

# Addressing CyanoHABs as a Threat to Water and Air Quality in the San Francisco Bay-Delta

Study Period:  
2022-2025

Funded By:



**Delta  
Science  
Program**

DELTA STEWARDSHIP COUNCIL

## About this Project

The Sacramento-San Joaquin Delta (Delta) faces a serious threat from the recent proliferation of cyanobacterial harmful algal blooms (cyanoHABs), particularly due to the production of high levels of cyanobacterial toxins. These blooms jeopardize water quality and pose a significant risk to air quality when toxins are released as particles in a process known as aerosolization. When people inhale these aerosols, it can trigger an inflammatory response, yet the specific form in which toxins are aerosolized remains unknown. Thus, an improved understanding of cyanobacterial toxin aerosolization mechanisms has significant human health implications.

To assess the public health risks associated with airborne cyanobacterial toxins, the project examined the size distribution of cyanoHAB aerosols and the factors influencing their aerosolization. They also investigated the role of nutrient enrichment in cyanoHAB growth, cyanobacterial toxin production, and cyanotoxin aerosolization through a combination of laboratory and field experiments.

## Lead Investigators

- Hans Paerl, University of North Carolina – Chapel Hill
- Haley Plaas, University of North Carolina – Chapel Hill
- Ryan Paerl, North Carolina State University
- Raphael Kudela, UC Santa Cruz
- Kim Popendorf, University of Miami

## Project Objectives

1. Investigate and quantify the production of primary spray aerosols during cyanoHABs
2. Assess the linkage of nutrient enrichment, phytoplankton community composition, toxin production, and cyanoHAB aerosol formation



## Why this Research Matters

This project addresses a pressing environmental and public health concern. The data can be used to protect vulnerable communities living near affected bodies of water and inform ways to mitigate the adverse impacts of cyanoHABs on the Delta's environmental and public health.

## Management Application

This research improves Delta-specific human exposure guidelines to cyanoHAB aerosols by providing data essential for implementing effective public health measures, including recommendations on mask usage and understanding the expected way aerosols travel through the air from the shoreline. Their investigation into the relationship between nutrient availability, cyanoHABs growth dynamics, toxin production, and aerosol formation will offer valuable insights for management efforts aimed at regulating algal blooms to improve both water and air quality outcomes. Ultimately, this research will strengthen state agency responses to human illness associated with cyanoHABs and toxin exposure.

## 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