Mercier](mailto:Alexand.Mercier@unh.edu) for questions or comments

Observations

Species

Location

The World

2,500,490
OBSERVATIONS

89,001
SPECIES

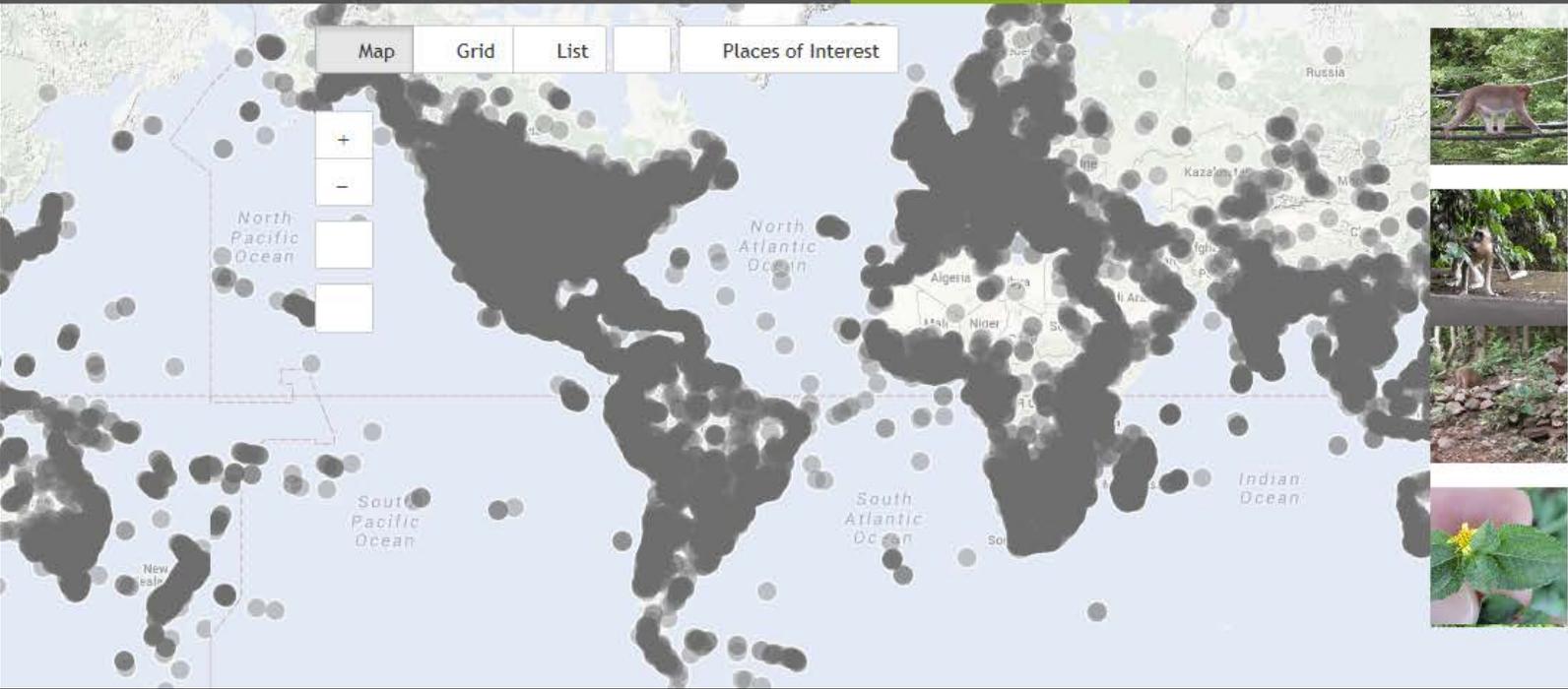
11,199
IDENTIFIERS

Map

Grid

List

Places of Interest



cyanoScope

MAPPING CYANOBACTERIA ONE SLIDE AT A TIME

ADD
OBSERVATIONS



cyanoScope

Stats

Totals

102

Observations »

17

Species »

19

People »

Most Observations

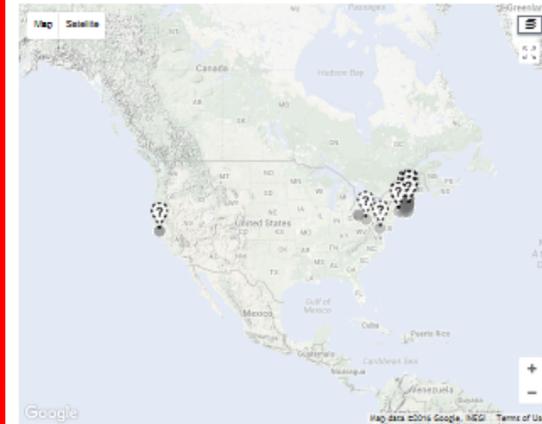
- willbmsaid 37 observations
- richfmas 10 observations
- karoline 9 observations
- wmcrescarch 9 observations
- nanje 7 observations

Most Species

- karoline 4 species
- willbmsaid 1 species
- richfmas 1 species

Most Observed Species

- Gloeotrichia 6 observations
- Microcystis 3 observations
- Oscillatoria 3 observations
- Diatoms 2 observations
- Coelastrum 2 observations



Members 40 members

View all members -

Export observations

Atom RSS KML CSV

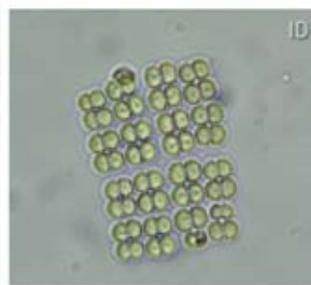
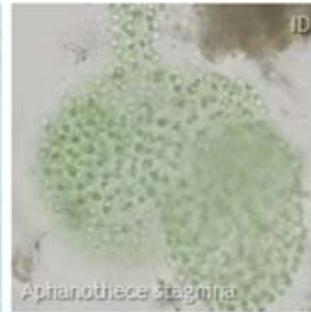
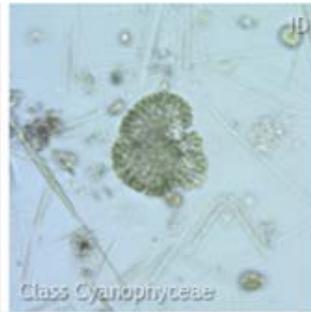
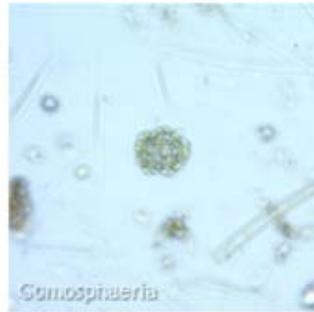
About

What is cyanoScope?
cyanoScope uses modern technologies and social media platforms to learn more about cyanobacteria.
By participating you will be helping scientists and water resource managers gain information on the occurrence and timing of cyanobacteria in lakes, ponds, and reservoirs.

The Process:

Collect

- Collect a water sample from your favorite lake or pond as ...more ↓



Identithon!

CyanoMonitoring

GOAL: Tracking of cyanobacteria concentrations within waterbodies in combination with efforts to forecast bloom occurrences, determine risk, and assess waterbody/human health vulnerability to toxic cyanobacteria.

- Consistent methods/QA
- Consistent tools (Cyano Kit)
- Temporal component
- Centralized Data Control
- Data Visualization tools



Baseline Sampling Design

On-Shore and/or On-Lake

- ▶ BOH/Beach Programs, Lake associations, state WQ folks
- ▶ 1 meter IT sample & net tow
- ▶ 3 meter IT sample & net tow
- ▶ CyanoMonitoring Kit
- ▶ JUN-SEP minimum
- ▶ Sample every other week
- ▶ 1 fixed site per waterbody minimum

Designed to complement currently existing programs

Handheld 2-Channel Fluorometer

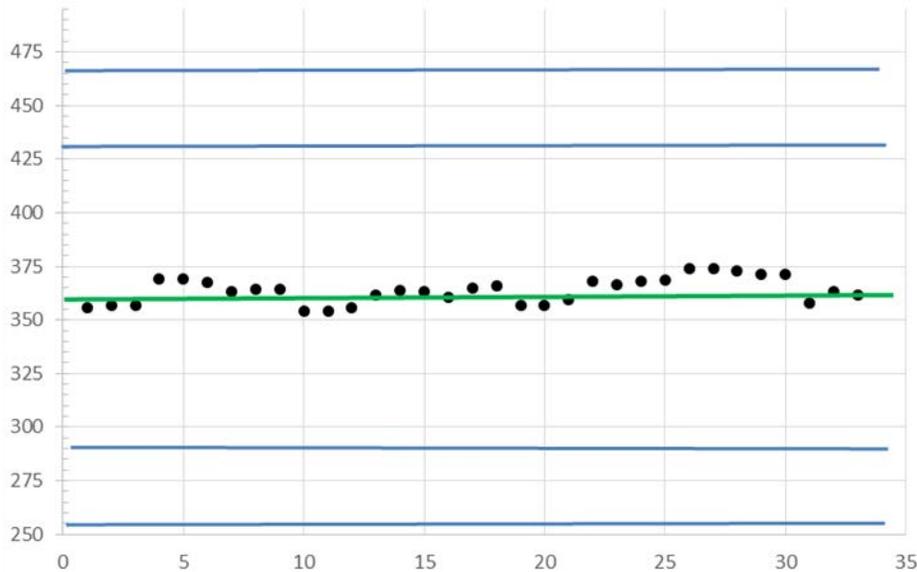


- ▶ Chlorophyll
 - ▶ .25 - 2,500 ppb
- ▶ Phycocyanin
 - ▶ 10 - 100,000 ppb
- ▶ Other 2-chnl handhelds available
- ▶ \$1,500 - \$2,500
- ▶ Stnds approx. \$200 each
- ▶ Rhodamine solid state standards (2 year shelf)

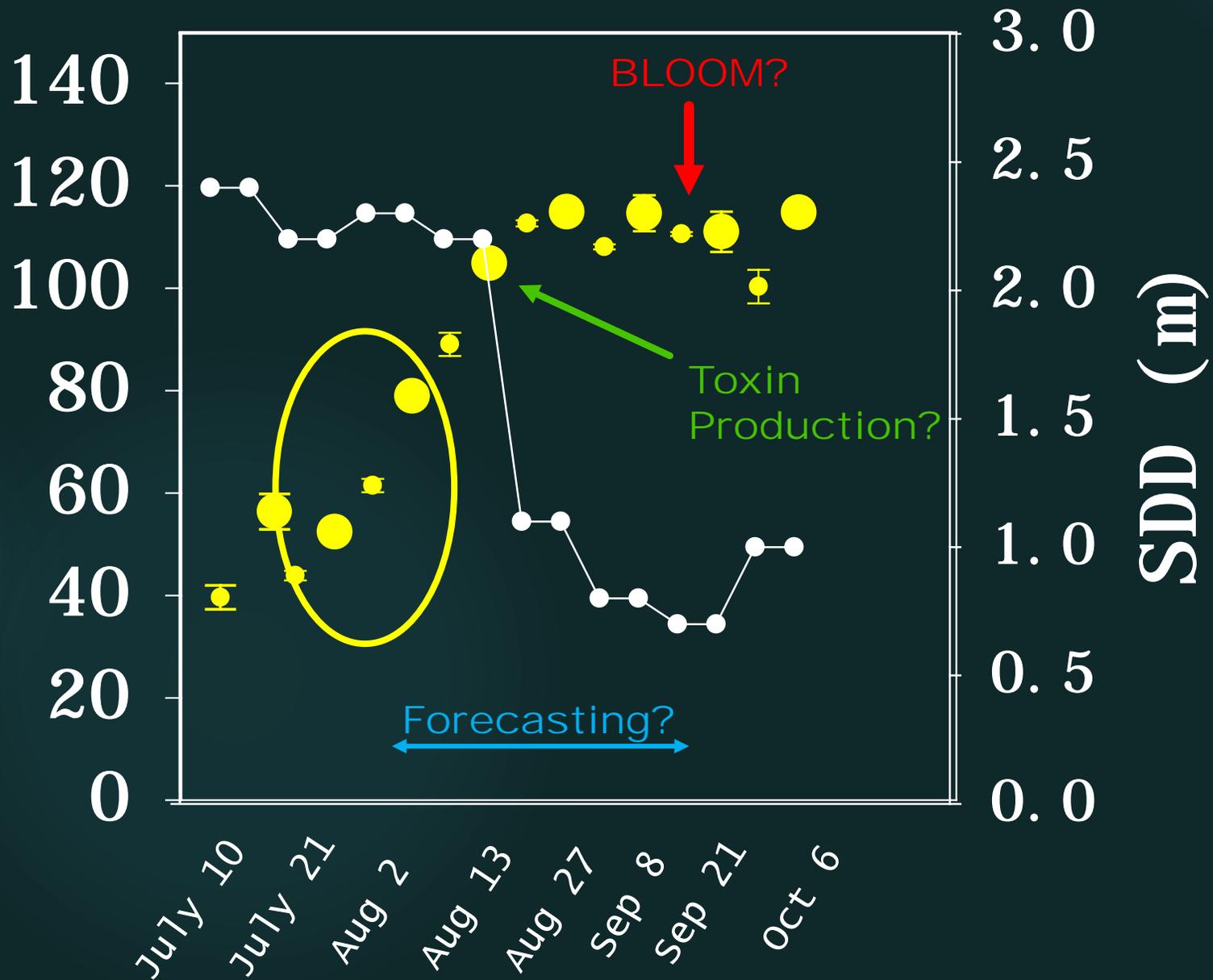
Meter Madness!



Beagle 100 w/0.5mL cuvettes



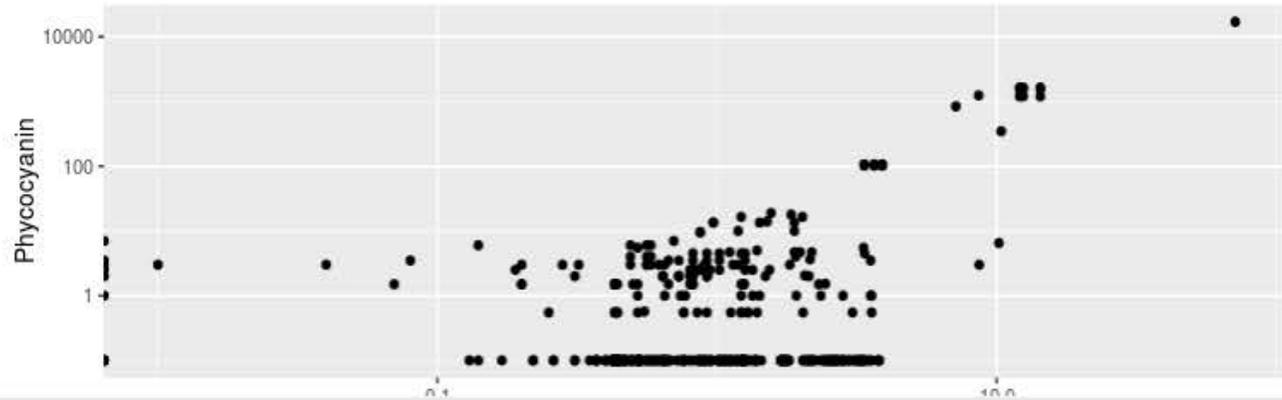
PC/Chl a Ratio



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

Chlorophyll *a* and Phycocyanin Scatterplot

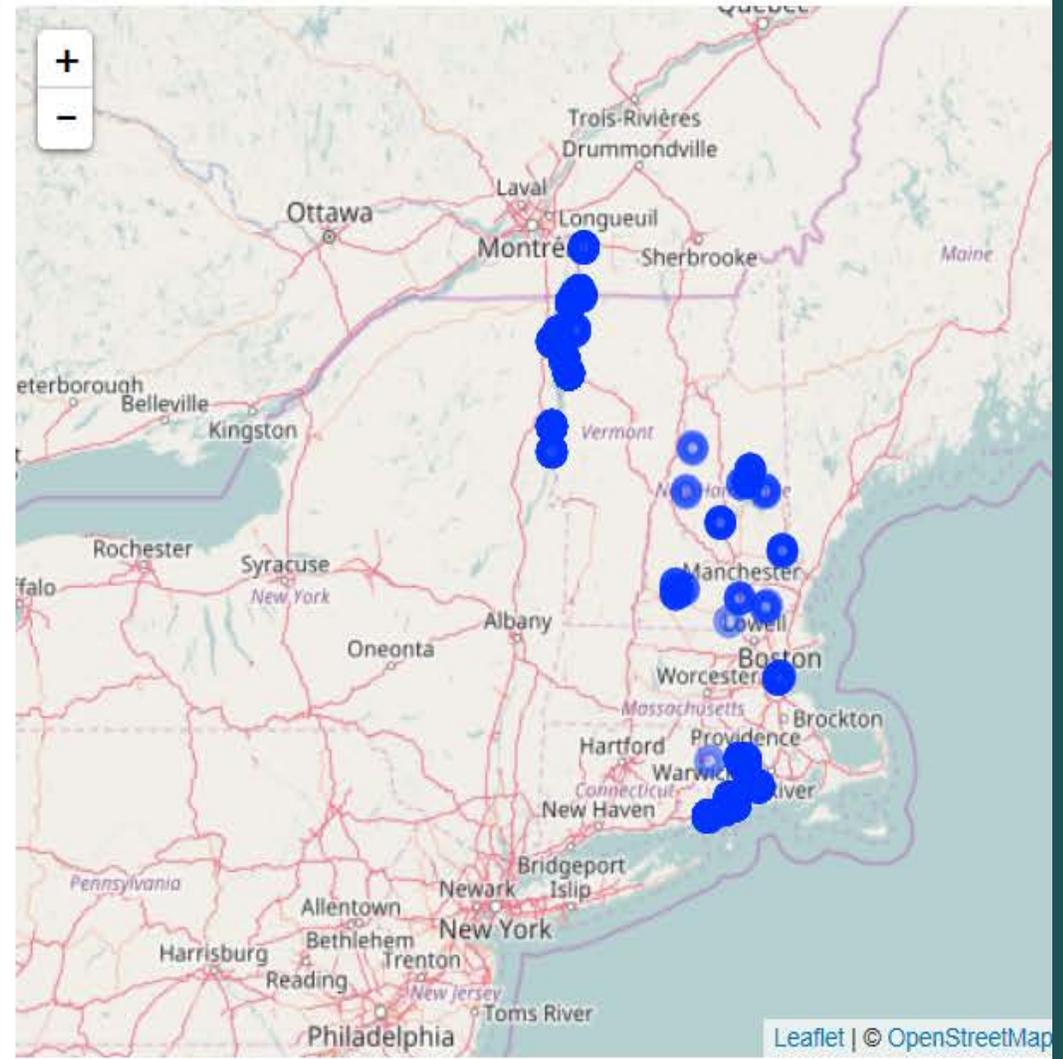
drag to select points



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









CYANOS.ORG

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

http://listserv.uri.edu/cgi-bin/wa?SUBED1=CYANO_COLLAB

Snook.Hilary@epa.gov

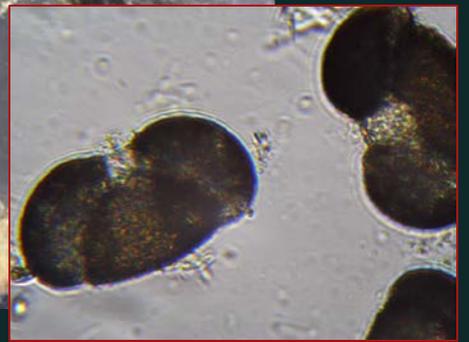
617-918-8670



Snook.Hilary@epa.gov
617-918-8670



Additional Slides



Cyanoscope Kit



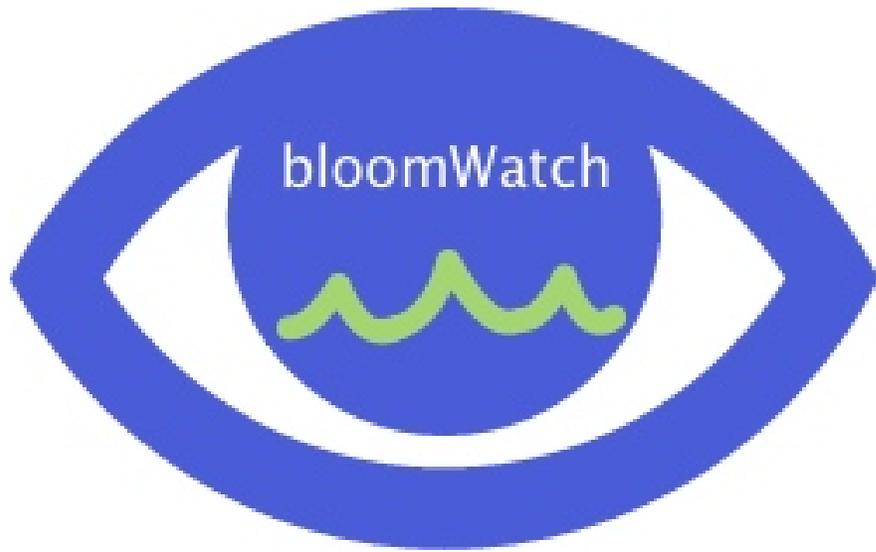


cyanoScope

cyanoScope uses modern technologies and social media platforms to learn more about the occurrences and timing of cyanobacteria in our waters

Goals:

- **Public Outreach:** Increase awareness about cyanobacteria
- **Crowdsourcing Identification:** Use social media to identify the cyanobacteria in lakes, ponds, and other surface water bodies
- **Scientific:** Map the spatial distribution and seasonal occurrence of potentially toxin producing cyanobacteria



A smartphone app-based project to determine the spatial and temporal patterns of bloom occurrences

<http://cyanos.org/bloomwatch>

Users: General public, trained citizen scientists, water quality professionals

Goal: Engage public (increase awareness about cyanobacteria), collect basic surveillance bloom data

Data Collected: Macro-level photo(s), geolocation, contact information, qualitative questions, notes

Considerations: Distribution, simplicity, responding to submissions (state capacity to respond), photo storage