




Clear Lake Cyanotoxins Monitoring Program: Toxins and Tribal Beneficial Uses

Sarah Ryan, Environmental Director, Big Valley Band of Pomo Indians

Cyanosymposium 2023




Overview

- ▶ Tribal Water Programs
 - ▶ Impacts to Beneficial Uses
 - ▶ Clear Lake Cyanobacteria and Cyanotoxin Monitoring Program
 - ▶ Cyanotoxins and Public Health Issues/CalWATCH
- 



California Native American Tribes

- 109 federally recognized in 34 counties in California
 - 78 petitioning for recognition
 - Some are now “landless” because of a series of policies that allowed the land to be sold from under them.
 - Because of a legal relationship with the federal government, Tribes are recognized to be self governing with inherent sovereignty over their members and territories
- 

California Indian Pre-contact Tribal Territories





Tribes as Water Quality Data Partners

- ▶ Tribes are monitoring waterbodies throughout California to protect their uses and resources
- ▶ Their data is legally defensible with federally approved QAPPs and often available in federal or state exchange networks
- ▶ Tribal programs should be partnered with to enhance cyanotoxin and other water quality monitoring throughout the state
- ▶ Tribal data sovereignty should be respected – how data is used, ownership of data

Tribal Beneficial Uses - Definitions

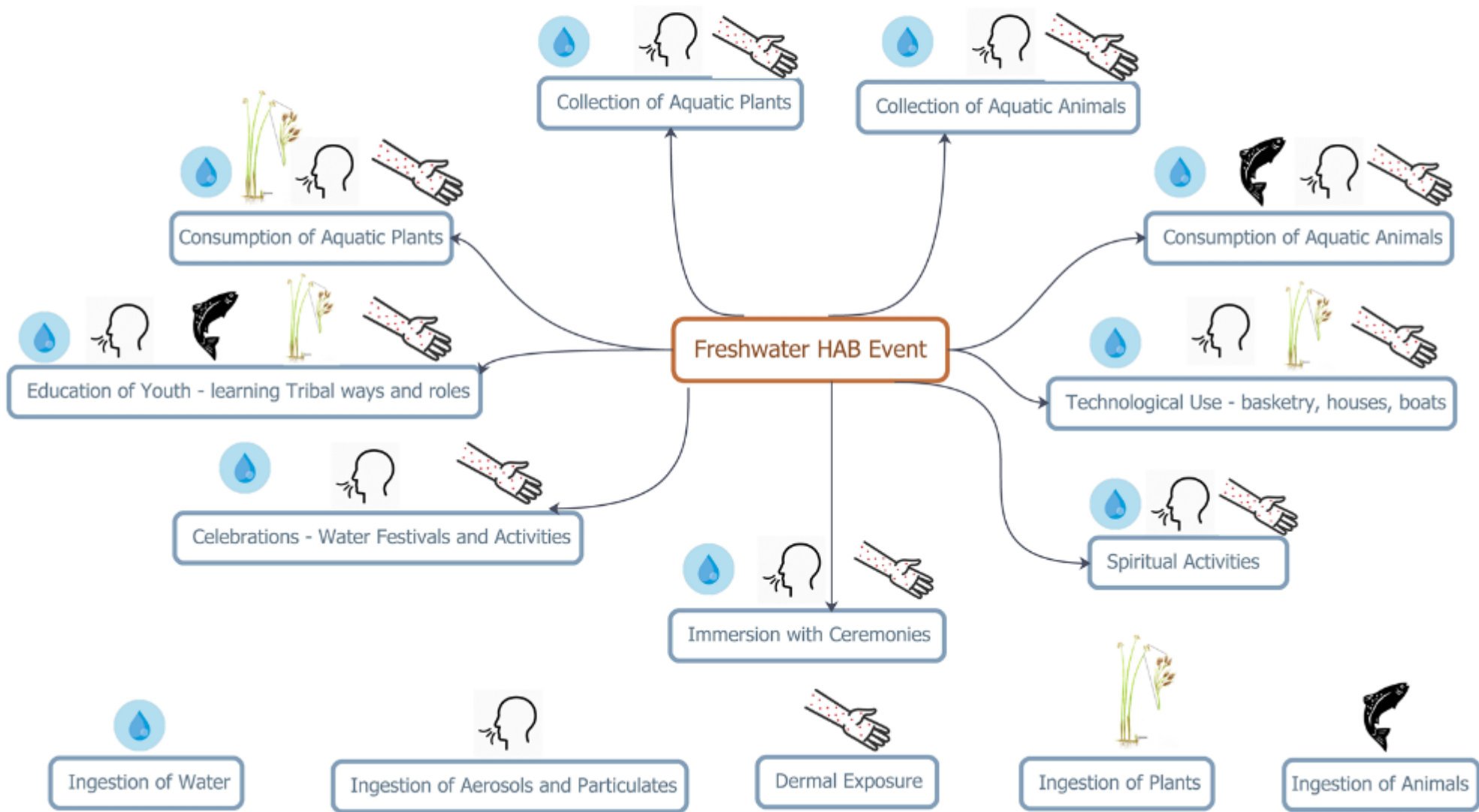
- ▶ **Tribal Tradition and Culture (CUL):** Uses of water that support the cultural, spiritual, ceremonial, or traditional rights or LIFEWAYS of CALIFORNIA NATIVE AMERICAN TRIBES, including, but not limited to navigation, ceremonies, or fishing, gathering, or consumption of natural aquatic resources, including fish, shellfish, vegetation, and materials.
- ▶ **Tribal Subsistence Fishing (T-SUB):** Uses of water involving the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities of California Native American Tribes to meet needs for sustenance.

Adopted by the State Water Resources Control Board in May 2017

https://www.waterboards.ca.gov/about_us/public_participation/tribal_affairs/beneficial_uses.html

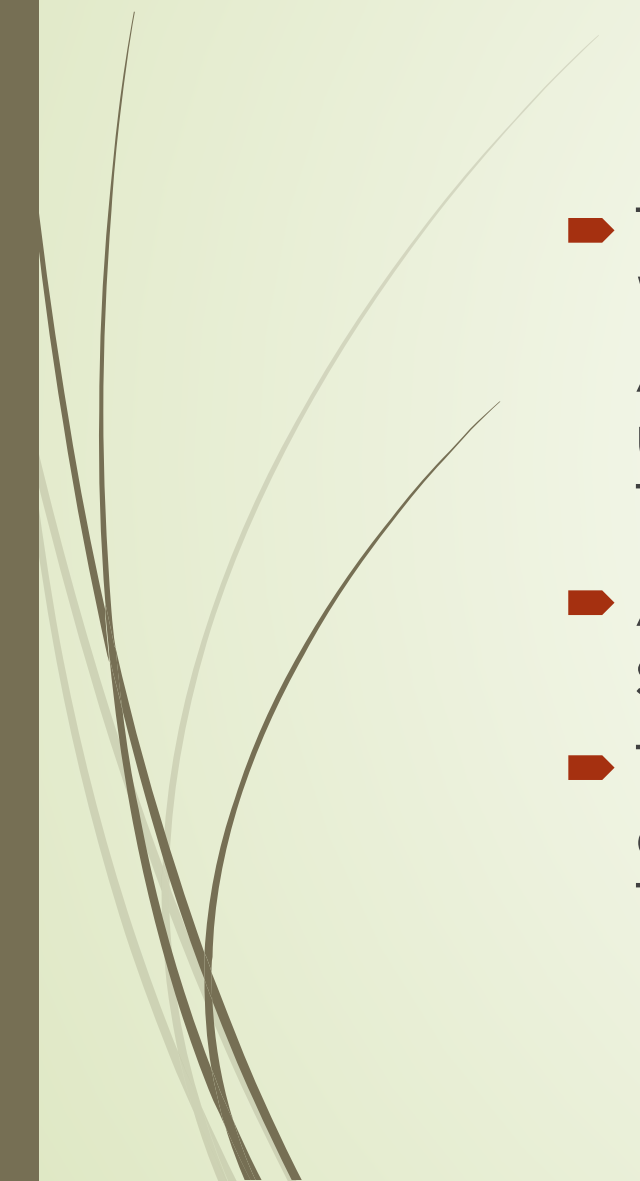
Tribal Cultural Use Conceptual Freshwater Harmful Algal Bloom (FHAB) Impact Pathway

Native peoples were given their land by Creator and honor Creator and their Ancestors by maintaining traditions and cultural landscapes. This is the connection between the land and the people. Uses can be repetitive, gender assigned and long term. Exposures can occur second hand through the use and trade of plants and animals that have been in contact with HABs.





Amending Basin Plans to Protect Tribal Beneficial Uses

- ▶ Tribes in California are now engaging with Regional Waterboards to take the next steps of the Clean Water Act – designating water bodies with Tribal traditional uses and identifying Water Quality Objectives related to Tribal Beneficial Uses for these Basin Plans
 - ▶ All NPDES permits and TMDL clean ups are linked to stated beneficial uses and water quality objectives
 - ▶ The Clean Water Act requires period review of water quality data against water quality objectives. Available Tribal data is used during these 305b evaluations.
- 

Clear Lake (Xabatin)



- Largest natural freshwater lake in California
- 100 miles of shoreline
- Surface area of 43,785 acres
- Average depth 27 feet, max depth 60 feet
- Oldest lake in North America – sediment cores dating 1.8 million years

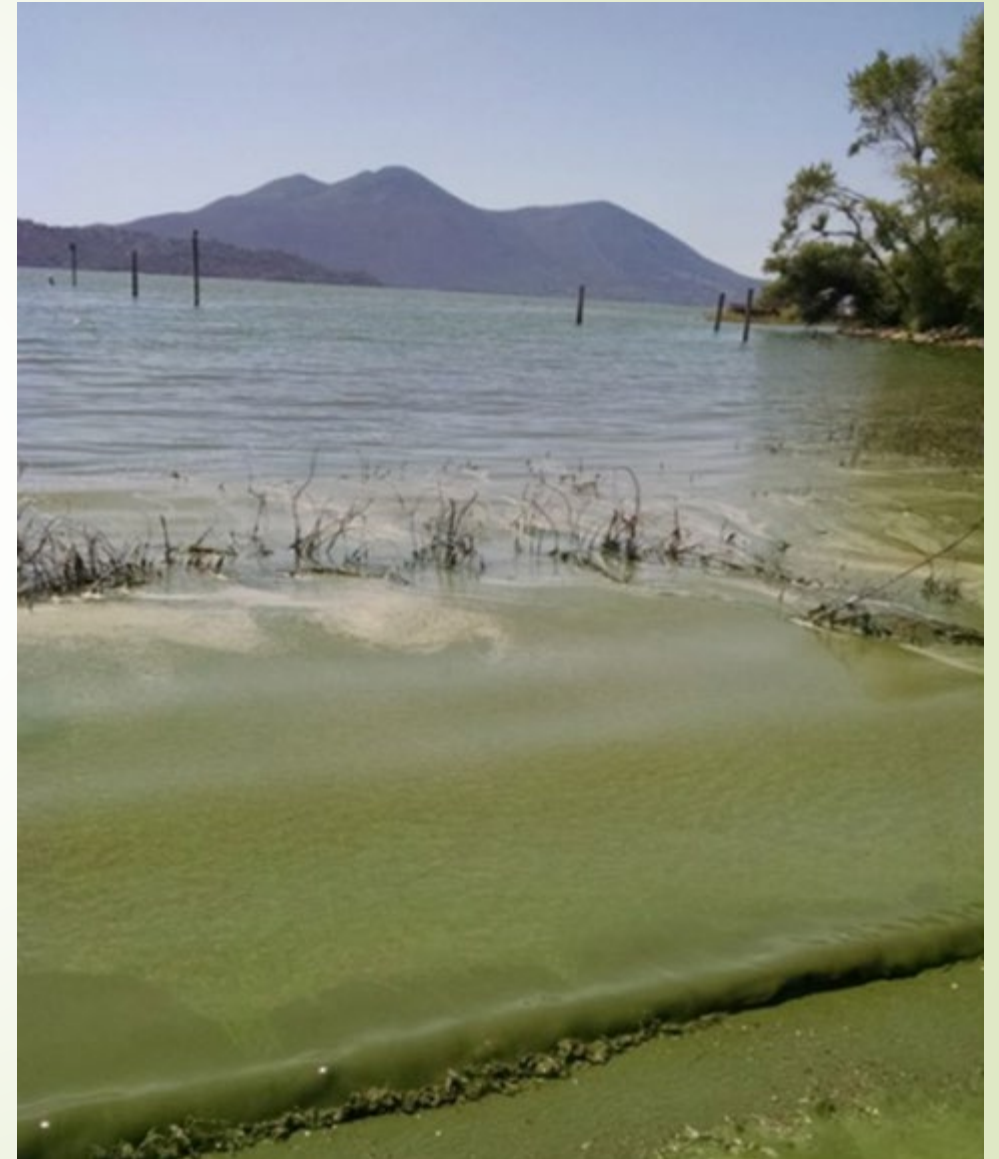
Clear Lake Cyanotoxin Monitoring Program



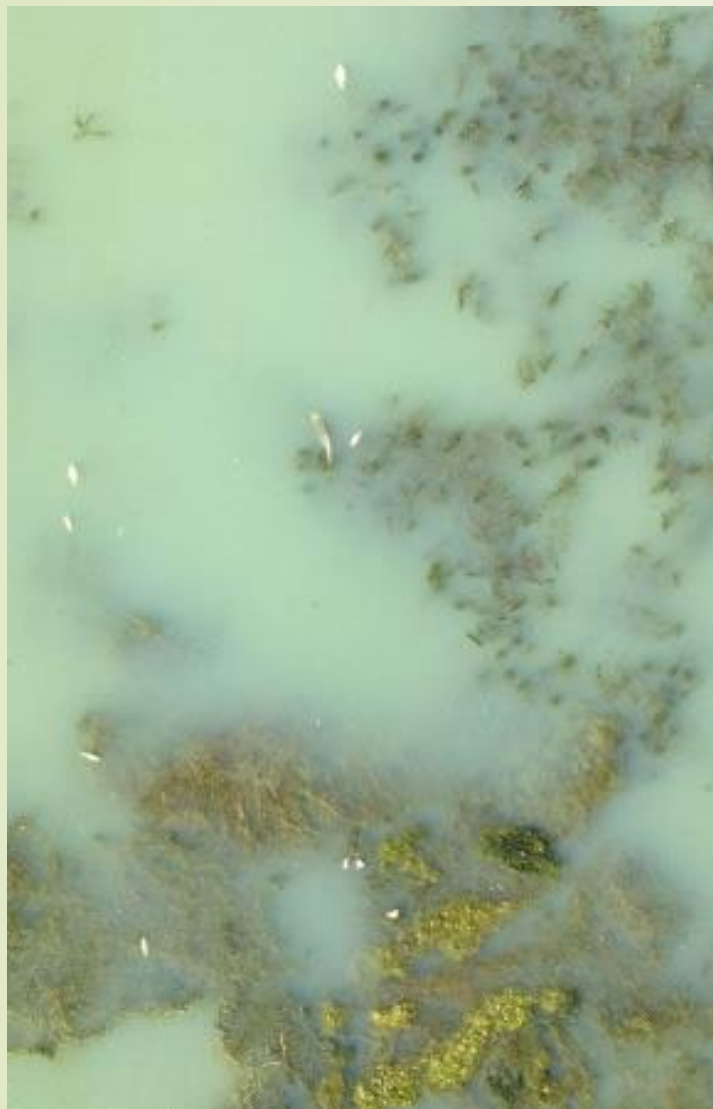
Initiated and developed by Big Valley Band of Pomo Indians and Elem Indian Colony, 2014. <https://bit.ly/ClearLakeCyanoMonitoringProgram>

Cyanobacteria Impacts

- Bloom proliferation ➔ reduced sunlight in water column, impacting plant growth
- Dying blooms ➔ oxygen depletion ➔ fish kills
- Questions about water safety
- Strong odor, visually unpleasing
- Increased filtration and treatment costs for drinking water systems



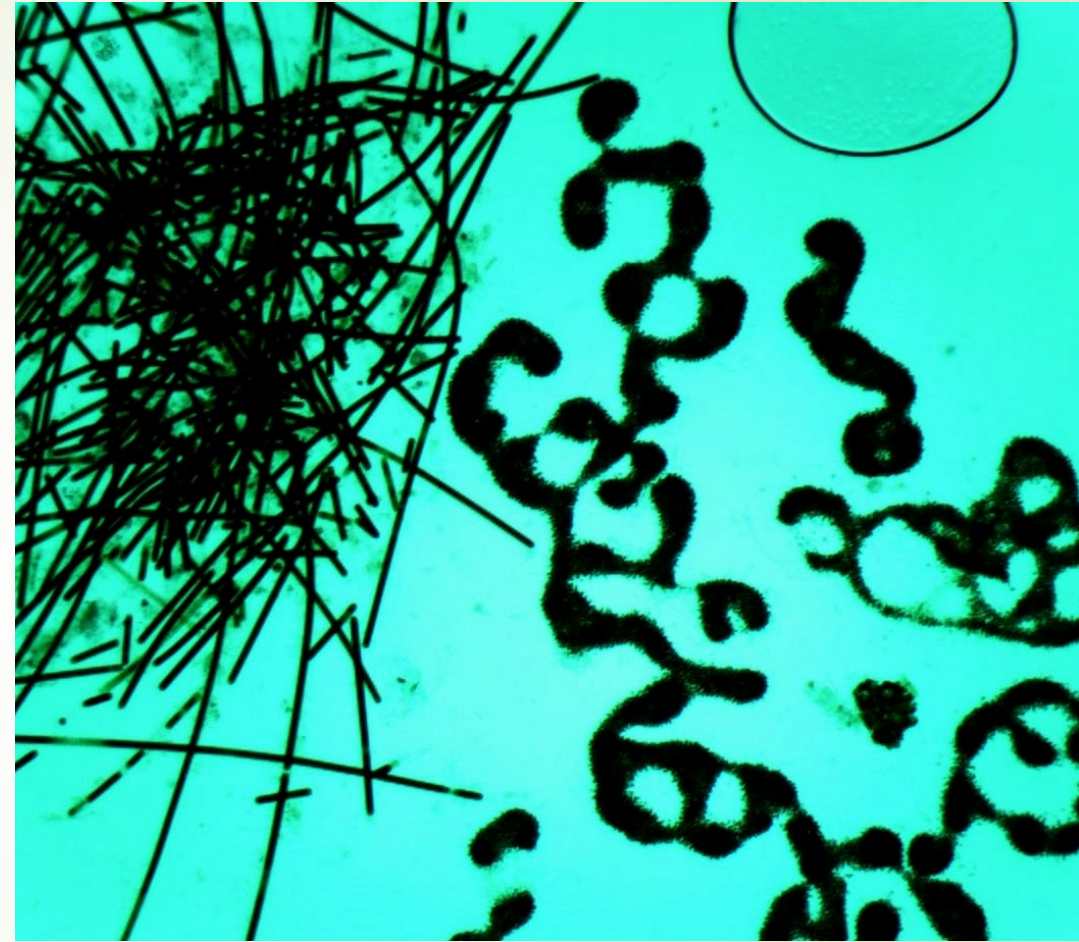
Clear Lake Cyanobacteria Blooms



2014



2021



Microcystis and Lyngbya bloom,
Clear Lake, August 2021

Freshwater cyanotoxin producers chart

California State Water Boards Freshwater Harmful Algal Bloom Program | mywaterquality.ca.gov/habs

Cyanobacteria
and Known
Toxins

Toxin types^a

Liver toxins	microcystin (MC), nodularin (NOD), cylindrospermopsin ^b (CYN)
Neurotoxins	anatoxins (ATX; including homoanatoxin and derivatives), saxitoxins (STX), guanitoxin ^c (GTX)
Skin toxins ^a	lyngbyatoxin (LTX), debromoaplysiatoxin (DAT), aplysiatoxin (AT)

^a In addition to the toxins listed, all cyanobacterial cell membranes contain lipopolysaccharides, which can irritate the skin and gastrointestinal tract¹

^b Cylindrospermopsin also impacts the kidney²

^c Previously anatoxin-a(s)³.

Genus	Liver toxins			Neurotoxins			Skin toxins		
	MC	NOD	CYN	ATX	STX	GTX	LTX	DAT	AT
<i>Anabaena</i>	X ⁴		X ⁵		X ⁶				
<i>Anabaenopsis</i>	X ⁷								
<i>Anagnostidinema</i> ^b (prev. <i>Geitlerinema</i>)	X ⁹				X ⁶				
<i>Aphanizomenon</i>			X ¹⁰	X ^{*11,12}	X ^{13,14}				
<i>Aphanocapsa</i>	X ¹⁵								
<i>Chrysosporum</i>			X ¹⁶						
<i>Coelosphaerium</i>	O ¹⁷								
<i>Cuspidothrix</i> ¹⁸ (prev. <i>Aphanizomenon</i>)				X ¹⁹	X ²⁰				
<i>Cylindrospermum</i>				X ¹¹	X ⁶				
<i>Dolichospermum</i> ²¹ (prev. <i>Anabaena</i>)	X ²²		X ⁵	X ¹³	X ²³	X ³			
<i>Fischerella</i>	X ²⁴								
<i>Geitlerinema</i>	X ⁹			X ⁹	X ⁶				
<i>Gloeotrichia</i>	X ²⁵								
<i>Hapalosiphon</i>	X ²⁶								
<i>Iningainema</i>		X ²⁷							
<i>Kamptonema</i>				X ²⁸					
<i>Leptolyngbya</i>	X ⁴								
<i>Limnospira</i> ²⁹ (prev. <i>Arthrospira</i>)	X ³⁰			X ³⁰					
<i>Limnothrix</i>	X ³¹				X ³²				
<i>Merisimopedia</i>	X ³³								
<i>Microseira wollei</i> ³⁴ (prev. <i>Lynqbya</i>)			X ³⁵		X ^{36,37}				

<https://drive.google.com/file/d/1jSK9zEW-POTILXB0S60KQB7ksNEvc0nP/view>

California Cyanotoxin Guidelines

Action levels for selected scenarios

	Microcystins ¹	Anatoxin-a	Cylindrospermopsin	Media (units)
Human recreational uses ²	0.8	90	4	Water (µg/L)
Human fish consumption	10	5000	70	Fish (ng/g) ww ³
Subchronic water intake, dog ⁴	2	100	10	Water (µg/L)
Subchronic crust and mat intake, dog	0.01	0.3	0.04	Crusts and Mats (mg/kg) dw ⁵
Acute water intake, dog ⁶	100	100	200	Water (µg/L)
Acute crust and mat intake, dog	0.5	0.3	0.5	Crusts and Mats (mg/kg) dw ⁵
Subchronic water intake, cattle ⁷	0.9	40	5	Water (µg/L)
Subchronic crust and mat intake, cattle ⁷	0.1	3	0.4	Crusts and Mats (mg/kg) dw ⁵
Acute water intake, cattle ⁷	50	40	60	Water (µg/L)
Acute crust and mat intake, cattle ⁷	5	3	5	Crusts and Mats (mg/kg) dw ⁵

‘Suggested Action Levels and Six Cyanotoxins’, CA OEHHA, 2012

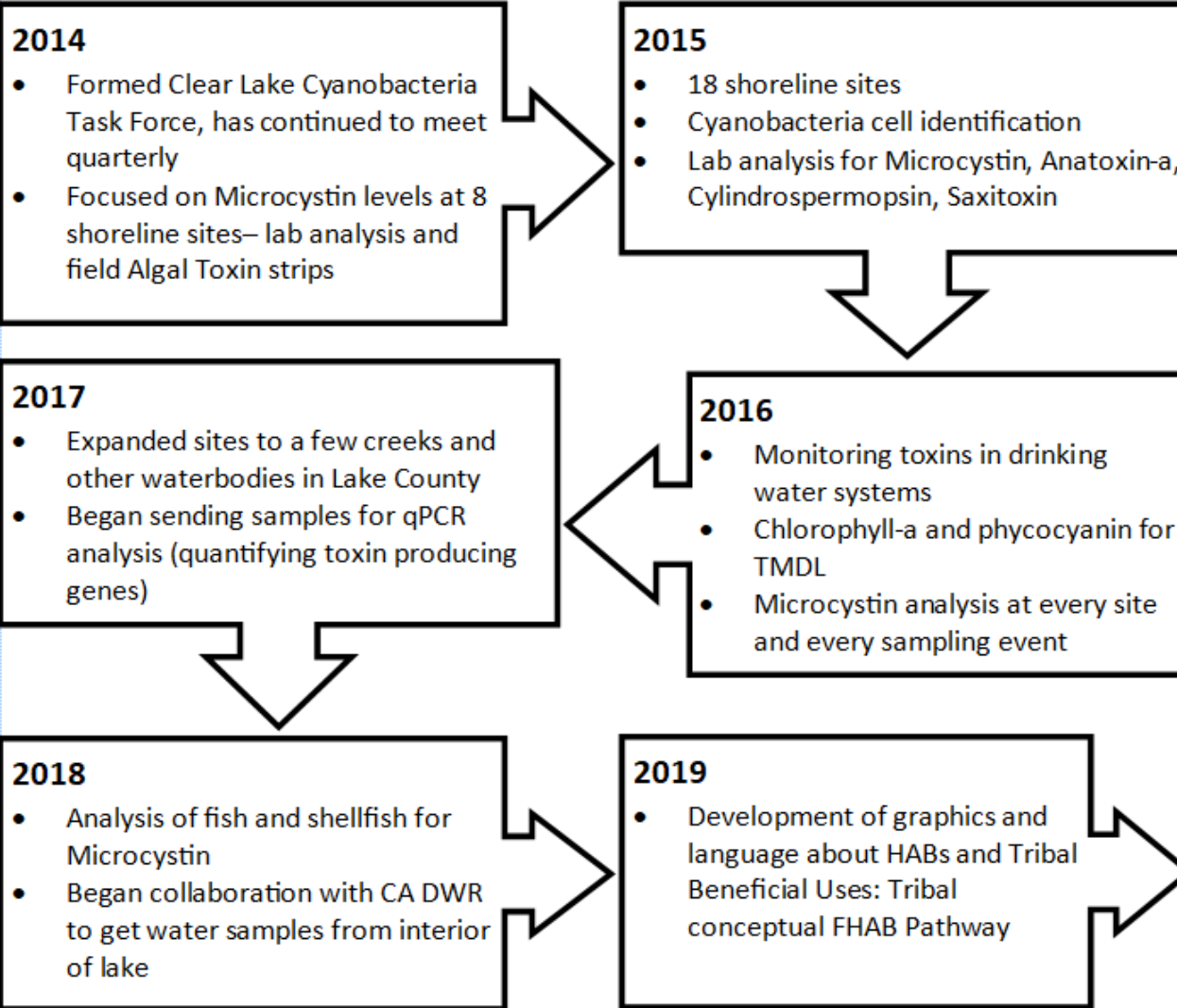
<https://oehha.ca.gov/risk-assessment/document/toxicological-summary-and-suggested-action-levels-reduce-potential-adverse>

Clear Lake Cyanobacteria Monitoring Program

- 2014: Tribes wanted more info on blooms, realized they had to start the program.
- Big Valley Band of Pomo Indians, Elem Indian Colony already had established water monitoring programs and QAPPs so added this element.
- Funding used: CalEPA EJ, BIA Water Resources, GAP, US Fish and Wildlife.



Tribal Cyanobacteria Monitoring Program



Fish Kill During Cyanobacteria Bloom, Clear Lake

CLEAR LAKE WATER QUALITY, TRIBES, AND CYANOTOXINS



<https://www.bvrancheria.com/epa>

Tribal Centric Program

- Include locations that are Tribally important
- Monitoring to coincide with important dates of Tribal uses of the water
- Communicate with Tribes and the public about the results



2022

- Program development for creek cyanotoxin monitoring using grab samples and SPATT bags
- Program development for cyanotoxin analysis of other traditional foods: waterfowl (mudhens) and tules

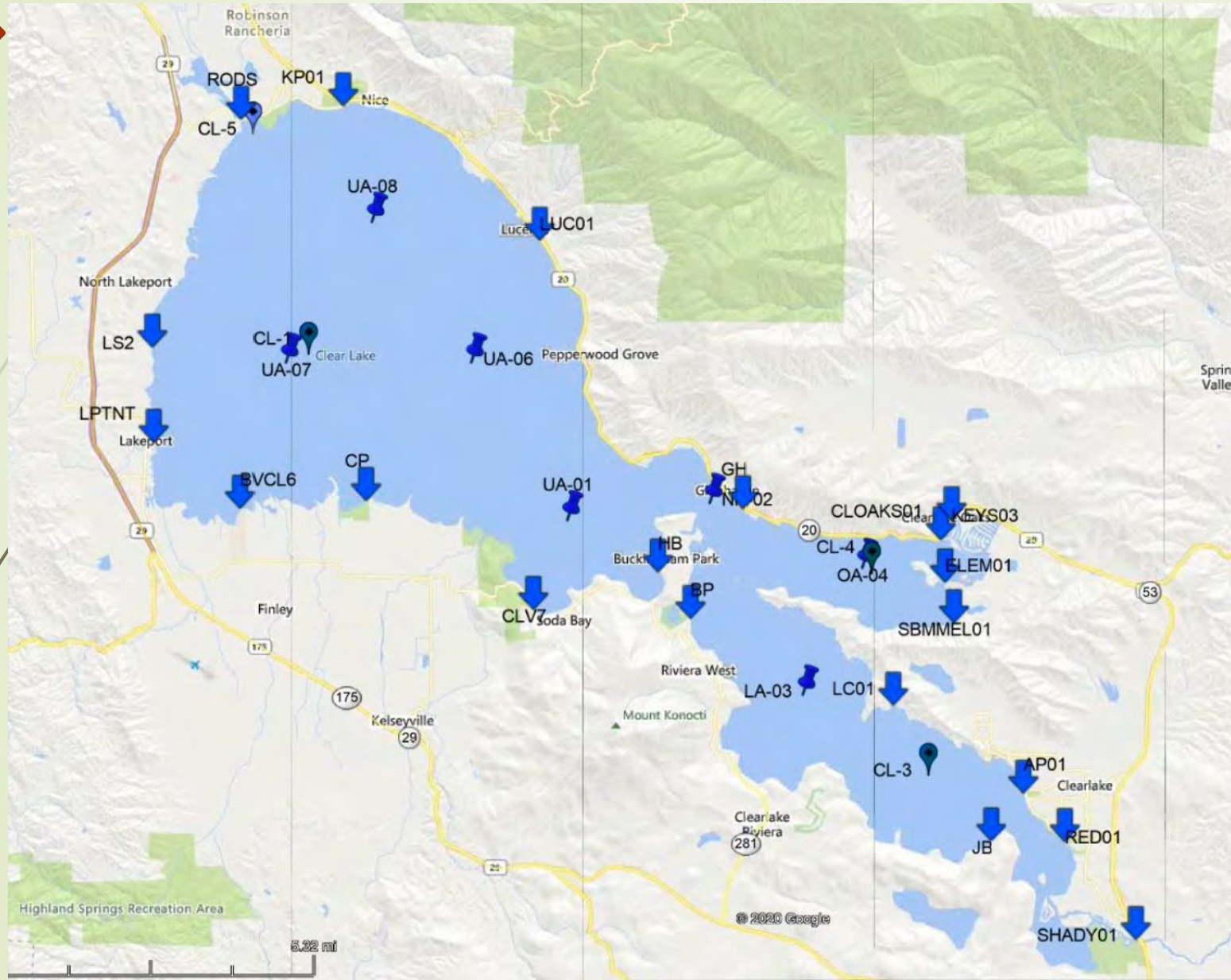
2020

- Development of signage tracker for Lake County and other agencies to monitor the changing toxin levels and communication signage throughout the sampling season

2021

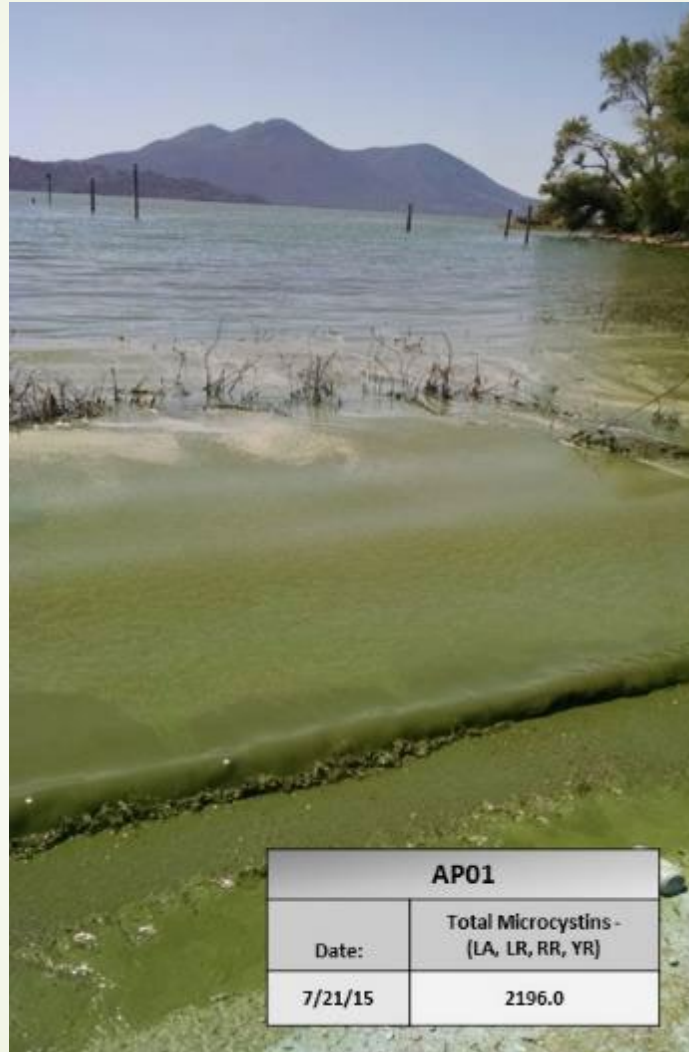
- Analysis of private (self supplied) drinking water taps for cyanotoxins
- Work with local Public Health Officer to alert on cyanotoxins in private drinking water systems

Clear Lake Cyanotoxin Monitoring Locations



- Included locations that are Tribally important
- Monitoring to coincide with important dates of Tribal uses of the water
- Communicate with Tribes and the public about the results

Cyanotoxins' Impacts on Beneficial Uses



HUMAN EXPOSURE



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.

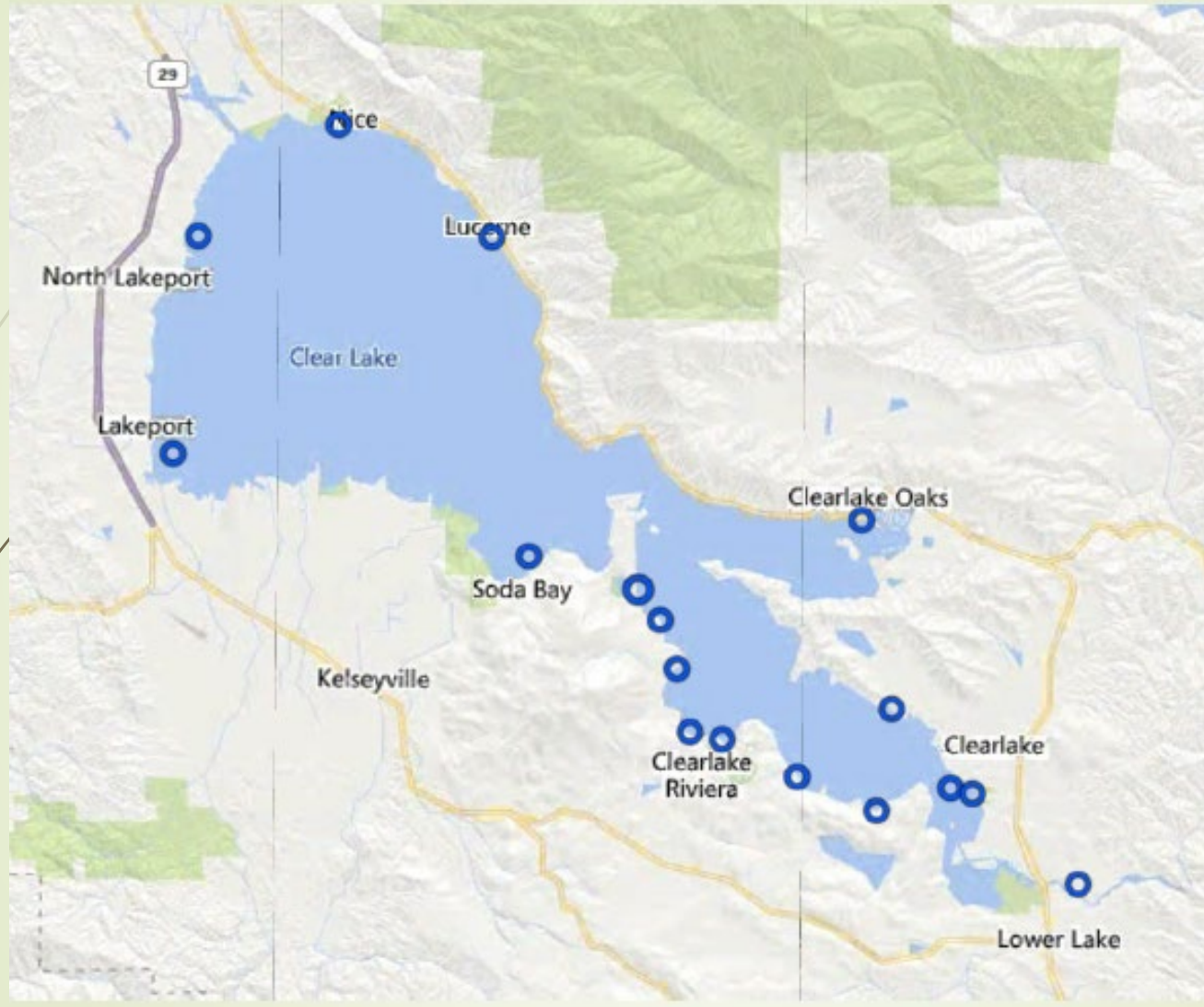
DO NOT let pets or livestock drink or go into the water or go near the scum.

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.

AP01	
Date:	Total Microcystins - (LA, LR, RR, YR)
7/21/15	2196.0

Cyanotoxins' Impacts on Beneficial Uses



Surface Water Public Water Systems, Clear Lake

DRINKING WATER

Clear Lake surface water serves approximately 60% of Lake County residents through 17 Public Water Systems.

The Safe Drinking Water Act guidelines on cyanotoxins:

<https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisory-documents-cyanobacterial-toxins>

Cyanotoxins' Impacts on Beneficial Uses

FISH CONSUMPTION



INVENTORY NAME	SITE ID	DATE COLLECTED (see seasonal color chart at bottom of spreadsheet)	SPECIES NAME *species are categorized by different colors	Microcystin RESULT TISSUE (ng/g)	Microcystin RESULT LIVER (ng/g)
83	M4	4/21/2015	CRAYFISH	5.94	
84	609	4/22/2015	BLACK CRAPPIE	4	59.75
85	762	4/23/2015	TULE PERCH	3.02	6.18
86	609	4/22/2015	TULE PERCH	4.56	ND
87	AC1	3/25/2010	HITCH	13.34 ★	52.42
88	AC1	3/25/2010	HITCH	16.5 ★	10.89
89	AC1	3/25/2010	HITCH	9.08	1.65
90	AC1	MAY, 2010	HITCH	8.47	7.51
91	215	5/26/2015	LM BASS	1.94	8.04
93	BVCL6	12/12/2017	MUSSEL	28.6 ★	
100	BVCL6	12/12/2017	MUSSEL	17.25 ★	
101	BVCL6	12/12/2017	MUSSEL	15.21 ★	
103	CP	12/14/2017	MUSSEL	12.73 ★	
104	CP	12/14/2017	MUSSEL	19.53 ★	
105	CP	12/14/2017	MUSSEL	22.95 ★	

Table 12: Sport Fish and Shellfish Action Levels for Consumption (ng/g, ww¹)

	Microcystins	Anatoxin-a	Cylindrospermopsin
Sport fish tissue level	★10	5000	70

Fish Cyanotoxin Study, 2018

- Using CalEPA EJ funds, Big Valley EPA staff collected fish and shellfish species from 2010-2018 and submitted them to a lab for microcystin cyanotoxin analysis.
- A total of 44 Clear Lake fish (tissue and liver samples) and 49 Clear Lake shellfish (crayfish and mussels), totaling 126 samples and ten species were submitted in February 2018.
 - Multiple species - Tribally important fish
 - All arms of the lake
 - All seasons

FISH	AVERAGE MICROCYSTIN IN TISSUE NG/G	COUNT
CRAPPIE	4.15	8
BLACKFISH	6.91	1
BLUEGILL	ND	2
CARP	13.60	2
CATFISH	2.02	6
CRAYFISH	4.19	23
HITCH	9.81	8
BASS	1.85	7
MUSSEL	10.33	26
TULE PERCH	2.99	9
all fish species	5.90	43
all shellfish species	7.26	49

Data can be found in CEDEN, Parent Project: Clear Lake Fish Cyanotoxin Study
<https://ceden.waterboards.ca.gov/AdvancedQueryTool>

Educating the Public About Water Quality Conditions

➔ <https://www.bvrancheria.com/clearlakecyanotoxins>

➔ <https://www.facebook.com/ClearLakeWaterQuality>

CLEAR LAKE CYANOTOXIN ISSUES

Click on the buttons below to find resources and data relating to cyanotoxins in Clear Lake. Explore the map below to view the latest cyanotoxin levels measured at sites around Clear Lake. During the summer season we take water quality samples every two weeks at each of our shoreline or interior of the lake sites. Results are posted once we received them. All Result Values are microcystin cyanotoxin unless otherwise noted.

- [Current Monitoring Results >](#)
- [Report a Bloom or an Illness >](#)
- [State and Local Govt HAB Resources >](#)
- [Visitor Information >](#)
- [Traditional Tribal Activities >](#)
- [Resources for Residents >](#)
- [Historical Cyanotoxin Data >](#)

Clear Lake Water Quality
Published by Epa Sarah · October 13, 2021 ·

MICROCYSTIN TOXIN LEVEL HAS DECREASED SUBSTANTIALLY SINCE PREVIOUS SAMPLING, HIGHEST LEVEL ON LAKE FROM 9/21/21 SAMPLING EVENT IS NOW 1,449.50 µg/L (DANGER LEVEL) .

ALERT: HIGHEST ANATOXIN-A TOXIN LEVEL ON CLEAR LAKE FOR THE THIRD SAMPLING EVENT IN A ROW: 33.61 µg/L at SHADY01.

At our last sampling event on 9/21/21, we collected water samples from 14 sites on the lake. We submitted all of the samples for microcystin analysis, and 7 sites for Anatoxin-a analysis. ... See more

Current Microcystin Cyanotoxin Conditions on Clear Lake
September 21, 2021

ANGER - PELIGRO

From algae in this water can harm people and kill animals.

Evite beber agua de esta fuente. No permita que los niños beban agua de esta fuente. No permita que los animales beban agua de esta fuente.

WARNING - ADVERTENCIA

From algae in this water can harm people and kill animals.

Evite beber agua de esta fuente. No permita que los niños beban agua de esta fuente. No permita que los animales beban agua de esta fuente.

CAUTION - PRECAUCIÓN

From algae in this water can harm people and kill animals.

Evite beber agua de esta fuente. No permita que los niños beban agua de esta fuente. No permita que los animales beban agua de esta fuente.

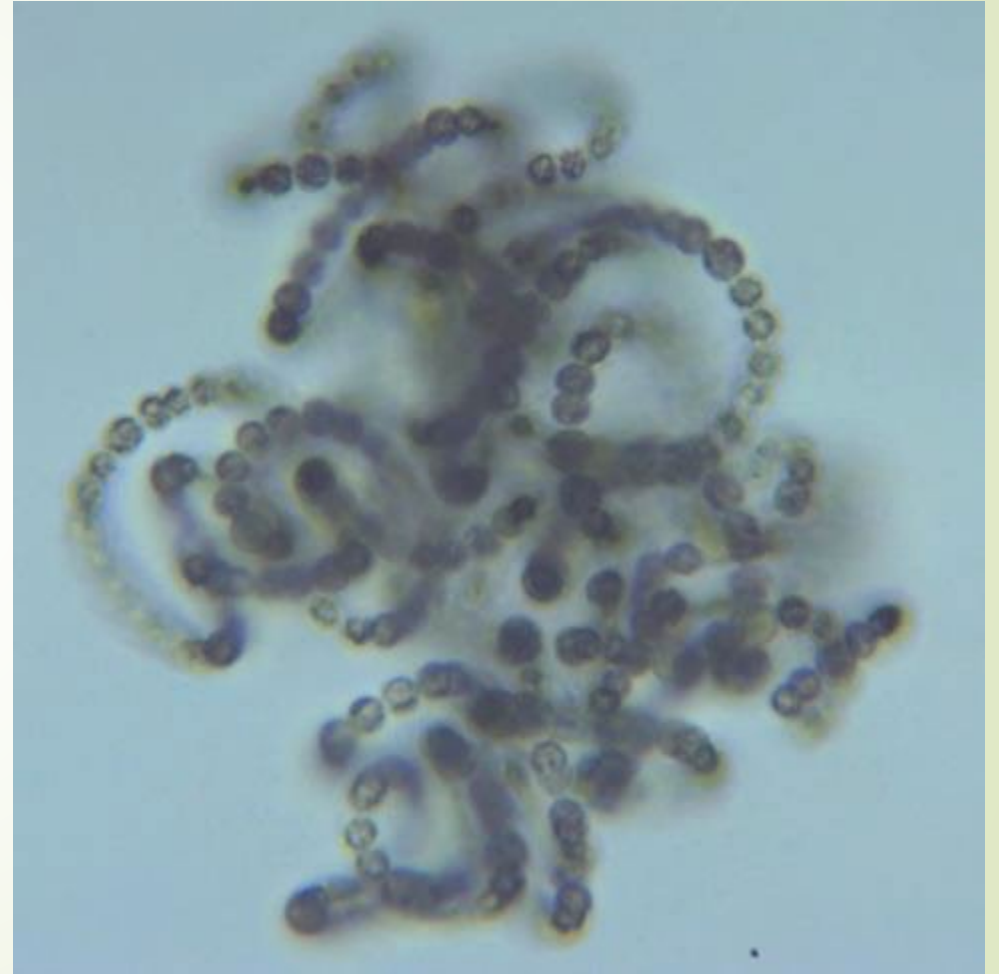
6,490
People reached

385
Engagements

Boost post

Clear Lake Cyanobacteria Task Force

- Local Tribes
- County agencies
- City agencies
- Local elected officials
- US EPA
- CalEPA
- Central Valley Regional Water Quality Control Board
- California Dept of Public Health
- California State Parks, Clear Lake

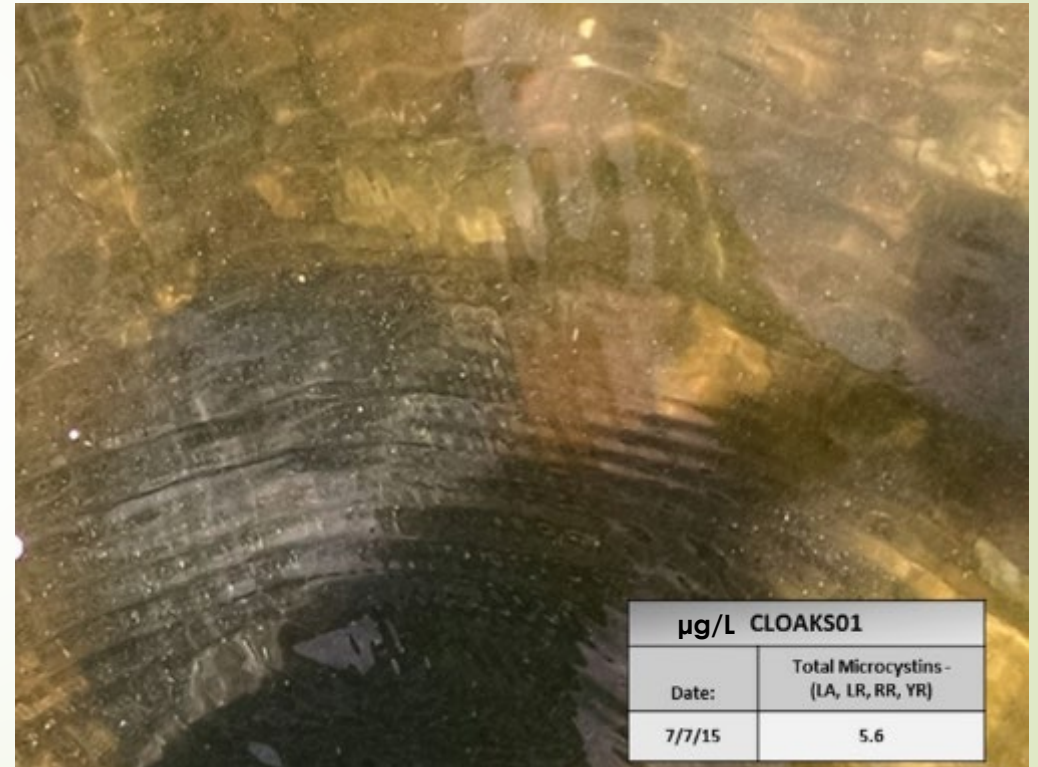


Research from Tribal Work on Clear Lake

Evidence of bloom and low toxin levels



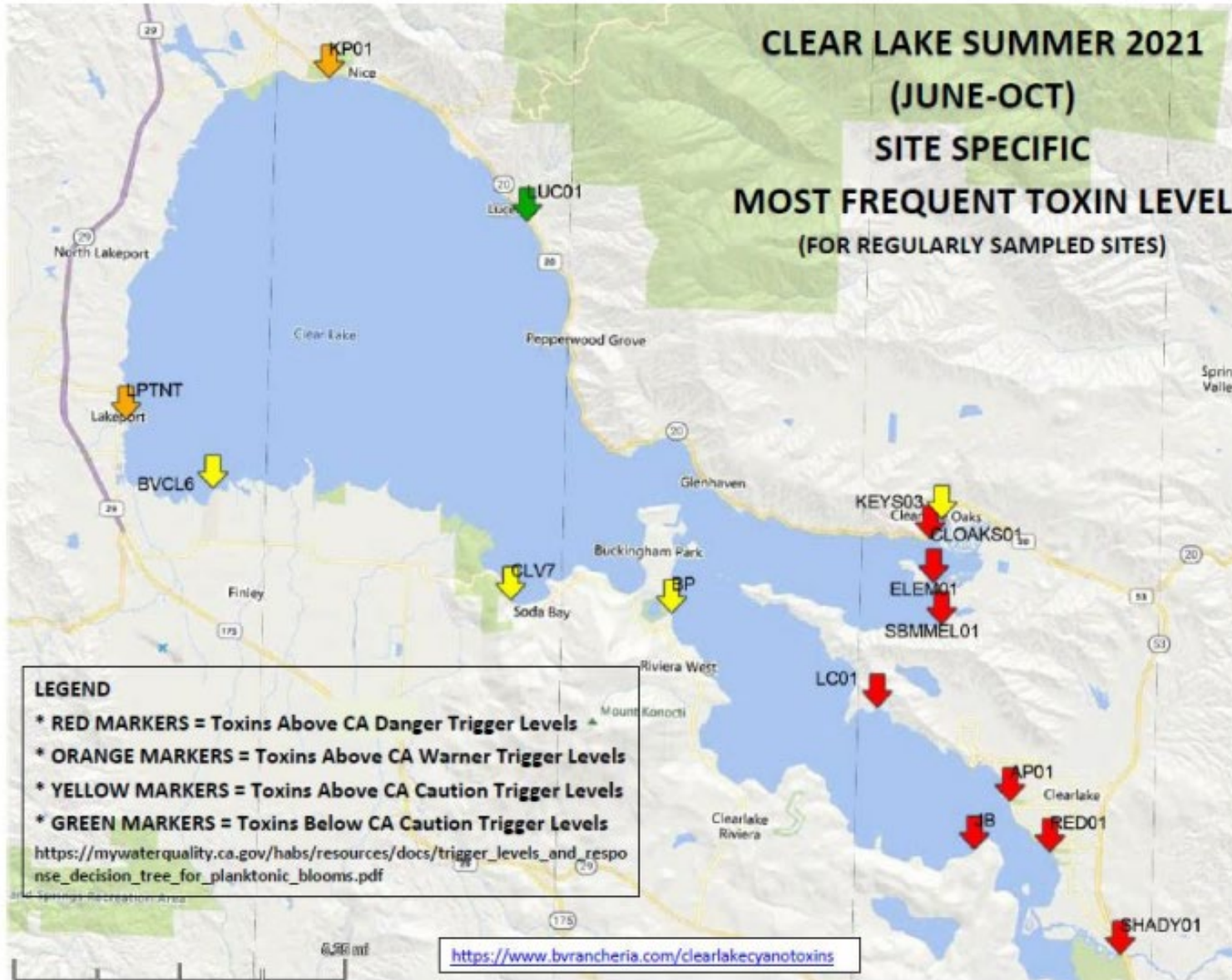
No evidence of bloom and caution toxin levels



Toxins can be present with no obvious bloom. Widespread blooms don't always have elevated toxin levels. This fact changed the county's outreach on blooms.



Identifying Trends For Toxin Levels



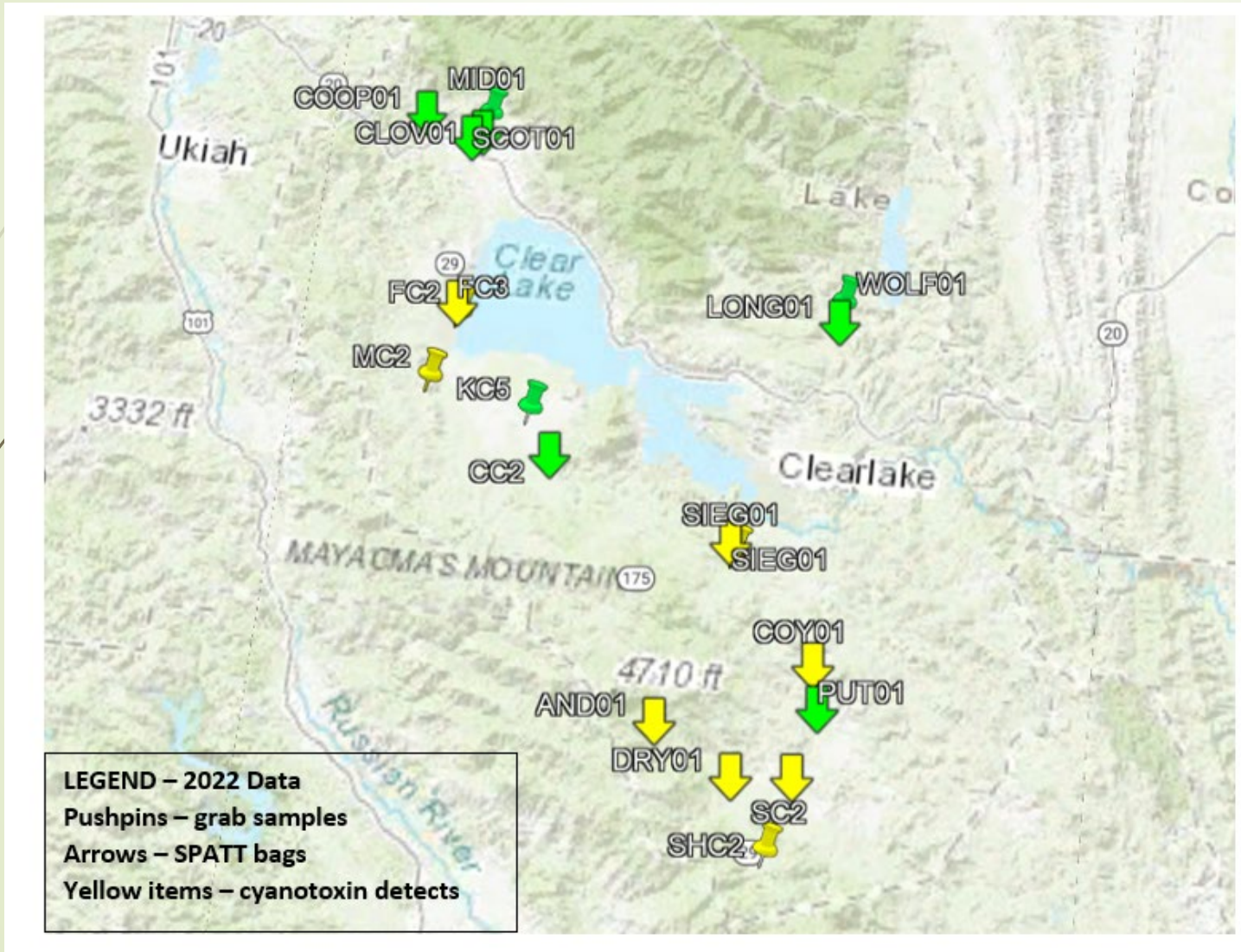
Ongoing Review of Conditions for the Tribe and Community



Summer 2021 Most Sampled Sites Percentage of Times at Elevated Toxin Levels

SITE ID	ARM	6/21	7/14	7/28	8/11	8/25	9/7	9/21	10/12	10/26	CAUTION	WARNING	DANGER	% OF SAMPLING EVENTS AT C/W/D
AP01	L	CAUTION	CAUTION	DANGER	DANGER	DANGER	DANGER	DANGER	WARNING	WARNING	22%	22%	56%	100%
BP	L	CAUTION	CAUTION	CAUTION	WARNING	CAUTION	CAUTION	DANGER	WARNING	WARNING	56%	33%	11%	100%
BVCL6	U	NONE	NONE	CAUTION	NONE	CAUTION	CAUTION	CAUTION	NONE	NONE	44%	0%	0%	44%
CLOAKS01	O	CAUTION	NONE	WARNING	DANGER	DANGER	DANGER	DANGER	WARNING	WARNING	11%	33%	44%	89%
CLV7	U	CAUTION	NONE	NONE	CAUTION	CAUTION	DANGER	CAUTION	NONE	NONE	44%	0%	11%	56%
ELEM01	O	DANGER	CAUTION	DANGER	DANGER	DANGER	CAUTION	CAUTION	DANGER	N/A	38%	0%	63%	100%
JB	L	CAUTION	WARNING	WARNING	WARNING	DANGER	DANGER	DANGER	DANGER	CAUTION	22%	33%	44%	100%
KEYS03	O	WARNING	WARNING	CAUTION	DANGER	CAUTION	CAUTION	N/A	N/A	NONE	43%	29%	14%	86%
KP01	U	CAUTION	NONE	WARNING	WARNING	CAUTION	WARNING	CAUTION	NONE	NONE	33%	33%	0%	67%
LC01	L	WARNING	WARNING	WARNING	DANGER	DANGER	DANGER	DANGER	WARNING	WARNING	0%	56%	44%	100%
LPTNT	U	NONE	CAUTION	WARNING	DANGER	DANGER	WARNING	WARNING	CAUTION	CAUTION	33%	33%	22%	89%
LUC01	U	NONE	NONE	NONE	CAUTION	NONE	CAUTION	NONE	NONE	NONE	22%	0%	0%	22%
RED01	L	WARNING	DANGER	WARNING	WARNING	DANGER	DANGER	DANGER	DANGER	DANGER	0%	33%	67%	100%
SBMMELO1	O	CAUTION	CAUTION	DANGER	DANGER	DANGER	DANGER	DANGER	DANGER	WARNING	22%	11%	67%	100%
SHADY01	L	DANGER	DANGER	DANGER	DANGER	DANGER	DANGER	DANGER	WARNING	NONE	0%	11%	78%	89%

Benthic cyanobacteria testing in local creeks



SPATT bag and grab sampling in the creeks

Anderson Springs Cyanotoxin Comparison to Nearby Creeks


2022:

CREEK	CREEK CONDITION						SPATT BAGS													
	DATE OF CREEK OBSERVATIONS	% COVER BENTHIC	FLOATING MATS?	FLOW (FT/SEC)	LEFT BANK-RIGHT BANK CONDITION (ERODED, VULNERABLE, STABLE)	RIPARIAN VEGETATION COMMENTS	DATE OF INSTALL 1	DATE OF REMOVAL INSTALL 1	DATE OF INSTALL 2	DATE OF REMOVAL INSTALL 2	(PRIMARY) MICROSCOPY AT INSTALL 1	(PRIMARY) MICROSCOPY AT INSTALL 2	MC RESULTS INSTALL 1	ATX RESULTS INSTALL 1	CYL RESULTS INSTALL 1	SAX RESULTS INSTALL 1	MC RESULTS INSTALL 2	ATX RESULTS INSTALL 2	CYL RESULTS INSTALL 2	SAX RESULTS INSTALL 2
Dry Creek	5/3/2022	100% cover of benthic algae.	Yes	3.5	S-S	very rocky shoreline and most trees were	5/3/2022	5/24/2022	5/24/2022	6/23/2022	diatoms	Gietlerinema	3.62	ND	ND	0.32	1.95	1.27	ND	ND
Anderson Creek	7/18/2022	70% benthic cover	NO	3.5	S-S	most trees between 0.5-5m. Blackberries,	7/18/2022	8/17/2022	8/17/2022	9/12/2022	unknown cyanobacteria. Pictures	didn't collect	2.04	15.18	ND	ND	3.06	3.65	N/A	N/A
Putah Creek	9/12/2022	30% benthic cover	NO	No Flow	S-S	most all vegetation is on the right bank and is >5m high. Dominated by	9/12/2022	10/11/2022	10/11/2022		Diatoms	Nostoclean Filaments	ND	ND	ND	ND	ND	ND	ND	ND

Benthic cover, toxin levels

2023 - awaiting toxin results

CREEK	SITE ID	USES OBSERVED	When did creek dry?	CREEK CONDITION						SPATT BAGS													
				DATE OF CREEK OBSERVATIONS	% COVER BENTHIC	FLOATING MATS?	FLOW (FT/SEC)	LEFT BANK-RIGHT BANK CONDITION (ERODED, VULNERABLE, STABLE)	RIPARIAN VEGETATION COMMENTS	DATE OF INSTALL 1	DATE OF REMOVAL INSTALL 1	DATE OF INSTALL 2	DATE OF REMOVAL INSTALL 2	(PRIMARY) MICROSCOPY AT INSTALL 1	(PRIMARY) MICROSCOPY AT INSTALL 2	MC RESULTS INSTALL 1	ATX RESULTS INSTALL 1	CYL RESULTS INSTALL 1	SAX RESULTS INSTALL 1				
Dry	DRY01	wildlife and recreation	7/26/2023	7/12/2023	100	no	0.79	stable	oak and grass dominated	7/12/2023	7/31/2023	creek completely dry, lost SPATT bag data	n/a	DIATOMS	n/a								
Putah	PUT01	wildlife and recreation	still water as of 8/15/2023	7/31/2023	85	yes; mild	no flow	stable	grass and shrub dominated	7/31/2023	8/15/2023	8/15/2023		phormidium									
Anderson	AND01	heavy community recreation including seniors >65, children and pets	still water as of 8/11/2023	8/11/2023	45	no	2.56	stable	cattail, shrubs, wildflowers, some trees	8/11/2023	8/28/2023	8/28/2023		Heteroleibleinia									

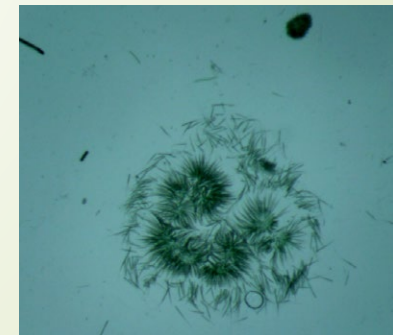
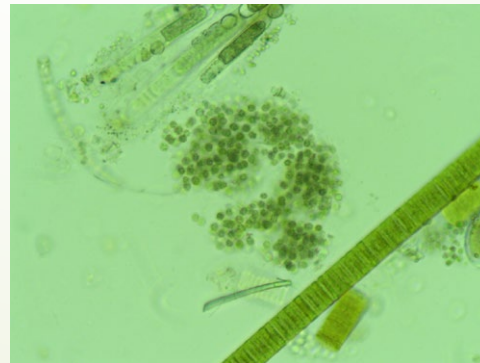


Cal-WATCH Program: Testing of Drinking Water from Private (Self-Supplied) Systems off Clear Lake

- ▶ Cal-WATCH = California Water: Assessment of Toxins for Community Health
 - ▶ CDC grant awarded to Tracking California/Public Health Institute
 - ▶ Collaboration with Big Valley Band of Pomo Indians and California Dept. of Public Health (Env. Health Investigations and Env. Health Lab), Office of Environmental Health Hazards Assessment, State Water Resources Control Boards
 - ▶ Five year, multi component award for environmental health capacity building

Results of Summer Testing for Cyanobacteria

- ▶ June-October 2021, self supplied (private) tap water from 36 homes collected and analyzed.
- ▶ Microscopy identified *Microcystis*, *Gloeotrichia*, *Kamptonema* spp. in samples.
- ▶ Of the 36 homes, 20 had detectable microcystin in them, with 13 homes above the US EPA Health Advisory of 0.3 µg/L. The highest value in the tap water was 3.85 µg/L.
- ▶ Ambient lake microcystin levels reached 160,378 µg/L during September.



Photos from tap water samples from private intakes, Clear Lake.

Public Health Advisory

Presence of cyanotoxins and cyanobacteria in tap water from privately supplied tap water in Clear Lake led to a Public Health Advisory from September 16- November 16th, 2021 lifted with improved lake conditions.



COUNTY OF LAKE
Health Services Department
Public Health Division
922 Bevins Court
Lakeport, California 95453-9739
Telephone 707/263-1090
FAX 707/263-4395



Denise Pomeroy
Health Services Director

Gary Pace, MD, MPH
Public Health Officer

Angela de Palma Dow
Invasive Species Program Coordinator

Craig Wetherbee
Environmental Health Director

Sarah Ryan
*Environmental Director, Big Valley
Band of Pomo Indians*

***Joint Press Release from the County of Lake Health Services and Water Resources
Departments and Big Valley Band of Pomo Indians***

**PRESS RELEASE
FOR IMMEDIATE RELEASE**

Tap Water Taken Directly from Clear Lake (not through a Public Treatment System or Groundwater Well) in the Oaks and Lower Arms Should Not Be Consumed Due to High Cyanotoxin Levels

Multifaceted Treatment Processes Utilized by Public Water Systems Can Effectively Treat Water

NOTE: a map demonstrating locations of concerning test results is included with this release, for your use.

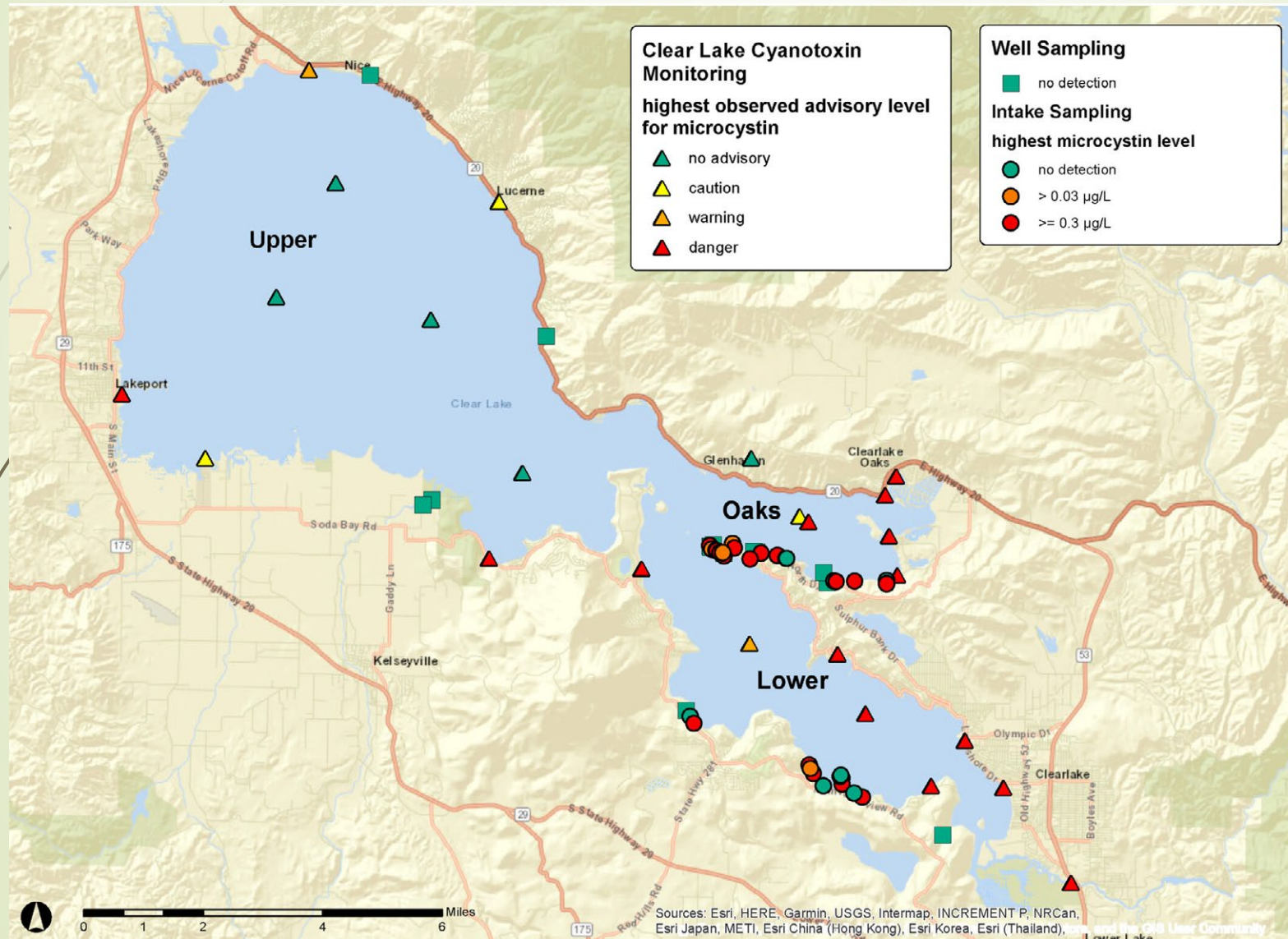
Lake County, CA (September 16, 2021) – Clear Lake is a large natural, biologically diverse lake. As such, it is dynamic in water quality. Due to severe drought and heat, we are seeing unprecedented levels of cyanotoxins in some areas of Clear Lake. For Lake County residents with individual water systems that draw water directly from the lake using a private intake, drinking water may become unsafe when high levels of toxins are present.

- ▶ “Lake County Public Health officials, working with two local water companies, have established a pair of water filling stations for about 280 households whose own supplies are at risk because of toxic blue green algae in Clear Lake.”



From <https://www.northbaybusinessjournal.com/article/news/water-filling-stations-set-up-for-clear-lake-households-whose-tap-water-is/>

Review of Public Water Systems vs Private and cyanotoxin detects



➔ <https://awwa.onlinelibrary.wiley.com/doi/full/10.1002/aws2.1337>

- Vulnerabilities of self-supplied water systems with intakes to source water microcystin and cyanobacteria compared with more advanced monitoring and treatment capabilities at public water systems.

CalWATCH Tap Water Treatment and Microcystin Results

TABLE. Drinking water sampling results, by private water source and treatment system — Clear Lake, California, 2021

Private water source/Treatment system	No.*	Result, no.	
		Microcystin detected†	Microcystin ≥ 0.3 $\mu\text{g/L}$
Lake water intake			
Chlorination and filtration	20	11 [§]	9
Chlorination, filtration, and ultraviolet disinfection	3	3	2
Chlorination, filtration, and ozone treatment	1	1	1
Filtration only	4	4	4
Filtration and ultraviolet disinfection	2	2	1
Filtration and ozone treatment	1	1	1
Total	31	22	18
Well			
Chlorination and filtration	6	0	0
Filtration and ultraviolet disinfection	1	0	0
Filtration, ultraviolet disinfection, and ozone treatment	1	0	0
Filtration only	1	0	0
None	6	0	0
Total	15	0	0

* Water was sampled multiple times at several homes. For those homes, the highest result was used.

† Limit of detection for most assays was 0.1 $\mu\text{g/L}$.

§ Does not include one value from a lake water intake system with chlorination and filtration that was listed as "detected not quantifiable."

➔ <https://www.cdc.gov/mmwr/volumes/71/wr/mm7141a3.htm>

Clear Lake Recreational Use HABs Survey Fact Sheet

FOR MORE INFORMATION:

Email:

info@trackingcalifornia.org

Website:

Cal-watch.org

This work is supported by grant 6 N0E1EH001427-02-01 from the CDC as part of the Environmental Health Capacity Building funding program

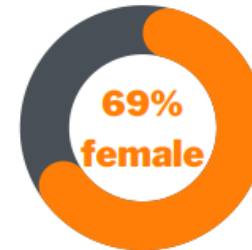
METHODS

Our online survey was advertised on local radio and news and promoted through facebook posts by Big Valley Rancheria. Spanish and English language posters were posted along the perimeter of the lake. In late July, our team also distributed and collected surveys around Clear Lake in person.

RESULTS

412 total responses

- **94%** of respondents are aware of HABs in Clear Lake
- **64%** of respondents live in Clear Lake full time
- **44%** experienced a health issue potentially related to HABs
- **37%** of respondents with pets or livestock reported them experiencing symptoms potentially related to HABs



<https://bit.ly/HABsImpacts>

The Cal-WATCH team sought to collect data on awareness of harmful algal bloom (HABs), resident and visitor behavior and experiences, and the utility and effectiveness of HAB outreach in Clear Lake Area.

Table of Contents

Workshop Schedule	4
Workshop Participants	5
1.1 Introduction to HABs	7
1.2 Harmful Algal Bloom Identification	10
1.3 Clean Water Act and Beneficial Uses	14
2.1 Tribal Beneficial Uses	33
2.2 Current Status of TBUs	36
2.3 Developing TBUs for Your Region	40
3.1 Why Tribes Monitor for Cyanotoxins	44
3.2 Cyanobacteria Identification	50
3.3 Cyanotoxins and Drinking Water	54
4.1 Structuring Your Monitoring Program	58
4.2 Field Equipment and Kits	62
4.3 Choosing Labs	65
5.1 Conducting the Monitoring	68
5.2 Water Sample Collection and Processing	73
5.3 Shipping Logistics	84
5.4 Analyses and Presentations of Results	87
5.5 Reporting Out to State Agencies	92
5.6 Risk Assessment and Signage	99
6.1 Nonpoint Source Control to Reduce HABs/Cyanotoxins	104
7.1 Workshop Evaluation	106
8.1 Additional Resources	107

Working with Tribes

Kickstarting a Tribal Monitoring Program For Harmful Algal Blooms, Cyanotoxins, and Fish Kills Spring 2022





Welcome to Lake County

Be advised that Blue-Green Algae (Cyanobacteria) are in many lakes and streams, and some produce toxins that can harm humans and animals

BE ALERT and AVOID WATER THAT:

- Looks like spilled paint, has surface scum, mats or films
- Has green globs floating below the surface

BE ADVISED toxins may be present even if there are no visible signs

DO NOT DRINK water directly from the lake

DO NOT ALLOW children or pets to swim where Blue-Green Algae (Cyanobacteria) are present

RINSE OFF AFTER being in the water, shower with clean water, wash hands, and rinse off your pets thoroughly

Take appropriate precautions for people and pets while having fun on the water

Current Toxin Levels: <http://www.bvrancheria.com/clearlakecyanotoxins>
Information or Report a Bloom: <http://www.mywaterquality.ca.gov/habs/>
Call Local County Departments:
Water Resources (707) 263-2344 or Environmental Health (707) 263-1164



Around Clear Lake the influence of the monitoring program keeps growing. The data informs warning signs that the county posts at parks and boat launches. Ryan tallies the results on the [Big Valley website](#), too. There have been follow-on studies of toxins in fish tissue and in private drinking water intakes. Public drinking water providers check the data for toxin levels around their intakes.

Source: Brett Walton, Circle of Blue, 2021. "California tribes call out degradation of Clear Lake: A monitoring program tracks toxic cyanobacteria and influences change. May 3, 2021, Center for Collaborative Investigative Journalism. <https://ccij.io/article/california-tribes-call-out-degradation-of-clear-lake/>



Sarah Ryan

Big Valley Band of Pomo Indians

sryan@big-valley.net

<https://www.bvrancheria.com/clearlakecyanotoxins>

707-263-3924 x132