



INFORMATION ITEM

Lead Scientist Report

Summary

Excessive growth of algae and cyanobacteria is called an algal bloom. While some algal blooms are beneficial because they contribute to aquatic food webs (so-called beneficial algal blooms, or BABs), others can be harmful to human health or the environment (so-called harmful algal blooms, or HABs). In the Delta, most HABs are caused by cyanobacteria and are called cyanobacterial harmful algal blooms, or CHABs. CHABs now occur most summers in the Delta, especially in low-flow areas when water temperature is high. Climate change is expected to make CHABs worse. The Delta Stewardship Council is supporting efforts to implement a regional monitoring strategy for CHABs as well as other efforts to improve CHAB reporting, modeling, and data synthesis.

HABs, BABs & CHABs: What to know about (harmful) algal blooms in the Delta

What are algal blooms?

Algae and cyanobacteria are single-celled photosynthetic plankton that are important in aquatic ecosystems, serving as an important food source for fish and other aquatic organisms. Under certain conditions, algae and cyanobacteria can grow rapidly and develop into an excessive growth called an “algal bloom.” Algal blooms are often recognizable as bright green, deep red, or brown water. While their colors may appear alarming, not all algal blooms are harmful.

Three general types of algal bloom can form depending on the organisms involved and the bloom’s characteristics:

- **Beneficial algal blooms (BABs)** occur naturally and contribute significant amounts of food to aquatic food webs.
- **Harmful algal blooms (HABs)** create conditions that pose risks to human health and the environment.
- **Cyanobacterial harmful algal blooms (CHABs)** are HABs caused by a specific type of bacteria called cyanobacteria (sometimes referred to colloquially as blue-green algae).

HABs in the Sacramento-San Joaquin Delta

Harmful algal blooms, or HABs, may cause harm to people or environments by:

- producing toxins
- depleting oxygen in the water
- disrupting food webs
- forming noxious scum
- degrading water quality

In the Delta most HABs are CHABs and are frequently dominated by a type of cyanobacteria called *Microcystis*. *Microcystis* can produce liver-targeting toxins called microcystins, which can harm humans, pets, livestock, and wildlife.

Microcystins affect humans via drinking water, irrigation water, fish consumption, and contacting water through recreational activities. It's possible that the toxin can also be breathed in from the air.

However, not all CHABs produce toxins, and you can't tell from looking at them how toxic they are likely to be.

Where and when do CHABs occur in the Delta?

Microcystis blooms were first observed in the Delta in 1999 and now occur during most summers. Dead-end waterways and low-energy environments such as in Stockton and Discovery Bay are particularly prone to CHABs.

Many complex environmental interactions affect CHAB formation, including:

- water flow

- temperature
- water clarity (which affects light penetration)
- salinity
- nutrients

Periods of high temperature and low flow—i.e., drought-like conditions—promote CHAB formation. Without effective management strategies, climate change is expected to cause more frequent, more severe, longer-lasting CHABs in the Delta.

Monitoring and predicting CHABs in the Delta

The Delta Plan¹, Delta Adapts², and Science Action Agenda³ all identify the need to monitor, understand, respond to, and reduce CHAB risk. One of the Delta Plan performance measures is tracking spatial coverage of HABs.⁴

Current CHABs monitoring in the Delta includes:

- visual reports of blooms
- discrete sampling for cyanobacteria and toxins
- continuous water quality sensors for general environmental data
- satellite imaging

However, there is no unified monitoring effort focused explicitly on CHABs, making it difficult to fully capture the location, intensity, and frequency of CHABs. The Delta Stewardship Council is currently involved in the development of a comprehensive Delta CHABs Monitoring Strategy⁵. The strategy provides multiple research recommendations for advancing CHAB prediction and mitigation opportunities.

We can learn about prediction opportunities from a recent study by Nardelli et al. (2026),⁶ which assessed precursors to the large HAB that took place in SF Bay in

¹ <https://deltacouncil.ca.gov/delta-plan/>

² <https://deltacouncil.ca.gov/delta-plan/climate-change>

³ <https://scienceactionagenda.deltacouncil.ca.gov/>

⁴ <https://viewperformance.deltacouncil.ca.gov/pm/harmful-algal-blooms>

⁵ <https://deltacouncil.ca.gov/pdf/science-program/2024-10-21-final-delta-chabs-monitoring-strategy.pdf>

⁶ <https://link.springer.com/article/10.1007/s12237-025-01629-7>

2022. This bloom was caused by a marine alga called *Heterosigma akashiwo*, and was the largest HAB in estuarine history. Typical environmental conditions associated with HABs (such as increased nutrient inputs, increased light availability, and separate, unmixed layers of water) were not present leading up to the bloom and were not unusual compared to other years. Instead, the biological plankton community was different in the months before the 2022 bloom, illustrating the importance of seasonal community changes in bloom formation and decline. Longterm DNA data available from USGS on the plankton community structure in the water column was a better bloom predictor than water quality, and may be useful for advanced notice of bloom formation.

Current CHABs efforts involving the Delta Stewardship Council

Several initiatives to address critical CHABs research gaps or monitoring needs are underway at the Council, including:

- helping to coordinate and implement the Delta CHABs Monitoring Strategy
- funding a 2025 Delta Research Awards project that aims to standardize a common CHABs reporting protocol⁷
- facilitating a project as part of the Delta Science Program's Collaboratory initiative⁸ to explore how different types of scientific modeling can inform CHAB predictions and management responses
- convening a synthesis working group⁹ in partnership with the National Center for Ecological Analysis and Synthesis to combine different CHABs-related datasets across the Delta and use them to explore relationships between pesticides and CHABs

The August 2026 Council meeting will feature an update on implementation of the Delta CHABS Monitoring Strategy and on CHABs research funded by the Council.

⁷ <https://sciencetracker.deltacouncil.ca.gov/activities/optimizing-monitoring-tools-cyanobacterial-harmful-blooms-sacramento-san-joaquin-river>

⁸ <https://deltacouncil.ca.gov/delta-science-program/collaborative-modeling>

⁹ <https://deltacouncil.ca.gov/delta-science-program/science-synthesis-working-group>

Delta Science Program Activities

Delta Synthesis Working Group Cohort 3 training is complete

The formal training component of the latest Delta Synthesis Working Group is now complete. Three week-long training workshops took place in April, May, and June, led by expert data scientists from the National Center for Ecological Analysis and Synthesis (NCEAS). The initiative is a partnership between the Delta Science Program and NCEAS, a global leader in open and collaborative data science. The main goals of Delta Synthesis Working Groups are to build scientific capacity through advanced data science training for early- to mid-career scientists in the Delta; create new collaborations across entities working in the Delta; and produce open and accessible data products that inform decision-making in the Delta.

The 20 working group participants represent a diverse selection of 11 entities that work in the Delta. In this cohort, participants have formed three subteams that are applying their new skills to three different management priorities: the *Natural and Working Lands Climate Smart Strategy*, the *California Salmon Strategy for a Hotter, Drier Future*, and the *Cyanobacterial Harmful Algal Bloom (CHAB) Monitoring Strategy for the Sacramento-San Joaquin Delta*.

1. Climate Smart Strategy project: This subteam aims to develop an open and accessible web-based data exploration tool for users to visualize the carbon and other benefits (e.g., wildlife habitat, biodiversity, economic) that are likely to occur from rice conversion or wetland restoration across the Delta
2. Salmon project: This subteam is synthesizing vast amounts of data to tease out what environmental conditions make pulse flow events more or less beneficial for salmon migration
3. CHABs project: This subteam is working to integrate chlorophyll, hydrometeorological, pesticide, and eDNA datasets to model relationships between environmental factors, pesticides, and HAB formation

New this year, community mentors from agencies involved in implementing these strategies are engaging with subteams to help guide them as they undertake their synthesis projects. For more information see: <https://deltacouncil.ca.gov/delta-science-program/science-synthesis-working-group>.

Bay-Delta Science Conference registration and late breaking abstracts

Early bird registration is now open for the 2026 Bay-Delta Science Conference! Register by August 24 to take advantage of the early bird discount. The call is still open for late breaking poster abstracts and for art, poetry, and storytelling contributions. The late breaking abstract portal will be open through August 24, and art abstracts were due July 15.

The conference will be held September 28–30 at the SAFE Credit Union Convention Center in Sacramento. Since 2000, the biennial Bay-Delta Science Conference has been co-hosted by the Delta Stewardship Council and the U.S. Geological Survey as a premier forum for presenting scientific research and analyses that inform management of the San Francisco Bay and Sacramento-San Joaquin Delta. All are welcome. New this year, the planning team is curating sessions that reflect the interdisciplinary nature of working in the Bay-Delta, as well as encouraging all speakers to describe how their research findings apply to policy and management. Art exhibits and performances will occur throughout the conference and be highlighted at the evening reception on September 28.

More information on abstracts and registration is available on the conference website: <https://baydeltascienceconference.com>.

Traditional Knowledge Roundtable report

This month, the Delta Science Program is leading three events as part of the Interweaving Traditional Knowledge Roundtable Series. Co-hosted by the Delta Stewardship Council, Shingle Springs Band of Miwok Indians, and California Indian Environmental Alliance, the series brings together Tribal leaders and Elders, agencies, and scientists to share experiences, discuss challenges, and explore practical approaches for interweaving Traditional Knowledge, science, and management. Day one on June 30 featured presentations from Vice Chair Malissa Tayaba from the Shingle Springs Band of Miwok Indians and Chairman Brian Wallace from the Indigenous Futures Society, and a panel on the dos and don'ts of interweaving Traditional Knowledge featuring a variety of perspectives from Tribes, non-profits, academics, and state agencies. More than 200 people attended in-person and virtually. Day two focused on Tribal Beneficial Uses of water as defined by the State Water Board and featured an overview presentation by Adriana Renteria from the Water Board and a panel featuring Tribes, non-profits, and state

agencies. Day three is coming up on July 28 and will be virtual only, focused on examples of successful co-governance and co-management. This series builds on the 2023 Tribal Listening Session hosted by the Council, the Council's 2025 Tribal and Environmental Justice Issue Paper, and a number of related efforts.

Delta Climate Adaptation Team kick-off meeting

On June 30, the Council hosted the first meeting of the Delta Climate Adaptation Team (DCAT)—a cross-sector collaborative of individuals and organizations working on climate adaptation in the Delta. The DCAT will convene adaptation practitioners from across disciplines to strengthen regional collaboration and further adaptation efforts in the Delta with a focus on inclusion of local interests and historically underrepresented groups. The creation of the DCAT builds upon the Council's Delta Adapts adaptation plan (<https://deltacouncil.ca.gov/delta-plan/climate-change>), as well as an adaptation governance survey published in 2024 (<https://sciencetracker.deltacouncil.ca.gov/activities/mapping-adaptation-governance-network-delta>) that highlighted the importance of the Council's Delta Adapts meetings as a forum for collaboration.

The kickoff meeting was well attended, with 72 people joining in person and another 37 on Zoom. Attendees included several Tribal partners who also attended the Interweaving Traditional Knowledge Roundtable in the morning, representatives from Delta communities, nonprofits, universities, federal, state, and local agencies, and private entities including farmers and landowners. The afternoon started with an expert panel made up of representatives from three climate collaboratives operating within the Delta region. Attendees also participated in a break-out group exercise to brainstorm and prioritize the ways in which this Delta Climate Adaptation Team can support climate adaptation planning and implementation across the Delta. A recording of the meeting is available on the Council's YouTube channel: <https://www.youtube.com/@DeltaCouncil>. For more information or to inquire about future DCAT meetings visit our Events page or email climatechange@deltacouncil.ca.gov.

On Your Radar

U.S. Bureau of Reclamation Peer Review, September

In September Council staff will launch an independent scientific peer review requested by the U.S. Bureau of Reclamation on New Lines of Evidence for Effects on Fish from the Long-Term Operations of the Central Valley Project (CVP) and State Water Project (SWP). The review's Charge will focus on assessing science that aims to better understand potential harm of CVP and SWP water operations on listed fish. Fish can be carried into water project facilities by diverted water in a process called entrainment. The new scientific evidence being reviewed includes literature reviews, particle tracking models, and lifecycle analyses. Four subject matter experts will produce a collaborative Panel Letter with recommendations related to the review's Charge. The Panel Letter will be made publicly available and posted to the Council's peer review website later this year: <https://deltacouncil.ca.gov/delta-science-program/scientific-peer-review>.

CoEQWAL launch, September 3

CoEQWAL, the Collaboratory for Equity in Water Allocation, is a collaborative, community-engaged research project focused on improving water management planning in California. Funded by a grant through the University of California Climate Action Initiative, the project brings together researchers, public agencies, Tribes, community groups, water districts, NGOs, and other water users to develop accessible data, modeling tools, and water management scenarios to help explore how water can be allocated more equitably across California. This is especially important as climate change creates new pressures on the state's interconnected water system and its different uses by communities, agriculture, ecosystems, and more. The team is planning the public launch of their interactive website in the California Natural Resources Agency headquarters auditorium from 1–5 p.m. on September 3rd, 2026. More details will be released soon on the website, including a detailed agenda and registration link: <https://coeqwal.berkeley.edu/>.

Science Day 2026, October 5–6

The California Council on Science and Technology (CCST) and the California Natural Resources Agency recently announced Science Day 2026 will be held October 5–6, 2026 at the California Natural Resources building in Sacramento, CA. The annual event seeks to connect state science and policy efforts with research universities, labs, and institutions to foster new opportunities to address California’s climate goals. As with previous years, Council staff will plan to attend and present posters on relevant Council efforts, such as the release of the 2026 Delta Science Plan.

By the Numbers

Science Program staff will summarize current numbers related to Delta water and environmental management. The summary figures (Attachment 1) will inform the Council of recent counts, measurements, and monitoring data driving water and environmental management issues.

Fiscal Information

Not applicable.

List of Attachments

Attachment 1: By the Numbers

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A recording of the presentation will be available on the Delta Council's YouTube page at <https://www.youtube.com/@DeltaCouncil>.