



## INFORMATION ITEM

### Lead Scientist Report

### Summary

The Sacramento-San Joaquin Delta has experienced significant declines in particulate organic carbon (POC) due to human activities, which have also led to an 81% decline in total suspended sediments (TSS) since 1957. This loss has reduced carbon availability in the Delta food web, affecting key species. Researchers found that river inputs alone cannot replenish POC losses, but in some months, local biological production—especially from wetlands—exceeded riverine inputs, suggesting that wetlands may play a critical role in POC retention. However, current monitoring efforts focus more on dissolved organic carbon (DOC) than POC, making it difficult to track the effects of wetland restoration. This study underscores the need for targeted wetland restoration and enhanced carbon retention strategies to mitigate POC scarcity and build long-term Delta resilience in the face of declining sediment supply, droughts, and species loss.

### Particulate Organic Carbon Scarcity Exacerbates Vulnerability of the Sacramento-San Joaquin Delta Ecosystem

*Mathers, M.A., Bergamaschi, B.A. & Hernes, P.J. Particulate Organic Carbon Scarcity Exacerbates Vulnerability of the Sacramento-San Joaquin Delta Ecosystem. Estuaries and Coasts 48, 67 (2025).*

<https://doi.org/10.1007/s12237-025-01502-7>

The Sacramento-San Joaquin Delta has undergone major changes due to human activities, leading to a large decline in particulate organic carbon (POC). POC is a crucial component of aquatic food webs, supporting everything from microbes to fish, yet it remains poorly tracked and understudied. This makes it difficult to assess how much is available to help sustain the Delta ecosystem. In the journal article, *Particulate Organic Carbon Scarcity Exacerbates Vulnerability of the Sacramento-San Joaquin Delta Ecosystem* (Mathers et al., 2025), the authors address this knowledge gap by quantifying POC levels, identifying key sources and losses, and evaluating how changes in hydrology affect carbon cycling in the Delta.



Mathers, one of the authors of the paper, received funding from the Delta Stewardship Council (DSC) in 2020 as a Delta Research Fellow at UC Davis. Hernes of UC Davis and Bergamaschi of USGS, additional authors of the paper, received DSC support for a Proposal Solicitation Notice (PSN), now known as Delta Research Awards) in 2021. Between 2021 and 2023, the researchers conducted Delta-wide surveys to measure POC, particulate nitrogen, and total suspended sediments (TSS). They found that river discharge was significantly lower during the 2021 and 2022 drought years, and that TSS levels have declined by 81% since 1957 due to dams, reduced high-flow events, and land-use changes. Because POC is largely carried by suspended sediments, this long-term decline in TSS has reduced the natural transport and storage of organic carbon, further contributing to POC scarcity and limiting its availability to support the Delta food web. POC concentrations were also found to be low across the study period, averaging between 0.42 mg/L and 0.77 mg/L, compared to historical averages of 0.3 - 6.0 mg/L, with the highest levels in spring and summer and the lowest in fall.

The study's model revealed that river inputs alone cannot compensate for ongoing POC losses, underscoring the need for new carbon retention strategies. It also found that, in some months, local POC production within the Delta exceeded what was entering from rivers—indicating that biological production, particularly from wetlands, may play an increasing role in maintaining POC levels. This finding highlights an opportunity for wetland restoration to serve as a carbon source similar to the levels found historically in the delta.

As the Delta faces ongoing environmental stressors, declining sediment supplies, worsening droughts, and species loss, restoration is becoming increasingly urgent. Wetlands naturally process and store carbon, retain POC through slowed water movement, and prevent rapid loss of POC through tidal flushing. Currently, POC concentrations and transport are not systematically tracked in restored wetland areas as extensively as dissolved organic carbon (DOC). This lack of monitoring makes it difficult to assess how restoration efforts impact POC retention and its role in the carbon cycle. This study reinforces the need for targeted monitoring and science-based restoration efforts to ensure wetlands contribute to long-term Delta resilience. By funding and supporting research that connects restoration actions with ecosystem outcomes, we can refine our strategies, scale up successful



projects, and create a more resilient Delta capable of adapting to future environmental challenges.

## Delta Science Program Activities

### 2025 Environmental Data Summit

Xoco Shinbrot, Senior Environmental Scientist with the Council's Delta Science Program, participated in the 2025 Environmental Data Summit focused on AI in conservation, hosted by the National Center for Environmental Analysis and Synthesis at UC Santa Barbara. The event included computer scientists and ecologists in academia, governmental and non-governmental organizations. Some non-academic organizations that participated include: The Nature Conservancy, CA Water Resources Control Board, Environmental Defense Council, National Renewable Energy Laboratory, and an aid from the US House of Representatives.

Most of the workshop was devoted to participant discussion on emerging ideas on how we can leverage AI in conservation. Participants came up with a range of 12 ideas that were developed during the event – For example, one group built out a Google Form that helps guides environmental researchers in selecting AI models, they also developed a database of case studies using AI in conservation (think of things like the Merlin App, out of Cornell's Lab or Ornithology), which identifies birds using acoustics, timing, and location collected from data and metadata on your phone. Using visuals and acoustics in large language models, machine learning, and deep learning will increasingly be of use and interest for things like species detection in the Delta.

### Update on the Social Science Extension Specialist position

In February, four candidates for the Social Science Extension Specialist position with California Sea Grant, funded in part through an agreement by the Council, gave public seminars and engaged in interviews. This position, to be housed at UC Davis, will lead research and outreach efforts to advance specific understanding about the human dimensions of natural resource management and advancing the coequal goals for the Delta, and assist the Council in furthering social science application in the Delta. The selected candidate must be approved by UC San Diego and is expected to start in summer 2025.



## On Your Radar

### State of Bay-Delta Science 2025: Extreme Events

The 2025 edition of the [State of Bay-Delta Science](https://sbds.deltacouncil.ca.gov/s) (available here: <https://sbds.deltacouncil.ca.gov/s>) will be released this month in the online, open access [San Francisco Estuary and Watershed Science \(SFEWS\) journal](https://escholarship.org/uc/jmie_sfews) ([https://escholarship.org/uc/jmie\\_sfews](https://escholarship.org/uc/jmie_sfews)). This edition explores extreme climatic and weather events and their impacts on the Bay-Delta. The March issue of SFEWS includes an introduction to the new edition and individual chapters addressing governance and climate adaptation, heatwaves, and droughts. The remaining articles, which focus on wildfires and water quality, atmospheric rivers and floods, and a synthesis from the editorial board with perspectives on Bay-Delta science and management, will be released in a forthcoming issue of SFEWS later this year.

### Save the Date: Delta Research Awards Seminar Series on May 7 9am-12pm

Mark your calendars! The final seminar in the 2020-2021 Delta Research Awards series is open to all who are interested in Delta science and management. Registration for the webinar is now open, available here: <https://bit.ly/41L8j7S>.

Join our researchers for these three exciting talks.

- *Reorienting to Recovery: Developing an inclusive, landscape-scale process for Central Valley salmonids.* Rene Henery (Trout Unlimited)
- *Juvenile Production Estimates: Tracking Spring-Run Chinook populations.* Russell Perry (USGS)
- *Predator Detection: Insights from salmonid telemetry data.* Rebecca Buchanan (University of Washington)

All previous seminars are available on [YouTube](https://bit.ly/4ijOkg!) (available here: <https://bit.ly/4ijOkg!>).

### Microplastic Pollution: Impact on the SF Bay Delta and Remediation Strategies

UC Davis Coastal and Marine Sciences Institute and the Delta Science Program are co-hosting a one-day symposium exploring the impacts of microplastics on aquatic ecosystems, with a focus on the heavily urbanized San Francisco Bay Delta and its diverse habitats. We will learn about how these tiny pollutants affect organisms and discuss the challenges in studying them as well as strategies for remediation and standardization. The symposium will run from 9:00 AM - 4:00 PM (PST) on Friday, May 9th, 2025 on the UC Davis



campus and will also be live-streamed and recorded. This is a ticketed event for in-person and remote attendees. Registration link is [here](https://bit.ly/4kH6f9A) (https://bit.ly/4kH6f9A).

## By the Numbers

Science Program staff will summarize current numbers related to Delta water and environmental management. The summary (Attachment 2) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

## List of Attachments

*Attachment 1: Visual Summary of Article*

*Attachment 2: By the Numbers*

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