SUMMER 2021

Delta Breeze

A newsletter by the Delta Science Program

Dear Colleagues,

Dr. Laurel Larsen in the Wax Lake Delta, in Louisiana.

When I moved to California in late 2012 for an Assistant Professor position at UC Berkeley, I could not have foreseen that, nearly 10 years later, I would be writing an introduction to a Delta science newsletter as the Delta Stewardship Council's Lead Scientist. But here I am welcoming you to the inaugural issue of the Delta Breeze—a newsletter by the Delta Science Program focused on science funding.

Before I became the Lead Scientist, I spent years working in the Everglades, Chesapeake Bay watershed, and Gulf Coast, where I was intrigued by the scientific challenges presented by the Delta but also felt overwhelmed by the complexity of management and science entities. I didn't know where to start to bring myself up to speed on the key science needs, the network of people I needed to engage with, or the mechanisms for getting work funded.

TOP SCIENCE NEWS

Delta Science Program

DELTA STEWARDSHIP COUNCIL

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I now know that the Delta Science Program, with its mission of providing unbiased science to support management of the Delta, functions as the hub of the Delta science wheel. It serves to connect scientists, stakeholders, and managers through its synthesis, communication, funding activities, and facilitation of collaborative work. Had I been more aware of the Delta Science Program and its resources, I would have embraced Delta science much earlier in my career. Part of my vision as Delta Lead Scientist involves making Delta science opportunities and processes more visible to more people.

This quarterly newsletter is one of several new initiatives spearheaded by Delta Science Program to facilitate new collaborations and lines of communication (particularly between scientists, managers, and policymakers), and reduce barriers for engagement. Other initiatives include monthly Delta Lead Scientist office hours (conducted on Instagram Live at noon on the third Thursday of each month) and new mechanisms through which our funding program and review process contribute to diversity, equity, and inclusion.

Inspired by newsletters distributed through National Science Foundation funding divisions and its “Dear Colleagues” letters, the Delta Breeze will help highlight the most exciting and relevant science that this community is carrying out while also highlighting upcoming funding opportunities, and raising awareness of existing work. This inaugural issue highlights the projects funded through the 2021 Delta Science proposal solicitation supported by the Delta Science Program and the U.S. Bureau of Reclamation, and in collaboration with California Sea Grant.

As the hub to our many-spoked wheel, connection is integral to what we do at the Delta Science Program. We love to hear from the science community! Please reach out, via engage@deltacouncil.ca.gov, with feedback on how we can improve, items you’d like us to consider including in future newsletters, or any questions about Delta science in general. We hope you find this newsletter useful and stimulating.

Connect with us on Twitter, Instagram, Facebook, LinkedIn!

Science News:
2021 Science Proposal Solicitation

A record 99 research proposals, requesting approximately $63.9 million, were submitted to the Delta Science Program's 2021 biennial Science Proposal Solicitation. This response marks an increase from the previous solicitation in 2019 for which we received 62 proposals requesting $43 million. Following two rounds of independent scientific evaluations by external reviewers, the Delta Science Program (DSP) is thrilled to announce that 16 proposals have been selected for funding. These projects will address critical biophysical and social science knowledge gaps in the Delta identified in the 2017-2021 Science Action Agenda (SAA) ranging across a variety of topics from salmon migration to harmful algal blooms to wetlands and food webs. Of the funded projects, two will carry out Integrated Socio-Ecological Systems (ISES) research (Henery et al., Takekawa et al.), a new project category for this solicitation that involves the meaningful joining of social and natural sciences to build comprehensive knowledge on a topic.

Funded projects will receive over $9.6 million in combined funds from the Council and the U.S. Bureau of Reclamation. The State Water Contractors are also providing funding support for one of the projects, pushing the total to over $10 million. In parallel, the California Department of Fish and Wildlife's Proposition 1 program recently awarded grants for Delta science, also leveraging the SAA, raising the combined amount of competitive research funding in the Delta to 26 projects totaling $16.7 million for 2021.

Many strong proposals with potential for significant added value could not be funded because demand for funding was far greater than available funds. The Delta Science Program thanks all principal investigators who submitted proposals, as well as the external reviewers, from across the globe, who helped to ensure the review process was robust and rigorous. We also thank California Sea Grant, who administered the proposal submission and independent review process.

Dr. Kimberly Popendorf and research staff analyze toxin data.

Addressing CyanoHABs As A Threat To Water And Air Quality

Dr. Hans Paerl[1], Dr. Karsten Baumann[1], Dr. Ryan Paerl[2], Hwa Huang[2], Dr. Kimberly Popendorf[3], Dr. Raphael Kudela[4]

High concentrations of the toxin microcystin are linked to the increased occurrence of cyanoHABs (harmful algal blooms that produce toxins) and present a public health concern for communities in the San Francisco Bay and Sacramento-San Joaquin Delta (Bay-Delta). Recent findings suggest that cyanoHABs threaten air quality in addition to water quality via emissions of spray aerosols carrying algal cells and toxins. This study aims to generate high resolution measurements of cyanoHAB toxins and DNA in the Bay-Delta airshed, with the goal of informing human exposure guidelines for airborne cyanoHAB toxins and bloom mitigation policy in the region.

[1]University of North Carolina
[2]North Carolina State University
[3]University of Miami
[4]University of California Santa Cruz

Emily Richardson, USGS, deploying cyanotoxin samplers during a boat-based mapping survey in the Delta, in October 2020.

Harmful Algal Blooms and Cyanotoxins in the Delta: Occurrence, Distribution, Trends, and Environmental Drivers

Dr. Tamara Kraus[1], Dr. Peggy Lehman[2], Angela Hansen[1], Dr. Brian Bergamaschi[1], Chuck Hansen[1]

A major impediment to improved understanding and prediction of cyanoHABs in the Sacramento-San Joaquin Delta (Delta) is the dearth of cyanoHAB data collected across space and time. To address this data gap, this study will add cyanotoxin sampling to five existing real-time water quality monitoring stations in the Delta. Additionally, two stations will be equipped with sensors that continuously measure the abundance of four different phytoplankton groups. These data will help to identify temporal patterns and key environmental drivers of cyanoHABs and cyanotoxins.

[1]United States Geological Survey
[2]California Department of Water Resources

Dr. Stefan Talke at a tide staff at the Coast Guard pier in Morro Bay, California.

Assessing Sea Level Rise and Flooding Changes Using Historical Water-Level Records

Dr. Stefan Talke[1], Dr. David Jay[2]

In the Delta, sea-level is rising, land is sinking, river flows may be decreasing, and tides are changing. This project will recover, digitize, and analyze more than 1,300 station years of 'lost-and-forgotten' water level records collected between 1857 to 1982. These measurements, augmented by modern data, will be used to determine tidal and sea level trends, and characterize 'hotspots' of habitat and flood risk sensitivity. The results may be useful for focusing future scientific and management priorities, protecting the environment, managing flood risk, and enhancing community resilience to climate change.

[1]California Polytechnic State University
[2]Portland State University

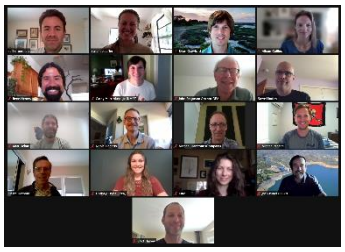
Dr. Dennis Baldocchi, sampling water and inspecting water sensors at the Mayberry Slough wetland restoration project on Sherman Island.

Quantifying Effects of Climate Change and Sea Level Rise on Carbon Accretion in Tidal and Non-Tidal Wetlands

Dr. Dennis Baldocchi[1], Dr. Ariane Ortiz[1]

Tidal wetlands that ring the Bay-Delta have great potential to remove carbon dioxide—the greenhouse gas responsible for climate change and sea-level rise—from the atmosphere and to protect shorelines from rising sea-levels. This study aims to understand how effective and how quickly restored wetlands bury carbon in soils, and the degree to which flooded wetlands may produce methane, a potent greenhouse gas. The project team will measure carbon dioxide and methane fluxes into and out of the wetlands to assess carbon sequestration across a network of tidal and non-tidal wetlands differing in age and salinity, and will create maps of the Bay-Delta with this information using remote sensing products.

[1]University of California, Berkeley.



The "Reorienting to Recovery Team" on a video call.

Developing an Inclusive, Landscape Scale Process for Central Valley Salmonids

Dr. Rene Henery[1], Dr. Natalie Stauffer-Olsen[1], Gary Bobker[2], Rafael Silberblatt[3], Dr. Noble Hendrix[4], Dr. Mark Tompkins[5], Dr. Eric Danner[6], Dan Ohlson[7], Sally Rudd[7]

Salmon of California's Central Valley are culturally and ecologically valuable but are subject to numerous stressors. This study will use sociological and ecological methodologies to develop an integrated, collective, and strategic approach for recovering Central Valley salmonid populations. The project will do this by leveraging existing collaborative efforts and decision-support tools to create a common, shared vision, and a common set of scientifically-based priorities for action that are both implementable and impactful.

[1]Trout Unlimited
[2]The Bay Institute
[3]Kearns & West
[4]QEDA Consulting
[5]FlowWest
[6]National Oceanic and Atmospheric Administration; University of California, Santa Cruz
[7]COMPASS

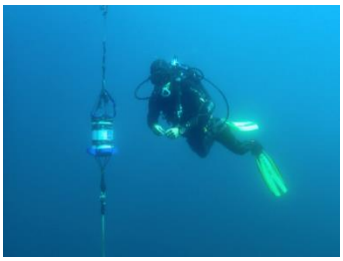
Sara Hugentobler in the Meek lab at Michigan State University processing Chinook salmon samples for genotyping.

Estimating Juvenile Production and Run Timing of Spring Chinook Salmon

Dr. Russell Perry[1], Dr. Mariah Meek[2], Brian Pyper[3]

The estimated number of young salmon that leave the upper watershed every year, or the "juvenile production estimate", has been highlighted as a critical data gap that could otherwise be used to inform population demographics, parameterize life cycle models, and provide a population-level criteria for managing take of federally threatened spring-run and endangered winter-run Chinook salmon at the state and federal water projects. In response to this data gap, the goal of this project is to estimate abundance and run timing of juvenile spring-run Chinook salmon leaving the Delta at Chipps Island by leveraging two existing studies that use the latest advances in genetic and acoustic telemetry technology.

[1]United States Geological Survey
[2]Michigan State University
[3]Fish Metric Inc.



UC Davis field technician deploying an Acoustic Doppler Current Profiler to measure water velocities in Lake Tahoe in a similar fashion that will be deployed in this study.

Regulation of Shasta Dam Temperature Control Device for Supporting Downstream Fish Populations

Dr. Alex Forrest[1]

The Temperature Control Device (TCD) at Shasta Dam provides a means for the U.S. Bureau of Reclamation to selectively withdraw water from different depths and temperatures to manage cold water releases to downstream river reaches during the spring, summer, and fall. Cold-water pool management, particularly during low water years, is essential for downstream winter-run Chinook salmon spawning and rearing. How the TCD operates under day-to-day operations for different gate openings, different powerhouse operations, and different thermal conditions within the reservoir is poorly understood. This work will build a flow model to optimize the performance of the existing infrastructure to protect downstream fisheries, enabling more informed operation of the TCD.

[1]University of California, Davis

Dr. Rebecca Buchanan and Dr. Steven Whitlock, University of Washington.

Standard Operating Procedure for Diagnosing and Addressing Predator Detections in Salmon Telemetry Data

Dr. Rebecca Buchanan[1], Dr. Russell Perry[2]

Predation of tagged fish (i.e., consumption of tagged fishes by predators) complicates analysis of juvenile salmon telemetry studies and can bias results, delay timely reporting, and prevent effective data synthesis. This project seeks to address these issues by characterizing predatory fish movement patterns from existing telemetry data in the Delta, developing a standard operating procedure for diagnosing and handling detections of predated tags in salmon telemetry studies, and implementing the recommendations in an R software package that includes code, a "library" of expected predator behaviors, and example vignettes. The R package will be freely available for download at www.cbr.washington.edu.

[1]University of Washington
[2]United States Geological Survey

Arnold Ammann deploying an acoustic receiver under the Golden Gate Bridge.

Comparing the Impact of Predation on the Outmigration Mortality of all Central Valley Salmon to Other Habitat Related Covariates

Dr. Mark Henderson[1]

This study will analyze acoustic telemetry data for the four runs of Chinook salmon (Oncorhynchus tshawytscha) in California's Sacramento River (fall, late-fall, winter, and spring) and determine the primary factors, for each run, that affect mortality of juveniles migrating to the ocean. The project team will develop models of juvenile salmon survival to examine the relative influence of flow and predation on survival through the Sacramento River, including indication of hot-spots of mortality, where predation may claim many juvenile salmon before they enter the ocean.

[1]Humboldt State University

Laura Heironimus releases an acoustic-tagged adult white sturgeon in the San Joaquin River.

Understanding Within-and Between-Basin Migration in White Sturgeon: A Synthesis of More Than 10 Years of Acoustic Tagging Data

Dr. Myfanwy Johnston[1], Zachary Jackson[2], Laura Heironimus[3]

White Sturgeon is a species of conservation concern in California. However, the scope and variability of movements of White Sturgeon in the Bay-Delta system between river basins remains unknown, despite the existence of over a decades' worth of acoustic telemetry data in the region. This project's objective is to combine and synthesize these existing datasets to address high priority research areas for the management of White Sturgeon in the Bay-Delta system, including spawning periodicity, the onset of upstream migration movement, and the scope and variability of inter-basin movements of White Sturgeon.

[1]Cramer Fish Sciences
[2]United States Fish and Wildlife Service
[3]Washington Department of Fish and Wildlife

Dr. Carson Jeffres, George Whitman, Dr. Malte Willmes, Dr. Flora Cordoleani, Jeff Rosenthal, Dr. Jelmer Eerkens, and Dr. Rachel Johnson.

The Effects of Climate Change on the Life History of Spring-run Chinook Salmon through Time

Dr. Malte Willmes[1], Dr. Flora Cordoleani[1], Dr. Eric Palkovacs[1], Dr. Rachel Johnson[2,3], Jelmer Eerkens[3]

Climate change is transforming California and is threatening already vulnerable salmon populations. This project will use archival tissues (otolith ear stones) from modern and historical spring-run Chinook Salmon to understand how shifts in migration timing and habitat use allowed salmon to cope with highly variable environmental conditions. We will learn how salmon responded to the recent drought and flood periods (2012-2020), the California Gold Rush Period (~1835-1870), the Little Ice Age (~1560-1780), and the Megadrought Period (~1200-1410). This effort will provide the insights needed for developing climate-adapted conservation actions to support salmon into the future.

[1]University of California, Santa Cruz
[2]National Oceanic and Atmospheric Administration
[3]University of California, Davis

Phragmites seed heads in late summer.

Integrating Social and Ecological Research to Control Invasive Species

Dr. John Takekawa[1], Dr. Karen Kettenring[2], Dr. Virginia Matzek[3], Dr. Zhao Ma[4], Dr. Richelle Tanner[5]

Suisun Marsh—a large area of wetlands—supports a variety of birds, fish, invertebrates, and plants, and provides recreation opportunities for hunters, fishers, birdwatchers, and boaters. The area has been invaded by nonnative, invasive Phragmites australis, a tall reed that grows in dense stands and impedes navigation, reduces fish and wildlife movements, decreases biodiversity, and creates fire hazards. Phragmites has spread rapidly over the last 25 years, including in recently restored tidal wetlands. This project will study social, cultural, and ecological factors that affect invasive species control, combining natural and social science data to develop a durable integrated control plan for Phragmites.

[1]Suisun Resource Conservation District
[2]Utah State University
[3]Santa Clara University
[4]Purdue University
[5]Chapman University

San Francisco Estuary Institute scientist Sean Baumgarten leads a public training on the historical ecology of San Francisco.

Suisun Landscapes: Historical Ecology, Functional Metrics, and Community Priorities for Landscape Planning

Dr. Letitia Grenier[1], Dr. Lydia Vaughn[1]

Suisun Marsh faces changes to its ecological, social, and economic systems due to interacting impacts of climate change and land and water management. Sustaining a functioning marsh that supports fish, waterfowl, recreation, and other benefits requires thoughtful planning and coordination among landowners, resource managers, and other stakeholders. To support these efforts, Suisun Landscapes will develop a synthetic and inclusive set of resources for conservation planners and managers that describe: the Marsh's historical ecology; the drivers, pathways, and impacts of change over time; and community uses and priorities. Resources will include maps, quantitative metrics, written reports, and tools for scenario planning.

[1]San Francisco Estuary Institute

Dr. Ravi Nagarajan, UC Davis.

Non-Invasive Environmental DNA Monitoring to Support Tidal Wetland Restoration

Dr. Raman Nagarajan[1], Dr. Andrea Schreier[1]

Extensive tidal wetland restorations are ongoing in the Bay-Delta. To understand which species are using these habitats, this project will use environmental DNA (eDNA) methods that indirectly detect species presence via DNA shed in the environment. In parallel with existing monitoring programs that use nets to catch and identify fish, this project will collect non-invasive water samples and perform eDNA assays to determine the presence or absence of fish and potentially other organisms. Successful completion of this project will establish eDNA monitoring as a complementary, cost-effective tool to help resource managers evaluate the success of restoration efforts.

[1]University of California, Davis

Dr. Michelle Jungbluth, San Francisco State University.

From Microbes to Zooplankton, What Defines a Beneficial Wetland?

Dr. Michelle Jungbluth[1], Jason Hassrick[2]

In the Bay-Delta, massive wetland restoration efforts are underway to help our declining aquatic species. However, it continues to be unclear what aquatic species, under the water surface, these efforts support. This project will use molecular methods to identify a subset of species ranging from “microbes to zooplankton” that are indicative of wetland conditions, in different stages of restoration. The project will also measure the foodweb resources provided by the wetlands to larval fish. This information will help managers prioritize restoration efforts that are most likely to directly help declining aquatic species.

[1]San Francisco State University
[2]ICF

Dr. Brian Bergamaschi driving a boat in the Delta, with sensor gear in the background.

How Delta food webs have changed: integrating detrital material into the Delta food web puzzle

Dr. Peter Hernes[1], Dr. Brian Bergamaschi[2], Dr. Tamara Kraus[2]

A Delta ecosystem that is healthy for fish is healthy for everyone. However, zooplankton resources for fish are scarce, thus, this project focuses on different food sources for increasing zooplankton, including known phytoplankton sources, but also wetland plant particles, which have only recently been identified as a zooplankton food source in the Delta. This project aims to determine and map all particle types that are beneficial to zooplankton in the Delta by coupling laboratory analyses of food quality with boat sensor measurements, thereby providing important tools for guiding management decisions to increase beneficial particles.

[1]University of California, Davis
[2]United States Geological Survey

Events on the Horizon

July:

- Delta Plan Interagency Implementation Committee Quarterly Meeting
  July 12, 1:00 pm to 3:00 pm

- Delta Independent Science Board Meeting
  July 13, 1:00 pm to 3:30 pm

- Delta Science Program Science Actions Workshop
  July 13-14, 9:00 am to 12:00 pm

- Delta Lead Scientist "Ask Me Anything" Digital Office Hours Instagram Live
  July 15, 12:00 pm

August:

- Delta Lead Scientist "Ask Me Anything" Digital Office Hours Instagram Live
  August 19, 12:00 pm

- Delta Independent Science Board Meeting
  August 19-20, 1:00 pm to 3:30 pm

- Delta Science Program Brown Bag Seminar
  August 24, 12:00 pm to 1:00 pm

September:

- Delta Lead Scientist "Ask Me Anything" Digital Office Hours Instagram Live
  September 16, 12:00 pm

- Delta Independent Science Board Meeting
  September 16, 1:00 pm to 3:30 pm

#SciComm Corner

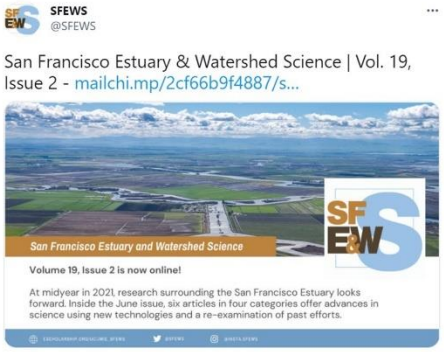
Visit the Council's blog archive to read the latest on the complex issues related to our work toward a reliable California water supply and resilient Delta ecosystem.

Delta Stewardship Council
@DeltaCouncil · June 24
#BIGNEWS: At our June Council meeting today, the Council voted to approve $9.6 million to fund 16 #sacdelta scientific studies! 🏆 @ReclamationCVP is contributing over $3.42M toward four projects + @SWC_CAWater is co-funding one, pushing the grand total awarded to over $10M. 💰
https://twitter.com/DeltaCouncil/status/1408167690431303683

Keith Bouma-Gregson
@K_BoumaGregson · June 24
Thanks @DeltaCouncil for funding @USGSwaterCA to monitor for #cyanoHABs in the #sacdelta. We look forward to contributing to improving our understanding of #toxic algae and #cawater.
https://twitter.com/K_BoumaGregson/status/1408213732845527040

ESTUARYNews @ESTUARYNews · June 17
Our summer issue is live! Digging deeper is the theme in this issue as Estuary managers and scientists scrutinize their options and check their #restoration work in light of a drier, hotter, more hungry #SFBay, #SacDelta, and entire #BayDelta system.
http://sfestuary.org/estuary-news-/estuary-news-june-2021
https://twitter.com/ESTUARYNews/status/1405576546601951232

SFEWS @SFEWS · June 10
San Francisco Estuary & Watershed Science | Vol. 19, Issue 2 - https://mailchi.mp/2cf66b9f4887/sfews-vol19-iss2
https://twitter.com/SFEWS/status/1402958680262332419



Interagency Ecological Program
@ IEPLeadScience · June 30
Check out the newest IEP Blog “The View From Here,” supplied by the IEP Lead Scientist Steven Culberson. Our hope is this occasional entry will spark useful conversations about monitoring science, ecology, and natural resources conservation. https://bit.ly/3qxKihA #IEPScience
https://twitter.com/IEPLeadScience/status/1410236818490990592

California Sea Grant
@CASeaGrant · June 7
Applications are OPEN for our State Fellows Program, which provides a unique educational opportunity for graduate students who are interested in marine, coastal, and/or watershed resources. Learn more from past participants on our blog: https://bit.ly/3gekNgB
https://twitter.com/CASeaGrant/status/1401920148018241541

ESTUARYNews @ESTUARYNews · March 30
Did you know that the Estuary Blueprint, which covers all aspects of environmental restoration in the #SFBayDelta, is being updated for the third time right now? Our reporter @cariadt dives in with an article AND podcast episode Writing handSpeaker with three sound waves

https://sfestuary.org/estuary-news-catching-up-estuary-blue-print-update/

#ClimateAdaptation
https://twitter.com/ESTUARYNews/status/1377004757974315008

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