

Item 3: Update on Freshwater Cyanobacteria  
Harmful Algal Bloom Response Efforts

# North Coast Regional Water Quality Control Board Cyanobacteria Harmful Algal Bloom Monitoring & Response Program



Photo Credit: KarukTribe

Katharine Carter  
June 15, 2016  
Santa Rosa, CA



# Presentation Topics

## (Cyanobacteria = Blue-Green Algae)

- Cyanobacteria Harmful Algal Blooms (cyanoHABs) Overview
- Federal & State CyanoHAB Response Efforts
- Regional CyanoHAB Response Efforts





# What are Harmful Algal Blooms? (HABs)

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# What are Harmful Algal Blooms? (HABs)

## RECORD ALGAE BLOOM



# CyanoHAB Toxins

## ■ Cyanotoxins

- ✓ Dermatoxins – affect the skin
- ✓ Hepatotoxins – affect the liver
- ✓ Cytotoxins – affect the kidneys
- ✓ Neurotoxins – affect the nervous system

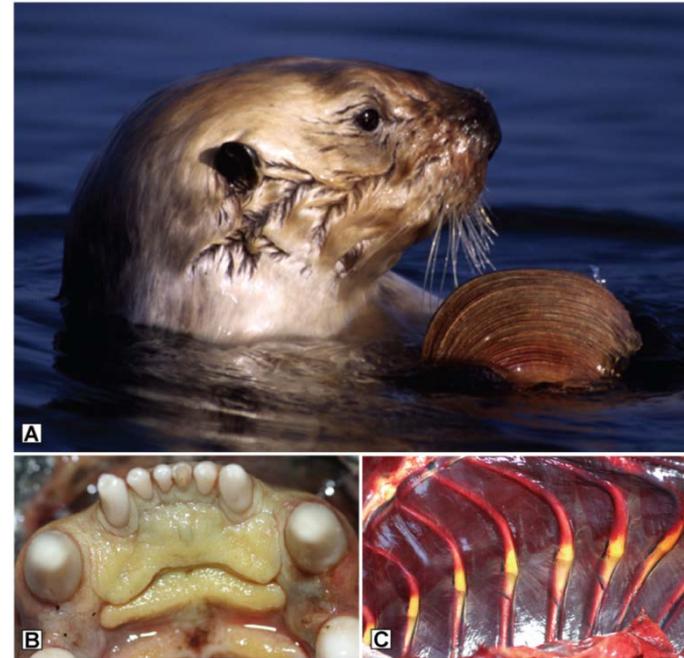
## ■ Pet and livestock health effects:

- ✓ Diarrhea
- ✓ Vomiting
- ✓ Convulsions
- ✓ Death



## ■ Humans health effects:

- ✓ Skin rash
- ✓ Eye irritation
- ✓ Diarrhea
- ✓ Vomiting
- ✓ Seizures
- ✓ Paralysis



Miller et al. 2010, PLOS ONE

# CyanoHAB Toxins

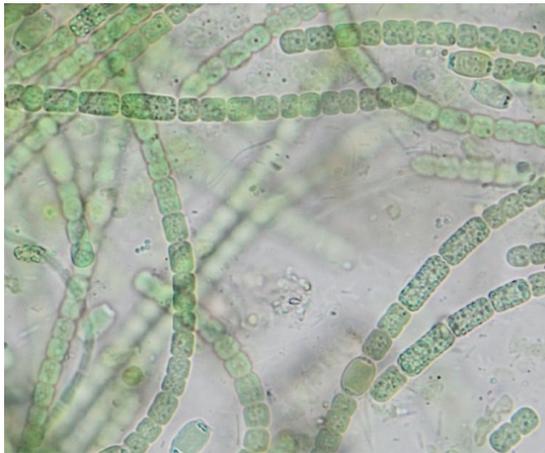
Lake Erie



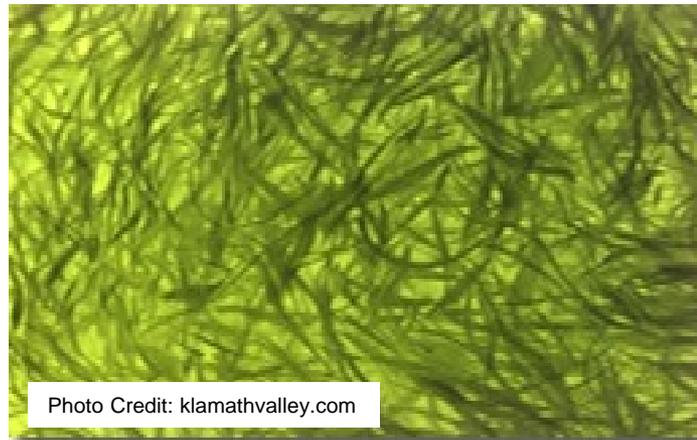
Photo Credit: Peter Essick, National Geographic

# Common HAB Forming Cyanobacteria

Anabaena



Aphanizomenon



Microcystis



**AKA: Annie, Fannie, and Mike**

## Toxins

- ✓ Microcystin
- ✓ Anatoxin-a
- ✓ Saxatoxin

- ✓ Anatoxin-a
- ✓ Cylindrospermopsin

- ✓ Microcystin

Klamath River

Crescent City

Yreka



Big Lagoon

Trinity River

Copco Reservoir

Iron Gate Reservoir

Van Duzen River

Eureka

Weaverville

# CyanoHABs

## Where do they occur in our Region?

South Fork Eel River

Eel River

Laytonville

Mendocino

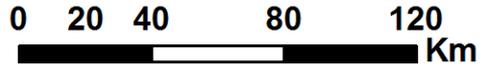
Ukiah

Spring Lake

Russian River

Santa Rosa

-  Suspected human effects from cyanobacteria (2014)
-  Dog deaths caused by cyanobacteria (2001-2015)
-  Lakes and reservoirs with recurrent cyanobacteria blooms
-  Streams with recurrent cyanobacteria blooms
-  Towns



# Federal Strategy

## Currently no Federal Water Quality Criteria or Regulations

- ✓ Established drinking water health advisories (microcystins and cylindrospermopsin)

## Federal Workgroup Report

- Improve testing and research methods
- Forecast modeling
- Developing tools for early detection of HABs
- Research on effects of HAB toxins on human and animal health



HARMFUL ALGAL BLOOMS AND HYPOXIA  
COMPREHENSIVE RESEARCH PLAN AND  
ACTION STRATEGY: AN INTERAGENCY  
REPORT

PRODUCT OF THE

National Science and Technology Council  
Subcommittee on Ocean Science and Technology



February 2016

# California Strategy

- Centralized Website for Reporting & Data Storage
- Cyanobacteria ID and Response Training
- Management and Remediation Workshop
- Satellite Imagery / Early Detection Methods
- California CyanoHAB Network



Strategic Plan – Phase 1

2016

## California Freshwater Harmful Algal Blooms Assessment and Support Strategy

Beverley Anderson-Abbs  
Meredith Howard  
Karen Taberski  
Karen Worcester

SWAMP-SP-SB-2016-0001

January 2016



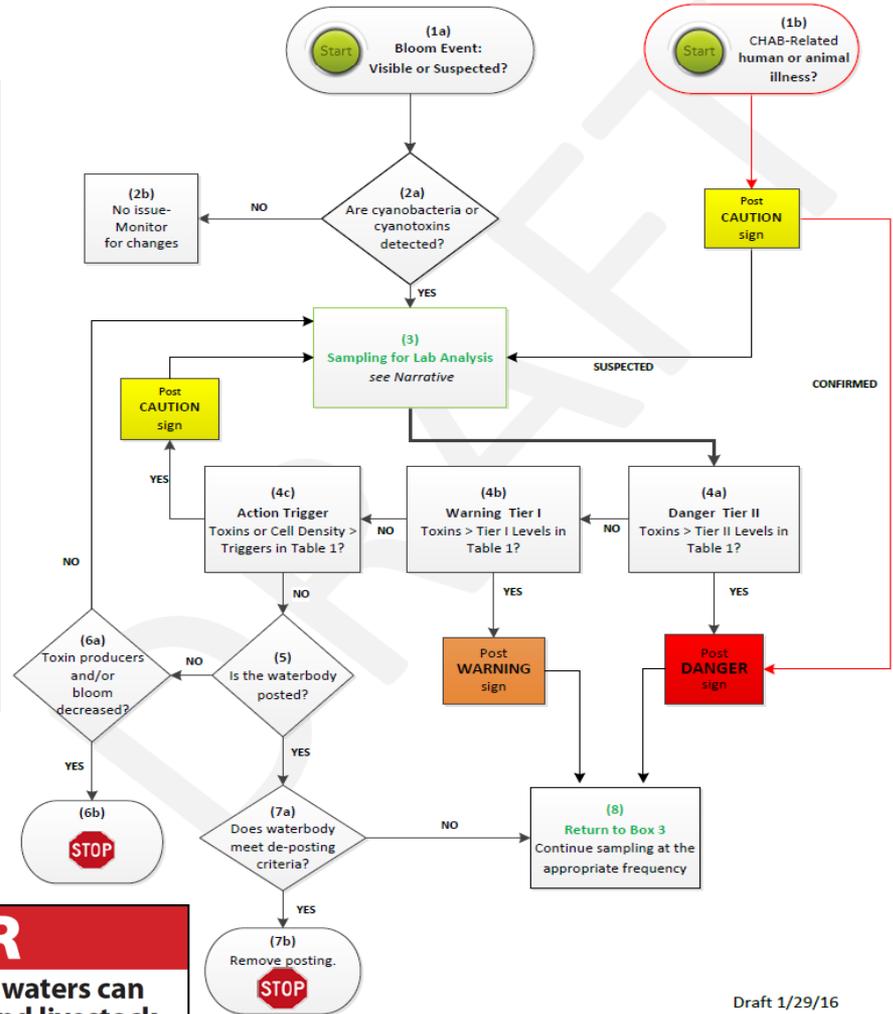
[www.waterboards.ca.gov/swamp](http://www.waterboards.ca.gov/swamp)

**Table 1. CyanoHAB Trigger Levels for Human Health**

**DRAFT**

	Caution Action Trigger	Warning TIER I	Danger TIER II
<b>Primary Triggers<sup>a</sup></b>			
<b>Total Microcystins<sup>b</sup></b>	0.8 µg/L	6 µg/L	20 µg/L
<b>Anatoxin-a</b>	Detection <sup>c</sup>	20 µg/L	90 µg/L
<b>Cylindrospermopsin</b>	1 µg/L	4 µg/L	17 µg/L
<b>Secondary Triggers</b>			
<b>Cell Density (Toxin producers)</b>	4,000 cells/mL	--	--
<b>Site Specific Indicators of Cyanobacteria</b>	Blooms, scums, mats, etc.	--	--

- a. The primary triggers are met when ANY toxin exceeds criteria
- b. Microcystins refers to the sum of all measured microcystin variants. (See Box 3)
- c. Must use an analytical method that detects  $\leq 1\mu\text{g/L}$  Anatoxin-a



Draft 1/29/16

# 2016 Updates to Voluntary Guidance for: "Cyanobacteria in CA Recreational Waterbodies"

## CAUTION

Harmful algae may be present. For your protection, please do not swim or wade near algae or scum.

- DO NOT SWIM OR WADE near algae or scum.
- KEEP CHILDREN AWAY from algae in the water or on the shore.
- DO NOT drink this water or use it for cooking.

Call your doctor or veterinarian if you or your pet get sick after going in the water. For more information, contact:

## WARNING

Toxins from algae in these waters can harm people and kill.

- NO SWIMMING
- STAY AWAY from scum, and cloudy or discolored water.
- DO NOT use these waters for drinking or cooking. Boiling or filtering will not make the water safe.

**For people, the toxins can cause:**  
 • Skin rashes, eye irritation  
 • Diarrhea, vomiting  
 Call your doctor or veterinarian if you or your pet get sick after going in the water. For more information, contact:

## DANGER

Toxins from algae in these waters can harm people and kill pets and livestock.

- STAY OUT OF THE WATER UNTIL FURTHER NOTICE. Do not touch scum in the water or on shoreline.
- DO NOT let pets or livestock drink or go into the water or go near the scum.
- DO NOT eat fish or shellfish from these waters.
- DO NOT use these waters for drinking or cooking. Boiling or filtering will not make the water safe.

**For people, the toxins can cause:**  
 • Skin rashes, eye irritation  
 • Diarrhea, vomiting  
**For animals, the toxins can cause:**  
 • Diarrhea, vomiting  
 • Convulsions and death  
 Call your doctor or veterinarian if you or your pet get sick after going in the water. For more information, contact:

# Regional Strategy

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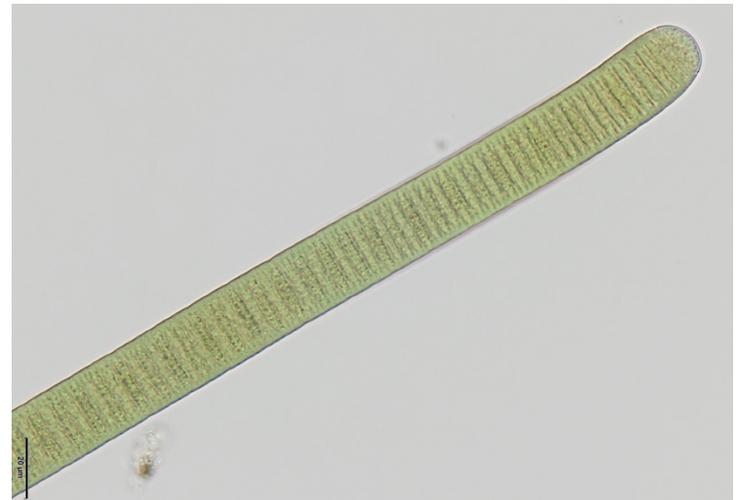
## ■ Public Workshop

- ✓ Overview of cyanoHABs & toxins
- ✓ Review California Strategy
- ✓ Case studies

## ■ Workgroup Meeting

- ✓ Build strong North Coast cyanoHAB responder partnerships
- ✓ Define each partner's role
- ✓ Begin planning for summer 2016

## ■ Develop CyanoHAB Monitoring & Response Program





# Building Partnerships

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- **Klamath River & Reservoirs**
- **Eel River**
- **South Fork Eel River**
- **Van Duzen River**
- **Trinity River**
- **Russian River**

# Klamath River & Reservoirs

- ✓ Contacted Siskiyou County Environmental Health
- ✓ Coordinating with those doing monitoring & postings
- ✓ Information sharing: KBMP Blue-Green Algae Tracker

## Klamath Basin | Monitoring Program



Home About Us **Maps & Monitoring Data** Meetings & Documents Stewardship Collaboration News



**Klamath Basin  
Monitoring  
Program**

### Blue-Green Algae Tracker

#### About the Tracker

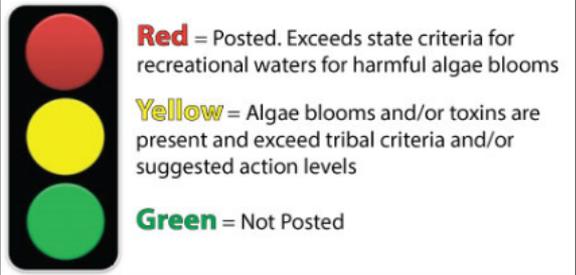
The BGA Tracker was built to inform the public and research community regarding river conditions. The Tracker utilizes current information to track and map the blue-green algae blooms throughout the Klamath Basin. The Blue-Green Algae Tracker identifies blue-green algae public health threats (i.e. exceeds health thresholds identified in the statewide voluntary guidance) by river segment bounded by public health monitoring locations. River reaches which exceed [California](#) or [Oregon](#) criteria for public health are highlighted in RED. Reaches which exceed lower criteria based on [tribal](#) and/or [non-regulatory "Action Levels"](#) are highlighted in YELLOW. Reaches that do not exceed state or tribal criteria are GREEN.

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#### BGA Tracker Interactive Map

#### Blue Green Algae

In the Klamath Basin blue-green algae blooms typically occur between June and October when temperatures rise and water conditions are favorable for algal growth. Blue-green algae monitoring typically occurs May - November. If river conditions exceed public health standards for toxic algae the area is posted with a health advisory sign.



**Red** = Posted. Exceeds state criteria for recreational waters for harmful algae blooms

**Yellow** = Algae blooms and/or toxins are present and exceed tribal criteria and/or suggested action levels

**Green** = Not Posted

#### Real-Time Data

[Link to Real-Time WQ Map](#)





# Eel River / South Fork Eel River / Van Duzen River / Trinity River

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## ✓ Public/Environmental Health Workgroup:

- Humboldt County Env. Health
- Mendocino County Env. Health
- Lake County Public Health



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

# Eel River / South Fork Eel River / Van Duzen River / Trinity River

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## ✓ Public/Environmental Health Workgroup:

- Humboldt County Env. Health
- Mendocino County Env. Health
- Lake County Public Health

## ✓ Informational Postings that Blue-Green Algae May Be Present

# CAUTION

**Harmful algae may be present in these waters.  
For your family's safety:**



**DO NOT SWIM OR WADE** near algae or scum.



**DO NOT** let pets or livestock go into or drink the water, or eat scum on the shoreline.



**KEEP CHILDREN AWAY** from algae in the water or on the shore.



For fish caught here, **THROW AWAY GUTS AND CLEAN FILLETS** with tap water or bottled water before cooking.



**DO NOT** drink this water or use it for cooking.



**DO NOT** eat shellfish from these waters.

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Call your doctor or veterinarian if you or your pet get sick after going in the water.  
For more information, contact:

# Eel River / South Fork Eel River / Van Duzen River / Trinity River

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- ✓ **Public/Environmental Health Workgroup:**
  - Humboldt County Env. Health
  - Mendocino County Env. Health
  - Lake County Public Health
  
- ✓ **Informational Postings that Blue-Green Algae May Be Present**
  
- ✓ **Eel River Recovery Project & Regional Water Board Monitoring**



**Solid Phase Adsorption  
Toxin Tracking (SPATT)**

# Russian River

- ✓ **Coordination Meeting**
  - Sonoma County DHS/EH
  - Sonoma County Water Agency
  - Sonoma County Parks
  
- ✓ **Weekly Water Quality Data Summary & Bi-weekly Algae/Cyanobacteria Monitoring**
  - Sonoma County Water Agency
  
- ✓ **Pilot Public Health Monitoring Program (weekly at 10 beaches)**
  - Sonoma County DHS/EH
  
- ✓ **Pilot Ambient Monitoring Program**
  - North Coast Regional Water Quality Control Board



# Russian River

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## ✓ Visual Monitoring Training

- Russian Riverkeeper
- Russian River Adventures
- And others

## ✓ Outreach

- Sonoma County Water Coalition  
Technical Meeting





# Summary

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- **Cyanobacteria are a natural part of our environment**
- **Utilizing existing Regional Water Board programs to address controllable factors in cyanoHAB formation**
- **Effective cyanoHAB response requires planning and coordination**
- **Effective cyanoHAB response requires evaluation of multiple lines of evidence**
- **Goal to keep beaches open to recreation while protecting public health and beneficial uses**

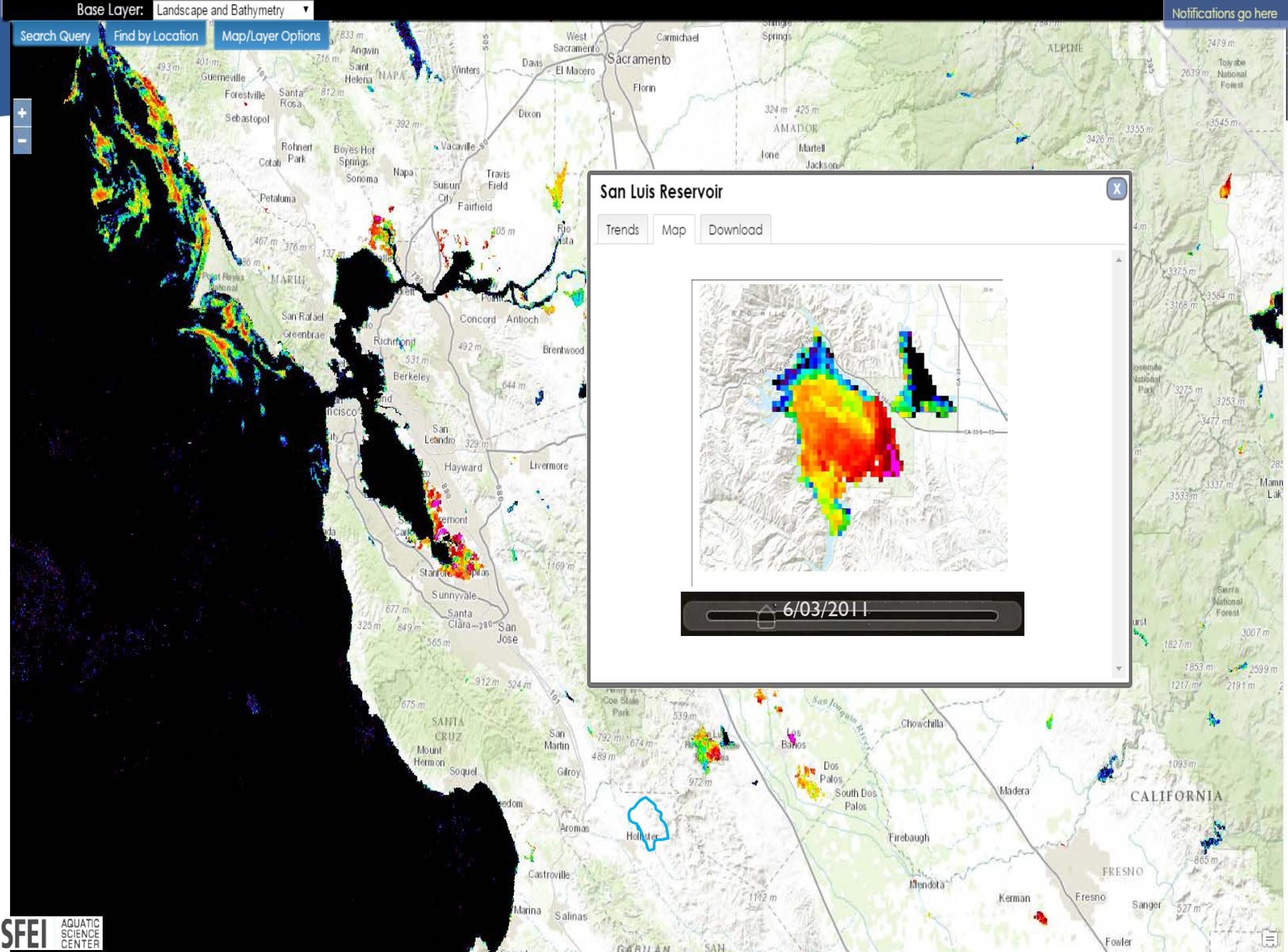
**Contact Information:**  
**Katharine Carter**  
**Katharine.Carter@waterboards.ca.gov**  
**707-576-2290**

**Useful Resources:**

- **USEPA CyanoHAB Webpage**  
✓ <https://www.epa.gov/nutrient-policy-data/cyanohabs>
- **California CyanoHAB Network (CCHAB)**  
✓ [http://www.mywaterquality.ca.gov/monitoring\\_council/cyanohab\\_network/index.shtml](http://www.mywaterquality.ca.gov/monitoring_council/cyanohab_network/index.shtml)
- **North Coast Regional Water Board – Surface Water Monitoring**  
✓ [http://www.waterboards.ca.gov/northcoast/water\\_issues/programs/swamp.shtml](http://www.waterboards.ca.gov/northcoast/water_issues/programs/swamp.shtml)
- **California Department of Public Health – Blue Green Algae Webpage**  
✓ <http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Bluegreenalgae.aspx>
- **Sonoma County Department of Health Services – Russian River**  
✓ <http://www.sonoma-county.org/health/services/bluegreen.asp>
- **Klamath Basin Monitoring Program – Klamath Blue Green Algae Tracker**  
✓ <http://www.kbmp.net/maps-data/blue-green-algae-tracker>

Questions?





### San Luis Reservoir

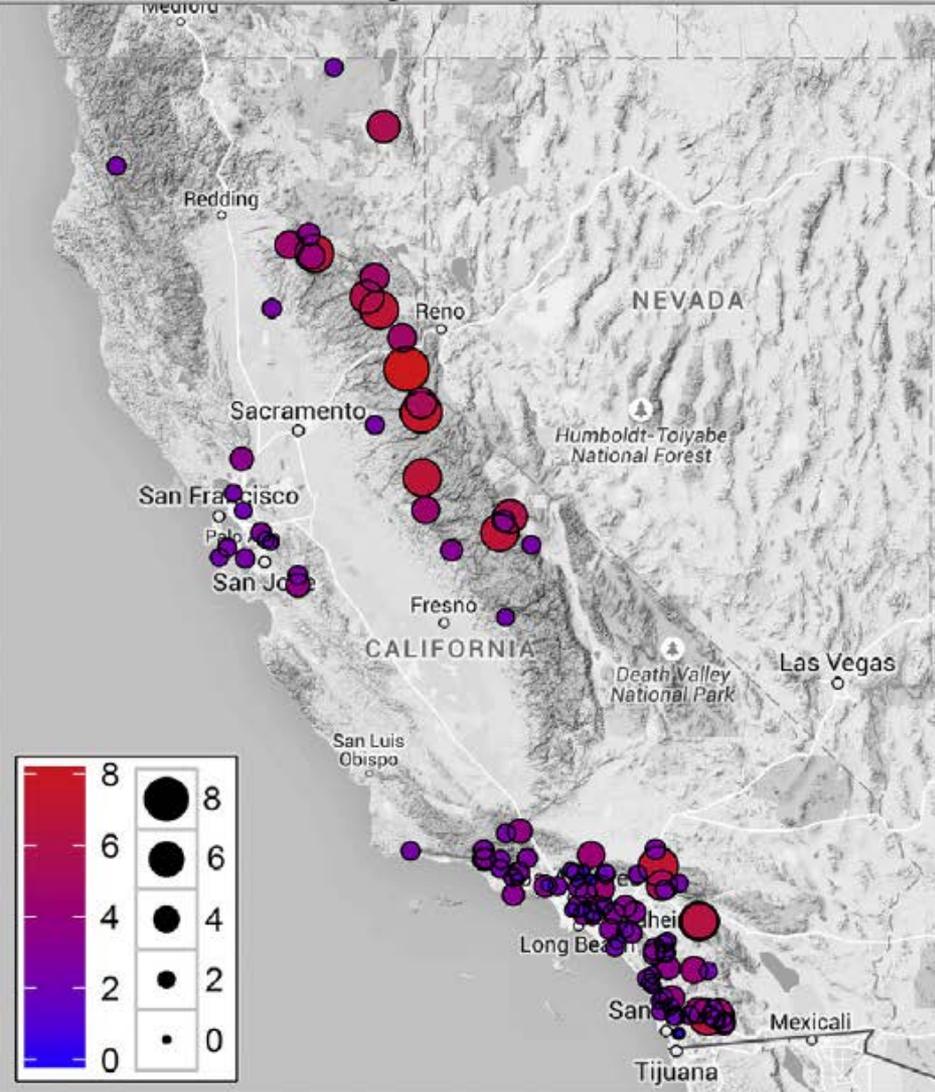
Trends Map Download

6/03/2011

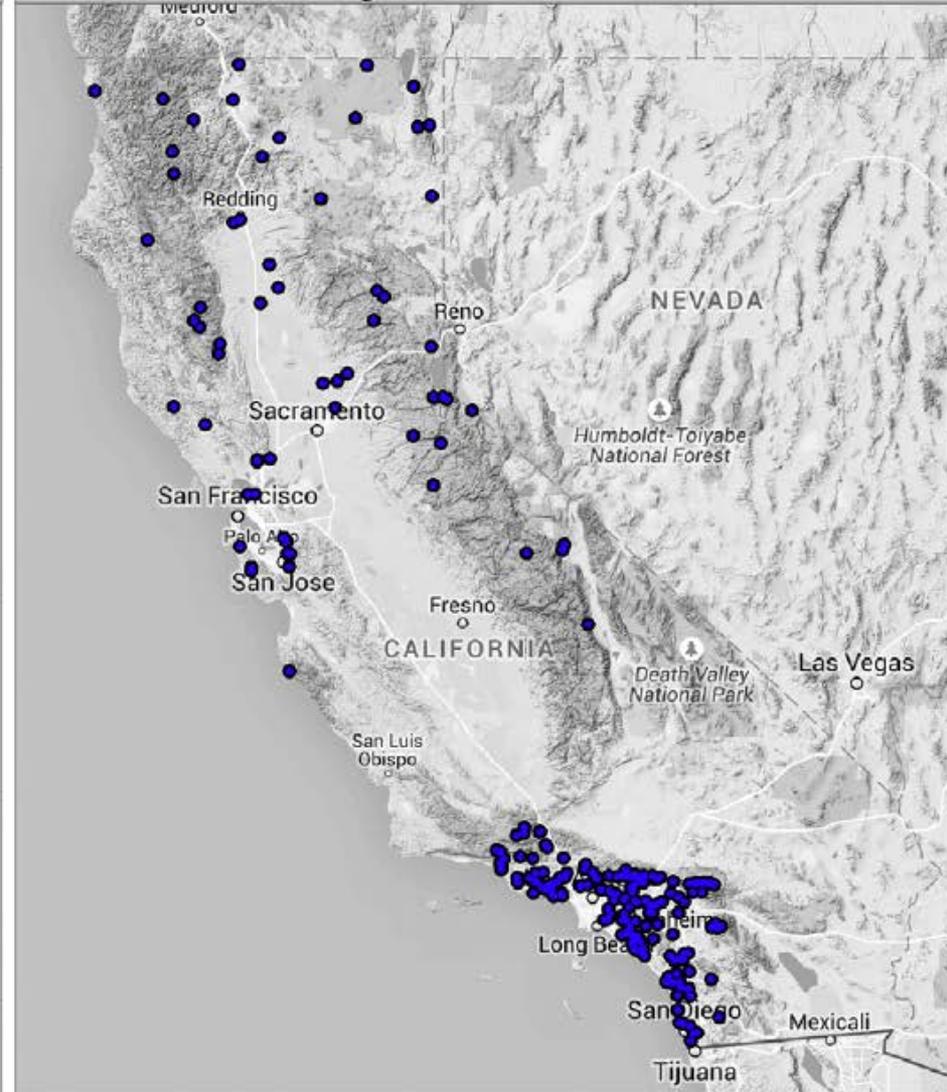


# Wadeable streams assessment of cyanotoxins

microcystins detected



microcystins not detected



Fetscher et al. 2015, Harmful Algae