BAY-DELTA SCIENCE CONFERENCE

2026 CONFERENCE

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POSTER 02

The Great Wakasagi Escape: Tiny Fish, Zero Boundaries

Wakasagi (Hypomesus nipponensis) is native to Japan, where, similar to its California relative the Delta Smelt (Hypomesus transpacificus), it functions as a forage species to regulate its native ecosystem. The species was first introduced from Japan in 1959 by the California Department of Fish and Game as an experimental forage fish for trout.

The introduction of Wakasagi has become a concern for Delta Smelt conservation. Although Wakasagi were first introduced exclusively into six California reservoirs, the species eventually made its way to the San Francisco Estuary. Given the dynamic nature of the estuary and the highly connected waters of California, there have likely been continuous and unrecorded events of Wakasagi re-introductions from these bodies of water. These serial invasions are a topic of concern and uncertainty for conservation due to the immediate and continued impact they have on native populations, especially those of similar life histories. In the case of Delta smelt, Wakasagi has been shown to compete for resources and space and to hybridize with the native Delta Smelt, directly threatening its reproductive success. In 2026, the 20-mm survey observed the highest Wakasagi catch since the inception of the project in 1995, with most of the catch collected during a single survey at two stations in Miner Slough. This increased observation is believed to have resulted from a Folsom Lake water release.

The goal of this poster is to describe previous significant documented or theoretical Wakasagi invasion events to the Delta and explore whether these events are worthy of consideration for understanding present and future population trends and conservation efforts.

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POSTER 03

Dry feed improves survival and reshapes tissue lipid composition in cultured longfin smelt (Spirinchus thaleichthys) larvae

Longfin smelt (*Spirinchus thaleichthys*) populations have declined substantially throughout the San Francisco Estuary, increasing the need for improved conservation aquaculture practices that support larval survival and development. This study evaluated the effects of a commercial dry diet on larval performance and tissue lipid composition during early ontogeny. Newly hatched larvae from eight crosses were assigned to either a live-feed control treatment consisting of rotifers and *Artemia* or a dry-feed treatment consisting of rotifers co-fed with Otohime-A from 10 to 40 days post-hatch (dph).

Larvae were then fed only *Artemia* or dry feed from 41 to 80 dph, respectively, and growth, survival, and untargeted lipidomic profiles were assessed. Lipidomics analyses were performed at the UC Davis West Coast Metabolomics Center using LC-MS/MS workflows. Larval growth trajectories were generally similar between treatments throughout the study. Survival at 40 dph did not differ significantly between treatments; however, by 80 dph, dry-feed larvae exhibited substantially higher survival (84.4 ± 6.0%) than control larvae (11.3 ± 6.9%). Principal component analysis demonstrated clear separation between treatments, while volcano plot analysis identified 13 lipid species significantly enriched in dry-feed larvae and only one enriched in controls.

Lipids elevated in dry-feed larvae included triacylglycerols, galactosylceramides, ceramides, sphingomyelins, and phosphatidylcholines associated with membrane structure, energy storage, and stress-related cellular processes. Heatmap analyses further demonstrated strong relationships between dietary lipid sources and larval tissue lipid composition. KEGG pathway analyses revealed enrichment of pathways associated with steroid biosynthesis, cholesterol metabolism, and fat digestion and absorption in dry-feed larvae. These findings demonstrate that formulated dry feed can substantially improve longfin smelt larval survival while reshaping lipid metabolism during early life stages, providing insight into nutritional mechanisms that may enhance larval resilience in imperiled estuarine fishes.

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POSTER 04

Longfin Smelt (Spirinchus thaleichthys) Phenology

Within the Sacramento-San Joaquin Delta (Delta), the Longfin Smelt (*Spirinchusthaleichthys*) population continues to decline. The California Department of Fish and Wildlife and other agencies within the Interagency Ecological Program (IEP) monitor the presence and spatial distribution of larval and juvenile Longfin Smelt (LFS) across the Delta through numerous surveys throughout the year. These surveys provide robust data for extrapolation of Delta-wide population trends. Furthermore, they aid in understanding environmental conditions in relation to seasonal variability and management actions. Comprehending LFS life cycle dynamics, especially spawning phenology, can assist with predicting population response to environmental fluctuations as well as temporal variability in entrainment zones.

We estimate seasonal spawning periods by back-calculating spawning dates from larval and juvenile observations using established growth and egg incubation rates. Timing and duration of spawning are expected to vary with environmental conditions such as precipitation and temperature. This analysis revealed substantial interannual variability in spawning timing and abundance, with a few large spawning peaks in some years and multiple distinct peaks in others, possibly indicating multiple spawning cohorts and possible serial spawning. Annual spawning initiation timing also varied considerably. Water year variability showed no obvious relationship with the number of spawning peaks or overall estimated spawning activity. These findings suggest that the expansion of surveys, like the Smelt Larva Survey, are valuable for early spawning detections. Improved understanding of spawning timing, duration, and abundance can enhance monitoring efficiency and inform adaptive management strategies for LFS.

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POSTER 06

Longfin Smelt habitat and prey use in the upper San Francisco Estuary

The Longfin Smelt (*Spirinchus thaleichthys*) is an anadromous species that is listed as threatened under the California Endangered Species Act (2009) and endangered under the Federal Endangered Species Act (2024). The upper San Francisco Estuary (SFE) functions as an important nursery habitat for Longfin Smelt, as it typically provides cooler, low-salinity outflow and abundant zooplankton prey. Since the early 2000s, several key fish species have declined in abundance in what is known as the Pelagic Organism Decline. Warmer water temperatures may contribute to these shifts in fish abundance and habitat use by Longfin Smelt in the SFE. Additionally, the introduction of the overbite clam (*Potamocorbula amurensis*) may have led to a dramatic decline in zooplankton availability. Factors that influence trends in abundance and habitat use by Longfin Smelt in the upper SFE remain important research and management questions. In this poster, we will summarize Longfin Smelt presence in the upper SFE from 2015 to 2025 using abundance data from the Summer Townet and Fall Midwater Trawl Surveys. These monitoring projects routinely sample meso- and macro-zooplankton alongside many of their fish tows to assess prey availability in the environment. We will compare meso and macrozooplankton abundances across subregions of the upper SFE where Longfin Smelt were collected, and evaluate how those patterns align with the diet composition of Longfin Smelt.

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POSTER 07

Longfin smelt distribution in the San Francisco Bay and Sacramento-San Joaquin Delta following first flush events

Longfin smelt (*Spirinchus thaleichthys*) are an estuarine-obligate forage fish whose abundance and distribution in the San Francisco Bay and Sacramento-San Joaquin Delta (Bay-Delta) are strongly influenced by freshwater outflow from the Sacramento River. While their positive association with outflow is well established, far less is known about how they respond to specific storm events, in particular the first storm event of each water year. These “first flush” events mobilize large volumes of sediment, restructure turbidity gradients, and trigger short-term redistribution of several fish species, yet direct assessments of longfin smelt responses remain limited. In this study, we evaluate how early-season storms influence the spatial distribution of salinity, turbidity, and longfin smelt across the lower Bay-Delta. Specifically, we test whether adult longfin smelt shift upstream following large first flush events, and whether larval catch responds to the timing and magnitude of those pulses. We characterize storms with respect to pre-, during, and post-storm periods, and assess how rapidly changing physical conditions are associated with changes to the within-estuary distribution of longfin smelt. Our preliminary findings show that first-flush dynamics can alter estuary-wide environmental gradients in ways relevant to longfin smelt occupancy. These results improve understanding of how storm-driven processes interact with freshwater flow to structure habitat for a declining, flow-sensitive species.

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POSTER 08

From marsh to mouth: Longfin smelt diet in tidal wetlands

The California Department of Fish and Wildlife's Fish Restoration Program (FRP) conducts sampling for fish, macroinvertebrates, zooplankton, and nutrients at restored tidal wetlands, their reference site, and adjacent waterbody throughout the Sacramento-San Joaquin Delta and Suisun Marsh. Staff monitor sites to evaluate the FRP goal of restoring altered wetland habitats to a beneficial state for native fish species of interest, including Longfin Smelt (Spirinchus thaleichthys). While invertebrate species composition and density from regular sampling provide information on food availability, diet studies give insight into prey selection and foraging success. In 2019, Tule Red, a FRP restoration site in Suisun Marsh, was breached to Grizzly Bay. This re-established natural tidal action to a 460-acre parcel previously managed for duck hunting.

Our study examined differences in larval Longfin Smelt diet between a restoration site, Tule Red; a reference site, Ryer Island; and the adjacent water body, Grizzly Bay in April 2023 and April 2024. We reported zooplankton abundance at each site, counts of empty guts by location and size, and mean total length of fish by year and location. Then, we compared gut contents of larval fish with species composition from concurrent zooplankton trawls for evidence of prey selectivity. For additional information, we analyzed gut contents of juvenile Longfin Smelt collected from Tule Red in January 2026. This study provides critical information concerning the role of tidal wetlands as habitat for Longfin Smelt in supporting foraging success and providing spawning and rearing habitat. Moreover, our research elucidates Longfin Smelt prey selectivity and generally deepens our understanding of beneficial habitat.

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POSTER 09

The Monitoring Special Study (MSS): A Character Study of Flow and Salinity in the Southern Delta (1/3)

Within the interior southern portion of the Sacramento-San Joaquin Delta, existing water infrastructure and water use practices have complicated the hydrology so that impeded water circulation and high salinity concentrations are common. The 2018 amendment to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary directed the California Department of Water Resources and the United States Bureau of Reclamation to conduct a Monitoring Special Study (MSS) to characterize the spatial and temporal dynamics of water levels, flow, and salinity conditions in the southern Delta waterways.

We collaboratively developed eight technical studies with interested parties via a series of public coordination and technical workgroup meetings. Extensive field efforts between 2021 and 2023 collected observational data to strategically fill gaps in the pre-existing monitoring network in the South Delta. We deployed 18 temporary monitoring stations that continuously measured salinity and/or flow, we collected and mapped 28 transects of spatially continuous salinity data from a boat during variable conditions, and we collected monthly discrete water samples from 16 different locations to analyze for ion concentrations and stable isotope compositions.

The boosted coverage of flow and salinity measurements from the MSS were used to improve and validate the Delta Simulation Model II (DSM2) and the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM) for application in the South Delta. Key modeling advancements include updated bathymetry, data assimilation, and more accurate parameterizing of leakage through the temporary rock barriers in the study area. We used both historical observations and simulated scenarios to examine the influences of the following variables on southern Delta flow and salinity: timing and rates of pumping at the state and federal export facilities, San Joaquin River flow and salinity conditions, configuration of the temporary barriers, tidal flows, in-Delta water use, and channel bathymetry.

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POSTER 10

Go with the Flow: Water Movement Through the Southern Delta (2/3)

The California Department of Water Resources and the United States Bureau of Reclamation have conducted a Monitoring Special Study (MSS) to characterize the spatial and temporal dynamics of water levels, flow, and salinity conditions in the southern Sacramento-San Joaquin Delta. Within the southern Delta (or South Delta), existing water infrastructure and water use practices have complicated the hydrology, impeded water circulation and reduced tidal flushing.

How water moves through the South Delta is particularly important in terms of salt transport and the implications for local agriculture and water export operations. Data from an established network of flow and salinity monitoring stations and additional temporary stations were analyzed and also modeled with the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM) to determine circulation patterns, sensitivities to operations and inflows, the fate of salt transport in the South Delta from 2021 to 2023. Here, we present the outcomes of these investigations by answering a few key questions.

What are the main flow paths within the South Delta? Where does water exported at the state and federal pumping facilities come from? How do exports affect the South Delta? Is there a primary controlling variable on South Delta circulation? What are null zones and how do they form? This poster aims to challenge several commonly held beliefs about South Delta hydrology based on results from the multi-year MSS effort.

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POSTER 11

Got Salt? Salinity Sources and Movement Through the Southern Delta (3/3)

South Delta salinity is influenced by water quality of San Joaquin River inflow, local in-Delta discharges, seawater, and Sacramento River water. The Monitoring Special Study (MSS) conducted DWR and Reclamation found that salt transport throughout the South Delta is shaped by seasonal changes and combinations of exports, barriers, and flow dynamics. River inflow controls salinity from late fall through spring, whereas in-Delta sources become the dominant influence during the summer and early fall.

Differences in channel salinity are driven by channel complexity, conveyance limitations, and the formation of null zones, which elevate salinity in certain channel reaches and inhibit the flushing of salts. Null zones -- where flow convergences around regions of high channel depletion -- trap local return flows. Flow monitoring and modeling identified null zones in Old and Middle River. Null zones migrate under the influence of temporary barriers and inflow, and their effect is magnified when they coincide with regions of reduced tidal range.

We used an inverse modeling approach with the Delta Simulation Model II (DSM2) to infer in-Delta sources that are not directly measured, which provides good agreement with intricate tidal flow and salinity patterns. Remaining uncertainty highlights the need for more comprehensive monitoring and reporting of in-Delta water and salt sources, diversion rates, and return rates to improve real-time modeling and water quality management in the South Delta. Here, we use the MSS results to tell the story of salinity in the South Delta. Where does salt come from and how does it move through the South Delta waterways?

Where does salt accumulate and why? What, if any, key information remains unknown? The results challenge several commonly held assumptions about South Delta hydrology.

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POSTER 12

ROCKWADS - Piloting A Novel Approach for Expanding and Enhancing Juvenile Salmon Rearing Habitat Availability in the Upper Sacramento River

Increasing the quantity and quality of rearing habitats for Central Valley salmon is a priority objective of State and Federal fisheries agencies. Our objective is to reduce scientific uncertainties of a novel approach and provide technical guidance for expanding and enhancing salmonid rearing habitat in the Sacramento River below Shasta and Keswick dams, where a majority of endangered winter-run Chinook Salmon spawn. Downstream of the dams, the river differs from historical habitat upstream of the dams, with more limited desirable habitat attributes for salmon rearing, that cannot be re-created through flow alone, nor serve as an equitable surrogate for lost upstream habitats. Due to the nature of the upper-most confined reaches of the river where most of the winter run salmon spawn in deep water, it is thought that limited available rearing habitat can lead to premature emigration of fry and increased mortality risks. Abundant juvenile salmon are frequently observed rearing near artificial structure in the main channel (e.g., bridge piers), which may suggest the fish are using those areas because natural structure on the riverbed is limited or absent.

USBR, ACOE-ERDC, CDFW, and SRSC are collaborating on evaluation of rockwad design and layout, including a laboratory flume-based fish behavior model, hydraulic measurement and modeling of field installations, and surveys of fish response using quantitative sonar and underwater videography.

A total of 70 rockwads have been installed, beginning in 2017, at two locations on the river near Redding, CA, the most recent in April 2026. These installations provide for testing and refinement of construction techniques, and evaluation of location and configuration on fish responses. A multi-media summary is provided of our progress on ongoing development of a fish behavior model, hydraulic habitat monitoring and modeling, and fish distribution and abundance surveys of the rockwads projects.

PRESENTER

Keith Marine, Aquatic Resources Consulting Scientists

CO-AUTHORS

Brian Wardman, Northwest Hydraulic Consultants

David Smith, Engineer Research and Development Center

Jeff Souza, Tehama Environmental Solutions, Inc.

POSTER 13

Estimating juvenile salmon discovery using 2D models and mechanistic fish movement in the Upper Sacramento River

Objectives. Increasing the quantity and quality of rearing habitats for Central Valley salmon is a priority objective of State and Federal fisheries agencies. One of the limitations of many habitat-based assessments is that the process of habitat discovery by fish is neglected. Therefore, we evaluated a technique that provides estimates of fish discovery as a first step toward improved habitat design. We used HEC-RAS 2D to model 1300 meters of the upper Sacramento River near Redding CA under existing conditions and with project conditions. Project conditions consisted of 25 individual rockwads placed in a 4- to 6-meter-deep location. Rockwads are a large rock with the lower portion of a tree bolted to it that are intended to attract and retain juvenile salmonids as rearing habitat. We then implemented a fish behavior model for 80 mm salmon with a rearing habitat algorithm that moves fish toward slower water when specified hydraulic conditions are met. We estimated fish discovery for three flows (3250, 5050 and 12500 cfs) for a total of 6 simulations. Our results suggest that proximity to rockwads increases discovery and while ground speed, which increases with discharge, decreases discovery. This modeling technique is preliminary and will benefit from inclusion of monitoring data at the location and wider application to other sites. Future work will involve site monitoring where fish discovery and occupancy will be evaluated.

Approach. USBR, ACOE-ERDC, CDFW, and SRSC are collaborating on evaluation of rockwad design. Layouts and fish occupancy.

Progress and Anticipated Results. A total of 70 rockwads have been installed, beginning in 2017, among two locations on the river near Redding, CA, the most recent in April 2026. These installations provided for testing and refinement of construction techniques, and evaluation of location and configurations on fish responses.

PRESENTER

David Smith, Engineer Research and Development Center

POSTER 14

POSTER CLUSTER: Rockwads for Salmonid Rearing Habitat in the Sacramento River

These posters by Dr. David L. Smith (USACE-ERDC-EHL) and Dr. Keith Marine (Aquatic Resources Consulting Scientists) describe Rockwads for juvenile salmonid habitat. Rockwads are large (>3ft) boulders with poles and rootwads attached. Rockwads are placed in rivers to provide velocity and predator refugia for juvenile fishes, primarily salmonids in the Sacramento River system. The posters describe the fish behavior research at the USACE Laboratories in Vicksburg, Mississippi, installation design, installation of a pilot project this past April near the Sun Dial Bridge in Redding, California, and the on-going evaluation and monitoring.

PRESENTER

Rod Wittler, Fish Resource Area Coordinator, US Bureau of Reclamation

POSTER 15

The Effects of Stand Structural Complexity on Avian Biodiversity in Carbon-Restored Wetlands of the Sacramento-San Joaquin Delta

Carbon-restored wetlands in the Sacramento-San Joaquin Delta aim to reverse subsidence in lands below sea level and sequester carbon through rapid vegetation growth and burial in flooded soils. With these goals in mind, projects often prioritize the establishment and growth of reeds. However, carbon-restored wetlands in this area often have trees and woody debris on the landscape that may not be as efficient at achieving carbon goals but could be vital to supporting other ecosystem functions and services. To better understand the impact of adding trees, shrubs, and dead woody debris to carbon-restored wetlands, we quantified avian biodiversity across five Delta wetlands in locations with a variety of vegetation characteristics during Fall 2025. Point counts were conducted in spots designated as “open”, “snag or woody debris”, “mixed snag and forested”, and “forested.”

At each point count location, vegetation was sampled to construct an index of stand structural complexity (SSC). Currently, we are examining the relationship between stand structural complexity, individual metrics of vegetation structure and composition, and avian taxonomic, functional, and phylogenetic diversity. Preliminary results suggest that individual vegetation characteristics and wetland site characteristics may be driving avian community composition rather than SSC. Our work will assist future restoration planning in identifying which types of vegetation to invest in if we hope to support diverse populations of birds on carbon-restored wetlands.

PRESENTER

Mel Baldino, University of California, Berkeley

CO-AUTHORS

Iryna Dronova, University of California, Berkeley

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POSTER 16

Impacts of Altered Flooding Regimes in Managed Wetlands on Waterfowl Species Assemblage and Behavior in Suisun Marsh

Suisun Marsh supports roughly 300,000 wintering waterfowl that rely on managed wetlands for foraging and roosting. Wintering dabbling ducks depend primarily on plant seeds as a food source, making seed availability a key driver of wetland use and species assemblage. The California Department of Water Resources (DWR) plans to flood three managed wetlands in Suisun Marsh in summer 2026 — months earlier than the typical October–November flood-up schedule, in order to supplement zooplankton production for fish species of concern. Early flooding may cause vegetation to have less time to mature and disperse seeds, thus altering waterfowl foraging habitat quality. We hypothesize that early flooding will shift the species assemblage at these wetlands: dabbling ducks will reduce foraging use of the wetland due to reduced seed content, overall species diversity will decline, and waterfowl that do use the wetland will shift toward roosting rather than foraging behavior.

To test these hypotheses, we are conducting a before-after-control-impact (BACI) study. During the winter of 2025–2026, we deployed six cameras across three wetlands in Suisun Marsh: two cameras at Meins Landing, two at Potrero Pond, and two at Denverton Pond (all impact sites). Cameras were deployed for four months and captured over 60,000 images. We identified every bird visible in each image and recorded behavior (foraging vs. roosting). These data establish our pre-treatment baseline.

Analysis of baseline imagery is ongoing. Preliminary results characterize the species assemblage and behavioral patterns at all three wetlands prior to the early flood-up. We will compare these data against imagery collected during the winter of 2026–2027, following the experimental flood-up, to evaluate changes in species composition, abundance, and behavior attributable to altered flood timing.

PRESENTER

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John Durand, UC Davis

POSTER 17

Status of Giant Gartersnakes in the Sacramento-San Joaquin Delta: Progress Report

Giant gartersnakes (Thamnophis gigas), endemic to California's Central Valley, are listed as threatened under both state and federal endangered species acts due to extensive loss of wetland habitat. The status and distribution of giant gartersnakes in the Sacramento–San Joaquin Delta (Delta) remain uncertain, yet the region is increasingly important for the species' long term conservation. Early 2000s genetic sampling indicated notably high local genetic diversity in the Delta, and recent restoration of tidal and managed marshes has created substantial potential habitat.

Understanding whether self sustaining populations persist—and assessing their genomic health—is critical for guiding recovery actions. During summer 2026, we surveyed three Delta islands (Sherman, Twitchell, and Jersey) and documented giant gartersnakes from multiple age classes, including individuals in each island's interior, providing strong evidence of reproducing, resident populations. We collected tissue samples from each encountered snake, along with opportunistic samples elsewhere in the Delta, to evaluate genomic diversity and estimate population size using both genomic (Ne) and demographic (Na) metrics.

These findings provide the most compelling evidence to date that the Delta supports viable populations of giant gartersnakes. Given the ecological importance of the region, expanded study of giant gartersnake distribution, habitat use, and genomic resilience in the Delta is essential for informing conservation strategies and advancing species recovery.

PRESENTER

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POSTER 18

Advancing Scientific Understanding and Management of the Delta Through a Food Web Perspective

The Delta is a complex ecosystem characterized by multiple food webs dynamics. The ability to predict the impact of habitat restoration, fishery management actions, changes in environmental drivers on ecological carrying capacity and productivity, as well as the bioaccumulation of contaminants on species and the ecosystem, requires an understanding of food web processes. The Delta Independent Science Board, which is legislatively mandated to provide scientific oversight of adaptive management, has finished conducting a review of the current and emerging science related to food webs, with emphasis on upper trophic food webs. This poster will provide an overview of findings and recommendations from the review.

The goal of the review is to provide relevant information to help organizations, including State and federal agencies, assess how to better incorporate and advance food web knowledge in managing the Delta's ecosystems and to identify what tools are available or should be developed. This review is based on an analysis of published literature, public comments, community engagement through a series of conference calls, and a focused two-day workshop.

A key finding is that an improved mechanistic understanding of food webs is essential to predict the impacts of biophysical drivers and management actions on individual fish species and ecosystem-level processes. Collaboration among agencies, academia, Indigenous Tribes, and the public, along with adaptive management, will be needed to make implementation of the recommendations efficient and effective. The benefits will be improved capacity to forecast effects on fish and other aquatic organisms due to management actions and their interactions with an ever-changing climate and ecosystem.

PRESENTER

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CO-AUTHORS

Kenneth Rose, Delta Independent Science Board

Diane McKnight, Delta Independent Science Board

Anika Agrawal, Delta Independent Science Board

POSTER 19

Prey group cohesion mediates the outcome of predator-prey interactions under artificial lighting

Fish predation is presumed to be highest during low-light crepuscular periods, but similarly bright conditions are frequently produced by sky glow from distant sources of artificial light at night (ALAN).

Understanding how ALAN influences the interactions between piscivorous fish and their prey relative to crepuscular light levels and nighttime darkness is critical for understanding the predation risk of imperiled fish species in inland waterways and deltas.

PRESENTER

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POSTER 20

Water the weeds doing in the Delta: the effect of submerged aquatic vegetation on phytoplankton production in oligotrophic and eutrophic environments

The San Francisco Estuary (SFE) is a dynamic system that has experienced declines in primary production from habitat alteration, invasion, and water diversions. The most inland region of the SFE, the Sacramento San-Joaquin Delta (the Delta), is experiencing a shift in habitat structure through the increase of invasive submerged aquatic vegetation. This has altered pelagic fish habitat but little is known about its impact on phytoplankton production; which constitutes the foundation of food webs in this system. We conducted a mesocosm experiment to investigate how submerged aquatic vegetation competes with phytoplankton for nutrients in oligotrophic, mesotrophic, and eutrophic conditions to better understand this interaction. We put different nutrient amendments in mesocosms with and without vegetation. They were kept in a climate controlled room with water quality parameters and zooplankton measured every three days. Our preliminary results show how water quality changes over the prime growing season of aquatic vegetation with chlorophyll-a acting as a proxy for phytoplankton growth.

PRESENTER

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POSTER 21

Characterizing Tidal Wetland Ecotones at Benchmark Sites of the San Francisco Estuary Wetland Regional Monitoring Program

Tidal wetlands in the San Francisco Estuary are characterized by relatively distinct vegetation ecotones, transitioning between habitat types such as across the low to mid marsh, into the marsh from tidal channel edges, and the high marsh into uplands. These ecotones are known to shift over time, particularly due to changes in tidal inundation and salinity associated with sea-level rise. Here we report on a pilot project initiated at two representative tidal wetland landscapes to establish a baseline of ecotone vegetation communities in saline and brackish marshes that comprise NOAA's San Francisco Bay National Estuarine Research Reserve. These marshes serve as two of the benchmark sites for the Wetland Regional Monitoring Program and will be resampled in future years.

During 2025, we installed permanent markers at replicate locations along the approximate boundary of key dominant species in each ecotone type. We characterized vegetation in a total of 360 1-m^2 plots arranged in belt transects extending in opposite directions from the boundary marker at each location to document baseline conditions that will be used to assess shifts over time in vegetation cover and composition. We also measured land surface elevations along each transect to understand how vegetation patterns relate to mean sea level and to allow for future assessments of those relationships. Initial data illustrate vegetation gradients across each type of ecotone and highlight differences between the two sites. Periodic monitoring in future years will provide insight into the relative importance of key drivers of vegetation change and will provide a reliable leading indicator of wetland response to sea-level rise.

PRESENTER

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POSTER 22

Building an isoscape in the Yolo Bypass to trace dry-season flows to food

The Yolo Bypass is a managed landscape where local jurisdictions collaborate to implement summer month (dry-season) environmental flow actions to enhance hydrologic connectivity, while also supporting existing land-use practices. Although flow augmentation during dry-seasons can increase local productivity, there is uncertainty regarding the spatial and temporal influence that local dry-season agricultural practices have on consumers in the local aquatic food web.

To better understand dry-season flow connectivity, land use, and associated food web processes in the Yolo Bypass, the U.S. Geological Survey, in cooperation with the California Department of Water Resources hypothesized that water column constituents would reflect local and regional anthropogenic influences and that resultant isotopic landscape pattern (isoscape) would be consistently reflected in the primary consumers within the system.

We collected representative ecosystem constituents (particulate organic matter, zooplankton, and macroinvertebrates) from six locations across the Yolo Bypass and its upstream and downstream connections in September 2022 and July and September 2023, and analyzed the samples for carbon-13 and nitrogen-15 isotopes. Concurrent water quality samples were collected and analyzed for conductance, chlorophyll-*a*, nitrate and nitrite, and ammonium concentrations to assess land use sources of fluctuations in water quality.

Our results show that water quality during the dry season is strongly influenced by both local and regional land use and varies both spatially and temporally. This spatial variability produced a well-defined isoscape at regional and local scales, indicating strong potential for use of stable isotope tools to track the impact of flow actions on local food webs.

These findings help develop a baseline of information on bypass flow and food web dynamics in the dry seasons that could support future seasonal food web analyses in the Yolo Bypass.

For more information see the Delta Science Tracker: https://sciencetracker.deltacouncil.ca.gov/node/49902

PRESENTER

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POSTER 23

Seasonal Zooplankton Community Dynamics in the Yolo Bypass and its Tributaries

The Yolo Bypass floodplain is a multi-use landscape managed for flood mitigation, agriculture, and wildlife habitat. Despite land repurposing and habitat fragmentation, the bypass still retains some historic wetland functionality. With extended flood inundations, long water residence times, and habitat mosaic, the bypass offers refuge for migratory birds, extensive aquatic lower trophic community development, and abundant feeding opportunities for a variety of fish species. However, the spatial patterns and seasonality of lower trophic communities across this habitat mosaic remains understudied. Furthermore, recent construction of the Big Notch in the Fremont Weir will alter hydrologic connectivity in the bypass, potentially affecting seasonal zooplankton assemblages and source/sink zooplankton dynamics. To better understand these shifts in the spatiotemporal dynamics of lower trophic zooplankton communities, we sampled zooplankton at 14 sites from November 2025 through April 2026. Sites were split into three habitat classifications (i.e., tributary, off-channel, channel) for analysis of habitat specific community changes. We found distinct temporal shifts in community composition and overall abundance as a result of hydrologic variability within habitats across the season. Our results showed similar richness across habitats, supporting previously reported bypass literature. Limited Big Notch operations this season provided a last chance to establish pre-notch conditions to compare to future years with full operational capacity. Our results highlight the potential for source water attribute synergy in supporting robust Yolo Bypass foodwebs. Future assessments should include source contributions to help answer key gaps in zooplankton community spatiotemporal dynamics. Elucidating mechanisms behind lower trophic community dynamics within delta water sources will ultimately lead to more nuanced management and a more resilient Sacramento–San Joaquin Delta ecosystem.

PRESENTER

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Amanda Niemela, California Department of Water Resources

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POSTER 24

Amphipods in the upper San Francisco Estuary

Amphipods are sampled by two components of the Environmental Monitoring Program; in pelagic mysid tows by the California Department of Fish and Wildlife's (CDFW) Zooplankton Study (1996 to present) and in benthic ponar grabs by the California Department of Water Resources' Benthic Invertebrate Monitoring program (1975 to present). Amphipods are also identified in the stomachs of pelagic fish collected by CDFW's Diet and Condition Study (2005 to present). Amphipods in benthic samples and fish stomachs are identified to lowest taxonomic level possible; amphipods in the Zooplankton Study were identified as either "*Gammarus*" or "*Corophium*" from 1996-2013 and to lower taxonomic levels starting in 2014.

Amphipods in the upper San Francisco Estuary (SFE) are not holoplanktonic. They are described as infaunal or epifaunal, suggesting they should be on or in sediment, in burrows on hard substrates, or associated with submerged aquatic vegetation (SAV), These life histories suggest that amphipods should be rare in the water column during the day, yet they are regularly collected in daytime net tows and found in the stomach contents of pelagic fish. Amphipods may be collected when floating SAV is caught in nets, but this differs from amphipods inhabiting the water column during the day. A few genera are known to enter the water column at night (*Ampelisca, Ampithoe, Corophium*), but their presence in zooplankton samples indicates they are regularly within the depth range of daytime net tows.

We will use these datasets to address three questions: 1) How similar are amphipod species assemblages in pelagic and benthic samples, 2) How closely do these assemblages resemble what fish are eating, and 3) How does identification to lower taxonomic levels contribute to our understanding of amphipods in the SFE?

For more information, see - https://sciencetracker.deltacouncil.ca.gov/activities/upper-estuary-zooplankton-study

PRESENTER

Caroline Shaw, California Department of Fish and Wildlife

CO-AUTHORS

Elizabeth Wells, California Department of Water Resources

Nene Ugbah, California Department of Fish and Wildlife

POSTER 25

Zooplankton Abundance Downstream of Managed Wetlands Outfalls and Implications for Presmolt Salmonids

Some wetlands from the Sacramento–San Joaquin River Delta through the San Francsico Bay are managed to attract waterfowl for hunting. During the wet season, water is allowed to flow in, is held for days or weeks consecutively, and then is allowed to flow out. Prior wetlands restoration efforts have focused on removing such management infrastructure to restore tidal flows. However, wetlands managed for waterfowl hunting often produce orders of magnitude higher abundance of zooplankton compared to adjacent tidal sloughs, including the taxa of zooplankton most common in the diets of presmolt salmonids. In this study, we examine the spatial distribution of concentrations of zooplankton downstream of the outfalls of three currently or formerly managed wetlands in the Suisun Marsh.

We examine the relative effects of differing management policies on zooplankton concentrations to inform wetlands restoration efforts and management policies to benefit salmonids. At each outfall (or former outfall notched to restore tidal flows), zooplankton were sampled using a thrown circular net at four locations along an 800 m transect downstream. Zooplankton were identified to lowest possible taxon to calculate taxon-specific CPUE. The sampling was repeated weekly during the salmonid rearing period in Suisun Marsh, capturing a range of tidal conditions, outfall flows, and times since flow was stopped. Sampling locations corresponded to the locations of cages holding presmolt salmonids for a related study. Preliminary results suggest a decreasing spatial gradient of concentrations of copepods and cladocerans downstream of the outfall, coupled to a decreasing temporal gradient since the most recent water release from the target pond. These results would imply that tidal sloughs adjacent to managed wetlands, which are known to be accessible to native and listed fishes, are abundant feeding habitat for presmolt salmonids, among other fish species of interest. Final results will be presented.

PRESENTER

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POSTER 26

Net Pen Rearing for Imprinting and Survival

Adult returns of fall-run Chinook salmon in the Upper Sacramento River Basin have declined despite continued production at Coleman National Fish Hatchery. Although trucking juvenile salmon to release sites in San Francisco Bay can improve outmigration survival, especially during drought years, it has also been linked to increased adult straying from natal watersheds. This study evaluated a novel net pen rearing strategy intended to promote olfactory imprinting to Sacramento River water prior to release. In March 2025, a 24 × 48 ft net pen with an adjustable depth of up to 8 ft was divided to rear a Bay Release Group (BRG; 298,596 fish) and a River Release Group (RRG; 239,609 fish).

In February 2026, a second net pen was added to increase rearing capacity and improve water exchange; the BRG pen held 199,905 fish and the RRG pen held 226,067 fish. All fish from both years were 100% coded wire tagged and adipose clipped. Pens were installed and removed using a crane and simple hand tools and were equipped with predator -exclusion nets above and below the water surface. Fish were reared for at least three weeks in Sacramento River water at the Tehama-Colusa Canal Settling Basin in Red Bluff before release. Growth, mortality, environmental conditions, and fish health were monitored throughout rearing, and nets were cleaned multiple times per week. RRG fish were transported to and released in the Sacramento River near the rearing site, while BRG fish were trucked and released in San Francisco Bay. Growth averaged 0.82 mm/day in 2025 and 0.78 mm/day in 2026, while mortality was 0.31% and 0.09%, respectively. Age-2 adults will return in 2027 to begin assessing whether net pen rearing improves homing fidelity and reduces straying.

PRESENTER

Thomas Avila, Kramer Fish Sciences

POSTER 27

Salmonid Conservation though the Study of an Annelid Worm; Manayunkia occidentalis in the Feather River CA

A major source of juvenile Spring-run Chinook Salmon mortality in the Feather River is disease caused by the parasite *Ceratonova shasta*, a myxosporean with a complex life cycle and two mandatory hosts: salmonids, and the definitive freshwater annelid *Manayunkia occidentalis*. Salmonids and *C. shasta* have been extensively studied on the Feather River, yet annelid [for *M. occidentalis*] populations are largely obscure. Locating these annelids is crucial for developing informed hatchery spring-run Chinook release strategies, as well as water release management to support out-migrating juvenile Salmon. Previous studies identified an "infectious zone" downstream of the Thermalito Afterbay Outlet, where *C. shasta* spores/L are significantly higher than elsewhere in the river. We hypothesize that the highest population density of annelids can be found in the previously identified infectious zone due to water with relatively high levels of primary production originating from the Thermalito Afterbay Outlet. To investigate this claim, we conducted a field collection study, used spectrophotometry to approximate primary production, and will estimate prevalence of *C. shasta* infection in the annelids through qPCR to determine which factors are most likely to explain the spatial and temporal distribution of the annelids and their prevalence of infection with *C. shasta*. Preliminary results suggest annelid population densities are negatively associated with large instream objects and dissolved oxygen concentrations, yet positively associated with cobble (150-300 mm) substrate, water temperature, and water depth up to 15 ft. Data will be analyzed using principle component analysis to identify which environmental factors are most likely to explain the density of M. occidentalis populations and prevalence of infections with C. shasta in the Feather River, CA. The results of this study will inform a larger model currently developed by UC San Diego.

PRESENTER

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POSTER 28

An exploration of environmental influences on Central Valley Chinook Salmon outmigration timing and length-at-date accuracy

There are four Chinook salmon runs in California's Central Valley, with varying (C)ESA statuses and management plans. Due to overlapping run-timings and cryptic phenotypes, distinguishing between the four runs frequently relies on length-at-date (LAD) models. Previous studies have shown that current LAD models are unreliable based on a mismatch between field and genetic identification. Preliminary genetic results from the Spring Run Juvenile Production Estimate show that LAD accuracy varies by tributary and sampling year. To better understand variation in LAD run assignment accuracy, we investigated the impact of environmental factors, including flow and temperature, in rearing and migration habitat on juvenile outmigration size and timing. We used over twenty years of rotary screw trap catch data from tributaries and the mainstem Sacramento River, in addition to more recent genetic run assignment data. We paired these fish datasets with flow and temperature data from USGS and DWR continuous monitoring stations and used a series of linear models to identify the best predictors of migration timing and LAD accuracy. Understanding how environmental covariants influence run timing and size at outmigration will help guide the management of Central Valley Chinook salmon by informing restoration efforts and water operations in the face of climate change.

PRESENTER

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POSTER 29

Modeling temperature and velocity effects on migration energetics of adult Chinook salmon in a regulated river

Pacific salmonids are culturally, ecologically, and economically important cool-water species, yet many stocks are declining. We investigated freshwater stress in Central Valley fall-run Chinook salmon in the highly altered Sacramento River, at the southern edge of the species' range. From 2021–2024 we tagged adults prior to freshwater entry and recorded migration timing, movement, and thermal exposure for 126 fish, and estimated energy content for 3,954 adults before and during upriver migration and spawning.

These data parameterized an energy budget model used to estimate migration costs across a range of migration timing and environmental conditions. This poster will share findings from the empirical data and modeled simulations in the context of salmon recovery.

PRESENTER

Miles Daniels, University of California, Santa Cruz & NOAA Southwest Fisheries Science Center Affiliate

POSTER 30

First flush timing affects juvenile Central Valley Chinook salmon outmigration

First flush storm events—early-season high-flow pulses—trigger mandatory pumping restrictions in the Sacramento-San Joaquin Delta designed to protect listed fishes, including Central Valley winter- and spring-run Chinook salmon (*Oncorhynchus tshawytscha*). We used Delta Juvenile Fish Monitoring Program beach seine capture data from 1977-2025 to quantify the annual migration timing for Central Valley Chinook, assess changes in migration phenology over time, and test whether first flush timing and magnitude predict migration timing. For each cohort and water year, we identified first flush events and calculated the day of the year when 10, 50 and 90% of the annual catch was reached, then modeled the relationship between these benchmarks, year, and first flush timing using Bayesian hierarchical regression. Preliminary results indicate that migration timing has shifted earlier by nearly 18 days over 46 years, and first flush timing is directly correlated with the onset of outmigration: For every day later in the water year that first flush occurs, the leading edge of migration (10th percentile) shifts approximately 0.23 days later. Critically, the 50th and 90th percentiles of the cohort are comparatively unaffected, effectively compressing the migration window. Furthermore, the magnitude of first flush events, and its interaction with first flush timing, did not improve prediction of migration timing. These findings suggest that Central Valley Chinook migration phenology is changing over time and that first flush not only triggers migration, but shapes its structure, with implications for how pumping restriction timing and duration should be calibrated to protect the outmigrating cohort.

PRESENTER

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POSTER 31

Native Fish in Recently Restored Tidal Wetlands: Early Evidence of Habitat Use

Fishes native to the upper San Francisco Estuary evolved using a landscape dominated by tidal wetlands, floodplains, and riparian forests dissected by dendritic channel networks. Post-Gold Rush land reclamation fundamentally remodeled the habitat available to native fishes, and many subsequently introduced stressors, including water diversions, combined to drastically decrease their populations. Federal and state permits for the operation of the Central Valley and State Water Projects require restoration of ~8,400 acres of tidal wetlands to expand the "diversity, quantity, and quality of [listed species] rearing and refuge habitat." The Fish Restoration Program (FRP), a partnership between California's Departments of Water Resources and Fish and Wildlife, has nearly completed the restoration and is continuing to monitor its effectiveness.

Evaluating the effects of an action on small populations is difficult, so FRP uses a weight-of-evidence approach that considers the capacity of restored wetlands to support listed fish species (e.g., appropriate water quality and food resources), the opportunity for fishes to access habitat and food, and realized function (i.e., improved outcomes for the populations). Fish occupancy in restored habitats confirms opportunity and is a first step in evaluating realized function, though measures of foraging success, growth, and survival are needed for definitive conclusions. Additionally, we consider non-listed native fish species as potential indicators of appropriate habitat.

We used otter trawls, beach seines, lampara nets, cast nets, fyke traps, and hook-and-line to sample fish communities in and around FRP restoration sites and in pre-existing comparison tidal wetlands from October – June, 2022 – 2025 (and on-going). While the expected non-native fishes were abundant, we found native fishes, in seasonally large numbers at some sites, everywhere we sampled. Early post-restoration habitat use is an encouraging sign of effectiveness.

PRESENTER

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POSTER 32

Rinundation: A Tool for Quantifying Fish Habitat Opportunity in Tidal Wetlands

Large-scale restoration of tidal wetlands is occurring in the Sacramento–San Joaquin Delta to enhance nursery function for native fishes. To bolster these efforts, we are developing Rinundation, a novel open-source R package that quantifies rearing habitat in tidally dynamic environments to inform restoration design and effectiveness monitoring. Using relatively simple and often publicly available datasets (tidal stage data and digital elevation maps), Rinundation calculates water depth across high-resolution units of space (1 x 1 meter) and time (every 15 minutes). The resulting data is combined with species-specific rearing (depth) thresholds to quantify restoration-relevant metrics including habitat availability, rate of change in habitat availability, habitat accessibility, marsh overtopping frequency, relative edge ratio, marsh transgression, and tidal prism. This approach facilitates comparison of habitat opportunity metrics across a range of restoration designs and sea level rise scenarios and allows the user to assess the capacity of juvenile fishes to take advantage of conditions that promote foraging, growth, and decreased mortality within restored tidal wetlands. Ultimately, we endeavor to elucidate linkages between tidal wetland form and desired ecological function for fishes in California's Central Valley and beyond.

PRESENTER

Jesse Schroeder, UC Davis

POSTER 33

Beyond the Boat Ramp: The Effects of Incorporating Inaccessible Deep and Shallow Habitat into Fish Abundance Estimates in the San Francisco Estuary

Since 1959, the California Department of Fish and Wildlife (CDFW) has continuously monitored fish populations in the San Francisco Estuary (SFE). Abundance indices are important scientific and management products of this monitoring, and are generally computed as catch per unit effort (CPUE) times a habitat size (water volume or area) expansion factor. The way expansion factors were computed historically for different studies has been inconsistent, and new habitat size information is available.

To improve comparability across long-standing abundance indices associated with CDFW's monitoring studies, estimates of the size of pelagic fish habitats in the SFE were updated in 2026, and were applied to a statistically consistent design-based approach for estimating abundance. We generated stratified habitat volumes and surface areas for the entire SFE and identified areas of shallow and deepwater habitat that are inaccessible to vessel-deployed sampling gears. Using two sets of expansion factors and survey data spanning 1985-2025, we generated monthly and annual abundance estimates with confidence intervals for species of regulatory interest, including Osmerids.

Where spatial gaps in sampling occur, we investigated how substituting catch per unit of effort (CPUE) from neighboring sampling areas impacts design-based abundance (DBA) estimates. For quality assurance, we simulated data to understand spatial evenness in sampling, and temporal variation in effort and CPUE. We studied the effect of aggregating data in time and space, an important step in making annual abundance indices, on DBA estimates and their uncertainty. For the Bay Study otter trawl, the only routine benthic survey, we compared elevations of trawl deployment to nearby topography to assess elevations not sampled.

This work provides a user-friendly toolkit for researchers interested in any species in the SFE to increase the comparability, accuracy, and transparency of abundance indices, which are foundational to many subsequent scientific modeling studies and management assessments of species status.

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POSTER 34

Different Nets, Different Stories: What Gear Type Reveals About Fish Presence in a Restored Tidal Wetland

Tidal wetland restoration in the upper San Francisco Estuary is being undertaken through the Fish Restoration Program (FRP) to support fishes of conservation concern through improved access to food web resources and rearing habitat. Tule Red, located in Suisun Marsh, is a FRP restoration project completed in 2019 that comprises heterogeneous fish habitats (different-sized channels, ponds, and tidal pannes) that cannot be sampled with a single type of gear. Our objective is to identify how species composition differs between gear types, and to understand how habitat type and seasonal variations in environmental conditions help shape those differences.

We have sampled Tule Red using lampara nets, beach seines, and otter trawls from October – June since 2022. Beginning in spring 2024, we initiated annual gear comparisons, sampling all currently utilized gear types close in time across each habitat type where gear deployment was feasible. Ordination and Permutational Multivariate Analysis of Variance revealed that gear type and season significantly affected species composition in the main channel. Pond comparisons suggest a similar pattern, but small sample size and inherent microhabitat differences between gears (edge vs. open water) limit confidence in this result.

Each gear type provided a slightly different picture of wetland usage by fishes, even within the same habitat types. Species of conservation concern, including Chinook Salmon, Longfin Smelt, and Steelhead, are regularly captured at Tule Red. We observed seasonal shifts in species composition, with native fishes becoming more abundant in the winter and spring. Species composition differed most between lampara and beach seine catches, likely reflecting habitat-specific use within the wetland. Together, these results suggest that Tule Red provides seasonally structured habitat value for native and imperiled fishes, supporting program hypotheses that restored tidal wetlands can function as meaningful rearing and foraging habitat in the upper San Francisco Estuary.

PRESENTER

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POSTER 35

Oxygen Isotopes Reveal Sturgeon Habitat Use

Green Sturgeon (Sinosturio medirostris) and White Sturgeon (Sinosturio transmontanus) are long-lived, migratory fishes native to California, historically supporting valuable fisheries in the San Francisco Estuary (SFE). Both species are highly threatened, experiencing rapid population declines demanding informed management strategies. The lack of comprehensive understanding of sturgeon life histories, due to their highly variable nature, remains a key hurdle to conservation and recovery. Declining populations and the protected status of these species make classic geochemical tools (otoliths) ineffective as they require the sacrifice of each specimen. Fin rays are bone-like structures made of biological apatite that can be collected non-lethally with aging and life-history reconstruction capabilities similar to otoliths. Well-developed methods using laser ablation to conduct in-situ analysis of stable strontium isotopes in sturgeon fin rays have been used to examine migratory movements, but this method becomes unreliable at medium to high salinities (>6 PSU). Oxygen isotopes allow for reconstructions of movement across the entire spectrum of SFE salinities, where strontium isotopes become inaccurate, but cannot be analyzed confidently using laser ablation. Here, we conduct a pilot study exploring the use of a novel, non-lethal approach to reconstructing the migratory life histories of green and white sturgeon using fin ray micromill solution oxygen isotope geochemistry. Preliminary results of this work suggest that this method will be useful in creating life history reconstructions with higher salinity confidence across the entire SFE while sacrificing the high temporal resolution of laser ablation methods. In tandem with strontium isotope analysis, this tool will make possible a more integrated understanding of the habitat needs of these ancient fishes to enable optimal conservation decisions.

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POSTER 36

Quantifying Sturgeon Mortality in the San Francisco Estuary: Carcass Fate and Implications for Population Assessment

White and green sturgeon (*Acipenser transmontanus* and *A. medirostris*) are long-lived species facing mounting pressures in the San Francisco Estuary, where adult mortality from anthropogenic sources, including vessel strikes and harmful algal blooms, poses meaningful but poorly quantified threats to population persistence. Understanding the frequency and magnitude of these mortality events is essential for refining population models, projecting extinction risk, and informing management decisions such as fishery harvest limits.

A fundamental challenge in estimating mortality rates is extrapolating from reported carcasses to true mortality totals. Critical unknowns include whether sturgeon carcasses float or sink post-mortem, how quickly decomposition proceeds, and how far carcasses may drift before stranding. Addressing these gaps would substantially improve mortality estimation and support larger-scale studies using tagged and released carcasses to quantify drift distances and detection probability. However, such studies require large carcass inventories accumulated over extended periods and kept in frozen storage, and the effect of freezing on decay dynamics has not been characterized for sturgeon.

To generate foundational data for this future work, we conducted controlled laboratory trials documenting the decomposition process and buoyancy dynamics of green sturgeon carcasses through the decay window. Trials compared fresh and previously frozen individuals in a controlled freshwater system with large scavengers excluded, reflecting conditions relevant to portions of the estuary. Experiments were conducted during summer 2026, and preliminary findings on flotation timing, decay progression, and the influence of prior freezing will be presented. These data represent a critical first step toward developing robust, carcass-based frameworks for adult sturgeon mortality estimation in a highly modified and ecologically stressed estuarine system.

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POSTER 37

White Sturgeon Science Plan

In response to decreasing abundances of the White Sturgeon in California, the Department of Water Resources and Department of Fish and Wildlife, developed a White Sturgeon Science Plan. The Plan identifies key knowledge gaps and priority science areas that will guide research, monitoring, and meaningful management actions for White Sturgeon. Development of an updated life cycle model is a keystone element in the Science Plan, shaping and informing each of the other priority science areas. Targeted research, supported by new and/or improved monitoring, will be an instrumental tool for addressing the data gaps identified during the development of the life cycle model and emphasizes filling key knowledge gaps in the spawning, development, and rearing phases of the White Sturgeon life cycle.

The Science Plan calls for the establishment of an Entrainment and Residency Program to better understand factors affecting White Sturgeon entrainment and residency in Clifton Court Forebay. This foundational research will be used in part to develop a salvage prediction model to inform real-time management of water operations. Additionally, the Science Plan designates the effects of harmful algal blooms on White Sturgeon as a priority science area for further investigation. Together, these elements of the Science Plan will strengthen understanding of White Sturgeon ecology and the stressors that influence population resilience. Adherence to the Science Plan will ensure the Science Program generates robust, defensible products that equip resource managers to craft appropriate and meaningful management actions.

PRESENTER

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POSTER 38

Evaluating Pond-Based Rearing of Free-Swimming Delta Smelt for Supplementation

The Delta Smelt (Hypomesus transpacificus) is a functionally extinct species of forager fish historically found in the Sacramento-San Joaquin Bay Delta, protected at both the federal and state levels. Conservation supplementation efforts have increased in recent years, but the number of fish available for release is constrained by current hatchery production capacity at the Fish Conservation and Culture Laboratory. To expand supplementation potential, additional rearing strategies that complement conventional hatchery production need to be evaluated. Previous pond-rearing efforts have relied on cages to contain fish; however, the feasibility of rearing Delta Smelt as free-swimming fish in ponds and efficiently recovering them for supplementation has not been well established.

During the 2025-26 season, we conducted three deployments of approximately 3,000 Delta Smelt into small artificial ponds designed to mimic aspects of natural rearing conditions.

After one week of free-swimming pond rearing, fish were corralled using a seine net, recovered with a fish friendly pump, counted, transported using different methods, and placed into recovery enclosures to evaluate post-recovery survival. Recovery was high across all three deployments, increasing from 90.0% in the first deployment to 95.5% and 97.1% in the second and third deployments, respectively. One-week survival after recovery was poor in the first deployment, potentially associated with toxic cold water algal blooms and variable dissolved oxygen concentrations, but improved to 85.4% and 89.7% in the second and third deployments.

These findings indicate that free-swimming Delta Smelt can be reared in semi-natural ponds and recovered at high rates under appropriate environmental and handling conditions. Subsequent deployments demonstrated improved post-recovery survival, supporting further development of free-swimming pond-based rearing as a potential strategy for increasing Delta Smelt supplementation capacity.

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POSTER 39

Evaluating seasonal variability in in situ embryo hatching to diversify Delta Smelt supplementation

Delta Smelt (Hypomesus transpacificus) supplementation efforts currently rely on hatchery-reared fish produced at the Fish Conservation and Culture Laboratory (FCCL) in Byron, California, with releases focused on adult life stages. Diversifying supplementation to include earlier life stages could expand release strategies, reduce hatchery space and labor needs, and lessen domestication effects. Preliminary enclosure studies suggest that it is feasible to deploy embryos directly in the Delta and to rear them in situ. To evaluate embryo deployment as a viable supplementation tool, we tested whether Delta Smelt embryos could hatch in semi-natural river conditions across winter and spring, assessing seasonal and geographic variability and identifying suitable deployment windows.

We selected two field sites, one in the river and one in a naturalized impoundment, and deployed three enclosures at each site. Each enclosure contained smaller nested enclosures designed to dissipate flows and allow water renewal and food entry. Embryos fertilized 7-13 days earlier were obtained from FCCL and deployed in the field at approximately 1,000 embryos per enclosure, where they remained for another 3-10 days. A control of approximately 100 embryos was kept in the lab to confirm embryo viability.

Delta Smelt embryos successfully hatched in the nested enclosures with minimal in situ intervention. Larval recovery ranged from 1.98% to 89.76%, with an average of 54.86% and a standard deviation of 22.17%, reflecting variation among deployment periods and among enclosures within deployments. Overall, we had successful recoveries with temperatures between 15°C-20°C, while within-deployment variation indicates that enclosure-specific conditions and recovery efficiency require further evaluation. Future work could expand on these findings by evaluating longer-term survival, feeding success, and hatch timing alignment with prey availability in the San Francisco Bay-Delta.

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POSTER 40

Range Testing of the Next-Generation Miniaturized JSATS Transmitter...the Shad Tag

Acoustic telemetry provides a non-lethal, independent approach for quantifying the impact of environmental conditions on fish movement and survival, making it a critical tool for informing restoration and management decisions. Historically, transmitter size has limited its application in small-bodied fishes such as salmon fry and smelt species. Recent advances by PNNL have miniaturized the JSATS tag (0.210 g) for use in American Shad, the Shad Tag (0.05 g), enabling use in smaller species. Laboratory studies of Shad Tag application and survivability in Delta Smelt are ongoing, with encouraging results for future tagging efforts; however, the impact of tag size on detection range in the natural environment remains uncertain. Shad Tags prioritize reduced size over signal output and battery life, resulting in a lower source level compared to previous-generation tags (142 dB vs 156 dB) and reduced detection range. To quantify detection efficiency, we conducted controlled drift tests in the Delta, towing Shad Tags at known depths through the detection fields of three stationary receivers under a range of environmental conditions. By pairing known tag and receiver positions with detections, we estimated detection efficiency as a function of distance, tag position, bottom depth, and physical water characteristics. Results will inform optimization of the existing JSATS receiver array to improve detection probability of fish carrying the Shad Tag, further extending acoustic telemetry to adult smelt and salmon fry.

This capability will provide direct observations of adult movement and entrainment into the South Delta, resolving key uncertainties in the Delta Smelt Life Cycle Model and bridging knowledge gaps between early and later salmon life stages. Ultimately, this work supports more effective monitoring of small-bodied species and provides resource managers with actionable information to enhance restoration strategies and recovery efforts for Delta Smelt.

For more information see the Delta Science Tracker: https://sciencetracker.deltacouncil.ca.gov/node/54564

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POSTER 41

Using qPCR to estimate Eurytemora carolleeae (Copepoda) biomass from Longfin Smelt digestive tracts

Larval Longfin Smelt (*Spirinchus thaleichthys*) are a conservation concern in the San Francisco Estuary, where food availability during early life stages is thought to be a key driver of recruitment success. Traditional visual diet analyses as well as dietary DNA metabarcoding studies have both supported evidence that the copepod *Eurytemora carolleeae* is the most important contributor to the diets of larval Longfin Smelt. However, each method has limitations. Visual analyses provide prey quantities, but species-level identification of partly digested prey is often difficult or impossible. DNA metabarcoding overcomes morphological degradation and detects a broader range of taxa but yields results that are not quantitative. This study combines the strengths of both approaches - visual gut content analysis to quantify the identified prey taxa and quantitative polymerase chain reaction (qPCR) to target and quantify *E. carolleeae* biomass in Longfin Smelt early-stage (age-0, larval and juvenile) digestive tracts. Larval longfin smelt for our study were collected in channels from San Pablo to Suisun Bay from February to June of 2024 and 2025 during the day and night. The visual gut fullness estimates will provide a measure of feeding success that can then be related to fish growth rates (using otolith geochemistry analysis conducted by collaborators on this study). We will present on the development and validation steps required by the qPCR assay to *E. carolleeae* and preliminary results from qPCR-based estimates of longfin smelt consumption of *E. carolleeae*.

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POSTER 42

Assessing Longfin Smelt Age, Maturation, Fecundity and Life History within the San Francisco Estuary

Effective conservation strategies for endangered Longfin Smelt (Spirinchus thaleichthys) require robust population models informed by accurate estimates of life history parameters such as age-at-maturity, size-at-maturity, and size-specific fecundity. To fill this knowledge gap, our lab analyzed archived individuals collected from across the estuary over the past two decades. We developed non-destructive, image-based methods for evaluating gonad maturation and estimating total batch fecundity and applied these methods to assess ontogenetic, temporal, and spatial patterns in reproductive traits. Our findings reveal a female-skewed sex ratio (3:1), with a Gonadosomatic Index (GSI) increasing sharply in fish exceeding 65 mm fork length (FL), and up to 33% of total body mass comprised of gonads. Females with maturing or spawn-ready ovaries were 70–128 mm FL and contained 300–18,000 oocytes, with an average of 95 mm FL and ~5000 oocytes. LFS oocytes generally exhibited synchronous development, but the presence of ovaries with atrophied and developing oocytes provides evidence of multiple spawning events either within a given season or across multiple seasons in some individuals. Concurrently, we have reconstructed age and growth histories from otoliths using seasonally produced transparent and opaque bands (“annuli”), image analysis, and strontium isotope geochemistry (MC-LA-ICP-MS). To date, age and growth data from ~900 archived specimens have been generated, indicating individuals reaching 3 years of age are born in medium to high salinities. Integration of reproductive and otolith-derived data will enable the estimation of size- and age-at-maturity, contributing essential life history parameters for population models. Collectively, this research enhances our understanding of the life cycle dynamics of Longfin Smelt and informs conservation strategies aimed at reversing population decline in the SFE.

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POSTER 43

Golden Mussel Invasion: Where and When Should We Fight Back?

The introduction of Golden mussels (Limnoperna fortunei) into the Sacramento-San Joaquin Delta (Delta) presents a growing challenge for water operations infrastructure, monitoring equipment, and field operations. The Department of Water Resources (DWR) has a monitoring network to inform water management decisions and meet regulatory requirements within the interior Delta. Since the discovery of golden mussels in October 2024, DWR North Central Region Office (NCRO) has documented golden mussel occurrence and visual abundance on water quality, flow, and stage monitoring equipment and infrastructure. These observations can help assess potential impacts on data quality and help determine where to spend time and resources to ensure the collection of reliable data for real-time water operation decisions. This data also provides some insight into the spatial and temporal distribution of golden mussels across the Delta.

However, this documentation is limited and highlights the need for a standardized monitoring approach that would be more beneficial long term. Therefore, starting April 2026, to quantify the temporal and spatial patterns of golden mussel colonization in the Delta, DWR NCRO selected 18 water quality stations for deployment of 8-inch square artificial substrate plates. Plates were deployed alongside 15-minute continuous water quality monitoring stations. These plates will be removed and replaced quarterly for one-year, with final retrieval planned for April 2027. Following retrieval, golden mussel density will be quantified and compared among stations. By implementing a standardized monitoring framework and tracking density patterns at monitoring stations, this project seeks to identify emerging temporal and spatial patterns of colonization, improve understanding of potential long-term impacts to monitoring operations, support management decisions for Delta infrastructure, and provide data to improve our understanding of the aquatic ecosystem impacts.

PRESENTER

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POSTER 44

Make your mussels weaker: testing bio-fouling prevention for golden mussels on continuous monitoring equipment

The Bureau of Reclamation's Bay-Delta Flow and Water Quality Monitoring Network maintains continuous hydrodynamic and water quality monitoring across the Sacramento-San Joaquin Delta and Suisun Bay. Scientists and water managers rely on high-quality and accurate data for real-time operation of water export facilities, understanding Delta ecosystem responses to hydrological conditions, and evaluating restoration actions. The highly invasive golden mussel (*Limnoperna fortunei*) threatens the quality and consistency of the monitoring data, as it will rapidly colonize a vast variety of substrates, including monitoring instrumentation. Preliminary data indicates a high likelihood of negative impacts on water quality sensors and potential interference on hydrodynamic equipment. These issues are likely to become more pronounced and widespread; therefore, it is critical to establish a methodology for preventing mussels from interfering with the real-time network.

In this study we evaluate the effectiveness of a preventative bio-fouling treatment and nylon stockings at reducing mussel colonization to understand potential use for monitoring instruments. We deployed paired plastic and paired metal tags at multiple depths to evaluate the success of the biofouling prevention treatment and the nylon stocking barrier compared to control tags with no treatments added at four water quality monitoring locations where golden mussels have been found (TRN, HLT, VCU and PRI). One of each paired tag is cleaned off monthly to assess the frequency needed for treatment reapplication. Every month, we took photos prior to cleanings to gauge colonization.

The information gathered from this study will be used to optimize maintenance of the monitoring stations to ensure data quality remains unaffected by the golden mussel while minimizing control costs.

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POSTER 45

Lethality of Copper to the Invasive Golden Mussel (Limnoperna fortunei)

The freshwater golden mussel (Limnoperna fortunei) is an invasive aquatic bivalve, where their presence can result in costly economic and ecological damage. In October 2024, golden mussels were discovered in California's Sacramento-San Joaquin Delta, representing the first known occurrence of golden mussel in North America. As part of a larger statewide response to contain and suppress golden mussels in currently infested waters, a chemical treatment pilot study to evaluate the efficacy of chemical treatment in open and closed water systems was implemented. As part of this study, dose-mortality relationships for golden mussel were developed utilizing two ionic copper based molluscicides (e.g., EarthTec QZ and Cutrine Plus). Laboratory based lethal time-to-effect relationships (LT50, LT100) were established utilizing field collected adult golden mussel exposed to copper in site water. The results of this testing will be presented.

PRESENTER

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POSTER 46

Don’t Move a Mussel: The Invasive Mussel Infestation Prevention Program at California State Parks’ Division of Boating and Waterways

With the reverberating impacts from Zebra and Quagga Mussels (collectively Dreissenid mussels) in the Great Lakes region, their 2007 discovery in California raised fears of similar impacts to the state.

In 2012, California Assembly Bill 2443 established the Quagga and Zebra Mussel Infestation Prevention Program at California State Parks’ Division of Boating and Waterways. The 2024 discovery and alarming spread of Golden Mussels in the Sacramento-San Joaquin Delta amplified concerns, prompting the passage of Assembly Bill 1772 expanding the program to include all invasive mussels in 2026.

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POSTER 47

Detection of non-native Bosmina (Eubosmina) coregoni (Diplostraca: Bosminidae) in the San Francisco Estuary

The California Department of Fish and Wildlife (CDFW) has confirmed the first appearance of the Baltic Long-nosed Waterflea, *Bosmina (Eubosmina) coregoni*, a non-native aquatic species of cladoceran, in California. This species has recently been reported at multiple locations throughout the upper San Francisco Estuary. The Eurasian species was initially introduced to the United States in the 1960s and has since established populations in the Great Lakes and in Oregon and Washington. The species has been detected by CDFW's Zooplankton Study, Summer Townet Survey, and 20-mm Survey in meso-zooplankton samples collected with the Clarke-Bumpus net at least as early as April 2024. The species was collected in fresh and brackish water from the eastern Delta into Suisun Bay, including the lower Sacramento River. We will map detection locations and describe diagnostic traits that distinguish *B. (E.) coregoni* from other bosminids (e.g. *B. longirostris*) found in the estuary. CDFW will examine archived samples to determine the earliest detection within the estuary and will continue to monitor catch going forward to track abundance, distribution, and potential impacts of *B. (E.) coregoni* on the current zooplankton community and food web.

PRESENTER

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POSTER 48

Quick-Start Guide for Managing Invasive Aquatic Vegetation in Tidal Wetland Habitats in the Sacramento-San Joaquin Delta and Suisun Marsh

Although wetlands cover a relatively small portion of the global land surface, many of the most harmful weeds are invaders of wetland habitats. This is true of wetlands in the Sacramento-San Joaquin Delta and Suisun Marsh. Invasive aquatic vegetation (IAV) is a particular concern for managers of Delta tidal wetland habitat, especially on restoration sites. As tidal wetland restoration continues across the landscape, new and existing sites experience invasion pressure following tidal reconnection. There is no singular lead entity for managing invasive species in the Delta and Suisun Marsh, so interagency coordination is critical to address this ecosystem stressor and improve resilience. To serve this need, the Delta Interagency Invasive Species Coordination (DIISC) Team was established in 2013 to provide a forum for collaboration on research and management needs related to invasive species. Through collaborative conversation, land managers and restoration practitioners identified a need for guidance on managing IAV. In response, DIISC Team members developed the "Quick-Start Guide for Managing Invasive Aquatic Vegetation in Tidal Wetland Habitats in the Sacramento-San Joaquin Delta and Suisun Marsh" (Guide). The Guide gives land managers an introduction to managing (IAV) in tidal wetland habitats. It summarizes information and refers readers to more detailed sources across the sequence of IAV management, including planning, prioritizing species, control, monitoring, regulations, and budget considerations. Released in December 2025, the Guide is available at https://deltaconservancy.ca.gov/iav-quick-start-guide/.

For more information, see - https://sciencetracker.deltacouncil.ca.gov/node/54671

PRESENTER

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POSTER 49

McCormack-Williamson Tract: adapting a habitat restoration and flood control project

McCormack-Williamson Tract (MWT) is a 1600-acre parcel located in the Sacramento-San Joaquin Delta within the Cosumnes River Preserve along the Mokelumne River. Key features of the McCormack-Williamson Tract Levee Modification and Habitat Restoration Project (Project) were completed in 2025, meeting long-standing, multi-benefit restoration, and flood control objectives outlined in California Department of Water Resources' North Delta Flood Control and Ecosystem Restoration Program. The Project was implemented in two phases, each complicated by unanticipated flooding that required adaption of the restoration strategy.

During Phase A planning, a portion of the Mokelumne River levee failed, compromising infrastructure on the tract and threatening surrounding communities. MWT was dewatered to protect these resources, and the restoration strategy was reevaluated. When completed, Phase A included an interior levee to protect tract infrastructure and landside levee reslope in anticipation of restored hydrologic connectivity. During preparation for Phase B, MWT unexpectedly flooded again, necessitating additional design and permitting revisions. Planned interior channel excavation was now infeasible and extensive in-water work was required to complete the Project. Ultimately, two weirs were created and a substantial portion of the southern levee was removed, providing valuable flood protection for surrounding communities and permanently restoring tidal and floodplain hydrology to MWT.

Tidal marsh continues to naturally establish on the tract, and additional riparian plants have been installed along floodplain margins and in higher elevation areas to diversity habitat. Completion of the MWT Project demonstrates successful adaptive strategy and restoration design within an inherently dynamic floodplain and tidal marsh system.

PRESENTER

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POSTER 50

Strategies for Overcoming Climate Adaptation Barriers in the Sacramento-San Joaquin Delta

Implementing transformative climate adaptation can be a long process, one that takes up more time than society can afford. Governance barriers are a leading cause of this slowdown, creating what is known as the adaptation implementation gap. Adaptation practitioners - the community leaders, planners, managers, and policymakers supporting adaptation - use a wide range of strategies to overcome these barriers.

To explore what this looks like in the Sacramento-San Joaquin Delta, semi-structured interviews were conducted in 2024 with practitioners from 38 different governmental and non-governmental organizations that work in and around the Delta to understand adaptation governance in the region. The data from this qualitative case study were used to create a database of strategies, coded by strategy type (financial, institutional, social, information, and cognitive), stage (applied, desired, improving, scaling), and specificity (general or specific).

This research will aim to determine how practitioners' strategies for overcoming adaptation barriers differ by organization type (higher-level government, local government, NGOs, tribal), and what gaps exist between implemented strategies and strategies practitioners most desire to implement. Results showed that institutional and social strategies were the most prevalent amongst all organization types. Relationship-building was the most applied strategy across organization types, and using diverse funding approaches was the most desired strategy.

All organization types tended to have more specific strategies than general ones, except for NGOs. Ultimately, the findings of this research offer valuable guidance for adaptation practitioners seeking to advance adaptation progress in the Delta by highlighting where governance barriers and implementation gaps exist, and how they can be addressed.

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POSTER 51

The Beneficial Baylands Tool: decision-support for nature-based shoreline adaptation in San Francisco Bay

Beginning in 2024, San Francisco Bay local governments are required by California law to develop sea level rise adaptation plans for 2050 and 2100. To support the health of bay shoreline ecosystems, these plans are required to protect, restore, and enhance bayland habitats and prioritize nature-based solutions. A growing focus on nature-based solutions calls for sound information on where measures are suitable and which benefits they are likely to deliver. Many relevant datasets and guidance documents exist, yet they are not well centralized and are difficult to apply at the relevant planning scale. To address this challenge, the Beneficial Baylands project is developing a new decision support tool for nature-based shoreline adaptation that builds on years of investment in regional adaptation science and integrates information across multiple systems, information types, and management priorities. Based on input from a workgroup of end users and interested parties, this tool will guide users through a step-by-step process to identify and compare nature-based adaptation scenarios for their site. Scenarios will be informed by spatially explicit analyses of new and existing data on site suitability and potential benefits, including wave attenuation, wildlife support, and carbon sequestration. This presentation will introduce the tool's key functions and guiding analyses, and will share lessons learned from a collaborative process to define and address local and regional decision support needs for nature-based adaptation.

PRESENTER

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POSTER 52

Enhancing Community and Wildlife Resilience to Sea-Level Rise and Infrastructure Development in the San Pablo Baylands

Tidal wetlands serve as critical nature-based solutions that enhance community resilience to sea-level rise (SLR) by providing water storage, flood protection, erosion control, carbon storage, recreation opportunities, and habitat for fish and wildlife. More than 80% of historical tidal wetlands in the San Francisco Bay (SFB) estuary have been lost, and continued SLR is expected to inundate remaining ecosystems and critical infrastructure. In the North SFB, the San Pablo Baylands contain the largest remaining tidal marsh complex, supported by over $600 million in restoration investments. This region also includes major transportation corridor upgrades and levee and flood protection projects to ensure the economic vitality of the region while serving under-represented and severely disadvantaged communities. Rising sea levels, persistent drought, intensifying winter storms, expanding infrastructure, and other stressors threaten the long-term effectiveness of tidal marsh restoration and the ecosystem services these wetlands provide. Yet, the combined and interactive effects of these stressors on tidal marsh resilience remain poorly understood. Local stakeholders have highlighted key data gaps related to SLR vulnerability of wildlife habitat, infrastructure, and public access. To address these gaps, we are integrating community engagement through workshops with data-driven modeling to develop decision-support tools that help resource managers evaluate trade-offs and co-benefits across wildlife habitat, flood protection, carbon storage, and public access under different management, infrastructure, and SLR scenarios. Here, we present preliminary results from synthesizing nearly two decades of spatially-explicit data on marsh elevation, accretion, water quality, vegetation, and the abundance and distribution of waterbirds. This integrated approach provides a foundation for assessing habitat protection options and improving resilience to SLR in the SFB.

PRESENTER

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Laureen Barthman-Thompson, California Department of Fish and Wildlife

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POSTER 53

Decision-Making Under Deep Uncertainty: What Is It and How Is It Useful?

Uncertainty about future environmental, social, and economic conditions significantly influences decision-making and how well decisions remain effective over time. When decisions are made without sufficient insight into how changing factors will affect systems, they can lead to unpreparedness and increased vulnerability to disruption. While scientific tools, such as simulation models, can help reduce some uncertainty by improving the accuracy and resolution of predictions, other uncertainties remain deeply unpredictable. Events such as global pandemics, fish population collapses, or invasive species outbreaks often occur without reliable warning, even with advanced research. These challenges represent Deep Uncertainty, conditions that cannot be well defined using current data, models, or scientific understanding.

Under Deep Uncertainty, there is often little consensus about system behaviors or the likelihood, timing, and interaction of disruptive events. These uncertainties, especially those that are extreme, novel, or compounding, are critical to Bay-Delta management. To strengthen the ability to anticipate and adapt to these conditions, the Delta Independent Science Board (Delta ISB) launched a review in spring 2023 on Decision-Making Under Deep Uncertainty (DMDU). This effort explores tools and strategies that could help better characterize uncertainty and improve decision-making across the Bay-Delta system. This poster will share insights from the Delta ISB's review by explaining what is DMDU, its benefits, and how scenarios are being used in the Delta region to prepare for change.

PRESENTER

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POSTER 54

Evaluating Input Data Effects on Agent-Based Land-Use Land-Cover Model Performance in California's Central Valley

California's Central Valley faces pressure from climate variability, water scarcity, and competing demands across agricultural, ecological, and community systems. Agent-based models (ABMs) can support land-use/land-cover (LULC), and water planning by representing how land managers respond to changing hydrologic, economic, and environmental conditions. However, their value as decision-support tools depends on input datasets used to define agricultural parcels, crop patterns, and behavioral parameters, including "give-up" and "give-in" tendencies that represent abandonment and colonization dynamics. This study evaluated how input data choices affected the performance of a Competition for Resources between Agent Functional Types (CRAFTY) model developed for simulating LULC dynamics across California's Central Valley. USDA-derived cropland boundaries were compared with Land IQ cropland boundaries to assess spatial representation and parcel agreement. Results showed asymmetric differences between the datasets, with USDA data covering 70% of Land IQ-defined cropland, and Land IQ covering 43% of USDA-defined cropland. On average, each Land IQ parcel overlapped with approximately three USDA parcels. These differences provided a basis for evaluating how parcel representation propagated through model inputs, calibration, output validation, and final interpretation. Calibration comparisons varied by region and behavior. For give-up behavior, linear regressions comparing USDA and Land IQ estimates produced R^2 values of 0.69, 0.71, and 0.89 for the Sacramento, San Joaquin, and Bay-Delta regions, respectively. For give-in behavior, they were 0.64, 0.70, and 0.83. Model outputs were evaluated across year-pair simulations from 2018 to 2022 to examine effects on prediction accuracy and transferability. The study provided a structured way to diagnose how inconsistent input data shape ABM performance and support the implementation of ABMs in Central Valley water and LULC planning.

PRESENTER

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POSTER 55

Final Design for a Multi-Benefit Wetland Mosaic Restoration on Webb Tract

Funded by a grant from the Sacramento-San Joaquin Delta Conservancy, the Metropolitan Water District of Southern California is advancing a wetland restoration project on Webb Tract in Contra Costa County. The project will restore a large-scale, multi-benefit wetland mosaic on a deeply subsided Delta island as a nature-based solution to reduce peat oxidation and reverse subsidence, promote carbon sequestration, support sustainable long-term land management, and provide high-quality habitat for wildlife. Designed, permitted, and brought to bid on an accelerated timeline of approximately two years, the project required the design team to address substantial site and implementation constraints, including ferry- or barge-only access and a modest grant-funded budget relative to the scale of the project.

These conditions required strategic design decisions to align scope, cost, and constructability, and shaped the cost-conscious, site-responsive solutions reflected in the final restoration design presented in this poster. The poster highlights the final restoration layout, key design elements, and the engineering and ecological considerations used to balance habitat, carbon sequestration and subsidence reversal benefits, constructability, and long-term site management. The project also offers a case study in advancing cost-effective large-scale Delta wetland restoration through strategic design under accelerated delivery and budget-limited conditions, with lessons applicable to other multi-benefit wetland projects facing logistical, regulatory, and funding constraints. With permitting and CEQA review completed through California's Cutting Green Tape initiative and responsive bids received, the project is pending contract award, with construction anticipated to begin in 2026.

PRESENTER

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Stephen Oldemeyer, GEI Consultants

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POSTER 56

Advancing Climate Resilience in DWR's Multibenefit Habitat Restoration Projects: Case Studies for Nature-Based Solutions

The Department of Water Resources (DWR) is advancing California's climate resilience by implementing nature-based habitat restoration projects in and around the San Francisco Bay and Sacramento-San Joaquin Delta.

The poster will highlight the successes of DWRs efforts since 2015 to accelerate habitat restoration projects in the San Francisco Bay-Delta region, implementing a comprehensive suite of habitat restoration actions to support the long-term health of the Delta and its native fish and wildlife species. DWR has completed or has projects underway to restore 33,400 acres, including 13,000 acres of tidal and freshwater wetlands, 16,000 acres of floodplain, and 1,100 acres of riparian habitat, with another 4,000 acres in planning stages to be completed by 2030.

These restoration efforts build resilience to climate change by factoring in sea level rise, reducing flood risk, maximizing carbon sequestration, improving hydrologic connectivity, and incorporating adaptive management strategies. The poster will highlight four projects in various stages of implementation to showcase case study examples of nature-based solution projects.

Projects include McCormack Williams Tract Project, the Dutch Slough Tidal Habitat Restoration Project (Phase 1), the Lookout Slough Multibenefit Project, and the Lower Elkhorn Slough Levee Setback Project. These case studies share strategies for scaling climate resilience and ecological restoration across the Bay-Delta region.

PRESENTER

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POSTER 57

Investigation of Floating Peat Wetlands in the Subsided Sacramento-San Joaquin Delta

Tidal wetland restoration on subsided Delta islands is limited by elevation, where tidal reconnection would lead to waters too deep for vegetative root establishment. This limitation is an integral setback to achieving the Delta co-equal goals. Floating peat wetlands offer an innovative nature-based solution for tidal habitat creation. Pilot mesocosm experimental results on Bouldin Island published in 2024 demonstrated the potential benefits of floating peat wetlands: food-web and fish habitat improvements, continuous flotation, vertical and horizontal expansion, carbon sequestration, and water quality improvement. These findings led to undertaking larger-scale open-water experiments. Floating peat blocks were placed in West Pond in March 2024 and smaller Delta Smelt ponds in November 2025 on Bouldin Island. The objectives of the ongoing pond studies are to test long-term flotation and ecosystem benefits of floating peat in open water.

Peat blocks were successfully excavated from Twitchell Island wetlands and floated in the new habitats, producing emergent vegetation (primarily *Schoenoplectus* sp). Floating peats supported greater zooplankton abundance and diversity in the pelagic space between the benthos and the peat mat than in control open waters, indicating food-web benefits for fish species of concern. Floating peats reduced water temperature compared to control open waters, and underwater root complexity and fish were observed, demonstrating fish habitat improvements. Preliminary carbon dioxide and methane flux measurements indicated that the floating wetlands may be strong net carbon sinks. Water quality and wetland biomass data provided further evidence of the GHG benefit of floating peats on subsiding peat soils. Future experimentation will include implementation in tidal areas and addressing questions about aquatic vegetation control, food-web benefits, flotation, and sources of wetland peat blocks.

PRESENTER

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Russell Ryan, Metropolitan Water District

POSTER 58

Are suspended-sediment concentration and marsh flooding reliable predictors of marsh accretion?

Marshes provide critical habitat for wildlife, act as coastal buffers from storm surge, and can trap carbon and pollutants. Sufficient mineral sediment supply is essential for the accretion necessary for successful restoration efforts and to prevent existing marshes from drowning. Mineral sediment accretion is often assumed to depend on the suspended sediment concentration (SSC) in adjacent waters along with flooding duration. However, there's no consensus on the most representative location to measure SSC, nor how the relationship to accretion might change between marshes in different locations with different edge types, wave exposure, and vegetation properties. This work investigates the relationship between SSC and marsh deposition at a range of elevations at two distinctly different marshes in northern San Francisco Bay. The study sites were: Muzzi marsh, which fronts Corte Madera Bay and has a scarped edge roughly 0.75 m high, and San Pablo National Wildlife Refuge western strip marsh, which has a graded edge along San Pablo Bay. From April 2022 through July 2023, we measured monthly deposition with transects of sediment traps extending from the bay edge towards the marsh interior. We deployed instrumentation to measure waves, tidal currents, SSC, and other hydrographic data at three different elevations per site: the marsh-adjacent subtidal shallows, adjacent intertidal, and over the marsh. Results indicate SSC alone was not a reliable predictor of deposition. The interaction between intertidal SSC and marsh flooding duration was the best predictor of deposition. However, the predictive relationship differed between the two sites: both sites experienced similar levels of deposition despite consistently higher SSC at San Pablo. This study also captured the effects of the wet 2022/2023 winter on deposition and SSC. Study results can improve restoration planning and help managers assess the fate of marsh survival and resiliency in the face of sea-level rise.

PRESENTER

Samantha McGill, US Geological Survey

POSTER 59

Delta Regional Conservation Investment Strategy

California Department of Fish and Wildlife's (CDFW) Regional Conservation Investment Strategy (RCIS) Program provides an excellent opportunity to blend existing regional conservation priorities and strategies to inform conservation investments, advance mitigation, and infrastructure planning in the Sacramento-San Joaquin River Delta (Delta) and Suisun Marsh. The California Department of Water Resources (DWR) is developing an RCIS in the Delta to mitigate a variety of impacts to threatened, endangered, and other special-status species and to comply with California Water Code Section 12310-12318, which requires mitigation for flood control projects on freshwater marsh, shaded riverine aquatic, riparian forest, and riparian scrub-shrub habitats.

DWR has a vital role in Delta conservation and water infrastructure. DWR plans to lead the development of an RCIS as it provides an excellent opportunity to synthesize existing regional conservation planning to inform conservation investments, advance mitigation, and infrastructure planning. As a public agency, DWR is able to develop an RCIS to guide voluntary priority conservation actions and habitat enhancement actions for focal species, natural communities, and other conservation elements such as working lands (i.e., lands that are being used for agriculture or other uses while still providing conservation value), habitat connectivity, and carbon sequestration.

PRESENTER

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POSTER 60

SFEI Automated Mapping of Upland and Tidal Wetlands: Wetland Monitoring and Change Detection

Mapping wetlands is essential for their protection, management, and preservation of ecosystem function. Historically a manual process, mapping methods are being transformed by technological advances. The San Francisco Estuary Institute (SFEI) is pioneering innovative automated approaches to replace inconsistent, manual mapping with consistent, repeatable geospatial methods. SFEI has developed advanced automated workflows to map both tidal and upland wetlands leveraging object-based image analysis, custom algorithms, machine learning, and tidal elevation data. SFEI's recent wetlands datasets, the Russian River Aquatic Resource Inventory and the SF Baylands Habitat Map, have resulted in high-accuracy, high-resolution mapping products that enable defensible change detection analysis and support wetland monitoring programs. These datasets contribute to a clear, up-to-date picture of California's wetlands, as they are integrated into statewide and federal datasets. Rule-based algorithms tend to work better than trained machine learning models to classify wetlands. Proper conditioning of elevation data contributes to better classification, as well as ample time and budget dedicated to post-processing workflows. Ultimately, SFEI's broad-scale, cost-effective, and scientifically defensible mapping approaches will enhance the monitoring, management, and protection of sensitive wetland habitats that safeguard communities, improve water quality, store carbon, and support biodiversity.

PRESENTER

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POSTER 61

Assessing Atmospheric and Hydrologic Carbon Fluxes in a Recently Restored Freshwater Tidal Marsh

Objective:

There is increasing interest in tidal wetlands as a nature-based solution for atmospheric carbon sequestration. However, a large gap can exist between atmospheric carbon uptake and soil carbon storage in tidal wetlands. Prior research suggests that a substantial fraction of atmospherically removed carbon can be exported hydrologically and may be released back to the atmosphere, consumed by plankton, or sequestered in the coastal ocean. The objective of this study is to evaluate the magnitude and fate of hydrologic carbon export, with an emphasis on dissolved organic carbon (DOC), in Gilbert Tract, a recently restored freshwater tidal marsh in the western Delta near Oakley, California, where tidal action was restored in 2021 after agricultural land use. This work helps determine whether the restored wetland is functioning as a net carbon source or sink.

Approach:

To quantify atmospheric carbon exchange, we use eddy covariance measurements to provide high-frequency, continuous measurements of vertical carbon dioxide and methane exchange. These vertical flux measurements are combined with in-situ, high-frequency hydrologic water-quality sensors that provide proxy measurements of carbon entering and leaving Gilbert Tract through tidal exchange. By integrating vertical atmospheric fluxes with lateral aquatic fluxes, this approach evaluates how restored Delta marshes redistribute carbon among atmospheric, aquatic, and soil pools.

Results:

We hypothesize that Gilbert Tract will exhibit high DOC export because of high plant productivity, and that methane emissions will also be elevated because of anaerobic conditions and low sulfate availability. However, we expect atmospheric carbon dioxide uptake to offset these losses, making Gilbert Tract a net carbon sink overall. Results will improve predictive modeling of wetland carbon budgets, restoration design, adaptive management, and land-use decisions in the San Francisco-San Joaquin Delta.

See the Delta Science Tracker for more information: https://sciencetracker.deltacouncil.ca.gov/node/53536

PRESENTER

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POSTER 62

Diel/Tidal Control on CH4 Flux from Dutch Slough

CH4 emissions from freshwater wetlands represent a key drawback to this type of ecosystem's otherwise powerful ability to mitigate climate change through high productivity and accretion of peat. Freshwater tidal systems are understudied, and offer new insights into the effects of water table fluctuation on greenhouse gas fluxes.

This study examines the dynamics of atmospheric CH4 fluxes from a tidally-influenced freshwater wetland named Dutch Slough, and identifies times within the diel and tidal cycles which produce anomalously high or low fluxes of CH4.

Our team measured quasi-continuous fluxes of CO2, CH4, and H2O using the eddy covariance method, and also measured fluxes of CO2, CH4, and N2O during midday low and high tide conditions using manual floating chambers. Data were analyzed to find the times and tidal conditions which resulted in especially high and low CH4 fluxes.

We found strong evidence that CH4 emissions are negatively correlated with water level at this site. Water levels below the mean during daylight hours produced roughly two-thirds of the system's total CH4 flux, offsetting between 30% and 65% of the system's otherwise strong sink of CO2 depending on the year observed. Nighttime low tides resulted in substantially less CH4 flux.

The tidal and diel cycles together have a stronger effect on CH4 flux than either alone. Low water levels during daylight hours produce consistent CH4 flux at this site, while high water tables produce less CH4 flux at all times.

PRESENTER

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CO-AUTHORS

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POSTER 63

Equity in NbS Carbon Credit Projects Through Practitioner Perspectives

Nature-based solutions (NbS) implemented as carbon credit projects sit at the intersection of climate science, market design, and local ecosystem impact—a case of system-wide outcomes shaped by ecological, social, economic, and institutional forces altogether. Credit integrity has been widely discussed, which should matter both biophysically and socially. However, the social dimensions have remained secondary, with mixed outcomes regarding equity. Practitioners drive project design and implementation directly.

Therefore, in a market that lacks consistency, understanding their diverse perceptions and practices is a critical step for navigating across ecological, social, and economic goals and tradeoffs. Such knowledge can, in turn, inform just project practice and equitable project outcomes. Through expert interviews, focus groups, and surveys, this ongoing multi-phase study synthesizes practitioner reasoning and documents shifts in perspective, revealing what outcomes practitioners prioritize and how to enhance project social impacts with a systems thinking lens. The study includes carbon project development in the Delta as a case study, examining how its distinctive social-ecological and policy landscape shapes outcomes and reveals cross-scale interdependencies.

Preliminary results surface systemic complexities: regulations can enable or constrain equity-oriented practice; social outcomes are often deprioritized relative to ecological and financial metrics; accountability is diffuse and contested; sustained climate finance is essential to maintaining equity commitments; and standardization carries fraught implications for context-specific justice. By centering practitioner perspectives and decision-making within a volatile and rapidly evolving market, this study bridges science, practice, and policy, offering insights into the accountability and cross-sectoral coordination needed to sustain both ecological integrity and community wellbeing. This poster will have a stronger focus on the Delta case study.

PRESENTER

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Alison Hoyt, Stanford University

POSTER 64

Designing functional flow regimes to benefit salmon in the Lower Sacramento River Basin

Multiple runs of chinook salmon spawn and rear along the highly engineered Sacramento River Valley where habitat characteristics (e.g., flows, temperature, floodplain access) are defined by infrastructure operations. As such, reservoirs, which block access to historical spawning habitat, have become an important lever for sustaining declining salmon populations. However, requirements for individual salmon runs, such as flows for fall-run versus temperature management for winter-run, sometimes create conflicting reservoir operation strategies that result in prioritizing one species over another. This research seeks to reconcile species-specific flow operations in the mainstem Sacramento River with holistic environmental flows developed using a Functional Flows Approach (see the California Environmental Flows Framework) and translate life-stage-specific flow needs into a salmon-centered environmental flow regime for the mainstem Sacramento River.

The proposed flow regimes combine functional flow principles with life-stage-specific flow objectives for varying salmon runs in the Lower Sacramento River. Flow components include a fall attraction pulse, wet season baseflows, wet season pulse flows that activate Yolo and Sutter bypass floodplains, and spring recession flows designed to support juvenile rearing and outmigration. The magnitude, timing, duration, and frequency of these flow components vary across hydrologic conditions using water year percentiles to account for interannual variability. The resulting hydrographs illustrate how environmental flow regimes can be tailored to ecosystem objectives while remaining compatible with operational constraints.

This poster is intended to elicit feedback from practitioners and experts on balancing flow variability, floodplain access, temperature management, and available flow science across salmon runs in the Central Valley to inform future flow design.

PRESENTER

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Ann-Marie Osterback, Fisheries Collaborative Program, University of California, Santa Cruz

POSTER 65

Antecedent Hydrology Determines Central Valley Steelhead Salvage at Export Facilities in the Sacramento-San Joaquin Delta

The species *Oncorhynchus mykiss* exhibits remarkable life-history plasticity, characterized by the expression of either residency (rainbow trout) or anadromy (steelhead). In California's Central Valley, federally threatened steelhead must navigate a highly modified migratory corridor where they face entrainment risk at large-scale water export facilities. Current management triggers designed to mitigate entrainment mortality often lack population-level context, and existing predictive models for other salmonids rely primarily on contemporary hydrologic metrics. Given that steelhead typically rear in freshwater for one to three years prior to emigration, we hypothesize that antecedent hydrologic conditions, rather than contemporary operations, are the primary drivers of outmigration magnitude and subsequent entrainment risk. We analyzed historical salvage data from 1994 to 2025 using Least Absolute Shrinkage and Selection Operator and mixed-effects negative binomial regression incorporating both contemporary and antecedent hydrologic variables. Our results indicate that San Joaquin River hydrology from the year prior to observed salvage is the dominant biological driver of entrainment. Notably, the highest salvage events were associated with an interaction between hydrology from one and two years prior, particularly when these periods exhibited starkly contrasting water-year types. These findings suggest that *O. mykiss* salvage is predictable based on antecedent conditions. By leveraging these drivers, water managers can shift from reactive operational shifts to proactive, forecast-based mitigation strategies that better account for the tributary-level processes governing steelhead outmigration.

PRESENTER

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POSTER 66

Projecting water temperatures in the San Joaquin River with a forecast-driven mechanistic model

FLUVIAL-EB (Fluvial Energy Balance; Bray et al., 2017) is a mechanistic model that predicts the longitudinal water temperature distribution along the 150-km reach of the San Joaquin River from Friant Dam to its confluence with the Merced River. The published model was calibrated and validated using meteorological forcing data from seven monitoring stations from the California Irrigation Management Information System (CIMIS), a network of meteorological monitoring stations throughout California.

Here we present a revised model forced with NOAA's High-Resolution Rapid Refresh (HRRR) dataset as meteorological data. Updated hourly, HRRR provides spatially downscaled meteorological data and 18-hour forecasts on a 3-km grid. We revised the model to incorporate HRRR data and forecasts as meteorological forcings, and to run a 7-day long spin-up period followed by an 18-hour forecast. The revised model thus produces an 18-hour forecast of water temperatures given current (i.e., update in the last hour) meteorological conditions and river observations.

Ongoing work on this model will focus on using recently observed Friant Dam temperatures as the upstream boundary condition and expanding its geographic scope to rivers outside of the San Joaquin. The work presented here, along with ongoing efforts, moves the model from a research application towards a decision support tool that can be used to inform future reservoir operations.

PRESENTER

Mark Hausner, Desert Research Institute

CO-AUTHORS

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POSTER 67

Impacts of Freshwater Flow on the San Francisco Bay Plume and Juvenile Salmon Early Ocean Residency: a new Ecosystem Modeling Framework

Coastal ecosystems evolved over millennia experiencing the full natural flow of fresh water, nutrient, and sediment inputs from river systems along the North American West Coast. Today, large-scale water diversions have reduced these inputs to a fraction of their full unimpaired flows. While the impacts of reduced flows on freshwater river and estuary dependent species have been well documented, there is less information about how this missing freshwater outflow directly impacts coastal marine ecosystems, including the fisheries that depend on them.

San Francisco Bay is the U.S. west coast's largest estuary, but only recently have the extent and variability of the San Francisco Bay Plume (SFBP) been characterized. In this project, we examine the relationship between the SFBP and the biological productivity in the Gulf of the Farallones and surrounding waters by characterizing plume impacts on fisheries species such as Chinook Salmon. As the SFBP includes a mixture of freshwater river outflow and seawater taken into the bay during tidal cycling, including river outflow alone is insufficient to fully characterize plume impacts.

We are developing a new ecosystem modeling framework with an explicit representation of the SFBP, by linking two existing methods: a model that characterizes the extent and variability of the plume from space using satellite imagery and an individual-based model (IBM) for juvenile salmon representing growth, survival, and predator-prey dynamics in the coastal waters.

By using the satellite products to parameterize the extent of the plume in the IBM, we can incorporate the impacts of the SFBP on juvenile salmon during their first few months at sea, providing a direct connection between freshwater outflow and coastal ecosystem productivity.

PRESENTER

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Devon Pearse, Friends of the River

Brian Wells, NOAA

POSTER 68

Proposed South Delta Gates Project— Managing water levels and enhancing water quality and fishery health in the South Delta

The Department of Water Resources (DWR) is exploring the construction of South Delta Gates (SDG) Project. The project would install permanent, operable gates at three locations in the South Delta and implement an action congressionally authorized as part of the CALFED Bay-Delta Program, a state and federal effort established more than 20 years ago to improve water management and environmental conditions in the Bay-Delta.

Currently, temporary rock barriers are installed and removed each year to help manage water levels in the South Delta. The proposed SDG Project would replace these temporary barriers with permanent, operable gates designed to provide more effective and flexible water level management. These gates would improve water supply reliability, water quality, and greatly improve fish passage while reducing environmental impacts, including greenhouse gas emissions associated with the annual installation and removal of temporary barriers.

A proposed Gate Operations Framework is being developed through advanced modeling techniques that include operational triggers for the opening and closing of each of the South Delta gates. The proposed Framework will estimate and balance project benefits.

PRESENTER

Jacob McQuirk, CA Department of Water Resources

POSTER 69

Velocity and Bubble-Field Mapping Around the Georgiana Slough Salmonid Migratory Barrier with ADCP and sUAS-Based Image-Velocimetry, 2023–2025

The Georgiana Slough Salmonid Migratory Barrier (GSSMB) is designed to be a “non-physical” barrier to reduce the entrainment rate of out-migrating juvenile salmonids into Georgiana Slough where their survival rate is much lower. The barrier consists of subsurface frames with sound projectors, flashing lights, and orifice lines that create a bubble curtain. This combination of deterrents is intended to discourage salmonids from traveling into Georgiana Slough.

Traditional boat-mounted Acoustic Doppler Current Profiler (ADCP) mapping was performed across a range of flow conditions, but spatial resolution is limited to single transect locations. In addition, air (produced by the GSSMB) severely hinders the efficacy of acoustic-based equipment to measure velocity. To better understand velocity patterns and the influence of the bubble curtain on the flow field, we employed a small Uncrewed Aircraft System (sUAS) outfitted with the River Observing System (RiOS) payload developed in collaboration with the National Aeronautics and Space Administration (NASA).

The combination of boat-based and aerial mapping provides distinct, yet complementary measurements of velocity and bubble fields near the GSSMB. Observations were made over a range of varying flow conditions and GSSMB configurations (bubbles on and off) and these data will yield novel insight into both the near-barrier and reach-scale velocity fields.

PRESENTER

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POSTER 70

Assessing juvenile Chinook salmon routing and survival for the Georgiana Slough Salmonid Migratory Barrier

The Georgiana Slough Salmonid Migratory Barrier (GSSMB) is a 640-foot-long bio-acoustic fish fence (BAFF) that uses complementary lights, sounds, and a bubble curtain to deter out-migrating juvenile Chinook salmon away from the entrance of Georgiana Slough to remain in the mainstem Sacramento River as they make their way to the ocean. If routed into Georgiana Slough, fish enter the complex and highly altered interior Delta, which can lead to increased travel time and decreased through-Delta survival because of exposure to sub-optimal habitat, predators, and water diversions. Beginning in 2023, the California Department of Water Resources began the annual deployment and operation of the GSSMB from November to May.

Additionally, using acoustic telemetry, a seasonal routing and survival study has been implemented to evaluate the effectiveness of the GSSMB on guiding out-migrating juvenile Chinook salmon. During two weeks in December, January, and February, approximately 240 late fall-run yearling Chinook salmon were implanted with JSATS ss400 acoustic tags and released each week (approximately 1,440 total fish released). Fish were tagged and allowed to recover for a minimum of 24 hours before groups of 10 fish were released every 3 hours over a 72-hour period near downtown Sacramento. In April, the same procedure was followed for two more weeks for young-of-year fall-run Chinook salmon (approximately 480 total fish). A series of acoustic receivers deployed along the Sacramento River and at the entrance and exit of Georgiana Slough provide information on fish travel times, routing, and an estimate of survival through the presence/absence of JSATS tag detections. Here we will present preliminary results on the efficiency of the GSSMB from the 2026 water-year study.

PRESENTER

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Steven Brumbaugh, California Department of Water Resources

POSTER 71

Operations of the Georgiana Slough Salmonid Migratory Barrier

As part of the Incidental Take Permit (ITP) governing continued operation of the State Water Project, the California Department of Water Resources (DWR), in coordination with the California Department of Fish and Wildlife (CDFW), operates a Bio-Acoustic Fish Fence (BAFF) at the confluence of the Sacramento River and Georgiana Slough. The barrier is designed to minimize entrainment of emigrating juvenile winter-run and spring-run Chinook salmon into the interior Delta, a complex network of channels and sloughs where fish face elevated predation and a greater chance of becoming lost. By deterring salmon from entering Georgiana Slough, the BAFF helps guide them toward the more direct Sacramento River route to San Pablo Bay and the ocean.

The BAFF functions as a behavioral deterrent rather than a physical blockage. High-intensity LED lights are synchronized with a Sound Projector Array (SPA) and combined with a bubble curtain to produce an acoustic field, an effect often described as an “Illuminated Wall of Sound.” Fish encountering this field respond by moving away from Georgiana Slough thus remaining in Sacramento River.

The barrier is installed and operated seasonally consistently with the primary salmon emigration window of October 1 through June 1. Operations run continuously from November 15 through May 31, with the BAFF frames removed each June for off-season maintenance and testing. BAFF operations began in fall 2023 and will continue seasonally through June 2034. This poster summarizes the design, technology, and seasonal operation of the Georgiana Slough BAFF as a salmonid migratory management measure in the Sacramento–San Joaquin Delta.

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POSTER 72

Trends in Temperature & Salinity: What We've Learned from Long-term Monitoring in San Francisco Bay, CA

Over the last several decades, California has experienced periods of severe dry and drought conditions. The associated increases in temperatures and reductions in freshwater availability have impacts for the water quality and ecological health of the San Francisco Bay and Sacramento-San Joaquin Delta (Bay-Delta) estuary. Since the 1990s, the U.S. Geological Survey has maintained a network of high-frequency, continuous water-quality monitoring stations established throughout San Francisco Bay.

Seven fixed stations, including five with sensors at two elevations, record measurements of temperature and specific conductance every 15 minutes. To quantify the impacts of drought within San Francisco Bay, we leveraged this long-term dataset to analyze trends in temperature and salinity, with salinity derived from specific conductance. Annual maximum and mean values for each parameter were compared over time. Trends were evaluated at individual site locations to account for the differences in hydrological characteristics between the northern, central, and southern subembayments. Additionally, parameters were analyzed in relation to mean Sacramento-San Joaquin Delta outflow, the most significant freshwater input into the system. Preliminary results revealed record-high measurements of temperature and specific conductance during the drought periods of 2014-2016 and 2020-2022.

This analysis provides insights into the spatiotemporal patterns of temperature and salinity within the San Francisco Bay. Understanding thermal and salinity regimens is critical for water and species management, as these parameters play a role in estuarine physical, biological, and chemical processes.

PRESENTER

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POSTER 73

Long-Term Water Quality Monitoring Across the San Francisco Estuary: Insights from the San Francisco Bay National Estuarine Research Reserve

The San Francisco Bay National Estuarine Research Reserve (SFBNERR) is part of the National Estuarine Research Reserve System, a network of 30 protected areas established under the Coastal Zone Management Act to support long-term estuarine research, coastal training, education, and stewardship. Through its System-Wide Monitoring Program, the SFBNERR maintains continuous water-quality monitoring stations in Richardson Bay, China Camp State Park, and in Suisun Marsh, creating decades-long records of conditions across the salinity gradient of the San Francisco Estuary. This spatially distributed network provides a basis for detecting seasonal and episodic variability in conditions as well as long-term ecosystem responses to climate.

Water measurements of temperature, salinity, dissolved oxygen, depth, pH, turbidity, and, in some cases, fluorescence are collected at 15-minute intervals. Monthly discrete water sampling is conducted to quantify nutrients, chlorophyll-a, and total suspended solids and most locations also include continuous meteorological measurements. Together, these datasets reveal seasonal and long-term patterns associated with estuarine location, land use and estuarine management, tidal forcing, seasonal freshwater flows and other meteorological events. Here we provide examples of insights gained through the monitoring effort. These long-term records provide a valuable foundation for understanding ecosystem change, assessing climate-related impacts, and informing natural resource management of the San Francisco Estuary.

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POSTER 74

U.S. Geological Survey Science Activities in the Bay-Delta Region

The San Francisco Bay and Sacramento-San Joaquin Delta (Bay-Delta) is a highly dynamic estuarine system where river flows, tides, water-management operations, meteorological forcing, and ecosystem processes interact across a range of spatial and temporal scales. Understanding these interactions involves both sustained monitoring and targeted investigations of the physical, chemical, and biological processes that drive ecosystem response. For decades, the U.S. Geological Survey (USGS) has maintained an extensive network of flow, water-level, water-quality, and suspended-sediment monitoring stations throughout the Bay-Delta, complemented by ship-based surveys, mapping campaigns, and specialized field studies. These observations provide critical information for water-resource management, ecosystem science, and regulatory decision-making throughout California's largest estuary.

Recent investigations demonstrate how integrated monitoring and process studies are used to examine stratification dynamics, sediment transport, and water-quality variability across the Bay–Delta. By integrating long-term observations with targeted field studies, advanced instrumentation, and quantitative analyses, USGS scientists develop a mechanistic understanding of estuarine processes and ecosystem response. The resulting publicly available, quality-assured datasets and scientific products provide a foundation for research, modeling, and science-based management of California's water resources and the Bay–Delta ecosystem.

For more information, see - https://sciencetracker.deltacouncil.ca.gov/activities/continuous-monitoring-sacramento-san-joaquin-delta-and-san-francisco-bay

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POSTER 75

Suspended sediment flux exchange between San Pablo Bay and Central San Francisco Bay, CA

Sediment budgets are integral in the San Francisco Bay (SFB) for management and research purposes regarding key habitats, light attenuation, contaminant transport, bathymetric change, as well as aiding the investigation of potential impacts from climate change or water-management decisions. Due to the size and complexity of SFB, these sediment budgets are developed from numerical models which are calibrated and checked using direct measurements of suspended sediment at key points within the SFB system. This project fills a major gap in our understanding of SFB sediment budgets by directly measuring sediment flux between San Pablo Bay and Central San Francisco Bay (a ~5km cross-section).

The field location, just north of the Richmond Bridge, is characterized by two channels converging north of the site. This project consisted of ~80 hours of cross-channel transects using an acoustic doppler current profiler (ADCP) to measure both velocity and acoustic backscatter (ABS). A total of 60 velocity-integrated suspended-sediment concentration (SSC) samples were taken to generate an ABS to SSC empirical model to calculate sediment flux between the subembayments. Additionally, continuous water temperature, specific conductance, and SSC via surrogate turbidity were monitored at both channels at both mid- and near-bottom depths. All measurements will be made publicly available as an U.S. Geological Survey Data Release.

Preliminary analysis shows a strong secondary circulation pattern with flood tide being dominant in the eastern channel and ebb being dominate in the western, sediment flux initiating in the shoals during ebb after slack prior to main channel activation, and a peak discharge measured of ~1.7 million cubic feet per second.

PRESENTER

David Hart, U.S. Geological Survey

POSTER 76

Sediment Deposition and Erosion on Intertidal Mudflats of San Leandro Bay

Recovery of receiving waterbodies from contamination by sediment-bound persistent pollutants such as polychlorinated biphenyls (PCBs) is largely dependent on local sediment processes. Masses of cleaner incoming sediment burying or mixing with and diluting existing sediment, and resuspension and advective export of contaminated sediment can help reduce exposure of resident biota over time. San Leandro Bay (SLB) is a waterbody highly contaminated by PCBs, where actions have been taken in local watersheds to reduce loads.

We therefore monitored rates of sediment deposition and erosion in 8 areas of SLB at points around mean tide level and mean lower water, revisiting quarterly over a year. At each location we deployed sediment marker ceramic plates, plastic grids, and reference posts for surface elevation transects to measure net change, and sediment traps to measure downward sediment flux. Quarterly changes at most sites averaged < 3cm, but there was often small-scale heterogeneity within sites. Seasonal changes were similar at many of the sites, with modest accumulation over the spring and summer, erosion in late fall and early winter, followed by deposition during the wet season (December to March), returning sites to near their starting elevations. During each quarter, downward sediment flux caught in the sediment traps exceeded net flux by a large factor at all sites, including those with net erosion. Thus even in a relatively enclosed waterbody such as SLB showing relatively little net change, daily sediment resuspension and settling processes can mix and export contaminated surface sediment, leading to recovery after management intervention to reduce incoming loads.

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POSTER 77

Preparing real-time chlorophyll ratings for Delta water quality stations

Chlorophyll is a key parameter measured in the Delta that informs assessments of water quality, identifies potentially hazardous algal blooms, and provides indications of ecosystem health. The US Bureau of Reclamation Bay-Delta continuous flow and water quality monitoring network includes *in situ* sensors that estimate real-time chlorophyll calibrated to rhodamine dye. While allowing for assessment of trends and rapid decision making, the relationship between measured fluorescence and actual chlorophyll concentration is complex. These sensors do not account for many of the environmental and biological factors that affect measured chlorophyll fluorescence, including turbidity, presence of other water constituents, and the local phytoplankton taxa present.

In addition to real-time measurements, we collect and measure discrete chlorophyll. While these analyses provide a more accurate estimate than real-time sensors, they are too rarely collected to analyze short- and medium-term trends. We will use these datasets to create chlorophyll ratings for 17 stations throughout the Delta and produce more accurate real-time chlorophyll concentrations. By modeling discrete chlorophyll data with deployed sensors and environmental conditions, we will provide a more accurate real-time chlorophyll concentration estimate throughout the system, similar to ratings developed in the Kansas River monitoring network.

We will prepare preliminary linear models predicting chlorophyll from fluorescence and temperature from data collected since March 2026. With continued sampling we will expand each station's model to include parameters that may affect chlorophyll fluorescence or the sensors' measurements. These real-time modeled chlorophyll ratings will be reported alongside the model methods, providing a more accurate local chlorophyll measurement to researchers, in addition to the historically reported chlorophyll fluorescence, to better evaluate ecosystem health and water quality.

PRESENTER

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POSTER 78

Characterizing Chlorophyll Fluorescence Sensor Performance Across Diverse Phytoplankton Assemblages in the Sacramento-San Joaquin Delta

Chlorophyll fluorescence (fCHL) sensors are widely distributed across the Sacramento-San Joaquin Delta and provide continuous estimates of phytoplankton biomass. While these sensors generate a temporally dense dataset, many factors can bias the sensor data, such as phytoplankton morphology and physiological state, light environment, and water quality conditions. We analyzed existing field data and conducted laboratory measurements to, 1) assess congruence among different sensor designs, 2) identify environmental and ecological conditions that reduce measurement accuracy, and 3) evaluate the capability of sensors to detect *Microcystis* colonies. Preliminary results suggest that different sensor designs sometimes respond differently to phytoplankton communities and environmental conditions. In particular, cyanobacteria-dominated communities may differentially affect readings from different sensor designs. In laboratory experiments, sensors responded to *Microcystis* colonies; however, at low colony densities, some sensors were not able to detect colonies due to small sampling volumes or slow response times. Preliminary results indicated that small and homogenously distributed colonies consistently produced more accurate fCHL values, highlighting morphology-dependent biases in sensor response. These experiments provide insight into the mechanisms controlling fCHL sensor performance in the presence of diverse phytoplankton communities and cyanobacterial colonies and identify the conditions under which sensors can most effectively detect and measure phytoplankton biomass.

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POSTER 79

Keeping PACE with Management Needs: Evaluating NASA PACE Satellite Chlorophyll-a Retrievals for San Francisco Bay Water Quality Monitoring

Satellite remote sensing of chlorophyll in San Francisco Bay (SFB) is an unmet need for water quality managers. The estuarine mixing of marine and freshwater drives high concentrations suspended sediment and colored dissolved organic matter, interfering with the signal from chlorophyll. The NASA Phytoplankton, Aerosol, ocean Color, Ecosystem (PACE) mission (launched February 2024) collects daily hyperspectral imagery, presenting a new opportunity for routine, accurate chlorophyll monitoring. The dense spectral sampling offers greater ability to isolate the chlorophyll signal, while daily revisits capture dynamic estuarine mixing. This project evaluates the performance of PACE for chlorophyll monitoring in SFB. We also evaluated the standard PACE chlorophyll product against in situ measurements and tested other chlorophyll algorithms (band indexes) developed with multi-spectral data in SFB and other turbid and eutrophic systems. Our initial validation (N = 28 match-up pairs, 2024-2025) revealed that the standard PACE chlorophyll product performs poorly in SFB, with no correlation (R2 = 0.00) to measured values. However, three algorithms developed for chlorophyll in turbid waters showed modest skill (R2 = 0.18-0.40) and positive correlations. The failure of the standard chlorophyll product is a result typical of algorithms developed in optically simple waters when used in waters laden with sediments and dissolved organics. The improved performance from algorithms developed in turbid systems is encouraging, and future work to develop novel chlorophyll algorithms with PACE data could be worthwhile. This project will provide the regional science and management community with a clear picture of where PACE data can contribute to SFB chlorophyll monitoring, and what development is needed to close that gap.

PRESENTER

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POSTER 80

Assessing the strengths and gaps of contaminant monitoring in the Sacramento-San Joaquin River Delta

Wastewater effluents, and agricultural, industrial and urban runoff contribute to the thousands of chemical contaminants present in the Sacramento-San Joaquin River Delta and Suisun Marsh. The large number of chemicals and their metabolites complicate understanding of the loading and ecotoxicological effects of contaminants within the Delta region. The Delta Independent Science Board, which is legislatively mandated to provide scientific oversight of Delta science and adaptive management, is currently conducting a review of contaminant monitoring programs in the Delta to assess how these programs support management needs and decision-making surrounding ecological risk. This review includes interviews, literature reviews, and a workshop that will identify the strengths and opportunities for improving current monitoring programs within the Delta region. To date, we have analyzed 18 interviews with subject matter experts from academia, non-governmental organizations, environmental consulting firms, and state and federal agencies using qualitative social science coding methods. Here, we present findings from these interviews. They will be used to inform presentation and discussion topics at a workshop (tentatively planned for February 2027), which will allow a wide audience to share their perspectives on contaminant monitoring programs that inform ecological risk within the Delta and explore potential areas for improvement.

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POSTER 81

Hydrodynamic modeling reveals the influence of natural and operational controls on methylmercury patterns and fluxes in surface waters of the Sacramento-San Joaquin Delta

The Sacramento-San Joaquin Delta (SSJD) and the San Francisco Bay estuary face many environmental challenges, including mercury (Hg) contamination - particularly methylmercury (MeHg) - the most regulated and toxic form of Hg in the estuary. While general patterns of MeHg concentrations in the SSJD are known, it is not well understood how upstream and downstream MeHg sources are transported and mixed throughout this region as a function of hydrodynamic processes and water management actions. In the current study, numerical 3D hydrodynamic and water quality models (Delft3D-FM and DELWAQ, which simulate water movement and contaminant distribution) are applied in the SSJD to study the influence of hydrodynamics on the spatiotemporal patterns of unfiltered MeHg in surface water. Our modeling, using historic monitoring results from multiple regional inputs, reveals several key patterns in MeHg transport including a) spatial patterns in surface water MeHg concentrations and fluxes vary seasonally and b) the operation of the delta cross-channel (DCC), a water diversion structure, has a strong influence on the distribution of MeHg from regional input sources. While these findings are largely consistent with previously reported trends of MeHg in SSJD surface water based on traditional (albeit lower resolution) monitoring programs, they demonstrate that both natural hydrodynamic processes and local water management operations strongly influence these spatiotemporal trends. These results offer insights into natural (seasonal and climate-driven interannual variations) and operational (water diversion) controls on MeHg distribution and transport in the SSJD. Furthermore, this modeling framework, based on natural and manipulated physical hydrodynamics, can be extended into future studies for a multitude of contaminants throughout the SSJD.

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POSTER 82

What fish mucus tells us about the chemical identity of endangered fish and their potential exposure to contaminants

Delta smelt (Hypomesus transpacificus) are a keystone species in the Sacramento-San Joaquin River Delta; however, their populations have crashed in recent decades as part of the pelagic organism decline in the Delta. Delta smelt are protected under the Federal and California Endangered Species Act and a refuge population is maintained to prevent extinction. The State Water Project and Central Valley Project pumping facilities, located in the southern Delta, are operated to prevent entrainment of protected fish based on modeling and “real-time monitoring.” A method to detect Delta smelt in the wild would not only help inform real-time operations of the pumping facilities, but also help find wild individuals to potentially bolster genetic diversity or identify critical habitats. Here we identify the chemical compound(s) responsible for the Delta smelt’s signature cucumber scent as a potential chemical detection method in the field. Thirty non-invasive swabs of fish mucus were collected from three species of smelt, including Delta smelt, Longfin smelt (Spirinchus thaleichthys), and Wakasagi (Hypomesus nipponensis). Each sample was analyzed via Solid Phase MicroExtraction-Gas Chromatography and Mass Spectrometry (SPME-GC-MS) to identify the organic compounds present in the mucus of each species and compare them. Overall, 59 different compounds were detected, only 21 of which were detected in >30% of the fish studied. Three compounds are attributed to the cucumber odor and are found only in Delta smelt and Wakasagi mucus. Swabs of fish-free tanks were also collected and analyzed to test the potential for trace detection of smelt-specific compounds in the field. No cucumber compounds were detected in the tank swabs; however, compounds likely sourced from the aquaculture system itself were present, suggesting that this methodology could be adapted to assess fish exposure to contaminants.

PRESENTER

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POSTER 83

Per-and polyfluoroalkyl substances (PFAS) concentrations and the co-occurrence of pesticides in agricultural drainage surface waters

Per-and polyfluoroalkyl substances (PFAS) have been documented to be frequently present in streams impacted by urban inputs. There are few studies documenting PFAS inputs sourced from agricultural pesticide applications. Pesticide containers can potentially be a source of PFAS, and some pesticide compounds themselves may contain “inert” ingredients that include PFAS compounds. To better understand the relationship between agriculturally applied pesticides and the co-occurrence of PFAS, 10 streams were sampled in two agricultural valleys that drain into Sacramento-San Joaquin Delta tributaries northern California, USA during two periods of pesticide application (May and July of 2024). Water samples were analyzed for 183 pesticides and 57 PFAS. Analysis resulted in the detection of 60 pesticides: 23 herbicides, 18 insecticides, 18 fungicides, and 1 synergist. Fourteen PFAS were detected: 6 perfluoroalkyl carboxylates, 5 perfluoroalkyl sulfonates, 2 perfluoroalkyl acid precursors, and 1 perfluoroalkyl phosphinic acid. Pesticide concentrations ranged from 0.6 nanograms per liter (ng/L) to 782.3 ng/L and PFAS concentrations ranged from 0.2 ng/L to 20.2 ng/L. This study provides insight and data for future research to investigate pesticides as a potential contributor of PFAS in the environment.

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POSTER 84

Sea-level and groundwater rise increase the potential for indoor exposure to volatile organic compounds near contaminated sites

Sea-level rise threatens cities with frequent flooding and a rise in unconfined groundwater elevations. Groundwater will emerge at the surface in low-lying areas and a wide range of hidden impacts could occur in urbanized areas where the vadose zone is shrinking. Rising groundwater can mobilize soil contaminants, increase sewer infiltration, and increase the need for dewatering by pumping. Nationally, tens of thousands of coastal sites with contaminated soil managed by government agencies may be exposed to unexpected contaminant mobilization. This study developed a method that can assess the potential for volatile organic compounds (VOCs) to be mobilized in soil and enter indoor air via sanitary sewers. Previous approaches examined flow directions of plumes and considered dispersal of VOCs in sewers but have not assessed potential impacts of rising groundwater. Our method focuses on risks to the use of buildings with particularly vulnerable occupants (schools, daycares, and residential buildings). As a case comparison, we investigated 21 urban sites that were selected from more than 1,800 in the San Francisco Bay Area with VOC contamination, shallow and rising groundwater, and moderate to high classifications of social vulnerability. The screening tool showed 22 schools or daycares and 1,264 residential structures represented 54% of all structures where sanitary sewer connections are plausible pathways for VOC intrusion indoors with sea-level rise. These results indicate potentially new VOC pathways of exposure with changing groundwater conditions. The impact of groundwater dynamics and rising seas on future VOC mobilization should be assessed at the tens of thousands of VOC-contaminated sites in the US and countless sites globally.

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POSTER 85

Optimizing monitoring tools for cyanobacterial harmful blooms in the Sacramento-San Joaquin River Delta

The Sacramento-San Joaquin Delta (Delta) is experiencing an increase in the frequency and severity of Cyanobacterial Harmful Algal Blooms (CHABs), which can produce harmful cyanotoxins. The most common CHAB genus in the Delta is Microcystis. Currently, the most extensive dataset for tracking Delta CHABs is the Microcystis Visual Index (MVI), a qualitative assessment of Microcystis colony densities observed in surface water.

This index, recorded by natural agency staff across numerous monitoring stations, provides broad spatial coverage but is inherently subjective and not quantitative, thereby limiting its utility.

This project has the following objectives:

1) Develop an MVI image classification model and model algorithm that can identify and quantify Microcystis aggregate presence and coverage level in digital photos;

2) Translate MVI rankings to Microcystis biomass ranges by obtaining data to ground-truth a range of Microcystis biomass that corresponds with MVI rankings 2 through 5;

3) Explore the relationship between proportion of toxic Microcystis cells and Microcystis biomass levels by relating each MVI scale (for ranks 2 through 5) and Microcystis biomass range to a) proportion of toxic Microcystis cells (i.e. ratio of mcyE and 16S rDNA gene targets) and b) microcystin concentration, in surface grab samples.

For the 2026 sampling season, we have sampled a variety of shore and ship-based stations across MVI rankings and will be analyzing them for chlorophyll, colony size and counts, microcystin, and a panel of nutrients.

PRESENTER

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POSTER 86

Hydrodynamics at the junction of a dead-end channel and tidal river

Harmful algal blooms are intensifying in the Delta, which is a concern for both human and environmental health. Physical factors like warm waters and reduced river inflow are hypothesized to drive growth of harmful algal blooms (HABs) in the Delta, but our understanding of the mechanisms and relative importance of these factors is not sufficient to inform effective HAB management decisions. Recent observational studies identify dead-end channels like the Stockton Deep Water Ship Channel (DWSC) as HAB hotspots and potentially a primary source of HABs in the Delta. Given the strong influence of hydrodynamics on HAB growth, we aim to improve our understanding of the flow dynamics in the Stockton DWSC, or more generally, a dead-end channel connected to a tidal river. These regions are underresolved in existing remote sensing data and numerical models. Using the high-resolution SUNTANS model, we investigate the wind-, river-, and tidally-driven exchange with an idealized model of the junction connecting the Stockton DWSC to the San Joaquin River. Simulations are run to study the impact of the different parameters on the residence time in the dead-end channel, providing insight into how the processes might impact HAB formation.

PRESENTER

Sarah Chang, Stanford University

POSTER 87

Training the Next Generation of Water Leaders Through Community-Based Harmful Algal Bloom Monitoring in the San Francisco Estuary Delta

Restore the Delta advances research, policy development, public education and community engagement throughout California's Sacramento–San Joaquin Delta. Through community science initiatives, the organization empowers residents to participate in water quality monitoring, stewardship of regional aquatic resources, and water policy advocacy. As a collaborator in a multi-institution Monitoring and Event Response for Harmful Algal Blooms (MERHAB) program focused on the San Francisco Estuary, Restore the Delta has established a community science monitoring program for the detection of freshwater cyanobacterial harmful algal blooms (cyanoHABs) in the San Joaquin River. Driven by warming temperatures, nutrient pollution, and reduced freshwater flows, cyanoHABs and their associated toxins are a regular threat to ecosystem function and public health during the summer and autumn. These impacts disproportionately affect unhoused individuals, Tribal communities, BIPOC subsistence fishers, and residents of historically disinvested neighborhoods. To strengthen both monitoring capacity and workforce development, Cal Poly Maritime partnered with Restore the Delta to establish a student internship focused on cyanoHABs and water quality science and, critically, the opportunity to contextualize science to support environmental education, community engagement and policy. The intern worked as part of a cohort to monitor cyanoHABs at sites along the San Joaquin River to Stockton, CA. They gained field and laboratory skills and synthetized their results for public outreach and education efforts. Through both HAB surveillance work and community engagement, the internship provided practical scientific training and other skills necessary to address environmental challenges. This partnership demonstrates how collaborations between community-based organizations and academic institutions can prepare future aquatic scientists to advance equitable and sustainable water resource management.

PRESENTER

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POSTER 88

Comparison of Community Science Programs and Monthly Ship-based Monitoring for Harmful Algal Blooms in the San Francisco Bay

Phytoplankton blooms are often spatially heterogeneous and short-lived, making them difficult to capture through traditional monitoring programs. As a result, blooms may be underestimated, particularly in nearshore habitats not included in monitoring programs and difficult to observe with satellite remote sensing. The detection of the 2022 San Francisco Bay *Heterosigma* bloom highlighted the value of community science for early detection of harmful algal bloom (HAB) events in estuarine environments. Through a Monitoring and Event Response for Harmful Algal Blooms (MERHAB) Project, the San Francisco Baykeeper Community Science Program trains volunteers to monitor shoreline locations that may be especially favorable for HAB development, including shallow embayments characterized by warm water temperature and longer water residence times. In contrast, traditional ship-based phytoplankton surveys conducted in the main channel of the San Francisco Estuary sample in deeper water where tidal mixing and reduced stratification may limit bloom formation or persistence. As part of a MERHAB-supported undergraduate internship, we compared phytoplankton observations collected through the Baykeeper Community Science Program with monthly phytoplankton community data collected from main-channel stations sampled through the USGS long-term water quality monitoring program. The comparison provided a means to evaluate how monitoring location and sampling approach influence HAB detection. Results demonstrate the complementary nature of community science and traditional monitoring programs, with shoreline observations providing increased spatial coverage of nearshore environments and expanded temporal coverage of the Bay's waters. These findings support continued integration of community science into estuarine HAB monitoring programs to improve early detection and the characterization of phytoplankton dynamics across the San Francisco Estuary.

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POSTER 89

Floodplain Mixology: The Role of Tributary Signatures in Yolo Bypass Management and Restoration

The Yolo Bypass supports a wide range of wildlife that use it for habitat and migration, emphasizing importance for its conservation and management. Operation of water infrastructure (e.g. Fremont Weir Big Notch) and adjacent systems (e.g. Lake Berryessa, Clear Lake) affect the quantity and qualities of different water sources---Sacramento River, Colusa Drain via the Knights Landing Ridge Cut, Cache Creek, Putah Creek---entering the Bypass. To determine flow and habitat restoration contributions to habitat suitability within the Bypass, we need to attribute the variable impact of each water source to the perennial channel (e.g. Toe Drain) and off-channel habitats. We measured point and continuous water quality in addition to chlorophyll and zooplankton data. Then, we applied time series analysis, heat maps, principal component analysis (PCA), and end member mixing analysis (EMMA).

The PCA highlighted the importance of specific conductivity and dissolved organic matter in differentiating water sources, consistent with previous studies (Schemel et al. 2004). Our results also demonstrated the importance of allochthonous delivery of phytoplankton and zooplankton from tributaries in shaping lower trophic conditions in the Bypass. Additionally, extreme local production of zooplankton in some off-channel habitats, which received blended tributary inputs, highlights the potential for synergy between water sources. At some locations, we observed habitat-quality-limiting events (e.g. low oxygen, high temperature) due to low flow, connectivity, and extended residence time. These conditions have large implications for upcoming expanded Big Notch operations which could improve floodplain flow in the Bypass and source attribute blending. Understanding tradeoffs between water quality, lower trophic food resources, and connectivity is essential for optimizing habitat suitability for sensitive species in the Yolo Bypass and addressing future needs through enhanced water management.

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POSTER 90

Linking Physical Process to Biological Response: Using emerging technologies to assess stratification in Suisun Bay

Understanding how physical processes structure ecological patterns is essential for interpreting estuarine variability. Recent observations in Suisun Bay have provided substantial insight into the predictability of stratification based on tides, a phenomenon which has been linked to phytoplankton blooms in the San Francisco Bay and Sacramento-San Joaquin Delta estuary. There remains a need for validation of stratification strength and substantial uncertainty in the magnitude and mechanism of biological response. Here, we present a framework for using paired high frequency measurements of physical process (i.e., velocity, mixing, and turbulence using experimental multi-frequency Acoustic Doppler Current Profilers [ADCPs]) with lower frequency measurements of constituents (i.e., suspended sediment, algae, zooplankton) to validate continuous monitoring and demonstrate linkages between physical process and estuarine ecology.

Using comprehensive sampling in Suisun Bay, we integrated ADCP measurements, continuous sensors, vertical profiles, discrete water samples, spatial mapping, fish acoustics, and zooplankton sampling to inform stratification-based monitoring strategies. Preliminary results indicated that stratification occurred most frequently during periods of weak tidal energy, with concomitant shifts in acoustic backscatter, chlorophyll *a*, and a range of other measured constituents. Regional surveys further highlighted fine-scale heterogeneity within the region, underscoring the dynamic interplay between hydrodynamics and biological responses. This interdisciplinary study represents one of the most comprehensive examinations of stratification-driven ecological responses in Suisun Bay, offering new insight into physical–biological coupling in a highly managed estuary.

PRESENTER

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POSTER 91

What Explains Agricultural Water Demand Change? Land-Use and Climate Drivers Across California's Central Valley

Understanding how land-use change and climate forcing independently and interactively reshape agricultural water demand is critical for equitable, climate-resilient water management. Although often studied separately, their combined and spatially varying effects remain inadequately quantified in California's Central Valley and Bay-Delta region. This study uses CalSimHydro within a multi-scenario ensemble framework to attribute demand responses to land-use and climate drivers across 42 subregions. We analyzed 20 scenarios that combined five land-use configurations with four Global Climate Models, including a historical baseline.

Results demonstrate strong spatial heterogeneity: some subregions consistently show a decrease in demand, while others exhibit increases or scenario-dependent reversals. Several land-use scenarios reduce systemwide applied water demand by 8.4% to 8.7% relative to the baseline, driven primarily by shifts in crop composition. Notably, almond acreage declines by 50%-62% systemwide, with the land replaced by pasture and fallowing, while other scenarios convert irrigated areas to native vegetation. A scenario with only a 0.2% to 0.3% increase in acreage yields a 3.1% increase in demand, largely due to an 86% expansion of almond and pistachio orchards.

Climate forcing acts as an independent demand signal, raising overall crop evapotranspiration by 7.1 inches and, in some cases, amplifying land-use effects. These findings indicate that basin-wide averages mask important local variations, and reducing irrigated acreage alone may not reliably lower demand under varying future climate conditions. Effective water management requires spatially explicit strategies that jointly consider crop transitions, climate stress, and regional context to enhance water resilience in the Central Valley and downstream Delta system.

PRESENTER

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POSTER 92

Exploring conservation and mitigation banking as restoration solutions: three case studies in the Bay-Delta

Over the past 200 years, the San Francisco Bay-Delta region has undergone major landscape changes. The Bay-Delta region was historically dominated by freshwater and tidal wetlands (SFEI, 2012), but flow alteration and levee construction converted most of those wetlands to agricultural and urban lands.

Mitigation and conservation banks (Banks) arec an effective tool for wetland and other habitat restoration in the Bay-Delta. By incentivizing collaboration with private landowners, the establishment of Banks protects properties that may not otherwise be conserved. Banks are subject to long-term monitoring and must meet agency-specified performance standards. These requirements, in addition to placing a conservation easement in-perpetuity on the property, support a long-term restoration vision.

RES manages Banks across California, including two Banks in the Delta and one Bank in San Pablo Bay. The Liberty Island Fish Conservation Bank and Preserve, constructed in 2010, and the North Delta Fish Conservation Bank, currently under construction, encompass 186 acres and 811 acres, respectively, of existing and planned wetland, riparian, open water, and upland habitats in the Cache Slough Complex and lower Yolo Bypass.

Halo Ranch Mitigation Bank encompasses 122 acres in the upper San Pablo Bay. When completed, Halo Ranch will provide high-quality tidal marsh and other wetland habitat through tidal channel excavation, floodplain grading, and planting.

This presentation provides an overview of a unique restoration vehicle using three pertinent case studies in the Bay-Delta region, in two different phases: active construction and long-term monitoring and management. This talk will explore the regulatory framework, design considerations, and restoration outcomes of Banks as effective Bay-Delta restoration projects.

PRESENTER

Trevor Kumec, Resource Environmental Solutions

POSTER 93

Data Quality in Motion: Modernizing Quality Policy Through Collaboration

The Department of Water Resources (DWR) Quality Assurance (QA) policy was enacted in 1992. Over the past three decades, needs, expectations, and regulatory requirements of DWR's data have evolved. To meet these needs, approaches to water quality and ecological monitoring have changed substantially, including advancements in monitoring methods, technologies, data management systems, and quality assurance practices. The original policy was never fully realized and was not meeting these modern requirements.

In 2025, the QA Program initiated a comprehensive effort to modernize DWR's quality policy. Because of the policy's broad scope and the complexity of the Department, the effort required a collaborative and interdisciplinary approach. Historically, initiatives of this scale have taken years to complete. Recognizing the urgency, importance, and scale of implementation, we adopted an innovative approach grounded in Lean efficiency principles. An interdisciplinary team was assembled to collaboratively develop the policy and streamline decision-making, thereby reducing numerous, time-consuming review loops.

Once the policy draft was completed, we employed an extensive change management and outreach campaign involving more than 50 affected programs. These meetings increased awareness of the upcoming policy changes, provided opportunities for key parties to ask questions and share concerns, and to build support ahead of executive approval.

This poster highlights how interdisciplinary collaboration and intentional change-management accelerated the successful modernization of a foundational quality policy and offers a scalable model for implementing large-scale policy updates within complex organizations.

PRESENTER

Rachel Pisor, CA Department of Water Resources

POSTER 94

Climate-beneficial practices on Delta working lands; how local agencies can collaborate with farmers and ranchers to sequester carbon and improve wildlife habitat

Solano Resource Conservation District partners with Delta farmers and ranchers to plan and implement habitat restoration and climate-beneficial farming practices on their properties. Projects include the creation of Carbon Farm Plans, installation of hedgerows and windbreaks, and cost-share assistance for practices like compost and cover crops that improve soil health and sequester carbon. Recent work, funded by the Sacramento-San Joaquin Delta Conservancy, installed 64 acres of native wildlife habitat, provided off-stream livestock troughs and protected 1.5 miles of stream, planned 292 acres of prescribed burn, created Carbon Farm Plans covering over 22,000 acres of rangeland and irrigated pasture, and leveraged over $1,000,000 in funding from local, state and federal sources to implement these projects. RCDs' long-standing relationships with the agricultural community make them a useful nexus between rural landowners, urban communities, regulators, and other public agencies to plan and implement climate-beneficial projects in the region.

PRESENTER

Amy King, Solano Resource Conservation District

POSTER 95

The Multidisciplinary Water Training and Operations Program: A New Academic-Agency Collaborative Training Program

This poster covers the first year of the new Multidisciplinary Water Training and Operations Program, a cooperative effort between the US Bureau of Reclamation and the UC Davis Center for Watershed Sciences. The program is unique in facilitating collaboration between the next generation of scientists, as students and postdoctoral scholars, and agency partners, ensuring trainees learn to produce science directly transferable to decision-makers. Trainees in the program develop science-based tools to provide actionable information on high-priority questions in water operations, fisheries, and aquatic ecosystem management in collaboration with Bureau of Reclamation mentors. Tools developed through this project improve water management and fish and wildlife conservation in the California Bay-Delta watershed, promote effective use of water within the system, help prevent species extinctions, and provide scientific information to support recovery efforts. This poster outlines the strategies and learning methods of the program; it also introduces the scientific projects developed by the first cohort of trainees.

PRESENTER

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POSTER 96

Developing a Conservation Broodstock Program for Threatened Spring-Run Chinook Salmon

Central Valley spring-run Chinook Salmon (Oncorhynchus tshawytscha) are currently state and federally listed as threatened and have experienced severe population declines across three remaining independent populations in Mill, Deer, and Butte creeks in California. Consecutive drought years (2019-2022), degraded habitat, water quality, migration obstacles, and disease outbreaks culminated in a “cohort collapse” in 2023, with fewer than 100 spawning adults observed in tributaries that were once strongholds for spring-run. The California Department of Fish and Wildlife (CDFW) and NOAA Fisheries partnered with UC Davis to establish a conservation broodstock program aimed at safeguarding the genetic integrity of this threatened species. Beginning in early October 2023 and continuing annually, CDFW collects juveniles from Mill, Deer, and Butte creeks and transports them to the UC Davis Center for Aquatic Biology and Aquaculture (CABA). At CABA, fish are PIT tagged, fin-clipped for genetic identification, undergo prophylactic treatments to prevent disease transmission, and reared to maturity under controlled laboratory conditions. As the fish and broodstock program matures, a strategic spawning matrix will be used to select mating pairs to maximize genetic diversity. Eggs and offspring will be reared for reintroduction to their natal creeks and to maintain the captive broodstock at CABA. With additional support from the California Department of Water Resources, CABA is expanding its capacity with new egg incubation rooms, large recirculating systems for housing adult salmon, and additional trained staff dedicated to husbandry and health management. This partnership represents one of Governor Newsom’s priority actions identified in the California Salmon Strategy for a Hotter, Drier Future, with the goal of the partnership to preserve genetic lineages of spring-run Chinook Salmon to support long-term recovery and reintroduction efforts across California’s Central Valley.

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POSTER 97

Advancing Earth Observations into Decision Making: Outcomes from End-User Co-Development Activities to Operationalization of an Invasive Aquatic Vegetation Monitoring Program in the Delta

Invasive aquatic vegetation (IAV) continues to threaten habitat quality, water conveyance, recreation, and restoration outcomes throughout the Sacramento-San Joaquin Delta. Effective management requires timely, spatially comprehensive information that is accessible and relevant to Delta managers. Through a NASA-funded partnership with the California Department of Water Resources, Delta Stewardship Council, and California Department of Fish and Wildlife, we are co-developing the first sustainable and operational Sentinel-2-based IAV monitoring program for the Delta.

A central component of this effort is an iterative co-development process that engages end users throughout product development and evaluation. We will describe participant feedback and key outcomes from workshops held during 2026 that brought together resource managers, scientists, and decision makers from the Delta Stewardship Council and CA Department of Water Resources. During the workshops, participants evaluated and interacted with our monthly Sentinel-2-derived IAV class maps (10m) in a cloud-based GIS environment, as well as participated in structured activities designed to identify opportunities for integrating these products into their organizations decision-making workflows.

Participants described the workshops as productive and valuable for understanding and evaluating the class maps, and identified priorities for operational implementation, including desired secondary map products, metadata, uncertainty reporting, visualization tools, and alternative delivery methods to accommodate a range of technical backgrounds.

Their feedback has directly informed revisions to class maps, documentation, and future development priorities while identifying opportunities and barriers for long-term adoption. The positive response from participants has prompted an additional end-user workshop (March 2027) to expand the co-development process to additional agencies and organizations interested in applying and operationalizing these products in their decision-making activities.

These workshops underscore the importance of co-development and end-user engagement to develop high impact Earth observation products that address management needs and support long-term operational use.

For more information, see - https://sciencetracker.deltacouncil.ca.gov/activities/earth-observations-combat-invasive-aquatic-vegetation

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POSTER 98

Mapping salinity intrusion: a satellite remote sensing approach to link estuarine turbidity maxima to low salinity zones

This study develops and evaluates a physics-based remote sensing framework to map salinity intrusion in the San Francisco Bay-Delta, where rising sea levels and changing hydrology increasingly threaten freshwater resources. Salinity intrusion is commonly characterized by the X2 index–the distance from the Golden Gate Bridge to the 2 psu isohaline location–but existing monitoring relies on sparse, fixed-point measurements that limit spatial resolution. This work investigates whether satellite-derived turbidity can provide a spatially continuous proxy for salinity structure. In estuarine systems, sediment dynamics and salinity are intrinsically coupled through particle aggregation, transport, and settling. In the Bay-Delta, tidal forcing and river inflows generate strong spatial and temporal gradients that influence stratification and sediment processes, particularly in Suisun Bay where the low salinity zone (LSZ) is typically located. Using Sentinel-2 satellite imagery, estuarine turbidity maximum (ETM) positions are identified from surface turbidity and compared with in situ salinity observations. By collocating these datasets, we quantify the relationship between ETM and LSZ locations and evaluate how tidal forcing, river discharge, and stratification influence their coupling. Results show that ETM positions closely track the landward extent of the salt front across a range of hydrologic conditions, demonstrating that satellite-observed turbidity can serve as a reliable, spatially resolved indicator of salinity intrusion. This approach provides a scalable tool to improve monitoring and understanding of estuarine dynamics.

PRESENTER

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POSTER 99

Elevate Bay Delta: Collaborative Lidar Effort Results in First Ever Seamless Coverage of the San Francisco Bay-Delta Estuary

High-resolution, accurate elevation data is critical for informed management and policy decisions within the Bay-Delta, including flood risk evaluation, subsidence tracking, restoration planning, and vulnerability analyses related to climate change and sea level rise. Historically, inconsistent timing and spatial gaps in Lidar data acquisition have limited the ability of scientists and planners to conduct comprehensive, coordinated regional assessments of the Bay-Delta. In 2025, more than 5,000 square kilometers were surveyed via a Cessna equipped with a Lidar sensor, producing Q1-level data with 12-centimeter vertical accuracy and 1-meter resolution elevation datasets.

The estuary-wide Lidar initiative established a unified baseline elevation dataset for the first time due to a partnership between the Wetlands Regional Monitoring Program, Delta Stewardship Council, California Department of Water Resources, South Bay Salt Pond Restoration Project, and Valley Water. The collaboration between agencies and groups underscores the need for consistent and comparable data for evaluations across the Bay-Delta.

This Lidar data resource is indispensable for habitat restoration monitoring, hydrodynamic modeling, and nature-based shoreline adaptation strategies. Moreover, it supports decisionmakers and resource managers in monitoring shoreline erosion, modeling subsidence and vulnerability, mapping invasive aquatic vegetation, preparing for sea level rise and storm surges, and identifying abandoned or derelict vessels. The current and anticipated applications emphasize the scientific and operational value of collaborative, cross-agency data collection efforts in the Bay-Delta Estuary.

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POSTER 100

Water-carbon field and remote sensing measurements for annual drought management in the Delta

In collaboration with multiple State Agencies, including the Delta Conservancy and local farmers, we aim to evaluate the efficiency of agricultural water-saving practices in the Sacramento-San Joaquin Delta for adapting to drier hydroclimatic scenarios expected under future unpredictable conditions. The Delta region used to experience regular flooding, and drier conditions could increase carbon emissions through the oxidation of exposed peat soils. Our approach involves a multi-year measurement effort with data collected at the farm and regional levels to inform water and carbon relations relevant for irrigation water management. In 2023, we installed a network of six micrometeorological stations to continuously measure evapotranspiration (water loss) and CO2 fluxes (capture and emission) using the eddy covariance method, a gold standard in the international scientific community. We carefully considered the location of the experimental equipment in order to represent different Delta Islands, crops, management practices, and soil conditions. We will show results from almost three years of data collection. These results highlight the particularity of the Delta in maintaining non-irrigated summer crops in some regions within the Delta. Our results also show that the elevation and location are critical to guarantee that the non-irrigated crops thrive. Our rich hourly dataset over multiple sites and years shows which water-saving practices are carbon neutral. Importantly, we can analyze in great detail the seasonality of the agricultural management practices and their critical role in CO2 sequestration. Additionally, we will assess the accuracy of OpenET, a new remote sensing tool, in estimating water loss at each of our experimental fields to verify its capacity for regional water management. We look forward to sharing some preliminary results and opening the floor for collaboration and constructive insights.

PRESENTER

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POSTER 101

Integrated Sensor-Satellite Dataset and Random Forest Regression Model for Predicting Delta Salinity

Salinity is a critical water quality concern in the Sacramento–San Joaquin Delta, where several municipal and agricultural entities rely on delta water exports. While in situ monitoring stations provide continuous measurements of specific conductivity (a common method of measuring salinity), their spatial coverage is limited. Likewise, process-based hydrodynamic models can accurately simulate salinity dynamics but often require substantial computational resources.

This study evaluates the feasibility of combining remote sensing and machine learning to generate spatially explicit maps of specific conductivity across the delta. Specific conductivity measurements from nine continuous monitoring stations were paired with Sentinel-2 satellite imagery collected between 2018 and 2021 to develop a Random Forest regression model. Model performance was assessed using standard regression metrics, and the resulting model achieved an R^2 value of 0.76, with a root mean squared error of 280 $\mu S\ cm^{-1}$. These results demonstrate that integrated sensor – satellite datasets and machine learning can provide rapid, low-cost estimates of specific conductivity across the delta, producing spatial snapshots of salinity conditions that complement traditional monitoring networks and may support more timely water resource management decisions.

PRESENTER

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POSTER 102

Delta Modeling Collaboratory: facilitating integrated modeling to tackle complex management issues in the Delta

The Delta is a complex social-ecological system influenced by multiple environmental and social drivers, including precipitation, tides, climate change, agriculture, and urban water operations. Managing this system requires assembling vast data using modeling, synthesis science, and decision-support tools.

In 2025, the Delta Science Program launched three use-case projects to assess integrated modeling feasibility for key management themes:

1) predicting cyanobacterial harmful algal blooms;

2) evaluating salinity intrusion and management actions; and

3) restoring tidal wetland food webs. Diverse teams from academic institutions, government, and NGOs created project "profiles" identifying potential modeling approaches, existing leverageable resources, and critical gaps.

Operating these three projects simultaneously provides unique benefits by highlighting synergies, facilitating resource sharing, and enabling prioritization of activities supporting multiple initiatives. This holistic approach generates benefits for each individual project while establishing the foundation for the Delta Modeling Collaboratory: an intentional community of modelers and modeling resources supporting integrated modeling projects.

The Collaboratory's overarching vision is establishing a geographically based modeling community centered on collaboration, innovation, and resource sharing. This framework not only advances individual project goals but creates a sustainable platform for ongoing Delta modeling efforts, enhancing the region's capacity for integrated environmental management and decision-making through coordinated scientific resources and expertise.

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POSTER 103

Managing Salinity Intrusion in the Delta: A Collaboratory Approach for Integrated Modeling of Infrastructure and Infrastructure Solutions

Salinity intrusion in the Sacramento–San Joaquin Delta is a system-scale constraint shaping water operations, infrastructure performance, ecosystems, agriculture, and Delta communities under increasing climate volatility and sea-level rise. Salinity patterns are driven from the interaction of upstream reservoir operations, in-Delta water use and drainage, tidal dynamics, and estuary boundary conditions — not from any single sector or management action. While decades of hydrodynamic modeling and monitoring have improved predictive capacity, fragmented workflows, inconsistent documentation, and limited model interoperability constrain transparent, reusable, and cross-agency analysis.

We present a Salinity Management Collaboratory as a standing framework to integrate modeling, data stewardship, and scenario evaluation across agencies and institutions — consistent with the Bay-Delta Science Hub concept recommended by the National Academies of Sciences in its recent review of CVP and SWP long-term operations. The Collaboratory structures analysis around three complementary research pathways: (1) infrastructure and barrier operations, (2) ecological revitalization through landscape and hydrodynamic connectivity, and (3) distributional impacts on agriculture and communities.

The framework emphasizes standardized stress-testing, shared scenario libraries spanning drought, sea-level rise, and levee failure, and emulator development for rapid screening of management alternatives. By reducing the transaction costs of model comparison and data reuse, the Collaboratory aims to support more durable cross-sector dialogue on salinity trade-offs and adaptation pathways. This effort also generates a transferable template for profiling other complex Delta management challenges within a common collaborative modeling infrastructure.

For more information, see - https://sciencetracker.deltacouncil.ca.gov/activities/tracking-saltwater-intrusion-sacramento-san-joaquin-delta-satellite-remote-sensing

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POSTER 104

Benefits of a Diamond Open Access Publication to Resource Management in a Water-Scarce Environment: San Francisco Estuary and Watershed Science

San Francisco Estuary and Watershed Science (SFEWS) demonstrates the benefits, tradeoffs, challenges, and lessons learned in building existing, valuable, scientific assets for Bay-Delta resource management. SFEWS was established as a peer-reviewed, regionally focused academic journal to improve collaboration among institutions and better connect multi-disciplinary research to Bay–Delta resource management.

SFEWS publishes credible science, meets the highest standards, offers broad accessibility to readers and authors, and remains independent from political or special-interest influence. SFEWS benefits resource management through its Diamond Open Access (OA) publishing model sustained by a partnership between the University of California, the Delta Stewardship Council's Delta Science Program, and the Bay-Delta science community. SFEWS' primary objectives were four-fold, which, in their pursuit, sustain the publication's value for

- Addressing inequities among institutions in the distribution of power, resources, administrative restrictions, and incentives to publish in peer-reviewed literature;
- Expanding access to readers and authors whose papers pass peer review, which can result in data publication that might not be interpreted or shared;
- Establishing a regional focus to develop new knowledge about the Bay–Delta, not just discipline-specific breakthroughs; and
- Expanding access to resource management through a shift from a traditional model to a Diamond OA model.

These objectives widen the circle of who can participate in and benefit from science. Increasing authorship across sectors can broaden a sense of ownership, foster a sense of fairness, and expand trust in published science. Greater citation of peer-reviewed science in regulatory documents shows the value of the extended accessibility and use of published science in decision-making to benefit resource management.

SFEWS published first in 2003 among the earliest OA journals, and now ranks in the 33rd percentile of 255 aquatic science journals and among the top 5 of 38 Diamond OA aquatic science journals, worldwide. Lessons learned in building a scientific asset like SFEWS reveal that (a) it takes time to build a new scientific asset and provide optimal value, (b) Diamond OA publication is rare but sustainable, and (c) if valuable scientific assets deteriorate, or are cast aside, their value may be difficult to replace, at best, and lost entirely, at worst.

PRESENTER

Lauren Muscatine, UC Davis

POSTER 105

State of Bay-Delta Science, Fishes Edition

In the Sacramento-San Joaquin Delta and San Francisco Bay (Bay-Delta) system, balancing the state's water needs with ecosystem health is an enduring and complex challenge, and effective decision-making relies on comprehensive and current scientific knowledge.

To help meet this need, the Delta Science Program coordinates the State of Bay-Delta Science (SBDS), a collection of peer-reviewed scientific articles that synthesize current understandings, highlight key advances, and identify remaining knowledge gaps on topics relevant to managing the Bay-Delta system. Since its inception, SBDS has moved from early editions with chapters covering a wide range of Bay-Delta topics (2008, 2016) to editions organized around a single theme, such as primary producers (2022) and climate change and extreme events (2025).

The next edition of SBDS, anticipated for publication in the open-access journal San Francisco Estuary and Watershed Science (SFEWS) in 2027-2028, will focus on Bay-Delta fishes. Fishes play central roles in ecosystem functioning and cultural practices across the region; yet native fishes are largely imperiled due to altered flow regimes, habitat loss, food scarcity, and climate change. For example, population declines of the native Delta Smelt, Longfin Smelt, Chinook salmon, and Green and White Sturgeon have led to multiple endangered species listings and extensive habitat restoration, population monitoring, and special studies.

This upcoming issue will examine key topics including life history, population status and trends, food web dynamics, habitat and flow relationships, climate change implications, management strategies, knowledge and data gaps, opportunities for conservation, recreational and subsistence harvest, and the cultural significance of fishes to diverse communities.

This next edition of SBDS aims to serve as a shared resource for scientists, managers, community partners, and decision-makers, fostering a common understanding that supports adaptive management, informs research priorities, and strengthens policy development for a changing estuary.

PRESENTER

Melissa Palmisciano, CA Sea Grant State Fellow, Delta Stewardship Council

POSTER 106

Delta Science Tracker poster: Fostering collaboration and transparency in the Sacramento-San Joaquin Delta science community

The Sacramento-San Joaquin Delta hosts a multitude of scientific endeavors conducted by diverse entities, including government agencies, Tribes, academic institutions, non-governmental organizations, and private research groups. Despite concerted coordination efforts, historically there was no standardized inventory to track these activities—limiting accountability and transparency and hindering opportunities for collaboration and coordination.

Addressing this gap, the Delta Science Tracker has emerged as a pioneering web-based project tracking and communication platform developed and supported by the Delta Science Program. This publicly accessible project hub is designed to centralize comprehensive information about science activities across the Delta, providing an invaluable resource for researchers, managers, decision-makers, and the public alike.

The Delta Science Tracker's primary objective is to enhance communication and connectivity within the Delta science community. In a landscape where the breadth and diversity of scientific work can be overwhelming, this platform offers a structured, easily navigable interface that allows interested parties to discover and explore science projects taking place in the Delta and beyond that are of interest or relevance.

In line with the Delta Science Plan's vision of “One Delta, One Science,” the Delta Science Tracker embodies a shared commitment to building a collective body of scientific knowledge. The platform reflects evolving science priorities and informs future water and environmental decisions, helping to support the long-term sustainability and resilience of the Sacramento-San Joaquin Delta.

Furthermore, in an era of increasing climate-driven uncertainty, the need for cross-institutional collaboration has never been greater. The Delta Science Tracker serves as a catalyst for enhanced collaboration by connecting managers, policymakers, scientists, and other interested parties across disciplines and geographies to inform critical decisions that will guide the Delta’s future.

PRESENTER

Nick Rowlands, Delta Stewardship Council

POSTER 107

A Shared Stream: Sharing Findings from the State Water Contractors Science Program

Since 2018, the start of the State Water Contractors (SWC) Science Program, SWC has funded over $16 million in studies, models, tools and science development, which has contributed to a better understanding of ecosystem function and key water management questions that impact water supply allocation decisions in the Sacramento-San Joaquin Delta (Delta) and throughout the State Water Project system. This work has created ongoing, collaborative partnerships with some of the leading scientists and researchers at universities, state and federal agencies, water agencies and private institutions.

Each year the SWC seeks to fund rigorous and objective, management-relevant science to help inform decision-making related to the California State Water Project. As part of our evaluation of the science being funded by the SWC, the Science Manager reports out on the status of projects that were funded in the previous fiscal year, as well as findings from research that is completed. This poster provides a snapshot of the work funded in fiscal year 2024/2025 and a description of findings from a subset of studies funded by the SWC.

PRESENTER

Darcy Austin, State Water Contractors

POSTER 108

Share Your Science: Help Inform the Science Action Agenda Progress Summary

The 2022-2026 Science Action Agenda (SAA) prioritizes science actions to fill knowledge gaps in the Sacramento-San Joaquin Delta (Delta) and achieve key objectives in the Delta Science Plan. Science actions in the SAA were collaboratively developed with the Delta science community and are intended to address management questions, challenges on the horizon, and anticipated long-term science needs.

As this current SAA approaches its end, an implementation progress summary is needed to help inform the next iteration.

The 2022-2026 SAA progress summary will build on the Snapshot Progress Summary released in 2025, which provided a glimpse of resources allocated to the SAA to-date and focused on State Water Contractors and Council-funded research. The final 2022-2026 SAA progress summary will consider projects across the greater Delta science community to understand the full breadth and depth of implementation progress and highlight what knowledge gaps remain. Data collection for the progress summary will be a highly collaborative process and require engagement with many entities and starts with attendees of the 2026 Bay-Delta Science Conference.

This poster will be informative and interactive with the goals of raising awareness about the SAA progress summary and starting the data collection process. Conference attendees will be encouraged to interact with the poster by placing sticky notes with their project information on one of six boxes that represent the different 2022-2026 SAA Management Needs. This interactive poster will be an essential part of capturing the breadth of work ongoing in the Delta for the progress summary.

PRESENTER

Kim Luke, Delta Stewardship Council

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POSTER 109

The 2026 Delta Science Plan in action

The recently released 2026 Delta Science Plan is composed of 24 Actions structured around four grand challenges facing the Delta: anticipating new conditions, rapid environmental change, decentralized flows of information, and siloed decision-making. Each of the 24 Actions within the Delta Science Plan also features an associated example of ongoing efforts coined “Action Example”. The Action Example sections are meant to showcase existing or planned initiatives that are making progress in addressing the Action. For instance, for Action 4.5: *Embrace more ways of knowing*, the Action Example is the Ecocultural Working Group for Webb Tract restoration which has served as the official voice for tribal partners throughout the Webb Tract wetland restoration process. These examples are by no means a comprehensive review of ongoing or planned activities in the Delta, but Action Examples are intended to inspire future work, identify partners, and build collaborations. This poster will highlight a subset of these Action Examples to encourage an understanding of how the Delta Science Plan can be put into action and have an interactive portion where participants can add new examples. By crowd-sourcing a more comprehensive list of Action Examples from the Delta science community we hope that participants can better see the 2026 Delta Science Plan in their work and inspire new connections.

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POSTER 110

Salmon at their range edge: Evaluating Chinook Salmon origins in the Guadalupe River using community sciences and isotopes

Chinook Salmon (Oncorhynchus tshawytscha) spawning runs are increasingly observed in watersheds outside of their currently accepted range. These occurrences create a management dilemma as observed adults may reflect straying of hatchery- and/or natural-origin fish or the early stages of local (re-)establishment. Distinguishing among these different events is challenging, especially in watersheds not systematically monitored for salmon.

We use the Guadalupe River watershed, an urban tributary to the southern San Francisco Estuary, as a case study for evaluating Chinook Salmon in novel spawning habitats. Chinook Salmon spawning, rearing, and smolt outmigration have been observed in the river since the 1980s, and ancient DNA from Mission Santa Clara salmonid remains found that Chinook Salmon occurred in the watershed circa 1800 CE.

We evaluate Chinook Salmon origins in the Guadalupe River using an establishment-continuum framework that distinguishes adult occurrence, spawning, juvenile production, local recruitment, and persistence. Citizen-science and community monitoring records document adult Chinook Salmon, redds, and outmigrating juveniles for seven consecutive years, indicating that the watershed supports more than episodic adult presence. Coded-wire tag recoveries identify contributions from Central Valley hatcheries, and genetic stock identification shows predominant Central Valley fall-run ancestry among analyzed adults, with occasional findings of coastal ancestry. Eye-lens stable isotope data indicate that some of the untagged adults were of natural origin rather than hatchery origin, while otolith geochemistry provides a method to assign natal watersheds and test for possible Guadalupe River origin. Together, these approaches can help distinguish hatchery-origin strays, natural-origin strays and local-origin returns.

We frame the Guadalupe River not as a confirmed self-sustaining population, but as a historically occupied urban watershed with evidence of a reproductive foothold. This case highlights how citizen science and multi-proxy origin tools may provide a framework to guide management decisions before population status is fully resolved.

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POSTER 111

From Source to Sea: Building an Integrated Cross-Cultural Vision of Delta Headwaters and Resilience

Climate change impacts on the Sacramento-San Joaquin Delta are well studied, but how warming will alter the Sierra Nevada headwater streams supplying the Delta's water remains poorly understood. Sierra Streams Institute (SSI), with the Nevada City Rancheria Nisenan Tribe, regional agencies, and research partners, is developing a framework combining high-resolution climate and hydrologic data with benthic macroinvertebrate (BMI) monitoring and Traditional Ecological Knowledge to identify which headwater ecosystems are most resilient or susceptible to climate extremes, and to guide climate-adaptive management across Northern Sierra Delta headwaters.

Using 25 years of physical, chemical, and biological data, we are building models to quantify relationships among climate, land use, hydrology, and in-stream biological response, including a state-and-transition approach to describe shifts between reference and degraded ecological states. In parallel, we are working with Tribal partners to document indigenous values under threat from climate change and explore how these values can be integrated into ecological state definitions, building a shared vocabulary for prioritizing management across scientific and Tribal perspectives.

As proof of concept, we present a completed pilot model for a single Sierra Nevada headwater watershed using SSI's long-term monitoring data. This pilot linked observed BMI responses to historical drought and flood extremes and projected future ecological states under regional climate models, demonstrating feasibility ahead of expansion to ten Northern Sierra watersheds. We also report preliminary progress aggregating data across 47 regional monitoring sites and early coordination with Tribal partners toward a shared climate resilience framework.

Findings from this ongoing project will help water managers anticipate how climate-driven changes in headwater ecosystems may affect the quantity, quality, and timing of water reaching the Delta, while also incorporating how indigenous knowledge can inform climate adaptation planning.

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POSTER 112

Rearing River-Ready Chinook Salmon (Nur): A Collaborative Indigenous and Western Science Approach to Reintroduction

For millennia, the Winnemem Wintu Tribe (WWT) has stewarded Winter-run Chinook salmon (Nur in Wintu) in the Winnemem Wakwaket (McCloud River). Displacing both people and salmon, Shasta Dam left Nur as a single, vulnerable population outside their historical range. Returning Nur to their ancestral, climate-resilient waters is a vital step towards their recovery. Historically, reintroduction methods have involved minimal rewilding efforts, potentially leaving fish unprepared for the dynamic, natural environments they encounter upon release.

To overcome these limitations, Chief Caleen Sisk of the WWT designed the Nur Nature Base System* (NNBS), drawing from Indigenous Traditional Ecological Knowledge (ITEK) to create a natural rearing environment that better prepares Nur for life in the river. Incorporating water, rock, and medicinal plants from the river, a mountain chute with variable swimming velocities, juvenile Nur are given a more natural environment to rear, imprint, and volitionally pass through before their downstream migration.

The goal of our study was to examine how the natural rearing conditions of the NNBS influenced morphological development, early habitat use, and antipredator behavior in Winter-run Nur. Bi-weekly morphometrics characterized the size of Nur prior to volitional departure from the NNBS into the Winnemem Waywaket. Behavioral data showed that Nur utilized the low-velocity swim-way (mountain chute) and sought refuge following a simulated predator event.

Together, these metrics provided a qualitative assessment of how the NNBS supports the development of characteristics associated with wildness in Nur. This study also illustrates how Indigenous and Western science can come together and complement one another to develop innovative approaches to Nur reintroduction and conservation. The NNBS provides a critical foundation for scaling reintroduction efforts above blocked natal watersheds throughout California, demonstrating the role ITEK and indigenous stewardship can play in a more connected, resilient Bay-Delta system.

*The Nur Nature Base System is patent pending.

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POSTER 113

Restoring Sediment Pathways: A Resilient Landscape Vision for Lower Adobe Creek

Sediment is essential to sustain tidal wetlands in San Francisco Bay and help them increase in elevation so they can keep pace with a rising sea level. Historically, many creeks draining the Bay's surrounding watersheds flowed directly onto tidal wetlands, bringing sediment during wintertime storms. Over time, these creeks were rerouted and constrained by levees, disconnecting them from their downstream wetlands. There is now great interest in realigning these creeks so that they drain directly onto tidal wetlands and provide sediment that will support long-term wetland resilience. SFEI scientists worked with partners to develop a resilient landscape vision for realigning lower Adobe Creek to drain onto the Adobe Creek Baylands, located in the City of Petaluma in North San Francisco Bay.

This 500-acre site contains publicly-owned land that has been highly modified by development over the past 200 years. The vision is a conceptual landscape design that is grounded in the understanding of how creeks and tides once worked together at the site, community and Tribal priorities, and interdisciplinary scientific expertise. The vision was shaped through a collaborative effort that included the City of Petaluma, Sonoma Water, Friends of the Petaluma River, San Francisco Estuary Partnership, Federated Indians of Graton Rancheria, regulatory agency partners, community members, and other interested parties. Near- and long-term actions within the vision include connecting lower Adobe Creek to adjacent tidal wetlands, reusing dredged sediment for wetland restoration, improving tidal exchange throughout the site, and adapting public access to create a more accessible and enduring landscape along the Petaluma River. This resilient landscape vision is the first step in the planning process to imagine a restored coastline with improved ecosystem functions for people and wildlife, increased resilience to sea level rise, and enhanced recreational and cultural uses of the landscape.

PRESENTER

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POSTER 114

Community Interviews to Assess Public Access and Sense of Belonging at San Francisco Estuary Tidal Wetlands

As part of the San Francisco Estuary Wetlands Regional Monitoring Program (WRMP), the San Francisco Estuary Partnership (Estuary Partnership) is conducting community interviews to assess how Bay-Delta residents access and use wetland sites, and the factors that contribute to their sense of belonging in these public spaces. This research will contextualize the WRMP's quantitative metrics on status and trends of wetland visitation across the region, and will provide important information to improve programming and implementation of wetland restoration and management so that publicly accessible wetland spaces are more beneficial and inclusive for all.

The project is designed as a community-engaged research study; social science staff at the Estuary Partnership are partnering with instructors at Berkeley City College, Chabot College, City College of San Francisco, College of Marin, College of San Mateo, San Francisco State University, San Jose City College, and Point Blue Students and Teachers Restoring a Watershed's Community College Conservation Internship program to train college students as research interviewers. Student interviewers are then conducting structured interviews in their communities and sharing the audio recordings with Estuary Partnership staff for qualitative thematic coding and analysis.

Over 1000 interviews are expected to be conducted through November 2026, and final results of the study will be available in Summer 2027. Preliminary and expected results include information about community perceptions of wetlands, modes of transportation for accessing wetlands, barriers to access, activities at wetland sites, place attachment to wetland sites, benefits derived from wetland site visits, and demographics of wetland site visitors and non-visitors, among others.

PRESENTER

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POSTER 115

Who Participates in Restoration Governance? Public Comments and Procedural Justice in Tidal Marsh Restoration

Assessing the success of tidal marsh restoration is crucial in coastal management, as complex social and environmental dynamics influence public perception of these initiatives. While much of the research focuses on ecological data and general social values, this study differs by focusing on the analysis of public comments (formal and recorded statements by individuals, groups, or institutions during specific consultation periods on proposed projects) related to restoration efforts in the Suisun Marsh and Sacramento-San Joaquin Delta.

To this end, a typology will be adopted that categorizes participation into individual, coordinated, and institutional modes, which will guide the analysis of participation patterns and interactions among actors involved in the commenting process. We will explore how the characteristics of participants (local residents, NGOs, and government agencies) influence the nature of contributions, the language used (personal experiences, advocacy, and technical terminology), and the types of knowledge drawn upon (local experiences, advocacy claims, and technical expertise).

By deepening the analysis of comments, we seek to understand justice and inclusion in decision-making processes, addressing central aspects of procedural justice. The findings will be relevant to environmental planners, policymakers, and conservation organizations, offering insights to guide strategic decisions, prioritize funding, and plan future restoration initiatives that integrate social impacts and ecosystem benefits, promoting both ecological resilience and social equity in the region.

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POSTER 116

Water sources of community water systems within the Delta

Community water systems provide essential drinking water supplies to Delta communities. These systems either use groundwater, surface water diversions, or some combination of the two. Some of these systems are small and isolated making the communities that rely on them particularly vulnerable to disruptions. This study investigates how many systems are served by each water source type and examines the risks associated with these systems. We combined a newly available statewide drinking water allocation network dataset from the COEQWAL project with Human Right to Water risk indicators from the SAFER database. This approach allows us to map the intersection of water source type and system risk across Delta community water systems. The findings provide insight into the vulnerabilities Delta communities may be experiencing due to their drinking water source.

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POSTER 117

Can AI pass the Delta modeling trivia? Benchmarking AI models on Delta knowledge

Large language models (LLMs) are increasingly being used to support scientific research, including literature review, data analysis, code development, and technical writing. This study evaluates and compares the performance of different LLMs on trivia questions related to the California Bay-Delta.

In addition, the study examines the relationship between model confidence and answer correctness to assess whether higher confidence is associated with better performance. The results provide a comparative assessment of LLM on domain-specific questions and offer insight into the usefulness of confidence as an indicator of answer reliability in the context of California Bay-Delta research.

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POSTER 118

Modeling Support Office, Hydrological models boundary regions

This poster showcases spatial information of key hydrology models developed by the Modeling Support Office (MSO), Department of Water Resources (DWR). Specifically, the (1) California Central Valley Groundwater-Surface Water Simulation Model, Coarse Grid (C2VSimCG), (2) CalSim3, (3) Bay-Delta SCHISM. The C2VSimCG model incorporates a two-dimensional element grid that consists of 1,393 nodes, which manifest to 1,392 elements, composing an area of 19,710 mi^2 (51,000 km^2). The area of individual elements approximates from 2.1 mi2 (5.4 km2) to 33 mi2 (87 km2) and averages 14 mi^2 (37 km^2). In addition, each element is designated individually to one of the 21 model subregions. C2VSimCG simulates water movement through the linked land surface, groundwater, and surface water flow systems in California's Central Valley. The C2VSimCG model contains monthly historical stream inflows, surface water diversions, precipitation, land use, and crop acreages.

CalSim3 is a water resources planning model that simulates California State Water Project (SWP), Central Valley Project (CVP) facilities, and operations. The California water system simulated by CalSim3 represents a vast network of nodes and arcs, where the arcs represent conduits of water flow as river channels, canals, and diversions. CalSim3 has 252 total demand units (DUs) within the water budget area (WBA) domain. The main features of Calsim3 and its uses are water-supply planning, State Water Project delivery capability analysis, environmental review, drought analysis, and evaluation of future climate scenarios.

The Bay-Delta SCHISM is an open-source computer software simulating the three-dimensional water flow and water quality in the San Francisco Bay Delta estuary. Additionally, it can also be used for simulating water levels and tides, currents and circulation, salinity, temperature, freshwater flows, exchange between the Sacramento, San Joaquin rivers, the Delta, and tidal influence from San Francisco Bay.

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