INFORMATION ITEM

Delta Synthesis Working Groups: A Collaboration with the National Center for Ecological Analysis and Synthesis (NCEAS)

Summary

The Council's Delta Science Program staff will present updates on a major scientific synthesis initiative coordinated by the Delta Science Program: synthesis working groups organized in collaboration with the National Center for Ecological Analysis and Synthesis (NCEAS). Synthesis working groups combine high-quality data science trainings with a focused opportunity for applying new skills in collaborative research. This presentation will update the Council on outcomes of recent synthesis working group activities and share information about planning efforts underway for the next working group scheduled for fall 2025. Staff will provide an overview of the roles open science and synthesis play in supporting water and environmental management and then share how these working groups make unique contributions to support advancement of our understanding of the Bay-Delta.

Background

The Sacramento-San Joaquin Delta is one of the most studied ecosystems in the world. But the information and data gathered through research is often siloed and confined to specific databases or institutions. To support greater use of existing data and raise awareness of its importance in water management, California enacted AB1755, the Open and Transparent Water Data Act (an act to add Part 4.9 (commencing with Section 12400) to Division 6 of the Water Code, relating to water data) (Water Data Act). in 2016. The Water Data Act designated several state agencies to collaboratively build and maintain a statewide water data platform and develop protocols for data sharing. Developing an implementation strategy for AB1755 was led by the Department of Water Resources with input from eight partnering state agencies, including the Delta Stewardship Council.

AB1755 aligns with the principles of the open science movement, which seeks to make all elements of scientific research – from datasets to statistical code to publications – available and accessible to everyone. Core principles of open science[11] include:

- **accessibility**, or sharing information so that it can be found and used by anyone, openly and without cost;
- **reproducibility**, or sharing methods and statistical code used in an analysis so that the work can be replicated by anyone; and
- **inclusivity**, or creating opportunities for participants from diverse backgrounds, perspectives, disciplines, and ways of knowing in a research process.

Scientific synthesis and open science

The Delta Reform Act provides that the mission of the Delta Science Program is to provide the best possible unbiased scientific information to inform water and environmental decisionmaking in the Delta, in part through synthesizing and communicating scientific information to policymakers and decisionmakers and coordinating with Delta agencies to promote science-based adaptive management. (Cal. Wat. Code § 85280(b)(4).) Synthesis refers to putting together existing information or data to generate new analyses and scientific insights. Rather than collecting new data from the field or lab, synthesis offers the ability to unleash new insights from the wealth of data that already exists. Synthesis takes on different shapes and sizes, including performing literature reviews to distill major takeaways from several independent reports or publications; performing new statistical analyses on data collected in different ways or by different research efforts; and combining data collected by multiple individual studies or monitoring efforts into a single integrated dataset. To be effective, synthesis depends on data that is both available and accessible, thereby making open science essential to successful synthesis.

The need for increased capacity, dedicated time, and coordinated synthesis in the San Francisco Estuary is widely recognized and was included as an action in the

[1] Mottar, J. (2022). NASA TOPS FAIR Pinwheel. Zenodo. https://doi.org/10.5281/zenodo.6565080

2019 Delta Science Plan (https://deltascienceplan.deltacouncil.ca.gov/) and 2022-2026 Science Action Agenda (https://scienceactionagenda.deltacouncil.ca.gov/). In response, the Delta Science Program established a partnership with the National Center for Ecological Analysis and Synthesis (NCEAS) in 2021 to create a venue through which participants could obtain training in reproducible research methods and the use of open-source tools in synthesis research. This initiative convenes synthesis working groups that promote collaboration and build open science skills, providing participants with the dedicated time, resources, and collaborative structure needed to tackle ecological challenges in the Bay-Delta. These working groups are an example of the Delta Science Program's commitment to open science in carrying out its mission to provide the best possible unbiased science to support water and environmental decision-making in the Delta.

Delta Synthesis Working Groups, a collaboration with the National Center for Ecological Analysis and Synthesis (NCEAS)

Established in Santa Barbara, California in 1995, NCEAS is a research center that has become world-renowned for analyzing and synthesizing large amounts of data to address major fundamental issues in ecology and allied fields. For 30 years NCEAS has partnered with agencies and organizations putting "science to action" in support of its mission to accelerate scientific discoveries that will enhance our understanding of the world, benefit people and nature, and transform the scientific culture into a more open, efficient, and collaborative space.

Since 2021, the Delta Science Program and NCEAS have facilitated two collaborative synthesis working groups, with a third iteration currently being planned in 2025. Synthesis working groups have three primary goals:

1. **Provide high-quality training** in data science and statistical techniques to researchers from a range of disciplines working in the Bay-Delta;
2. **Support participants in directly applying these new skills** i**n synthesis projects** to produce meaningful outputs that advance our state of knowledge; and
3. **Create a venue for enhanced collaboration** between researchers from federal and State agencies, non-governmental organizations, and academia.

Through synthesis working groups, participants representing a range of disciplines and institutions convene for three weeks of training and collaboration facilitated by experts from NCEAS. Following the training workshops, participants continue to work within groups after the workshops to complete synthesis projects, with additional data science support provided by NCEAS.

Trainings by NCEAS focus on open science principles such as reproducible research and collaboration techniques; all materials used in the workshops are posted on the Council's website so that the working group activities are accessible and reproducible. Products from working groups include peer-reviewed publications, reproducible workflows (e.g., exact records of what was done to a dataset, including analyses, to generate results), statistical software code (e.g., R functions), and integrated datasets (e.g., a single dataset that combines data from multiple separate activities). More information about these products, is available on the DSP-NCEAS web page (https://deltacouncil.ca.gov/delta-science-program/science-synthesis-working-group).

2021: Drivers of the estuarine food supply

The first Delta Synthesis Working Group consisted of 18 participants from nine agencies and universities. Following three weeks of training and collaboration facilitated by experts from NCEAS, participants performed data analysis and synthesis using their newly developed skills to address knowledge gaps about food webs in the estuary. To do this, the group compiled and used datasets relevant to food webs, including primary productivity, contaminants, connectivity, climate change, growth, floodplains, zooplankton, food web linkages, forecasting, hydrodynamics, and more. The working group's goal was to generate insights that informed decision-making for restoration, the protection of endangered fish species, and the management of flow actions.

A publication in the Journal of Ecology entitled "Evaluating top-down, bottom-up, and environmental drivers of pelagic food web dynamics along an estuarine gradient" (Rogers et al. 2024) was produced through this work and shared in the Delta Lead Scientist report at the April 25, 2024 Council meeting (https://deltacouncil.ca.gov/pdf/council-meeting/meeting-materials/2024-04-25-item-7-lead-scientist-report.pdf). The report highlighted the working group's

analysis of over 40 years of publicly available data from seven monitoring surveys, four regions, and 11 taxonomic groups. The single, integrated dataset produced through this effort has enabled researchers to model the estuary's food web in ways that were not previously possible.

2023: Managing the Delta as a social-ecological system

The second synthesis working group, convened in 2023, focused on integrating social, economic, and environmental data to better understand the human-environment interface in the San Francisco Estuary. This emphasis supports implementation of Management Need 3 "Expand multi-benefit approaches to managing the Delta as a social-ecological system" in the 2022-2026 Science Action Agenda. 16 participants with backgrounds in economics, social sciences, and environmental sciences participated in the cohort.

Two groups were formed during the training workshops: one group focused on analyzing social benefits and impacts of restoration projects in the Bay-Delta (Restoration group), and the other focused on evaluating the social, economic, and ecological costs and benefits of levee infrastructure within the Delta (Infrastructure group). Following the training workshops, NCEAS supported both groups in building reproducible and well-documented workflows for their projects, which are accessible through the Delta Stewardship Council's GitHub account (https://github.com/Delta-Stewardship-Council).

To date, both groups have produced interactive dashboards to share data and results of their synthesis projects. In addition, the Infrastructure group published a dataset to the Knowledge Network for Biocomplexity (KNB) repository (https://knb.ecoinformatics.org/view/urn%3Auuid%3A723b0519-ed6c-473d-9b62-5479f3362135). Additional analyses and publications from the Restoration group are in progress.

2025: Call for topics and participants

Building on past successes, planning is underway for a third iteration in 2025. To enhance community engagement and strengthen the relevance of working group activities, the Delta Science Program has released an open call for participants and topic submissions. Submissions should consider how existing data can be used to

address emerging challenges or management-relevant questions in the Bay-Delta and must clearly describe how an idea aligns with the 2022–2026 Science Action Agenda or other priority management need. Selected ideas will help shape both the working group curriculum and the focus areas for working group projects during and after the workshops. More information about these opportunities is available on the Delta Science Program's DSP-NCEAS website.

Fiscal Information

The Council provided $262,273 in funding to the National Center for Ecological Analysis and Synthesis (NCEAS) through a contract with the University of Santa Barbara to support NCEAS staff's participation in the 2023 synthesis working group effort.

List of Attachments

Attachment 1: 2025 Delta Synthesis Working Group Announcement (https://deltacouncil.ca.gov/pdf/science-program/2025-delta-synthesis-working-group-announcement.pdf)

Contact

Maggie Christman, Ph.D.

Program Manager II

Phone: (916) 320-6174