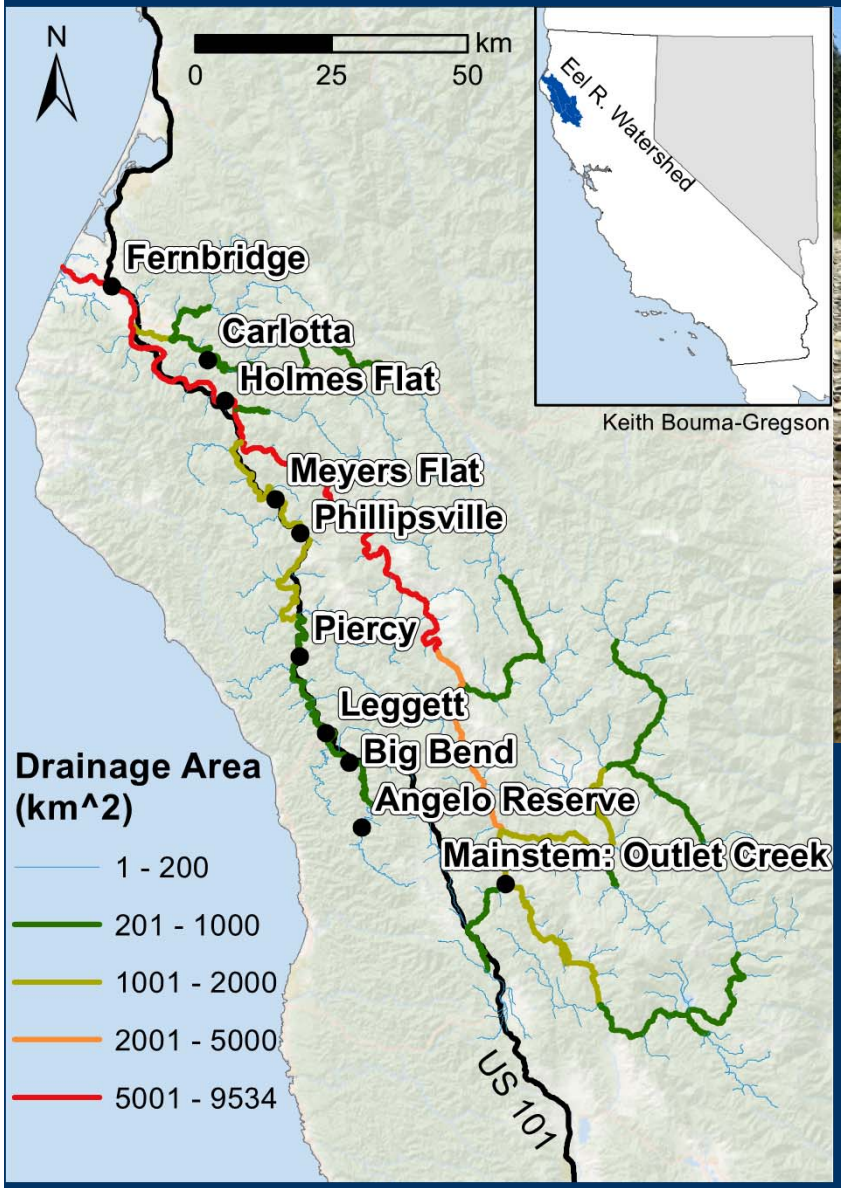
Cyanobacteria in the Eel River

Keith Bouma-Gregson, UC Berkeley

NCRWQCB CyanoHAB Workshop

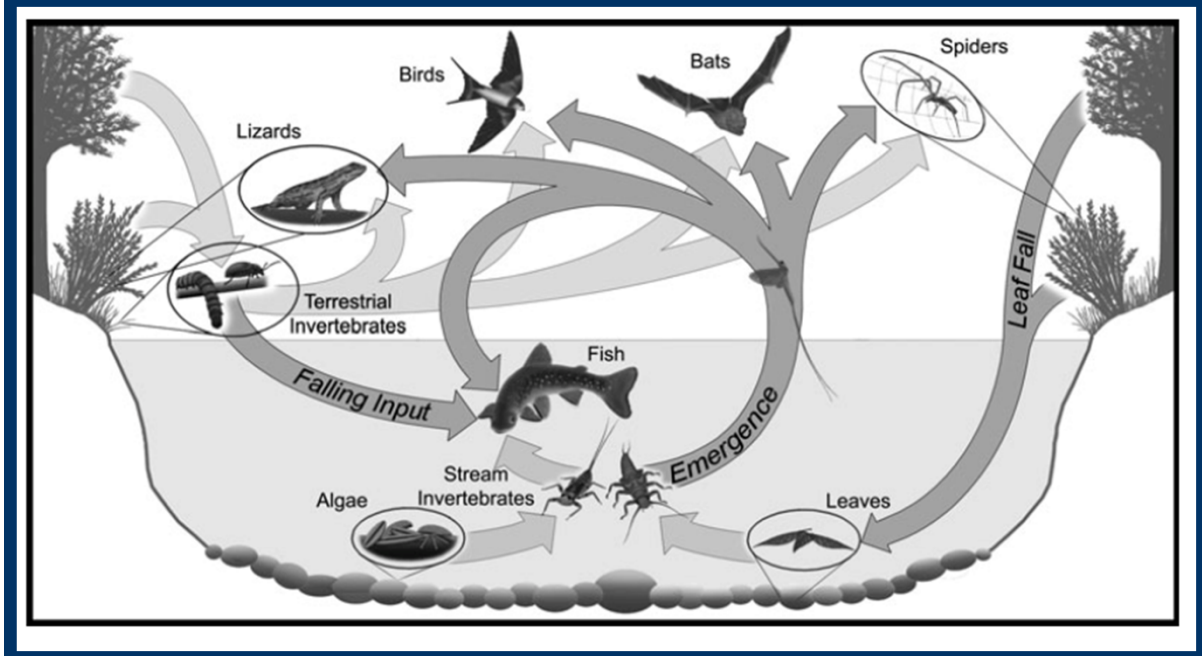
February 24, 2016

The Eel River



Power, Bouma-Gregson, et al. 2015, *Copeia*

Algae fuels aquatic summer food webs



Baxter et al. 2005, *FW Bio.*

Power et al. 2009, *FW Bio.*

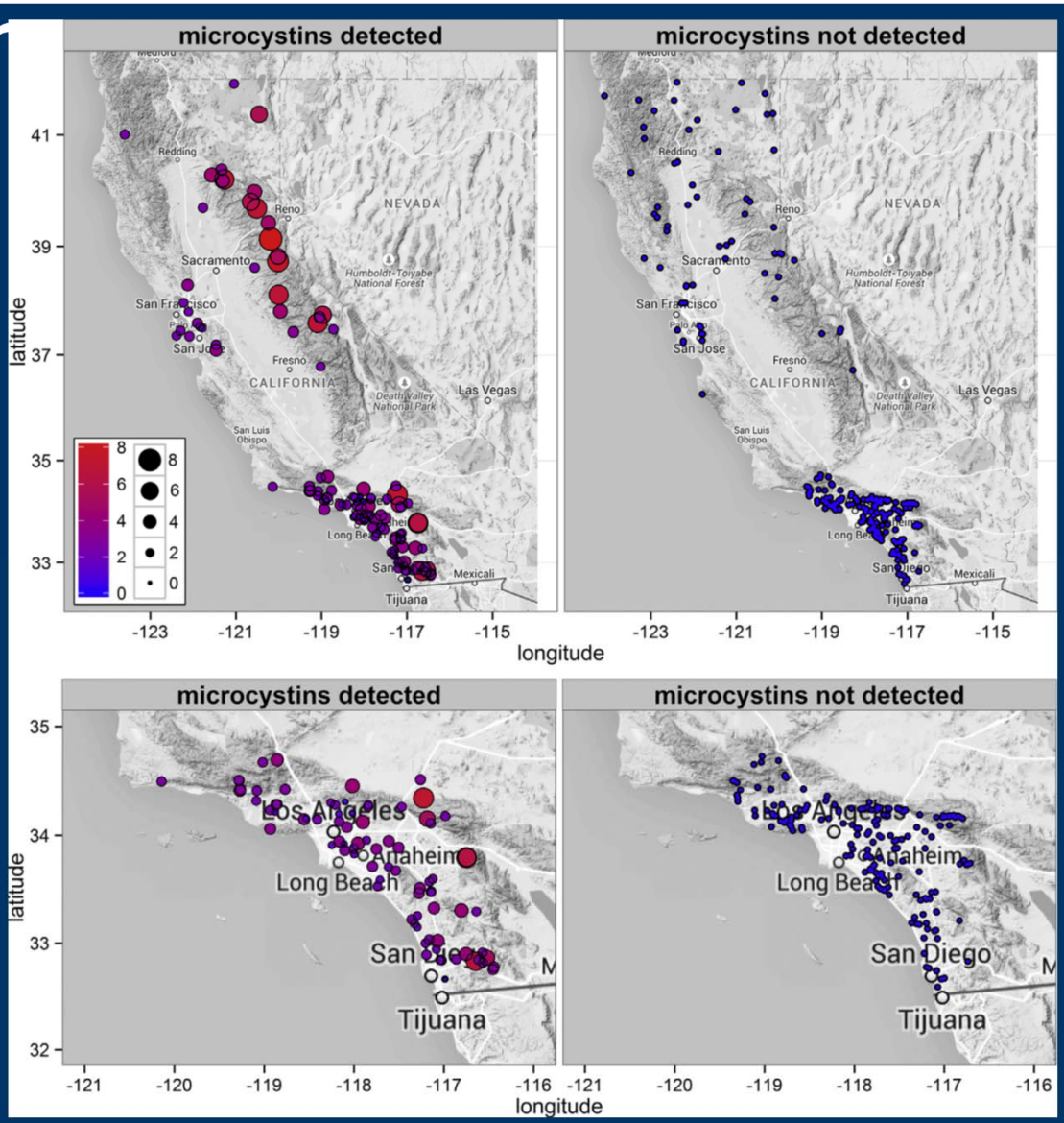
Algae kill dogs in the Eel river

Journal of Veterinary Diagnostic Investigation
http://vdi.sagepub.com/

Diagnosis of Anatoxin-a Poisoning in Dogs from North America
Birgit Puschner, Brent Hoff and Elizabeth R. Tor
J VET Diagn Invest 2008 20: 89
DOI: 10.1177/104063870802000119

Power, Bouma-Gregson, et al. 2015, *Copeia*

Cyanotoxins in wadeable strear

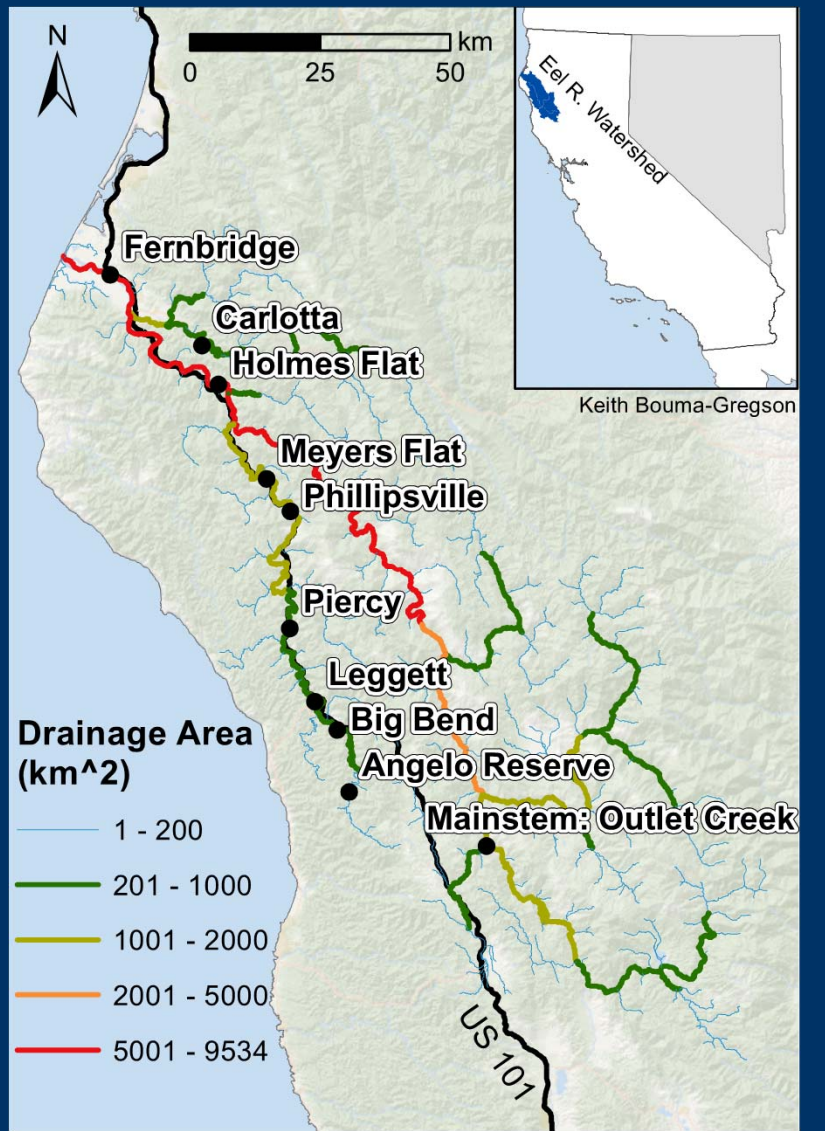


Fetscher et al. 2015, *Harmful Algae*, Fig. 3

What is the temporal and spatial distribution of cyanobacteria in the Eel River?

Monitoring sites:

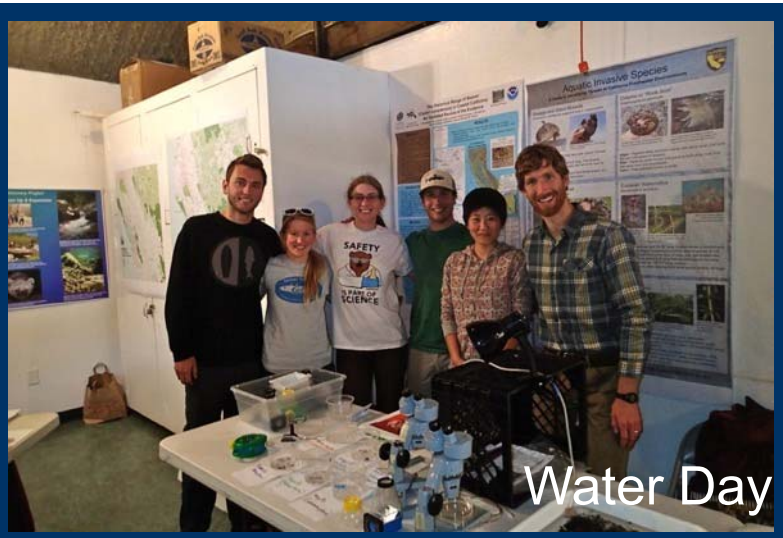
- Visited weekly June – Sep. 2013 and 2014
- Collected algal samples
- Measured cyanotoxin concentrations (SPATT)



Eel River Recovery Project

www.eelriverrecovery.org


Data Collection

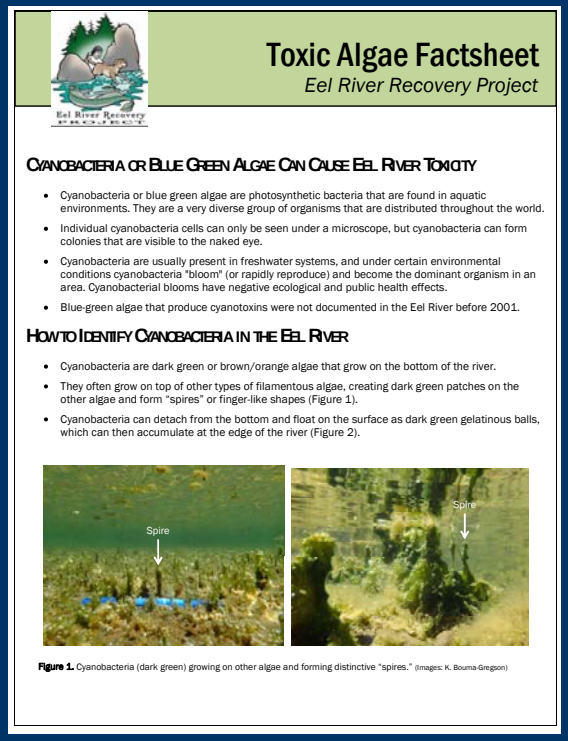


Water Day


Streamside Workshops


Algal Foray 2013 & 2015

Eel River Recovery Project



Toxic Algae Factsheet

Eel River Recovery Project

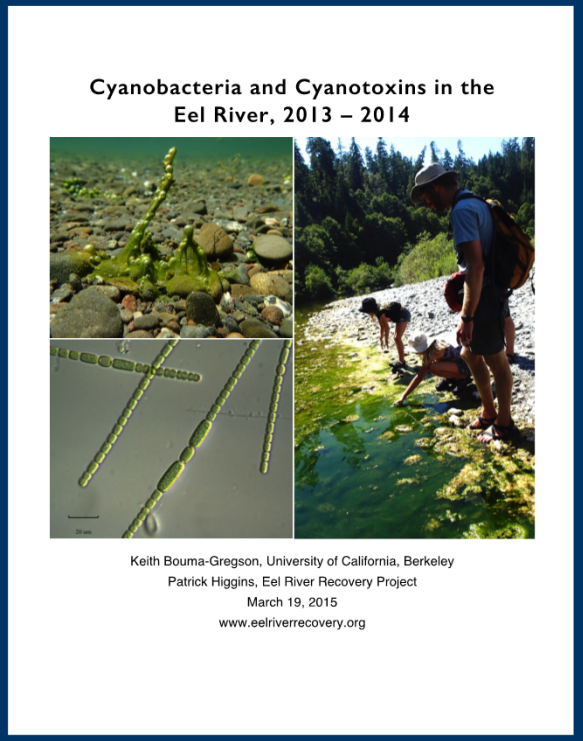
Cyanobacteria or Blue Green Algae Can Cause Eel River Toxicity

- Cyanobacteria or blue green algae are photosynthetic bacteria that are found in aquatic environments. They are a very diverse group of organisms that are distributed throughout the world.
- Individual cyanobacteria cells can only be seen under a microscope, but cyanobacteria can form colonies that are visible to the naked eye.
- Cyanobacteria are usually present in freshwater systems, and under certain environmental conditions cyanobacteria "bloom" (or rapidly reproduce) and become the dominant organism in an area. Cyanobacterial blooms have negative ecological and public health effects.
- Blue-green algae that produce cyanotoxins were not documented in the Eel River before 2001.

How to Identify Cyanobacteria in the Eel River

- Cyanobacteria are dark green or brown/orange algae that grow on the bottom of the river.
- They often grow on top of other types of filamentous algae, creating dark green patches on the other algae and form "spires" or finger-like shapes (Figure 1).
- Cyanobacteria can detach from the bottom and float on the surface as dark green gelatinous balls, which can then accumulate at the edge of the river (Figure 2).

Figure 1. Cyanobacteria (dark green) growing on other algae and forming distinctive "spires." (Images: K. Bouma-Gregson)



Cyanobacteria and Cyanotoxins in the Eel River, 2013 – 2014

Keith Bouma-Gregson, University of California, Berkeley
Patrick Higgins, Eel River Recovery Project
March 19, 2015
www.eelriverrecovery.org

2015 cyanotoxin monitoring
by ERRP and Round Valley Tribes

http://www.eelriverrecovery.org/algae.html

Cyanobacteria in the Eel

Benthic mats,
not
planktonic soups

Toxic algae found in Eel River in Mendocino County

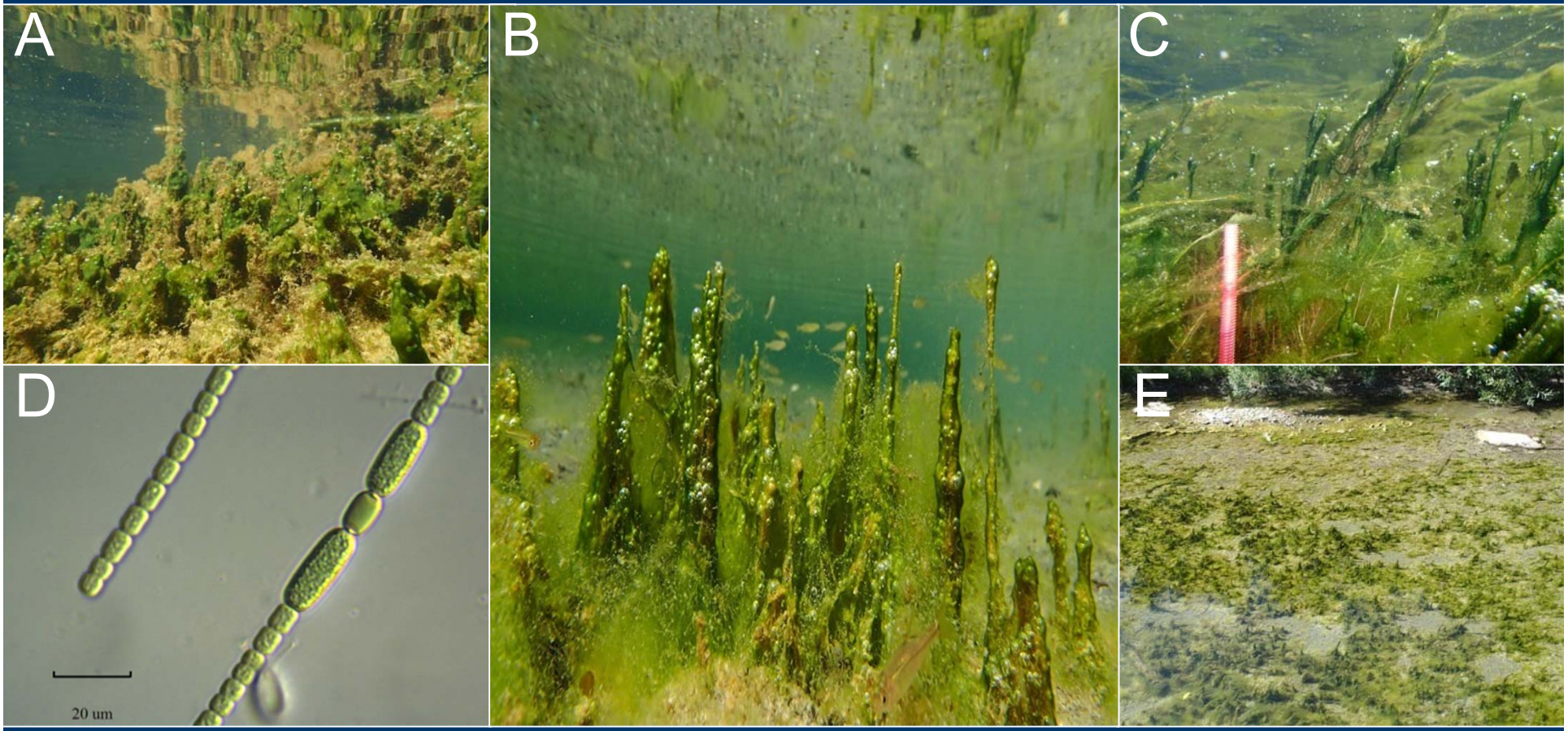
Toxic Blue Green Algae, pictured here, has been found in the Eel River. At least one dog has reportedly died after swimming in the river and ingesting the cyanobacteria. Contributed

By Ukiah Daily Journal staff

POSTED: 09/24/15, 2:26 PM PDT | UPDATED: ON 09/24/2015 0 COMMENTS

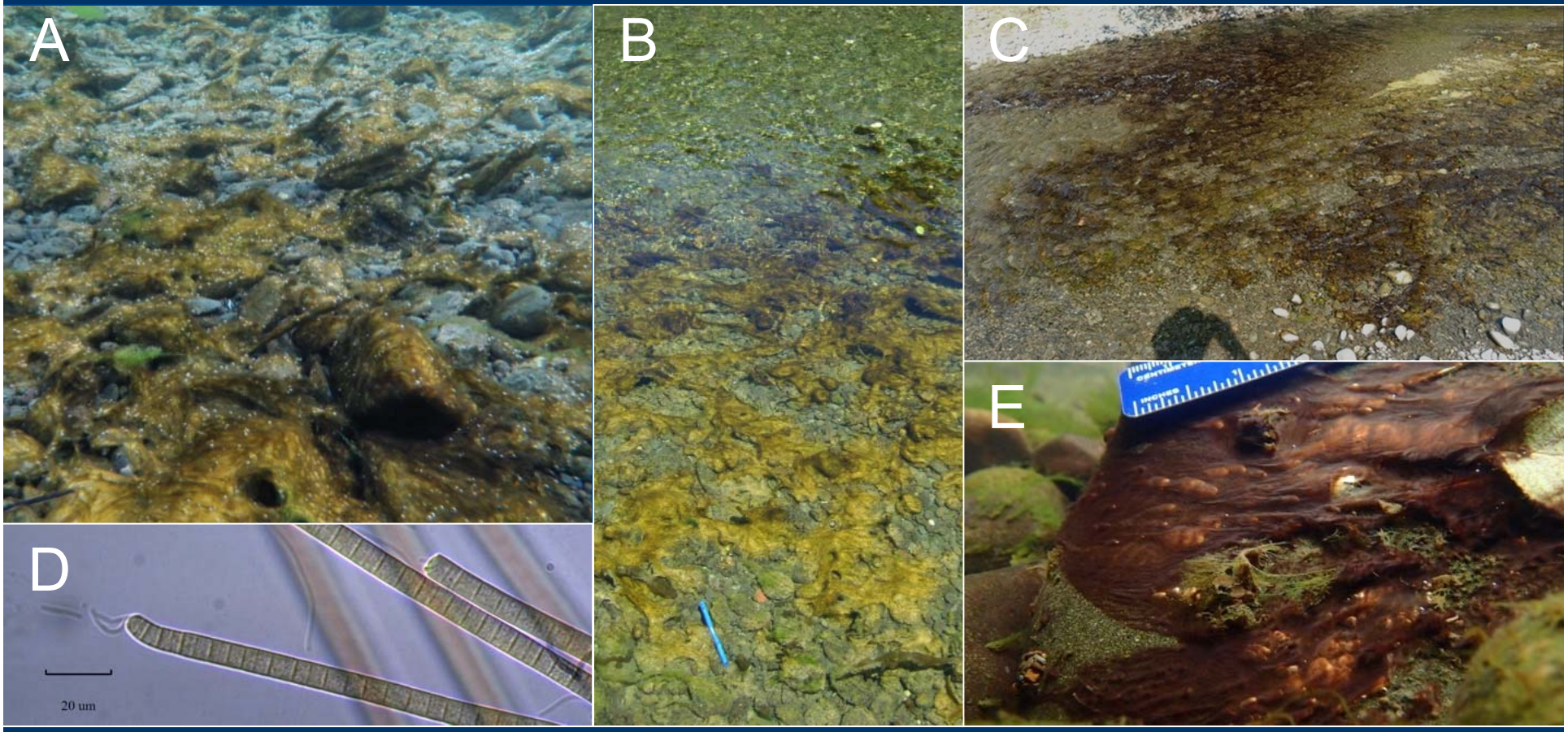
Observed common cyano. taxa

Anabaena spp.: slow water, fragile, on algae



Observed common cyano. taxa

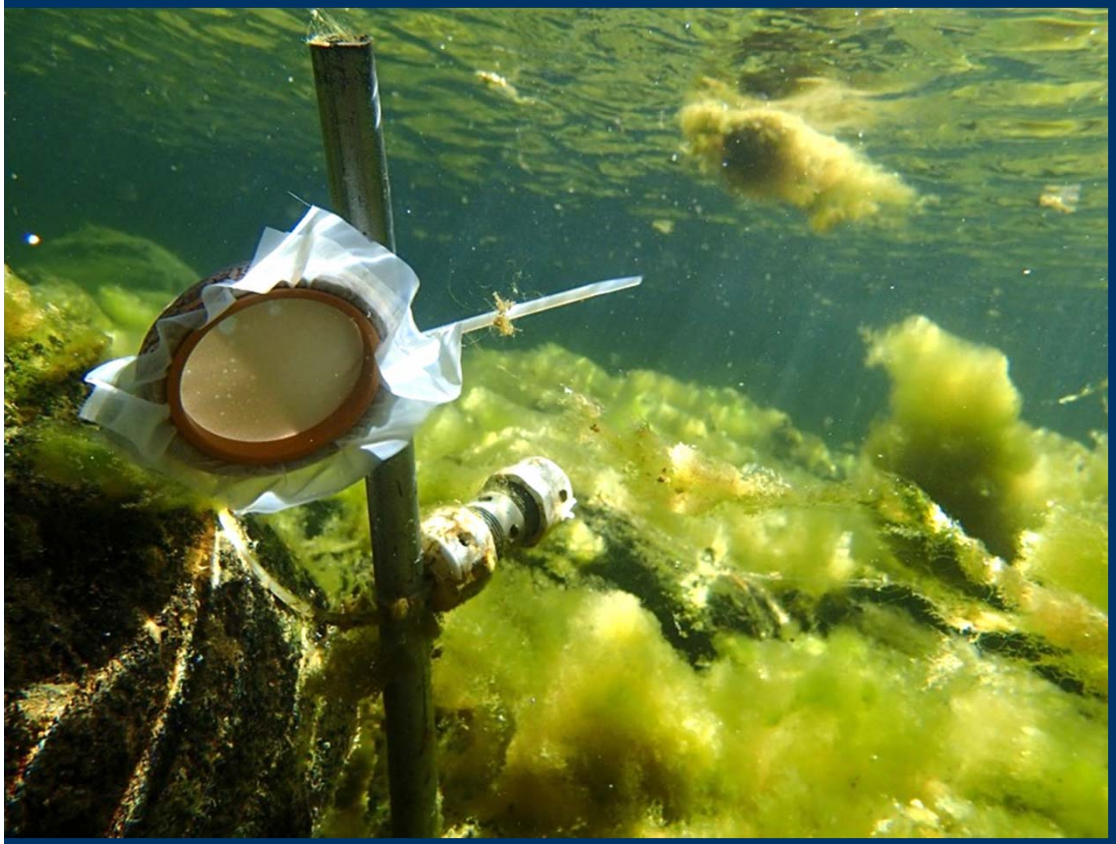
Phormidium spp.: fast water, robust, on rocks



Cyanobacteria in the Eel

SPATT Samplers

Solid Phase Adsorption Toxin Tracking (SPATT)

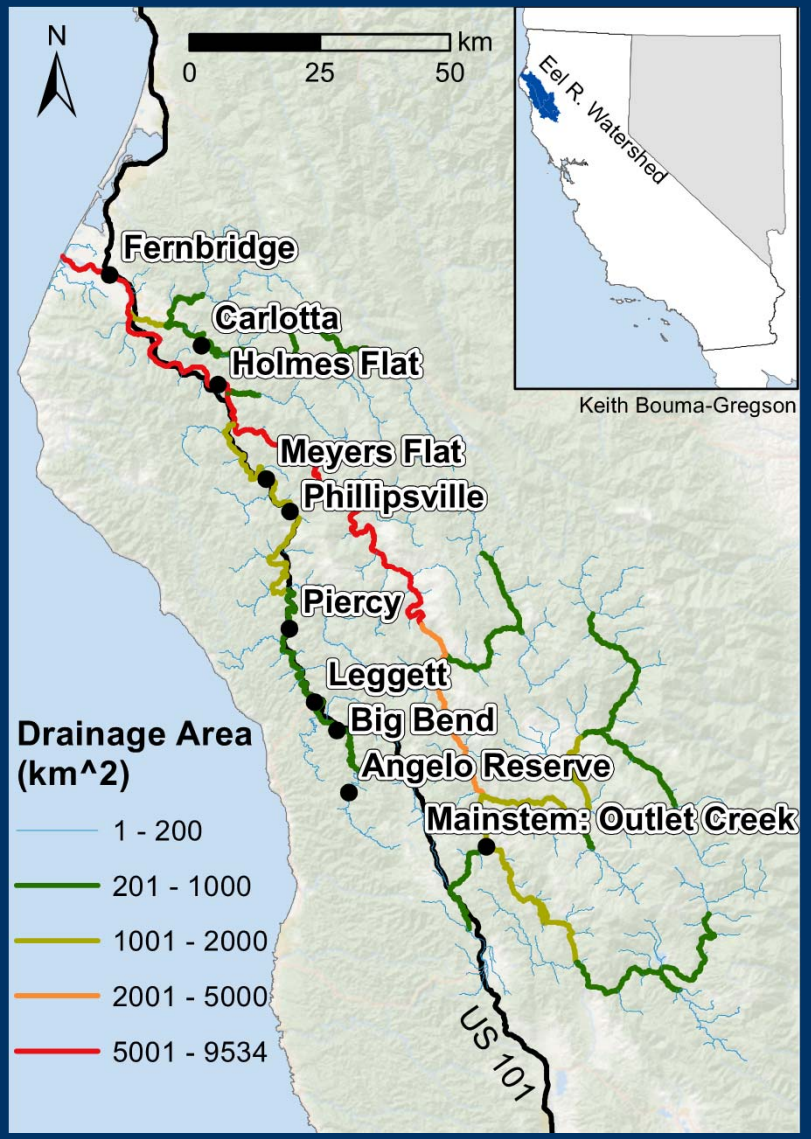


Prof. Raphael Kudela UCSC, oceandatacenter.ucsc.edu

- Captures temporal and spatial variability
- Multiple toxins detected
- Low limit of detection
- Easy to deploy and analyze
- Difficult to compare to regulatory limits

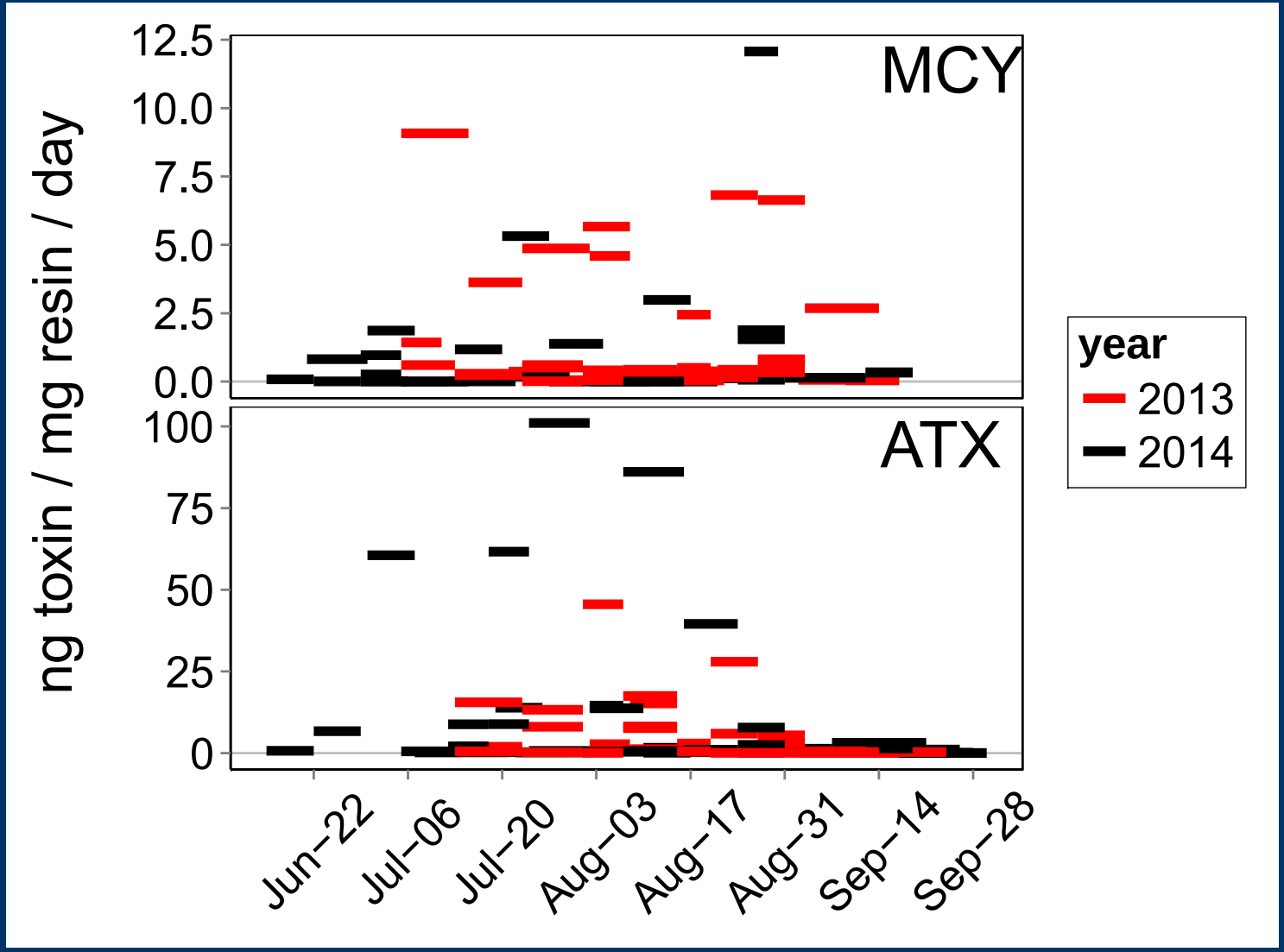
Lane et al. 2010. *Limnology and Oceanography: Methods* 8(1):645-660
Kudela 2011. *Harmful Algae* 11:117-125

SPATT Samplers

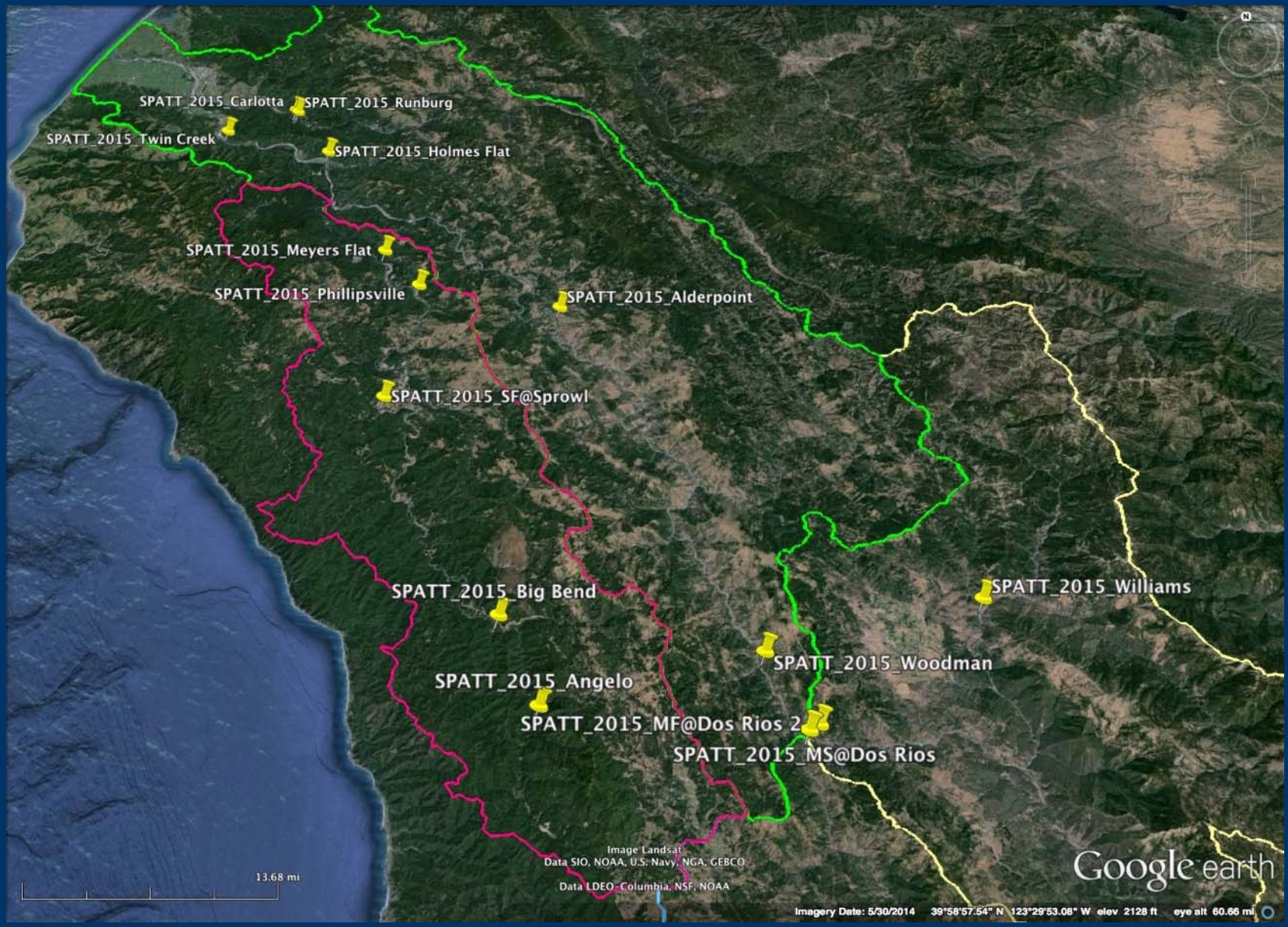


SPATT Results

Higher ATX levels than MCY levels



SPATT 2015 Map

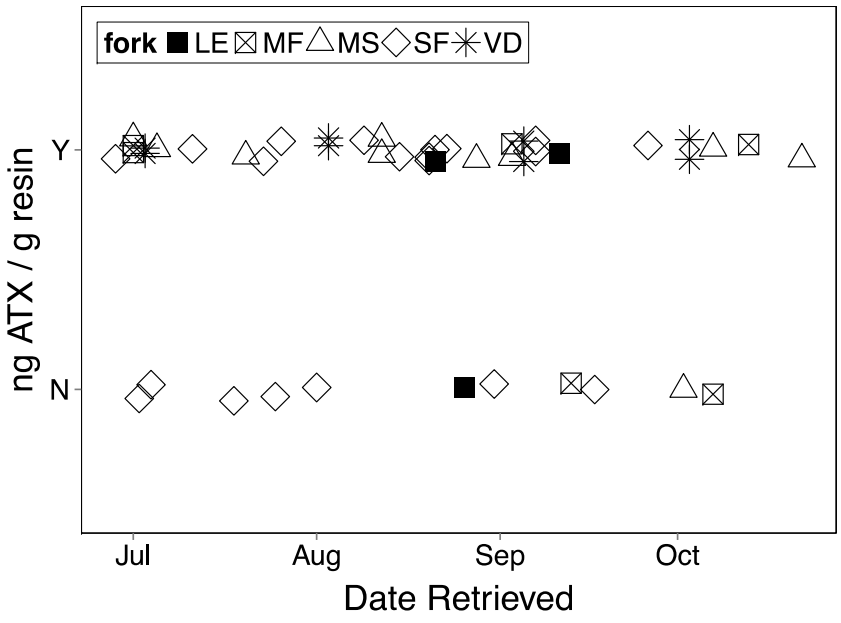


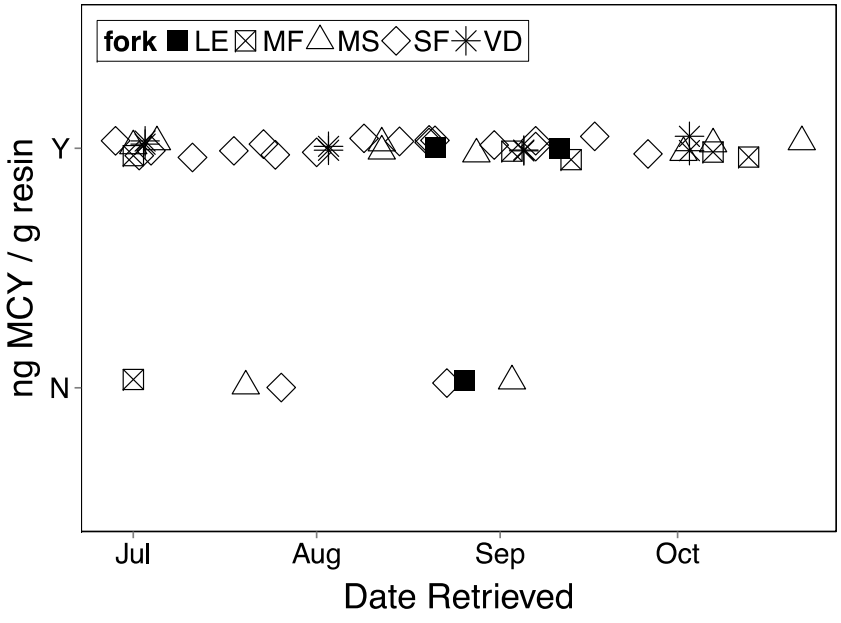
SPATT 2015: Presence/Absence

N= 47

ATX: 77% positive

MCY: 87% positive

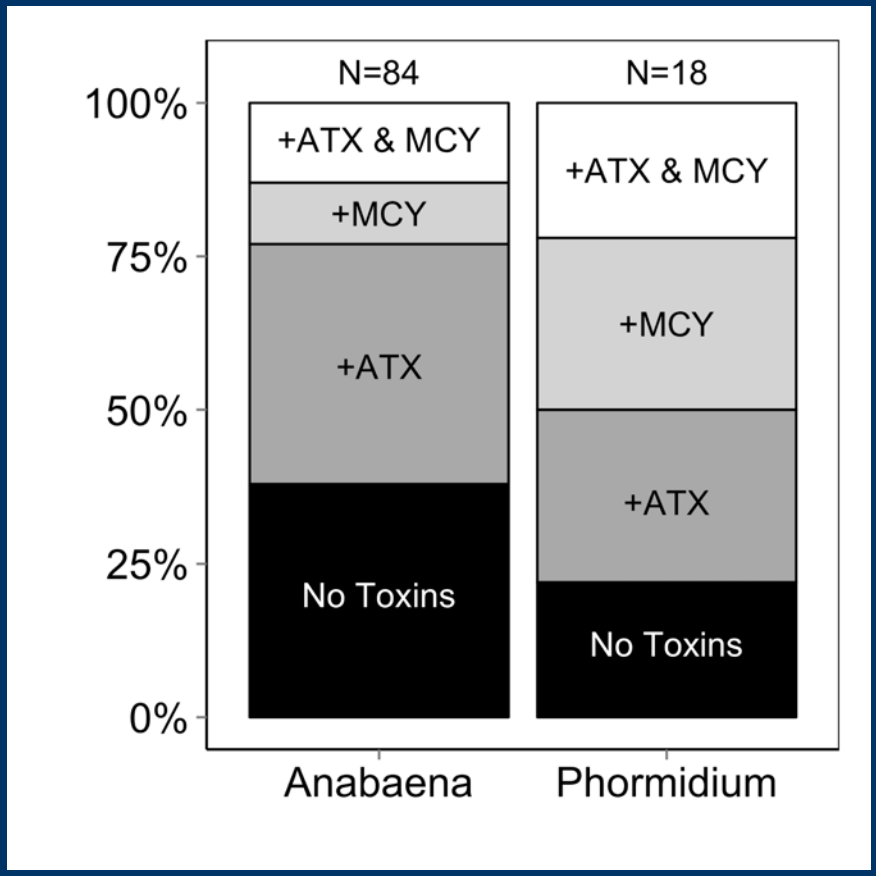




Mat Cyanotoxins

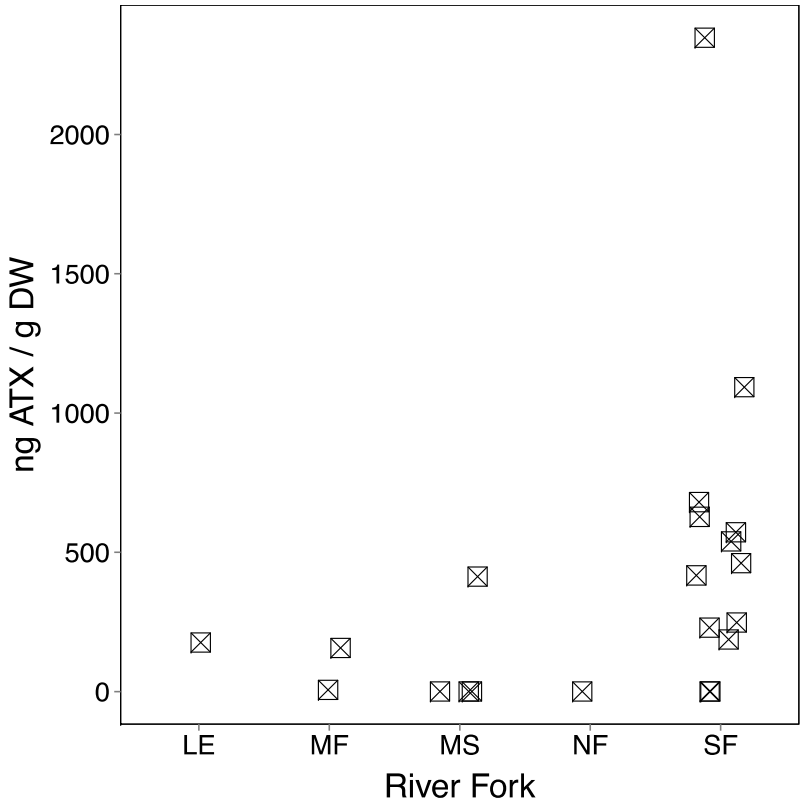
More frequent ATX production than MCY production

2014

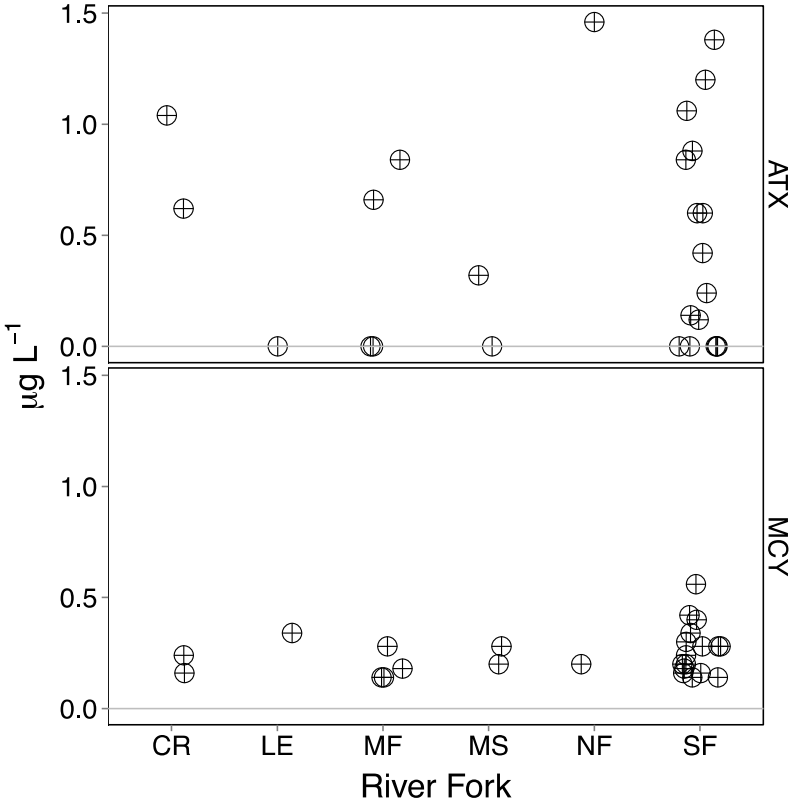


2015 Mat and H_2O Samples

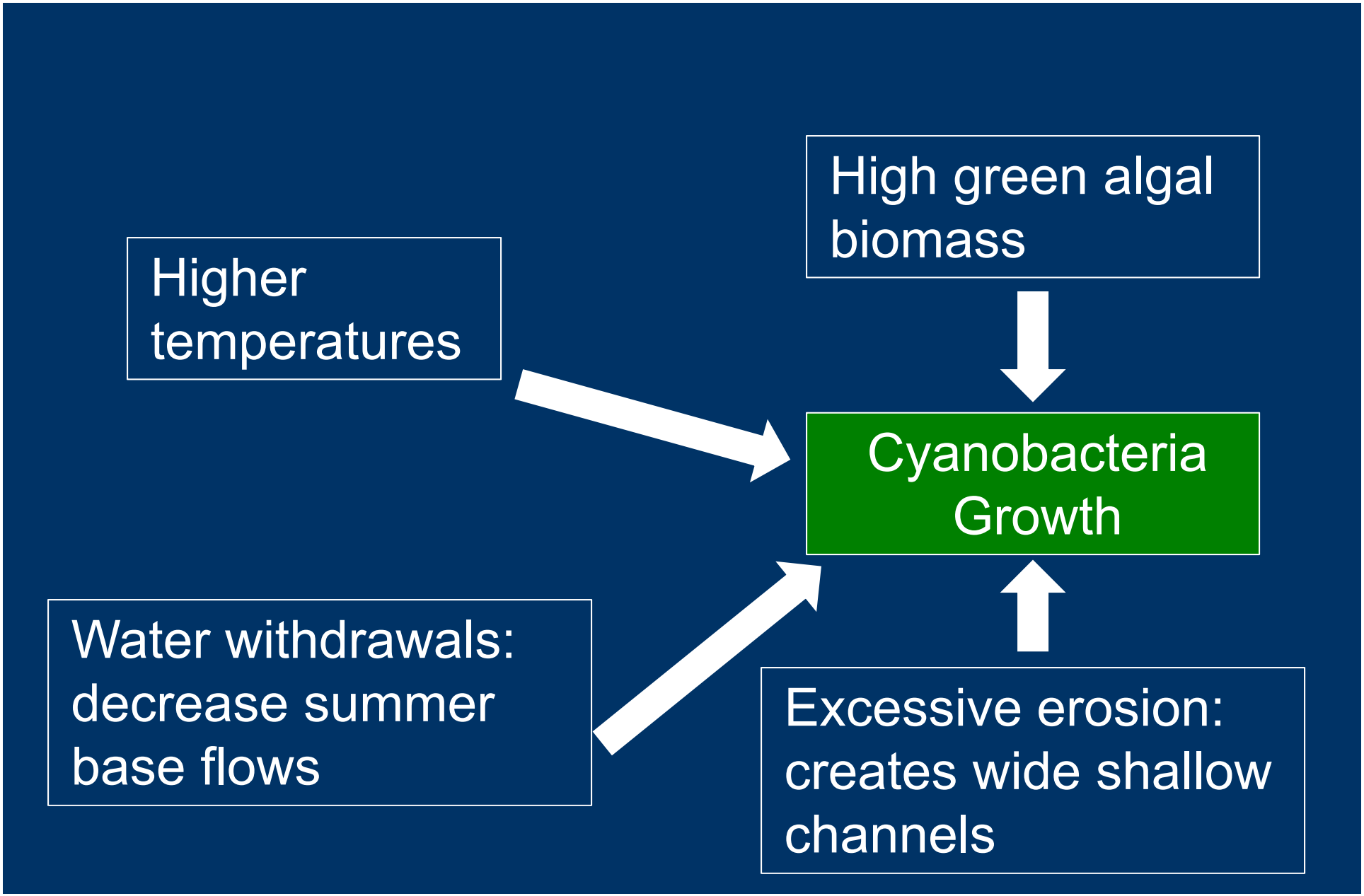
Cyanobacterial Mats



H_2O Samples



Conceptual model



Lessons Learned: Ecology

- Widespread occurrence of cyanobacterial mats, however less abundant in the Lower Eel.
- Different habitats for *Anabaena* versus *Phormidium*
- Growth probably driven by warmer temperatures.
- Anatoxin-a more common than microcystin.

Lessons Learned: Monitoring

- Main public safety threat is ingestion of actual cells, rather than only water.
- SPATT sampling can be conducted by citizen groups.
- Digital micro-photographs are helpful for sharing information.
- Regulatory metrics and sampling methods will be different for rivers & streams, versus lakes and open water.

Acknowledgements

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EPA STAR Fellowship

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People:

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Questions?

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