INFORMATION ITEM

Lead Scientist Report

Summary

Understanding the occurrence and impacts of chemical contaminants on the Delta is a long-standing science need that is encapsulated in Action 5E of the 2022-2026 Science Action Agenda. In particular, contaminants of emerging concern (CEC) are chemicals that are not routinely monitored and include those found in pharmaceuticals, household pesticides (e.g., pet flea and tick products, foggers), and sunscreens. In this study the research team sampled outflow from six wastewater treatment plants (WWTPs) discharging into the San Francisco Bay. They found that, even with dilution, several of these CECs are found above concentrations that pose ecotoxicological risk. Further, the ecotoxicological risk for one of the household pesticides and one of the sunscreen chemicals was even higher than that from some pharmaceuticals that are increasingly being included in routine monitoring problems. The research team suggests that phasing these substances out of consumer products or including ozonation treatment at the WWTPs could reduce or eliminate some of these ecotoxicological exceedances.

Pharmaceuticals, pesticides, and ultraviolet filters in wastewater discharges to San Francisco Bay as drivers of ecotoxicity

Vuckovic D, MacDonald JA, Lin D, Mendez M, Miller E, Mitch WA. Pharmaceuticals, pesticides, and ultraviolet filters in wastewater discharges to San Francisco Bay as drivers of ecotoxicity. Environ Pollut. 2023 Aug 22;336:122432. doi: 10.1016/j.envpol.2023.122432. Epub ahead of print. PMID: 37611792.

Contaminants of emerging concern (CECs) cover a broad class of chemicals that are used in daily life, pose toxicological threats to humans or nonhuman components of ecosystems, and are rarely monitored in the environment. They are particularly understudied in the Bay-Delta ecosystem and hence are prioritized in the 2022-2026 Science Action Agenda. Among CECs, some of the least studied contaminants include those in consumer sunscreens—including sunscreens that have been made illegal in Hawaii because of their damage to coral reefs—and pesticides used in urban environments.

This study, a research collaboration between investigators at Stanford and the San Francisco Estuary Institute, aimed to address this gap by measuring five representative pharmaceuticals, 11 pesticides or pesticide degradation products, and five chemicals found in sunscreen, from six wastewater treatment plants (WWTPs) contributing outflow to the San Francisco Bay. They then used a hydrodynamic model to determine how the contaminants would be diluted within the Bay and compared resulting concentrations to ecotoxicity thresholds (i.e., concentrations at which there are adverse effects for aquatic life).

The CECs tracked were pervasive in the WWTP outflow sampled. Out of the 21 CECs sampled, 11 were detected in at least 70% of the samples, with three of the pharmaceuticals and one of the urban pesticides found in 100% of the samples. Two of the high-detect CECs were sunscreen chemicals, and four were urban pesticides. Out of these 11 high-detect CECs, six exceeded ecotoxicological thresholds at concentrations present in WWTP effluent, including one sunscreen chemical (oxybenzone, banned in sunscreens used in Hawaii) and four urban pesticides. When accounting for the dilution present in the San Francisco Bay, one CEC—a pesticide often used to control for fleas and ticks—would be present in concentrations over two times higher than the ecotoxicological threshold, and one pharmaceutical would be present at a concentration approximately equal to the threshold.

Although this study focused on the San Francisco Bay, there is little reason to believe that results would not be similar in the Delta, though dilution factors would differ. They suggest that it is likely just as important to monitor at least some urban pesticides as it is to monitor pharmaceuticals. Based on their results, the study authors also recommend that treatment with ozone, effective at removing half of the concentration of the pesticide in question, be considered for the region's WWTPs.

Delta Science Program Activities

Social Science Integration Team Updates

This fall, the Social Science Integration Team has been continuing to: 1) work with the Bay-Delta Social Science Community of Practice to grow the network and connect social scientists into relevant science and policy venues throughout the estuary, 2) develop social-ecological data synthesis efforts in partnership with the National Center for Environmental Analysis and Synthesis (NCEAS), and 3) support the research team that has led the Delta Residents Survey (report-out included as a separate staff report).

- **Community of Practice**: In September, Delta Stewardship Council (Council) staff convened the Bay-Delta Social Science Community of Practice (CoP) for its quarterly meeting. The meeting featured a presentation by colleagues from Washington State who shared how the Puget Sound Partnership is integrating social science across the organization, including their ongoing monitoring of human wellbeing in the region. Their reporting on the collection and analysis of socioeconomic indicators garnered much interest, drawing meeting attendance from Council staff (e.g., in relationship to Delta Adapts and the Delta Residents Survey) and staff from other estuary organizations across the country, highlighting how the CoP functions as an effective scientific network for exchange of ideas. Also in attendance were representatives from Collaborative Science and Adaptive Management Program, who tapped into the CoP network to request feedback on adding socioeconomic analysis to their Delta Smelt structured decision-making project.

- **National Center for Ecological Analysis and Synthesis**: The Delta Science Program contracted with the National Center for Environmental Analysis and Synthesis (NCEAS) to provide training and synthesis support to agency staff and academics across the Bay-Delta to conduct research that integrates human dimensions of the Delta into management decision making. The workgroup includes staff from the Council, Department of Water Resources, State Water Resources Control Board, the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment, California Department of Fish and Wildlife, San Francisco Estuary Partnership and academic participants from UC Davis and UC Merced. The NCEAS Open Science Synthesis training consists of three 1-week long workshops to learn and implement open data science. Two research syntheses efforts are in development: 1. To understand how restoration benefits are distributed across the Bay-Delta considering social vulnerability; and 2. To understand the risks and benefits of levees to vulnerable populations across the Delta.

Delta Research Awards Update and Collaborative Science Survey

One important core function of the Delta Science Program is to fund research aligned with management needs *vis a vis* the Science Action Agenda. The Delta Science Program is preparing to release its biennial solicitation for Delta Research Awards in November 2024 (*available here: https://deltacouncil.ca.gov/delta-science-program/delta-science-proposal-solicitations*). Although proposals that address any science action in the 2022-2026 Science

Action Agenda (*available here: https://scienceactionagenda.deltacouncil.ca.gov/)* may be eligible for funding following a competitive independent review process, the upcoming solicitation emphasizes participatory research, in which information is co-produced by both the researchers and the community affected by the research. Through this approach, communities are engaged in the research process early and often.

In recognition of the fact that co-production takes time and that there are often challenges in identifying appropriate partnerships, the Delta Science Program launched a survey (*available here: https://www.surveymonkey.com/r/N7X8S9FI)* to help connect interested researchers with California Native American Tribes or community-based organizations. The survey was distributed via the Council listserv in September, and responses are due by November 1. Although successful matches are not guaranteed for all applicants, the intention is that this process will generate new partnerships that will contribute proposals to the forthcoming solicitation.

California Sea Grant State Policy Fellows Update

The Delta Stewardship Council has long partnered with California Sea Grant to recruit and administer awards to Delta Science Fellows, host State Policy Fellows, and, most recently, administer its Delta Research Awards program. In its September meeting, the Council approved the latest contract with California Sea Grant.

On October 16-18, Council staff participated in a matching workshop to recruit the 2024 cohort of California Sea Grant State Policy fellows to the Council. This year, the Council is recruiting five fellows, who will work within the Adaptive Management Unit, Collaborative Science and Peer Review unit, science funding team, Science Communication, Synthesis, and Decision Support unit, and the Planning and Performance Division. The Council has benefited tremendously from hosting previous cohorts of State Policy Fellows, with 39 fellows hosted since 2013.

Chesapeake Global Collaboratory Summit

Establishing a collaboratory—a set of shared modeling resources, best practices, and support personnel that facilitate complex decision-making—is a long-standing vision of the Delta science community, appearing in the 2013 and 2019 Delta Science Plans, the current and previous Science Action Agendas, and the Science Enterprise Workshop Executive Summary. The challenges faced with development of a collaboratory are not unique to the Delta, and the Delta Lead Scientist has been engaged in ongoing dialogue with scientists in the Chesapeake Bay community on how these challenges might be addressed effectively, efficiently, and collaboratively.

On September 28-29, Dr. Steve Culberson, Interagency Ecological Program Lead Scientist and Delta Science Program manager, formed part of a California delegation that attended the Chesapeake Global Collaboratory Summit in Baltimore, Maryland. Other California attendees included Joaquin Esquivel, Chair of the State Water Resources Control Board, Dr. Louise Conrad, Department of Water Resources Lead Scientist, and Dr. Ted Grantham, UC Berkeley Extension Specialist and principal investigator of the Collaboratory for Equity in Water Allocations (COEQWAL) project. The California delegation provided a unique perspective on efforts to develop a collaboratory in the Chesapeake, and both communities discussed common ground on the need for the collaboratory and approaches to its development. Emergent themes from the conversation included the importance of equity, agency-academic-community partnerships, and trust. Dr. Culberson will speak briefly at the Council meeting about his impressions and insight into next steps for the Delta's collaboratory.

On Your Radar

Tidal Wetland Restoration Symposium

On November 1st, the State Water Contractors and the California Department of Water Resources are jointly hosting a science symposium to discuss the latest research on tidal wetland restoration for support of native fishes in the Delta and Suisun Marsh. This first-of-its kind event will bring together researchers and managers to discuss the current state of the science around species' responses to tidal wetland restoration and science activities needed to fill knowledge gaps. A central goal of the symposium is to identify high-priority adaptive management activities needed to maximize the effectiveness of wetland restoration for native fish species. Dylan Chapple, Delta Science Program Environmental Program Manager, will lead a panel at the symposium focused on the implementation of adaptive management as it relates to the Delta Plan. This symposium promises to be an engaging opportunity to learn more about projects required by the Biological Opinions for Smelt and Salmonids, registration for the event is available here: https://bit.ly/49aqXsv.

Delta Breeze Newsletter

The Delta Science Program's Delta Breeze Newsletter is produced twice a year, with brief articles that highlight efforts, initiatives and research funded by the Science Program. The upcoming Fall 2023 issue will be released in early November, and articles will showcase the theme of open science—the global movement to make scientific research processes and products accessible to all. Open science increases transparency, equity, inclusivity, collaboration, and efficacy by encouraging scientists to make their workflows, code, data, and peer reviewed publications freely available to anyone who is interested.

The Fall Delta Breeze's main articles will provide a background on what open science is, and its growing use by the Delta Science Program and the science community at large. Articles will cover:

- Special considerations that should be made when sensitive information (e.g., information about human subjects or tribal cultural resources) is involved.
- How the Delta Science Program promotes open science through research funded through competitive proposal solicitations.
- Brief summaries of studies funded by the Delta Science Program that embody the spirit of open science.
- An introduction to the Shiny applications webpage (*available here: https://deltascience.shinyapps.io/Home/)* hosted by the Delta Science Program, where scientists from the Delta community can house and share point-and-click applications for the public to browse, visualize and download Delta data.

By the Numbers

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

List of Attachments

Attachment 1: By the Numbers

Attachment 2: Visual Summary of Article

Attachment 3: Information sheet on Chesapeake Global Collaboratory

Attachment 4: Agenda for Chesapeake Global Collaboratory Summit

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