For assistance in accessing this document please send an email to EPACyanoHABs@epa.gov

Phytoplankton Monitoring Network (PMN)

Promoting a better understanding of Cyano Harmful Algal Blooms by way of volunteer monitoring.

Using Citizen Science to Monitor HABs

NOAA Marine Biotoxins Program

Jen Maucher Fuquay, PMN Coordinator

PHYTOPLANKTON MONITORING NETWORK

NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Science Serving Coastal Communities

To educate the public on harmful algal blooms (HABs) while expanding the knowledge of phytoplankton that exist in coastal waters through research based monitoring.

- **PMN started in 2001 as part of Marine Biotoxins Program in Charleston, SC**
- **Over 100 active sites in 15 coastal states**

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To educate the public on harmful algal blooms (HABs) while expanding the knowledge of phytoplankton that exist in coastal waters through research based monitoring.

Train citizen scientists to:

- *Collect samples on weekly or bi-weekly basis*
- *Identify potential harmful algal species*

NOAA scientists can then:

- *analyze water samples for HAB toxins*
- *Together can identify temporal and geographic HAB trends*

PHYTOPLANKTON MONITORING NETWORK

NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Science Serving Coastal Communities

EPA United States Environmental Protection Agency
Office of Water

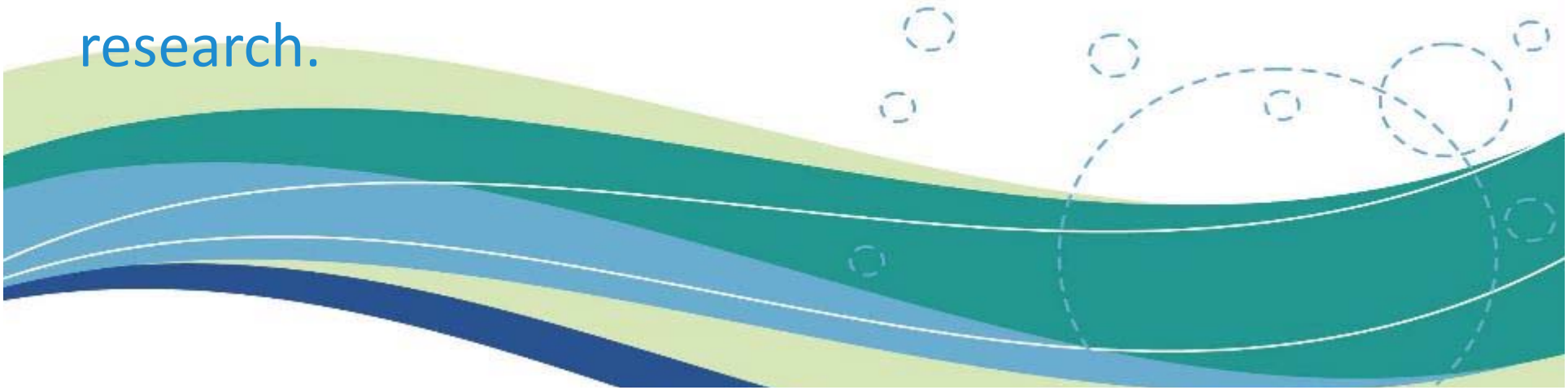
- **CyanoHAB monitoring started in 2015 as part of an EPA Office of Water grant**
- **25 active sites in 13 states**
- **EPA Regions 4, 5, 7, & 8 currently represented**

Cherry Creek Reservoir, Denver, CO June 2016
Dolichospermum bloom

Why the PMN?

Problem: Very few government or private institutions have the capacity or capability to monitor coastlines and thousands of lakes (and reservoirs) annually impacted by HABs.

Solution: Engage local citizens in environmental monitoring of potentially harmful cyanobacteria and algae to aid NOAA scientists and others in their research.



Monitoring Benefits

- **Allows for an 'early warning system'**
  - e.g. Can close shellfish beds/recreational waters and help prevent or reduce exposure and potential illness
- Monitor and maintain an extended survey area along coastal & fresh water bodies throughout the year
- Create a comprehensive list of harmful algal/cyano species inhabiting marine and fresh waters (establish baseline)
- Identify general trends where HABs are more likely to occur
- Promote an increased awareness and education to the public on HABs
- Create a working relationship between volunteers and researchers

Volunteer Equipment
(marine)

Volunteers are loaned all sampling equipment *except* light microscopes for monitoring!

Photo credit: Elizabeth Zerai

- Refractometer
- 20 um mesh plankton net
- Thermometer
- 5 gridded slides
- Cover slips
- 250 mL bottles
- 1L bottles
- 15mL of Lugol's solution for preservation
- All shipping materials

*Region specific volunteer manual

*The PMN Manual has data sheets, phytoplankton ID sheets, and HAB information specific to your local coastal waters.

Volunteer Equipment

Volunteers are loaned all sampling equipment

- Thermometer
- 5 gridded slides
- Cover slips
- 1L & 125 mL bottles
- 30 mL of Lugol's solution for sample preservation
- Pre-paid overnight shipping label and shipping envelopes

*Identification sheets for target species

Volunteer Equipment (freshwater)

SWIFT M10 T digital microscope

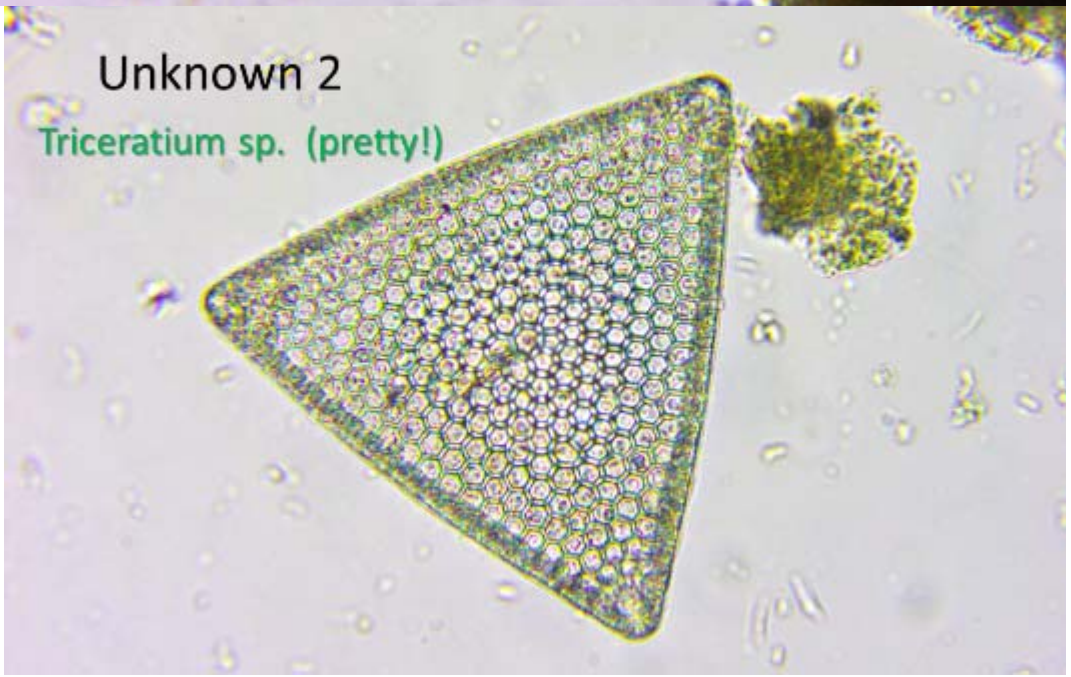
- **Provided to Pilot Program participants**
- **Volunteers take digital pictures of suspected target species and send to PMN**
- **Allows for rapid confirmation of tentative ID**
- **Build virtual archive of organisms observed**
- **WiFi capable- Great for public demonstrations**

Training

- Usually done remotely
- Background of algae/cyanos
- What puts the H in HAB?
- Sampling protocols
- How to ID Target species

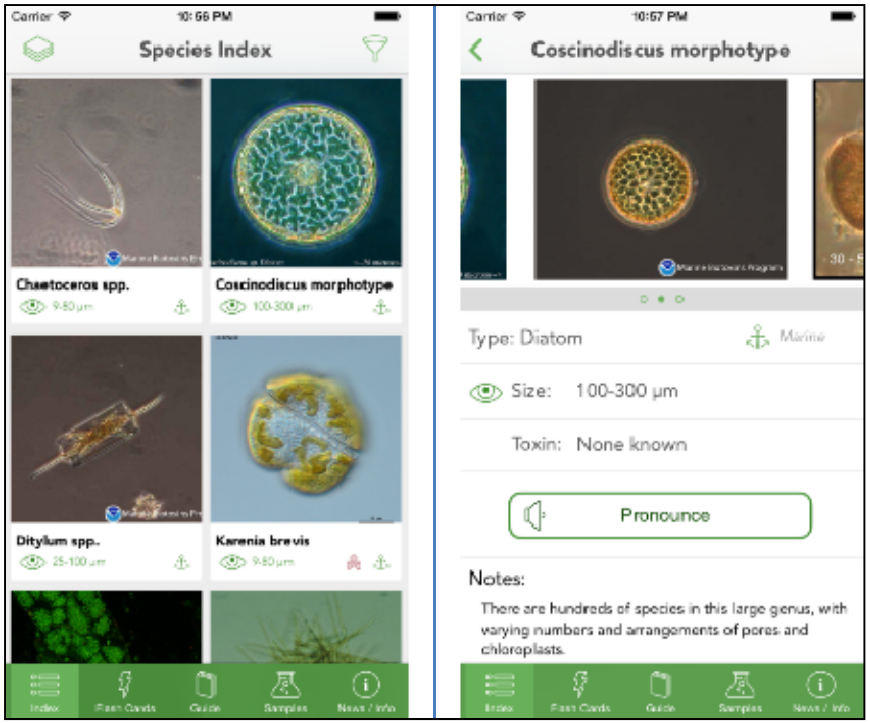
Training

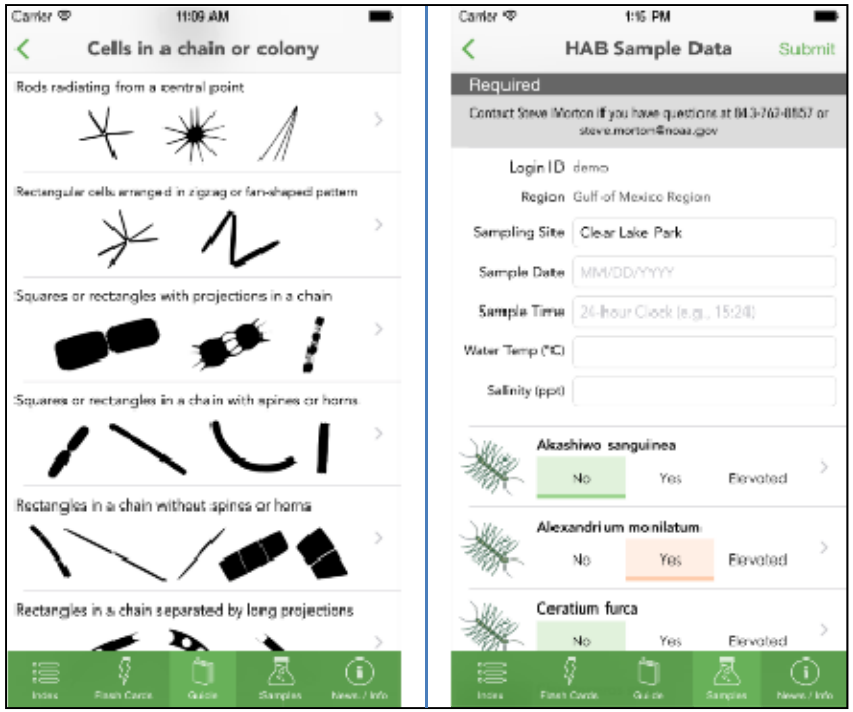
- Volunteers must do practice sampling
- IDs are confirmed by PMN staff via photos and/or mailed in samples



Phyto app version 2- *coming soon!*

-Will include freshwater species!
-More pictures!
-More pronunciations!
-Can enter data from phone or ipad!





http://youtu.be/ItzxoB06De0

Developed by PMN volunteer Shawn Gano to assist with and improve volunteer's identification skills of marine algae & cyanos

Phytoplankton Monitoring Network

Volunteer Requirements:

1) ***Collect sample*** at least once every two weeks during the sampling season
2) ***Analyze sample*** identifying target algae/cyanos
3) ***Take*** digital pictures to send into the PMN
4) ***Input*** data into the PMN database
5) ***Ship*** sample to PMN as required

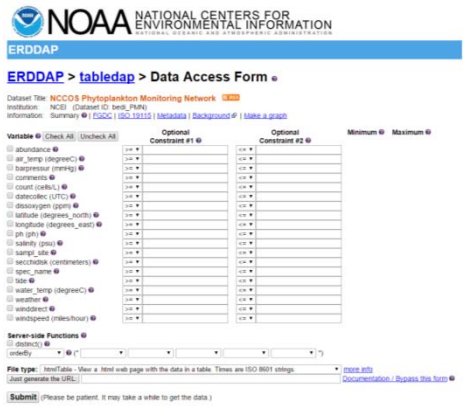
DATA ENTRY

- **Data entered online for each sample**
  - Whether target spp. found or not
- **No counting of cells**

  No= zip, zilch, zero

  Yes= 0-65% slide coverage

  Elevated = >65% with discoloration
- **Final data entered into NCEI BEDI database**



Phytoplankton Monitoring Network
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HAB SCREENING DATA SHEET

Freshwater Cyanobacteria

FIELD DATA ♦ REQUIRED

Name:

Sampling Site:

Sample Date:

Sample Time:

Water Temp (°C):

TARGET SPECIES SCREENING LIST

	No	Yes	Elevated
Aphanizomenon spp.	○	○	◇
Anabaena spp.	○	○	◇
Cylindrospermopsis spp.	○	○	◇
Microcystis spp.	○	○	◇
Oscillatoria spp.	○	○	◇

If water is visibly discolored and a target species is identified, please send pictures to pmn@noaa.gov and contact staff to confirm sample shipment for toxin analysis.

◊ OPTIONAL

Weather: Sunny | Partly Cloudy | Mostly Cloudy | Cloudy | Rain

Wind direction: N | NE | E | SE | S | SW | W | NW

Wind speed (mph): 0-5 | 5-10 | 10-15 | 15-20 | 20-25 | 25+

Tides: High | Low | Incoming | Outgoing

Air Temp (°C):

pH:

Dissolved Oxygen (ppm):

Barometric pressure (mmHg):

	None	YES	Elevated
Centric Diatoms	○	○	◇
Pennate Diatoms	○	○	◇
Dinoflagellates	○	○	◇
Cyanobacteria	○	○	◇
Ciliates	○	○	○
Other Zooplankton	○	○	○

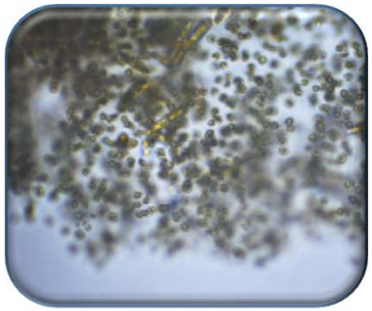
SHIPPING INFORMATION

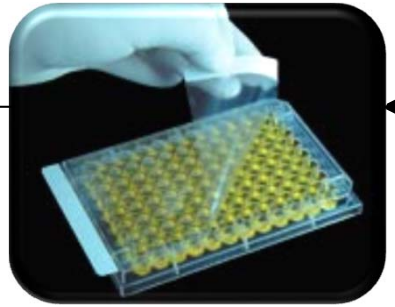
○ - No samples needed

◇ - **Contact PMN staff to confirm shipment of samples for testing.**
-preserve 125 mL bottle with Lugol's
-do NOT add Lugol's to 1 liter bottle.
-use overnight shipping label to ship both bottles

NOAA PMN, 219 Fort Johnson Rd, Charleston, SC 29412 | 843-762-8857

When a bloom is reported

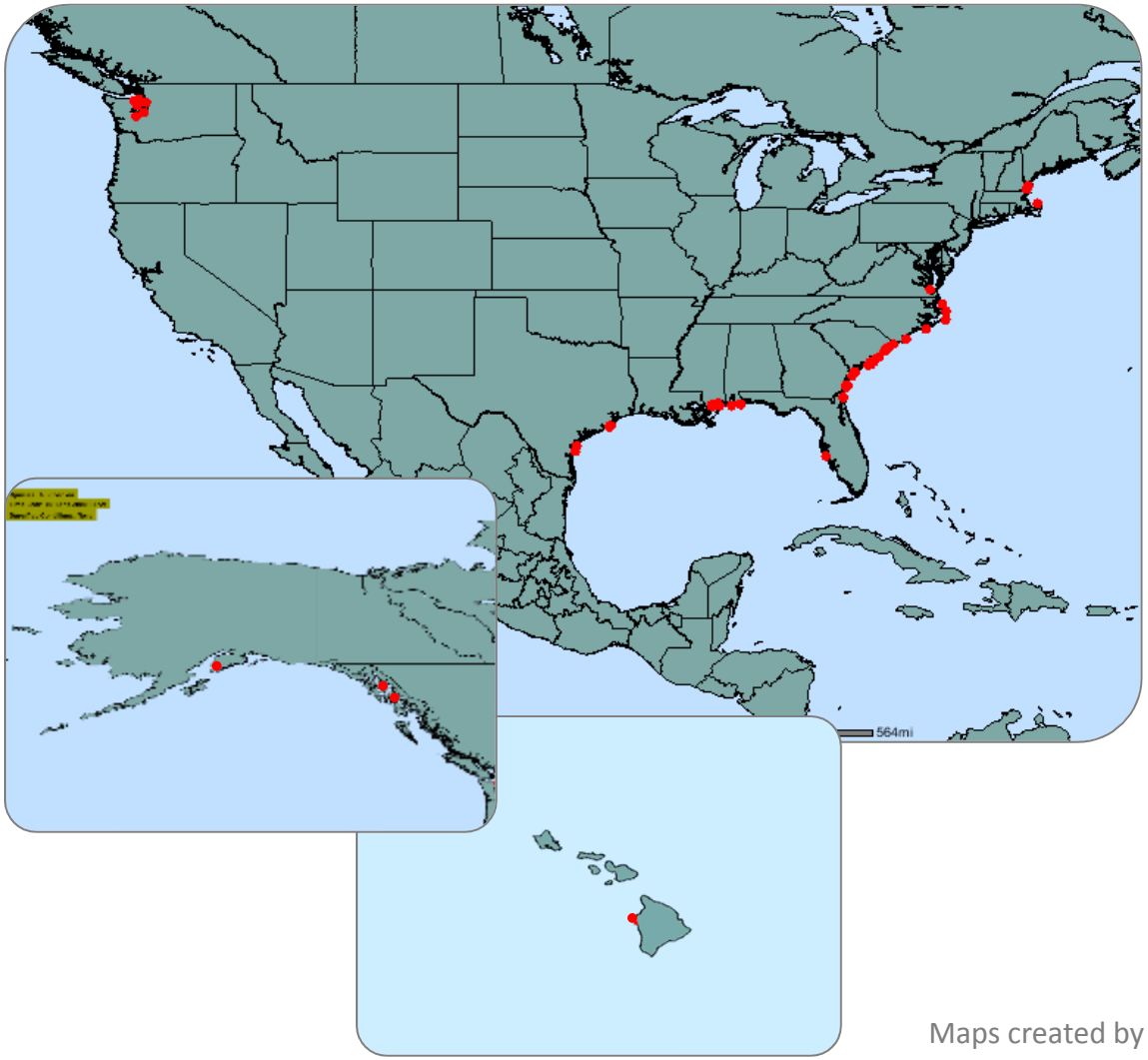




Managers
Stakeholders

Phytoplankton Monitoring Network

Bloom Events from 2001 – 2014



Volunteer Reported Blooms > 200

Non-harmful species > 150

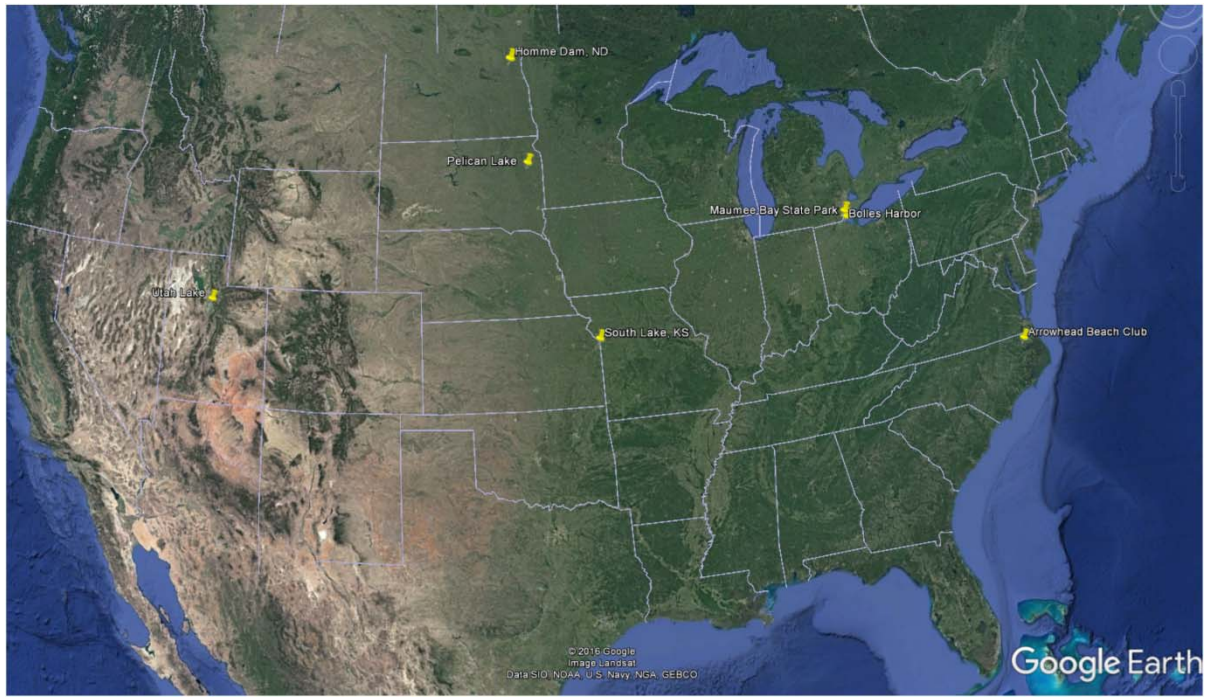
Potentially toxic species = 37

Confirmed toxic events = 12

- 9 Domoic Acid
  - Texas = 3
  - Mississippi = 2
  - North Carolina = 2
  - Alaska=2
- 1 Okadaic Acid
  - Texas
- 2 Saxitoxin
  - Alaska

Maps created by NOAA Coastal Data Development Center (NCDDC)

Freshwater
Bloom Events 2016



Volunteer Reported Blooms = 7

Potentially toxic species = 4

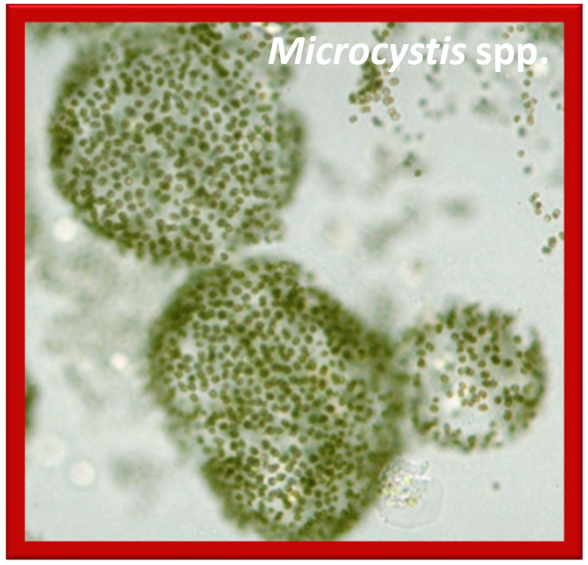
Confirmed toxic events = 4

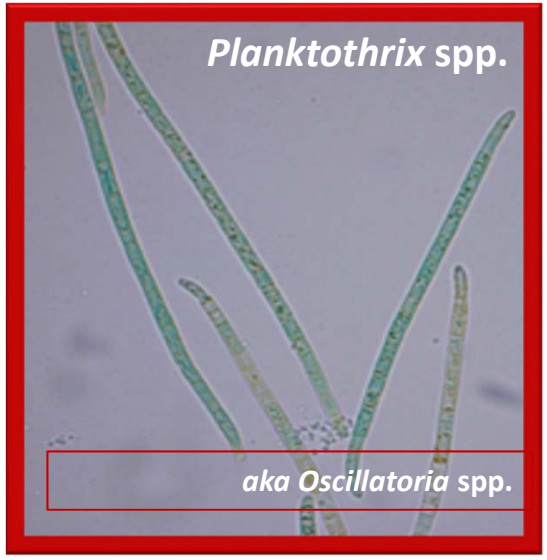
- Microcystis (MI/OH, MN)
- Aphanizomenon (ND)
- Dolichospermum (CO)

Non-Toxic blooms

- Anabaena/Dolichospermum
  - MN = 1
  - NC = 1
  - Kansas = 1
  - Utah=1
- Aphanizomenon
  - MN, NC
- Planktothrix/Oscillatoria
  - KS, MN
- Microcystis
  - MN, NC

Target Freshwater Algae





Toxic Cyanobacteria in Water: A guide to their public health consequences, monitoring, and management, World Health Organization, 1999

Funding partners

Many thanks to Andrew Chapman at Greenwater Labs for supplying cultures for todays demo

For more information

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Web site: www.pmn.noaa.gov
(will re-direct you!)