

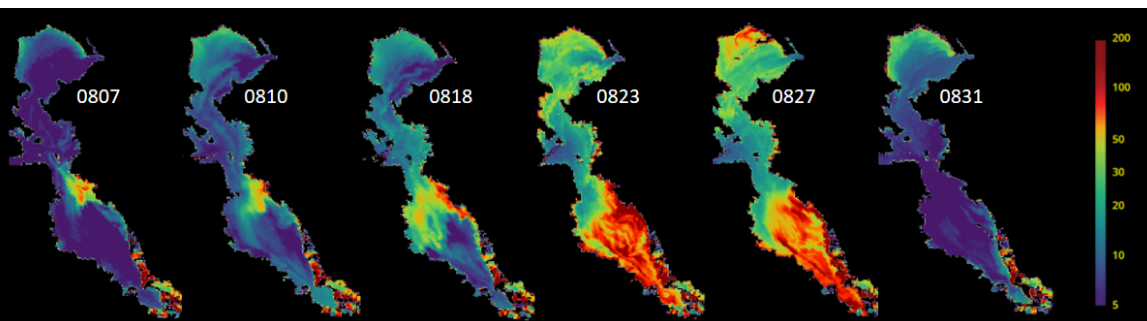
# Expanded Harmful Algae Monitoring in the San Francisco Estuary

Photo: Baykeeper

Over the last decade, harmful algal blooms (HABs) have emerged as one of the highest-priority water quality management issues in the San Francisco Estuary, which includes the San Francisco Bay (Bay) and Sacramento-San Joaquin River Delta (Delta). Although major HAB events in the Bay have historically been rare, recent studies have determined that multiple HAB species and their toxins are frequently detected in the Bay, highlighting the potential for major HAB risks. In 2022, an unprecedented HAB event caused the first documented HAB-related fish kills and widespread low dissolved oxygen event in the Bay. In the Delta, harmful cyanobacterial blooms have occurred with increasing frequency and severity since they were first recorded in 1999.

While there have been major expansions in HAB-related research and monitoring in the Bay and Delta over the last decade, there is currently no sustained, coordinated program for monitoring HABs throughout the San Francisco Estuary.

NOAA recently [announced](#) that it is awarding a \$3million grant, through its Monitoring and Event Response Research Program ([MERHAB](#)) to support the development of a HAB monitoring program for the San Francisco Estuary. The project, led by scientists at the San Francisco Estuary Institute (SFEI), US Geological Survey, and CA Department of Water Resources (DWR), will leverage on-going research and monitoring activities in the Bay and Delta to build a robust system-wide HAB monitoring program for the Estuary. Key collaborators include UC Santa Cruz, Bend Genetics, the San Francisco Bay and Central Valley Regional Water Quality Control Boards, San Francisco Baykeeper, Cal Maritime Academy, Restore the Delta, and NOAA-NCCOS.



Remotely-sensed chlorophyll estimates during the 2022 HAB event ( $\text{mg m}^{-3}$ ). Data are from the ESA Sentinel-3 satellite, processed using a locally-tuned algorithm for San Francisco Bay. (Kudela et al., in prep; SFEI et al. in prep)

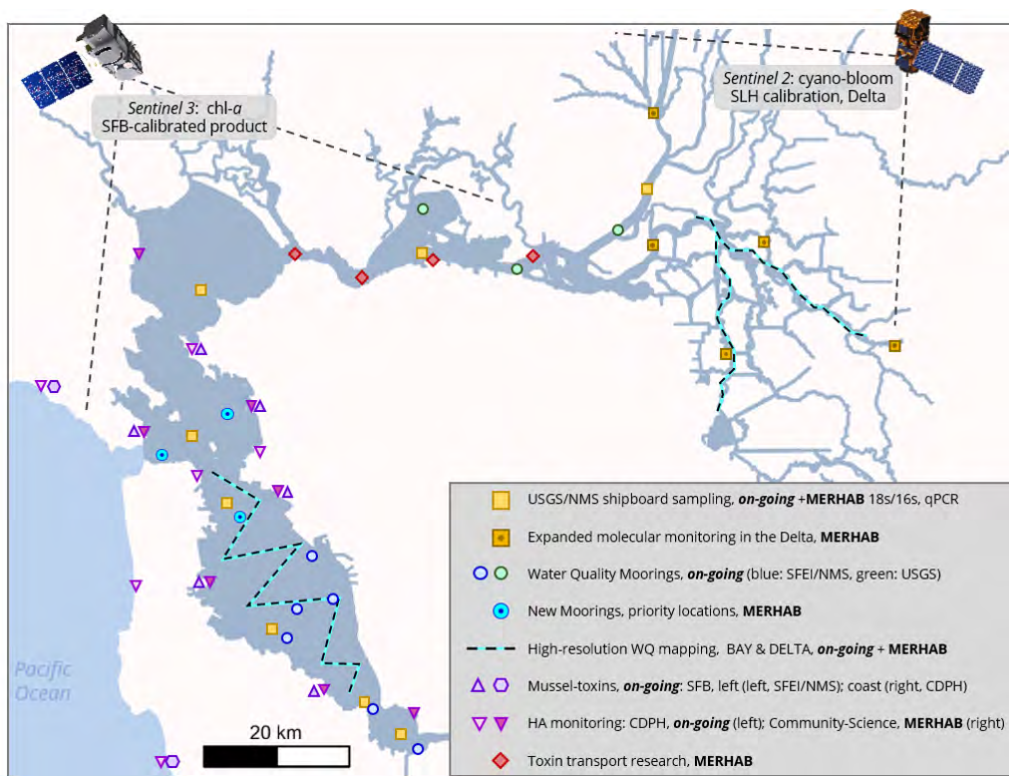
Major project components include:

- 1 Enhancing existing monitoring data sources with new technologies and tools, including: remote sensing, continuous water quality sensors, molecular DNA-based methods, and community science monitoring
- 2 Building an online HAB dashboard to provide managers with a decision-support-tool for HAB mitigation
- 3 Improved understanding of HAB transport dynamics through sampling of toxins/HAB cells using multiple methods such as water grab samples, passive samplers (Solid Phase Adsorption Toxin Tracking), shellfish, and molecular tools
- 4 Convening a Management Transition Advisory Group (MaTag) composed of managers, regulators, and NGO stakeholders to generate information necessary for developing a coordinated HAB strategy

## LOOKING AHEAD

By enhancing HAB-related measurements, and leveraging and integrating data collected by the region's nutrient- and HAB-focused programs, this project will strengthen our understanding of HAB drivers and ecology in the San Francisco Estuary.

This new information and understanding will support future decision-making related to nutrient management and HAB-related water quality impacts, and contribute to the long-term health of the San Francisco Estuary.



HAB monitoring across the San Francisco Estuary: Overview of existing/on-going work and MERHAB-funded work.

**For additional information, contact:**

David Senn  
davids@sfei.org

Keith Bouma-Gregson  
kbouma-gregson@usgs.gov

Ellen Preece  
ellen.preece@water.ca.gov