Harmful Algal Blooms and Cyanotoxins in the Delta: Occurrence, Distribution, Trends, and Environmental Drivers

Study Period:
2021-2025

Funded By:

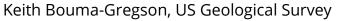**Delta Science Program**
DELTA STEWARDSHIP COUNCIL

About this Project

Cyanobacteria are the most common plankton causing harmful algal blooms in freshwater. The variety of cyanotoxins produced by cyanobacteria can impact the nervous system, liver, gastrointestinal tract, respiratory system, and skin of humans and other animals. In the Sacramento-San Joaquin Delta (Delta), cyanobacterial harmful algal blooms (cyanoHABs) have become more prevalent since the late 1990s. Even with the well-documented occurrence of cyanoHABs in the Delta over the last 15 years, there is no consistent monitoring program in the region, making it challenging to identify management actions to mitigate their occurrence and effects.

To fill this knowledge gap, this project focused on measuring cyanotoxins and cyanoHABs in the Delta, organizing relevant data for stakeholders, and synthesizing data about cyanoHAB extent and drivers. In addition to the generation of new data, this project developed tools to integrate existing and future data collection efforts. Synthesis of these data will help assess the status and trends of cyanoHABs in the Delta, elucidate factors contributing to bloom formation, cyanotoxin production, and transport, and ultimately better understand the effects of cyanoHABs on humans, other animals, and the ecosystem.

Lead Investigators

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Project Objectives

1. Start a monitoring program for cyanotoxins in the Delta at existing real-time continuous monitoring stations
2. Evaluate the utility of deploying *in situ*, continuous multi-channel fluorometers to monitor the occurrence, abundance, and duration of cyanoHABs in real-time
3. Modernize, integrate, curate, and visualize data related to HABs and cyanotoxins to meet stakeholder needs
4. Synthesize available data to understand the status and trends of cyanoHABs and their associated cyanotoxins and to identify environmental drivers that will help build predictive models and provide insight into effective management actions

Why this Research Matters

In addition to providing drinking water and supporting a diverse aquatic ecosystem, the Delta supports recreational and subsistence activities that are vital to people's lives but can also expose vulnerable communities to water quality degradation. For example, recreational opportunities for people who do not have access to vehicular transportation may choose to swim or boat in waters contaminated by cyanoHABs. Also, subsistence fishing will subject the fisherfolk and their families to cyanotoxin exposures through water contact or accumulation in fish tissue after consumption. Another particularly vulnerable community is those who inhabit levees and shoreline areas throughout the Delta. They will use untreated water for cooking and bathing, which exposes them to cyanotoxins.

Management Application

This project provides accurate and timely assessments of HAB abundance and toxin levels imperative for issuing public health advisories and formulating effective management strategies. For example, this project will share monitoring field observations and cyanotoxin results with the State Water Boards who will then coordinate any necessary health advisories in the Delta.

Connections to the 2017-2021 Science Action Agenda

1: Invest in Assessing the Human Dimensions of Natural Resource Management
3: Develop Tools and Methods to Support and Evaluate Habitat Restoration

Results/Next Steps/Call to Action

Water quality data generated from this proposed work will be available on public databases:

1) USGS Water Data for the Nation Water ([USGS Water Data for the Nation](https://www.sciencebase.gov/catalog/))

2) USGS ScienceBase (https://www.sciencebase.gov/catalog/)