



Cultivating Connections for a Dynamically Changing Environment

BayDeltaScienceConference.com
#BDSC2024

Sept. 30–Oct. 2, 2024

**SAFE Credit Union Convention Center
Sacramento, California**

The **Biennial Bay-Delta Science Conference** recognizes that, by harnessing the breadth of knowledge that exists across our community, we can meet the many challenges facing the Delta of today and into the future. However, the strongest path forward will require intentional cultivation and increased connection.

Just as cultivation can nurture the development of a sapling to a tree and the growth of many trees into a resilient forest, connection and cultivation will magnify our positive impact as practitioners, inhabitants, and stewards of the Bay-Delta facing the multiple challenges inherent with rapid change. Embracing connections across ways of knowing, disciplines, and geographies will be the key to fruitful adaptation. **We hope that the 2024 Bay-Delta Science Conference, “Cultivating Connections in a Dynamically Changing Environment” will plant the seed.**

Special Event

Tricia Lee, Delta Science Program

Town Hall: Jeopardy! Delta Science Plan Edition

October 1 at 12:30-1:30 in Rm B3-5

What does it take to plan for the “doing of science” in the Delta? How can members of the Delta science community have their voices heard in the planning done by the Delta Science Program? What are the “Grand Challenges” in Delta science and what can we do about them? Attend this interactive and fun lunchtime session to hear about how the Delta Science Plan has successfully created change in Delta science over the last decade and how YOU can inform the forthcoming development of the 2025 Delta Science Plan.

Organizing Committee:

Conference Co-Chairs:

Jim Orlando, USGS

Michele Stevens, Sac State

Program Chairs:

Brian Mahardja, USBR

Laura Twardochleb, SWB

Conference Coordinators:

Miranda Bell-Tilcock, Delta Stewardship Council

Maggie Christman, Delta Stewardship Council

Events Enterprises Team

Poster Chairs:

Scott Navarro, Delta Stewardship Council

Florian Mauduit, UC Davis

Art Chairs:

Kim Luke, Delta Stewardship Council,

Jessica Weidenfeld, Delta Stewardship Council

Student Mentor Chairs:

Ben Geske, Delta Stewardship Council

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Student Judging Chairs:

Stephen Elser, Delta Stewardship Council

Elizabeth Brusati, Delta Stewardship Council

Xoco Shinbrot, Delta Stewardship Council

Professional Societies Chair:

Darcy Austin, State Water Contractors

Brown-Nichols Science Award

Chair: *Lauren Hastings, Delta Stewardship Council*

Committee Members:

Amanda Cranford, NOAA/NMFS

Shawn Acuna, MWD

Christine Joab, CDFW/IEP

Tim Mussen, Sacramento Area Sewer District

Lisa Thompson, Sacramento Area Sewer District

Lauren Damon, Delta Conservancy

Anji Shakya, Delta Conservancy

Lydia Vaughn, SFEI

Donna Bell, SFEI

Lynn Takata, CDFW



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Plenary Session will feature talks from:



**Diana Almendariz,
Cache Creek
Conservancy**
*“Reinvigorating
Waters and Soil:
The Unexpected
Benefits of Ash”*



**Don Hankins,
Chico State**
*“Community
Connections:
Weaving Tradition
& Science for
Collaborative
Conservation”*



**Karen Morrison,
CDPR**
*“Downstream
Impacts of
Sustainable Pest
Management”*

Plus! Find out the winner of the 2024 Brown-Nichols Science Award!

See next page for talks and posters. Asterisks (*) indicate the presenter is competing in the student presentation awards competition.



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Day 1 Sept. 30	Session 1 (B2)	Session 2 (B3-5)	Session 3 (B6-8)	Session 4 (B9)	Session 5 (B10)	Session 6 (Rm 9/10)
8:00	Registration and Check in opens					
9:00 – 12:00	Plenary Session and Brown-Nichols Science Award					
12:00 – 1:30	Mentor Lunch or Lunch on your own					
1:30 – 3:30	From Monitoring to management: a Collaboratory to develop a spring- run Chinook Salmon juvenile production estimate	Emerging Technologies (General)	Flow and Physical Processes 1	Beyond Fish (Birds)	Phragmites control efforts and expansion in Suisun Marsh over 2 decades: can collective action improve the outcome?	Artificial intelligence (AI) approaches to advance ecosystem science
3:10-3:30	Break					
3:30-4:50	Fishes in South Delta	Emerging Technologies (Fish)	Flow and Physical Processes 2	Beyond Fish (Mammals and Herps)	SF Estuary Wetlands Regional Monitoring Program: Regional Science to inform estuary management	
5:00-7:00	Poster Reception and Art					



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Day 2 Oct 1	Session 1 (B2)	Session 2 (B3-5)	Session 3 (B6-8)	Session 4 (B9)	Session 5 (B10)	Session 6 (Rm 9/10)
8:00	Registration and Check-in opens					
8:30 – 10:10	O. mykiss	Delta Carbon Farming	Applied Science & Adaptive Management	Unbottling the secrets of the Bay-Delta: How environmental DNA is transforming biological monitoring	Longfin Smelt	Delta Collaboration 2.0: How can we improve collaborative engagements to incorporate more diverse perspectives and support more robust decisions?
10:10 – 10:30	Break					
10:30 – 12:10	Anadromous Fishes	Social Sciences & Human Dimensions	Post normal decision making in the Bay-Delta	Leveraging Synthesis Science: A collaboration between the Delta Science Program Synthesis Working Group and National Center for Ecological Analysis & Synthesis (NCEAS)	HAB and Invasive Species	Interweaving Traditional Knowledge and mainstream science in the San Francisco Bay-Delta
12:10 - 1:30	Lunch; Town Hall: Planning for science in the dynamic Delta system; Science Fellows Reunion Lunch					
1:30 – 3:10	Chinook Salmon 1	Democratizing Water Futures 1	Tools for Decision-Making Under Uncertainty	Species and Communities	Contaminants	2023 Delta Residents Survey: The first of holistic effort to monitor human well-being in the Delta
3:10 - 3:30	Break					
3:30 – 5:10	Chinook Salmon 2	Democratizing Water Futures 2	Tools for Decision-Making Under Uncertainty	Retro-ecological Futures for the 22 nd Century	Predation	Understanding Tribal Data Sovereignty, Research Protocols, and CARE + FAIR Principles



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Day 3 Oct 1	Session 1 (B2)	Session 2 (B3-5)	Session 3 (B6-8)	Session 4 (B9)	Session 5 (B10)
8:00	Registration and Check-in opens				
8:30 – 10:10	Delta Smelt 1	Healthy Rivers and Landscapes Program: Framing a Watershed-wide Adaptive Management Program	Human Dimensions of the San Francisco Bay-Delta: A path toward sustainability	Cultivating science-management connections to inform wetland restoration and management using the Dutch Slough Restoration’s living laboratory design 1	Water & Sediment Quality
10:10 – 10:30	Break				
10:30 – 12:10	Delta Smelt 2	Engineering with Nature and Strategic Placement of Dredged Material in San Francisco Bay	Weaving together Indigenous and Western sciences to restore wild Nur (Chinook Salmon) to the Winnemem Waywaket (McCloud River) – Part 1	Cultivating science-management connections to inform wetland restoration and management using the Dutch Slough Restoration’s living laboratory design 2	Collaborative Monitoring and Research: Advancing Nutrient and Algal Bloom Understanding in the Bay-Delta
12:10 - 1:30	Lunch				
1:30 – 3:10	Advancements in Longfin Smelt Science and Management 1	Advancing modeling tools to support long-range water allocation planning in a changing climate	Weaving together Indigenous and Western sciences to restore wild Nur (Chinook Salmon) to the Winnemem Waywaket (McCloud River) – Part 2	Food Webs 1	Assessing the drivers and impacts of the August 2022 Heterosigma akashiwo bloom in San Francisco Bay, California 1
3:10 - 3:30	Break				
3:30 – 5:10	Advancements in Longfin Smelt Science and Management 2	Perspectives on science supporting decision-making under deep uncertainty	Weaving together Indigenous and Western sciences to restore wild Nur (Chinook Salmon) to the Winnemem Waywaket (McCloud River) – Part 3	Food Webs 2	Assessing the drivers and impacts of the August 2022 Heterosigma akashiwo bloom in San Francisco Bay, California 2



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Session Name	Abstract
From Monitoring to management: a Collaboratory to develop a spring- run Chinook Salmon juvenile production estimate	Central Valley spring-run Chinook Salmon are protected under both the state and federal Endangered Species Act, but measures to protect and recover spring-run are challenged by the difficulty in tracking status and life stages of remnant populations across multiple streams and agency programs. The California Department of Water Resources and Department of Fish and Wildlife, U.S. Fish and Wildlife Service, NOAA Fisheries, and Bureau of Reclamation, plus agency partners, are collaborating to develop an approach for calculating an annual spring-run Chinook Salmon juvenile production estimate (SR JPE) for the Sacramento River and its tributaries. The SR JPE is a forecast of the juvenile spring-run abundance expected to migrate into the Delta each year. Although its immediate purpose is to support measures to protect and enhance spring-run populations, the SR JPE program supports salmon science beyond a JPE, beyond the Sacramento River, and beyond spring-run. This symposium describes the processes and partnerships formed to support an annual SR JPE and the outcomes of these partnerships, including: expanded monitoring, new genetics tools, a coordinated data management system among more than 20 data stewards and managers, a cloud-based data entry platform that ensures rapidly-reported cross-compatible data from over 40 individual sources, multiple models, publicly accessible databases and model code, and documentation via peer-reviewed publications. Model development involved coordination of field staff, geneticists, lab technicians, and modelers. Structured-Decision-Making guides development of alternative SR-JPE approaches, final approach selection for implementation, and coupled with the data management system provides a transparent framework to address multidimensional decisions, including updates of spring-run monitoring and models as new information is developed in the future.
Emerging Technologies (General)	Invention, development, or research of new technology and analytical tools relevant to the management of the Bay-Delta and its watershed.
Flow and Physical Processes 1 & 2	Science that improves the understanding of how physical processes such as hydrodynamics, sediment transport, and geomorphology may affect the Bay-Delta system.
Beyond Fish (Birds)	Work or studies in the Bay-Delta watershed that broaden our understanding of species and taxa of interest beyond fish.

Session Name	Abstract
Phragmites control efforts and expansion in Suisun Marsh over 2 decades: can collective action improve the outcome?	<p>The San Francisco Bay-Delta is a highly urbanized and invaded estuary with a large number of non-native species affecting its wetland ecosystems. Most wetlands require careful management to provide the greatest ecological value, and although there have been many costly efforts to control spread of invasive plants, most have been conducted or led by a single agency or landowner. In areas with numerous stakeholders, wetland plant invasions present a social-ecological challenge to address the barriers to collective action as well as the biophysical factors involved in the spread of the invader. For example, the common reed (<i>Phragmites australis</i>) creates impenetrable stands that impede navigation, limit site access and views, reduce wildlife movement, and create a fire hazard. <i>Phragmites</i> may rapidly colonize newly restored tidal wetland sites and undermine their desired habitat benefits. Several methods, including different herbicide treatments have been used to control <i>Phragmites</i> across North America, but most efforts have not been effective in eradicating invasions. In this session, we will use the example of invasive <i>Phragmites</i> in Suisun Marsh to examine invasive plant control efforts by both private and public landowners. We will provide a continental context on efforts to control this widespread invasive, examine spread and management efforts in Suisun Marsh over the past 20 years, discuss the value of implementing revegetation after control, present perspectives from different stakeholders, and consider how the different viewpoints may be incorporated into collective action. We will discuss how the social and ecological sciences may be used to inform a spatial prioritization roadmap to help guide collective action and improve future control efforts.</p>
Artificial intelligence (AI) approaches to advance ecosystem science	<p>Coastal ecosystems play a crucial role in carbon sequestration and climate resilience, yet they face significant threats from climate change, including rising sea levels, and human activities. Machine learning and deep learning ecosystem models offer innovative solutions to understand and manage these complex ecosystems effectively. This session focuses on leveraging AI and process-based ecosystem models to address climate change mitigation by examining greenhouse gas (GHG) dynamics and soil-plant-atmosphere interactions in coastal ecosystems, with a focus in the Delta-Bay region.</p>
Fishes in South Delta	<p>Studies done on fish in the South Delta.</p>
Emerging Technologies (Fish)	<p>Invention, development, or research of new technology and analytical tools relevant to the management of the Bay-Delta and its watershed.</p>
Beyond Fish (Mammals and Herps)	<p>Work or studies in the Bay-Delta watershed that broaden our understanding of species and taxa of interest beyond fish.</p>

Session Name	Abstract
SF Estuary Wetlands Regional Monitoring Program: Regional Science to inform estuary management	<p>The Wetlands Regional Monitoring Program (WRMP) delivers coordinated regional monitoring of the San Francisco Estuary’s wetlands to inform science-based decision-making for wetland restoration and adaptive management and increase the cost-effectiveness of permit-driven monitoring associated with wetland restoration projects. The science framework of the WRMP is built around the key information needs of a broad range of tidal wetland decision-makers, including restoration project proponents, resource and regulatory agencies, and the frontline communities that rely on these ecosystems for flood protection, cultural use, recreation, and other needs. By re-aligning and leveraging the region’s considerable investments in existing monitoring projects and programs, the WRMP will reduce the amount of time, money, and effort that restoration project proponents must invest in permit-required monitoring. It will help program partners understand the evolution of the estuary’s existing tidal wetland restoration projects, support effective adaptive management in a changing estuary, and provide the information they need to design projects that will be resilient to likely future conditions. The WRMP’s science framework integrates remote sensing, rapid field assessment, and quantitative observations of physical and ecological conditions to assess the distribution, abundance, and condition of the region’s tidal wetlands across multiple spatial and temporal scales. In this session, we’ll describe how WRMP science is already delivering answers for tidal wetland decision-makers, and provide examples of the types of data collection, analysis, and synthesis we expect to support with new funding from USEPA. This science includes: An innovative approach to consistent, high quality, and automated estuarine habitat mapping that can efficiently address change detection needs, Expanded monitoring of key tidal wetland processes such as inundation, shoreline erosion/progradation, and elevation change, and Monitoring across linked networks of existing reference and restoring marshes, to place observations at the latter within broader landscape contexts.</p>
O. mykiss	<p>This session will focus on a variety of studies featuring <i>Oncorhynchus mykiss</i>.</p>
Delta Carbon Farming	<p>More than 150,000 acres of land in the Delta have subsided significantly over the past 200 years, resulting in land surface elevation changes of up to 9 meters below sea level. Delta lands continue to subside at a rate of over 3.5 cm per year, leading to increased flooding risk from levee failure, seepage from groundwater, and greenhouse gas (GHG) emissions. Although Delta wetlands were historically carbon sinks that took carbon from the atmosphere and stored it in peat soils, land use changes in the Delta have reversed this process and the Delta currently emits 1.2 million metric tons of GHGs, the equivalent of about 375,000 vehicles, each year. Rewetting peat soils can halt or reverse subsidence, but common agricultural practices in the Delta require drained soils. Therefore, alternatives are needed that meet the many interests of the Delta community. This session will detail significant recent advancements in Delta carbon farming and paludiculture as viable options to address subsidence, reduce GHG emissions, create habitat, and generate revenue. To understand how to implement these alternatives, the speakers will 1.) Discuss ongoing GHG monitoring at multiple wetland sites throughout the Delta and provide insight on the carbon flux of different types of wetlands, 2.) The development and status of the wetland protocol used to quantify and validate carbon credits as required before the credits can be sold on the carbon market, 3.) Provide an overview of the carbon market and the current process for selling carbon credits, 4.) Discuss two wetland sites owned by the Department of Water Resources that have been successfully issued carbon credits and are meaningful case studies for future management and restoration, and finally, 5.) The Nature Conservancy will talk about Staten Island, a living laboratory and mosaic solution for wildlife, agriculture, and carbon farming.</p>

Session Name	Abstract
Applied Science & Adaptive Management	Work or processes to develop effective science-based management strategies for the Bay-Delta system, such as decision-support tools for structured decision making.
Unbottling the secrets of the Bay-Delta: How environmental DNA is transforming biological monitoring	Environmental DNA (eDNA) and RNA (eRNA) tools are emerging as important components of biological monitoring programs in the Bay-Delta region. These methods are sensitive, robust, safe, and cost effective and they produce new types of data that can be used to answer complex management questions. In partnership with academic and private institutions, management agencies have already applied eDNA and eRNA tools in areas such as listed species detection, evaluation of habitat restoration actions, and monitoring of nuisance species. This session will highlight the types of applications for which eDNA can be used, progress made toward broadscale adoption of eDNA techniques for monitoring, and the commitment of the Bay-Delta science community to innovation.
Longfin Smelt	This session will focus on a variety of studies featuring Longfin Smelt.
Delta Collaboration 2.0: How can we improve collaborative engagements to incorporate more diverse perspectives and support more robust decisions?	Lack of trust amongst participants in Delta management is an important factor slowing abilities to meet fast rising future challenges. Ongoing efforts to build trust are essential to engendering the discourse needed to address the challenges of the Delta’s rapidly changing natural and social environment. Collaborative science forums can be an ingredient in building trust and building sustainable policies. It can be argued that history shows failure of past collaborative efforts can increase inefficiencies via fragmentation of activities, siloed decision-making and litigation; ultimately slowing policy adaptation. The purpose of this session is discuss the current state of collaborative discourse in the Delta, whether it helps or hinders the pace of adaptation, and its role in the future of Delta management. This abstract proposes a special oral session designed to engage a panel of individuals with experience working on science and collaboration in the Delta and in other systems. The panel would be asked to provide their perspectives on a series of discussion questions designed to explore the state of collaboration in the Delta, and alternative approaches that could support robust, resilient, or defensible science designed to inform policy decisions. Outcomes from the panel would include lessons learned from existing collaborations and how they might be improved (or new structures created) to balance the perspectives and improve decision making in a fast-changing Delta. Outcomes will also highlight opportunities to improve co-production of science with tribes, community members, and other stakeholders.
Anadromous Fishes	This session will focus on a variety of studies featuring anadromous fish species.
Social Sciences & Human Dimensions	Research that addresses human dimensions of actions and strategies implemented in the Bay-Delta system. Of interest is work that explores the nexus of social and natural sciences to understand environmental issues.

Session Name	Abstract
Post normal decision making in the Bay-Delta	<p>In the Bay-Delta, where change is runaway and allocation of resources is contentious, decision-makers are adopting new methods and an expanding range of knowledge sources. We are proposing a special oral session in coordination with an edited volume in SFEWS that will focus more on approaches integrating science, values, and other forms of knowledge within decision-making processes that consider equity and uncertainty. Our special oral session will highlight decision-centered approaches in the Bay-Delta, including Structured Decision Making (SDM), Decision-Making under Deep Uncertainty (DMDU), and co-design. We see these decision-centered approaches as consistent with a ‘post normal’ science paradigm, a problem-solving strategy used when facts are uncertain, values are disputed, stakes are high, and decisions are urgent. This special oral session would include current efforts at multiple scales, highlighting the role of decision-centered approaches to planning, design, and policy. Contributions will emphasize effective decision-making processes that address uncertainty and equity, providing challenges, opportunities, and lessons learned. Contributions will include a general review and analysis of decision-centered approaches in the Bay-Delta region, covering best practices and lessons learned.</p>
Leveraging Synthesis Science: A collaboration between the Delta Science Program Synthesis Working Group and National Center for Ecological Analysis & Synthesis (NCEAS)	<p>Ecological synthesis is a critical component of ecosystem-based management and informed decision-making. NCEAS’s emphasis on open science principles and techniques promotes transparency and data sharing through reproducible data, software, and workflows. The need for increased capacity, dedicated time, and coordinated synthesis is recognized and included as an action in the Delta Science Plan, Science Action Agenda, and Interagency Ecological Program Science Strategy. The Delta Science Program partnered with the National Center for Ecological Analysis and Synthesis (NCEAS) in the summer and fall of 2021 and 2023 to lead two collaborative synthesis working groups. The synthesis working groups delivered high-quality training in synthetic data science, and statistical techniques and provided a focused opportunity for enhanced collaboration between scientists from federal and State agencies as well as academic scientists. The first workshop consisted of two groups which focused on synthesis work analyzing drivers of the estuarine aquatic food supply. The second workshop was once again split in two groups with work focusing on expanding multi-benefit approaches to managing the Delta as a social-ecological system and investigating the integration of human dimension data into research and management decision-making. Talks in this session will highlight the work from the 2021 and 2023 workshops in the form of traditional 15-minute talks as well as shorter, 5-minute talks to highlight data repositories and R packages.</p>
HAB and Invasive Species	<p>Studies focusing on Harmful Algal Blooms and their ecological drivers in the Bay-Delta watershed, including their associated ecological and public health effects.</p>
Interweaving Traditional Knowledge and mainstream science in the San Francisco Bay-Delta	<p>Interweaving knowledges systems, including Indigenous Knowledge (IK) and mainstream science, can provide valuable insights for science and management to improve both ecosystem monitoring and stewardship. Yet many scientists and agency staff do not know what IK is or how to begin the work of interweaving. This special session opens with an overview of Tribal and environmental justice issues in the Sacramento-San Joaquin Delta, highlighting the pivotal role of inclusive, equitable approaches in addressing these challenges. This foundation sets the stage for a panel discussion featuring Tribal perspectives on the obstacles and needs associated with interweaving Indigenous Knowledge and mainstream scientific practices. These insights will underscore the significance of culturally sensitive collaboration and the necessity of overcoming institutional and methodological barriers. By weaving together diverse perspectives and practical examples, this session aspires to illuminate the pathways towards more inclusive and effective environmental management practices, ultimately contributing to the resilience and sustainability of ecosystems and communities alike. This session aligns with the conference's theme of embracing diverse perspectives and contributes to the development of robust, resilient science for the Bay-Delta's dynamic environment.</p>

Session Name	Abstract
Democratizing Water Futures 1 & 2	<p>A participatory scenario planning process is critical for decision-making under deep uncertainty. Currently, two major scenario planning processes are independently generating and evaluating alternative futures for water and salinity management in the Sacramento-San Joaquin Delta and its greater watershed. Collectively, these projects—Just Transitions in Salinity Management and COEQWAL (Collaboratory for Equity in Water Allocations)—led by the academic sector, bring together agencies, community groups, and Tribes to curate and evaluate scenarios based on models and lived experience. These projects will make their products (models, results, and interpretations) open, accessible, and transparent. This session will report out on their progress and to seek feedback for the next steps. These projects will support public conversations about future reservoir operations, engineering and nature-based infrastructure development, water rights policy, and equity outcomes. The session is structured into two parts, with the first providing an overview of the process and structure of equitable engagement, and the second showcasing how different modes of engagement are operationalized.</p>
Tools for Decision-Making Under Uncertainty	<p>Making decisions under uncertainty is challenging, especially when integrating scientific data and value-based considerations. Resource managers in the Bay Delta face many such decisions, often investing substantial time and money in research and monitoring to facilitate decision-making. However, accumulating more information does not always lead to better outcomes, as the desirability of certain outcomes (i.e., objectives) can influence decisions as much as scientific uncertainty. Decision analysis provides a robust and transparent framework for decision-making, including tools to assess whether the value of information gained from additional monitoring or studies justifies the cost. Despite their potential, these tools are underutilized in natural resource management. We explore the challenges and opportunities of applying value of information (VoI) tools to Bay Delta resource decisions, emphasizing the decision-maker’s crucial role. Successful VoI analyses involve decision-makers in defining and framing decision problems, engaging parties that may be affected by or can affect the decision, identifying desired outcomes (objectives), and assigning weights (values) to those objectives. The diffuse and overlapping decision authority in the Bay Delta, along with legal constraints such as water rights and project permits, complicates the implementation of decision analysis. However, VoI tools seems ripe for taking Bay Delta decision-makers’ most vexing decisions and ranking them by the extent to which reducing uncertainty would improve decision outcomes, providing an objective criterion for allocating research and monitoring funding.</p>
Species and Communities	<p>Science that advances understanding and management of contaminants and their associated ecological effects in the Bay-Delta watershed.</p>
Contaminants	<p>Work that describe or further our understanding of any key species and/or ecological communities within the Bay-Delta and its watershed.</p>

Session Name	Abstract
Chinook Salmon 1 & 2	These sessions will focus on a variety of studies featuring Chinook Salmon.
2023 Delta Residents Survey: The first of holistic effort to monitor human well-being in the Delta	<p>The Delta Residents Survey (DRS) was conducted for the first time in the Sacramento-San Joaquin Delta in 2023 with the aim to pilot test an approach to monitoring human well-being across the estuary. This was a largescale collaborative effort led by a research team spread across California Sea Grant, Sacramento State University, UC Davis, UC Berkeley and Oregon State University, with collaboration from many university partners, non-governmental and community-based organizations, and multiple state agencies, and funded by the Delta Science Program. The survey aimed to better understand Delta residents' attitudes on key social and environmental challenges in the region and assess their quality of life in the Delta. Over 2,200 usable survey responses were received from residents across the rural, suburban and urban Delta (~3% response rate); respondents were found to be relatively representative of the Delta population as a whole. The purpose of this session is to (1) share the DRS key results, publicly available dataset, and data accessibility tools that have been developed and (2) to foster in-depth discussions with participants about further steps of fully integrating human well-being data into long term Bay-Delta estuary monitoring. The DRS will ideally continue as a longitudinal study for monitoring human well-being across the estuary in response to environmental change. Thus, building knowledge of and capacity to work with this data and a community of scientists and practitioners across the estuary to integrate human well-being metrics into estuary-wide management and evaluation efforts.</p>
Retro-ecological Futures for the 22 nd Century	<p>Ecological restoration is increasingly faced with the challenge of how to define an attainable benchmark of success in a rapidly changing environment. This is especially true in novel ecosystems, which are defined by a mix of physical and biological changes that impede a return to historical conditions. Reconsideration of the management and outcomes of restoration offers improved outcomes for future success. Assumptions about historic functionality are always biased by the lens of contemporary environmental, economic, and social concerns. At least as important as historic considerations are features that support positive human engagement in the landscape, especially as demographic shifts occur. As human populations continue to increase over the next one hundred years, features that moderate urban-wild conflicts will be of great importance. Subsequently, as human populations decrease or consolidate in cities, landscapes will require features that continue to engage people as stewards of landscapes that may otherwise become feral and degraded. In order to accommodate climate, demographic, and ecological uncertainty, investments in future restoration should support working landscapes, habitat curation for desirable species, increased public access by land and water, and flexible, adaptive features that can be modified to adapt to changing needs, realities and climates.</p>

Session Name	Abstract
Predation	This session will focus on a variety of predation studies.
Understanding Tribal Data Sovereignty, Research Protocols, and CARE + FAIR Principles	In this training, participants will learn about how to protect Tribal data sovereignty and understand and respect Tribal research protocols. CARE+FAIR research principles will be introduced and discussed, along with their potential relevance to research being done by and/or with Tribal nations. The session will provide the background necessary for researchers, agencies, and Tribes to develop cooperative working relationships that are responsive to and protective of Tribal rights and concerns.
Delta Smelt 1 & 2	These sessions will focus on a variety of studies featuring Delta Smelt.
Healthy Rivers and Landscapes Program: Framing a Watershed-wide Adaptive Management Program	The Agreements to support Healthy Rivers and Landscapes provide commitments for 155 – 825 thousand acre-feet (TAF) of spring-season flows and over 20,000 acres of restored habitat across the Sacramento-San Joaquin Delta and many of its major tributaries. These agreements are currently under consideration for contributing to the update of the State Water Resources Control Board’s update to the Bay-Delta Water Quality Control Plan. A major component of the agreements is a comprehensive science program, guided by a Science Committee, that ensures strategic monitoring across the watershed that informs adaptive management of the flow and habitat commitments during the proposed 8-year program. Adaptive management processes are central to the program and will occur at multiple temporal scales. For example, annual evaluation of whether spring pulse flows in tributaries result in increased outmigration rate and survival in tributaries will inform whether adjustments are needed to the timing and magnitude of pulses in future years. At a longer temporal scale, the program will require triennial synthesis reports that describe results of habitat restoration efforts of several types across multiple tributaries, floodplains, and the Delta to inform decisions in future years on habitat investments across the watershed. Evaluations are intended to inform State Water Resource Control Board decision-making on continued investment in a combined approach of habitat and environmental flows for future years. This special session will provide an overview of the Healthy Rivers and Landscapes Science program and how it is intended to achieve adaptive management through synthesized reporting and life-cycle models to evaluate decision alternatives. The session will explore the adaptive management framing for the program with specific examples floodplains, tributary restoration, and spring pulse flows. The session will conclude with a panel session that will allow for discussion and input on the program structure and adaptive management approach.

Session Name	Abstract
Cultivating science-management connections to inform wetland restoration and management using the Dutch Slough Restoration’s living laboratory design 1 & 2	The Department of Water Resources’ (DWR) Dutch Slough Tidal Marsh Restoration is a premier project created to explore science-based adaptive management. Dutch Slough restoration is one of the largest tidal wetlands currently implemented in the Delta and provides a learning opportunity for future projects. This half-day special oral session of 10 presentations will highlight the original vision of the project, the design, and the current science that is providing tangible information for restoration design and management. This half-day session will be divided into background, abiotic, and biotic topics and will highlight the partnership between science-management. The first two background sessions will share the intent and planning behind the project, the unique design process, the research working group, and implementing adaptive management under a long-term monitoring strategy. The three abiotic sessions include tidal marsh design linked to nutrient flux, regional greenhouse gas response, and hydrologic groundwater implications of creating tidal marsh. The biotic sessions will present on pre- and post-breach diversity and colonization of fish, aquatic communities and multiple terrestrial taxa, including birds, mammals, insects and bats. Presentations will be 15 min with 5 min Q/A. The 20-minute panel discussion will include all speakers and explore how the interdisciplinary science-management group is informing adaptive management using state-of-the-art equipment, new technology, and indicator species to answer questions more quickly and cost-effectively.
Water & Sediment Quality	Research on key environmental and drinking water quality constituents, associated biogeochemical processes, and their ecological and public health effects within the Bay-Delta and its upstream watersheds.
Engineering with Nature and Strategic Placement of Dredged Material in San Francisco Bay	The U.S. Army Corps of Engineers (USACE) San Francisco District is advancing several innovative engineering with nature approaches to increase marsh resiliency in San Francisco Bay. USACE is leading a pilot project to strategically place dredged material in San Francisco Bay to increase marsh resilience to sea-level rise. By placing dredged sediment in shallow water near shore, natural transport processes such as wind and waves can move those sediments onshore. This “Engineering with Nature” (EWN) approach provides a more cost-effective means of promoting marsh resilience to sea-level rise than direct sediment placement on tidal marshes—and, if successful, offers a nature-based solution to contribute to the region’s sediment needs. In addition, USACE is working with Marin County to study and implement a pilot study to evaluate strategic sediment pulse delivery. In December 2023, the USACE placed more than 90,000 cubic yards of sediment dredged from the Port of Redwood City in the eastern shallows of South San Francisco Bay, offshore of the Eden Landing Ecological Reserve. This pilot study was designed based on the results of numerical modeling which informed the site selection and strategy for strategic shallow water placements. Researchers from USGS are monitoring the project for ecological impacts, particularly to the benthos, and to determine the transport and fate of the placed sediment. This session will explore programmatic and regulatory framework for engineering with nature and strategic placement in San Francisco Bay, the modeling and data collection used to plan these studies, initial monitoring results, and the lessons learned and from implementing the strategic placement pilot study.
Weaving together Indigenous and Western sciences to restore wild Nur (Chinook Salmon) to the Winnemem Waywaket (McCloud River) – Part 1 - 3	This session features three leaders in California salmon recovery to talk about their partnership and vision for the future: Chief Caleen Sisk (Winnemem Wintu Tribe), Cathy Marcinkevage (NOAA Fisheries), and Tina Bartlett (CDFW), whose organizations entered into co-management/co-stewardship agreements to partner in advancing the return of Nur (salmon) to the Winnemem Waywaket (McCloud River). This partnership is a remarkable milestone that addresses past inequities, builds climate resilience, enhances biodiversity, and facilitates integration of cultural tribal values and agency recovery responsibilities.

Session Name	Abstract
Collaborative Monitoring and Research: Advancing Nutrient and Algal Bloom Understanding in the Bay-Delta	<p>The Delta Regional Monitoring Program (DRMP) has undergone significant transformation in recent years, enhancing its capacity to address the complex challenges of nutrient monitoring in the Bay-Delta ecosystem. This presentation will provide an overview of the DRMP, highlighting the evolution of the organization, its renewed focus on long-term monitoring strategies, and the development of stakeholder processes to foster collaborative planning. Key elements of the presentation will include an introduction to the DRMP's mission and structure, a summary of the recent changes within the organization, and an in-depth look at the Nutrient Multi-Year Study Plan. This document outlines the DRMP's strategic priorities for nutrient monitoring, emphasizing the integration of modeling, bioassay studies, and existing monitoring to better understand impacts of nutrient management in the Delta. The presentation will also address the DRMP's commitment to enhancing collaboration with existing programs, engaging a broader range of stakeholders, and maximizing the use of available resources to address critical data gaps. By fostering partnerships and leveraging collective expertise, the DRMP aims to create a more comprehensive and effective monitoring framework that supports the long-term health and sustainability of the Bay-Delta ecosystem. Attendees will gain insights into the DRMP's strategic vision, ongoing projects, and opportunities for involvement in shaping the future of nutrient monitoring in the region. This session will be particularly valuable for researchers, policymakers, and community stakeholders interested in the intersection of environmental monitoring, resource management, and collaborative planning.</p>
Advancements in Longfin Smelt Science and Management 1 & 2	<p>These sessions will focus on a variety of studies featuring Longfin Smelt.</p>
Advancing modeling tools to support long-range water allocation planning in a changing climate	<p>Adapting water operations for the Delta and greater Sacramento-San Joaquin system in anticipation of climate change requires models adept at long-range water allocation planning and conducive to tradeoff assessments. Such models form the toolkit for planning long-term operations of the State Water Project and Central Valley Project, as well as for other scenario-based projects to assess alternative water futures and perform structured decision making, such as the Reorienting to Recovery project (focused on Chinook salmon) and the COEQWAL (Collaboratory for Equity in Water Allocations) project. However, the models that have long been used for planning water operations were not initially designed for use under climate change or assessment of multibenefit operations and tradeoffs. Hence, the modeling community has needed to develop new tools and ways of representing climate change within existing modeling frameworks. In this special session, we highlight recent technical advances in how climate change and multibenefit operations are being represented in systemwide water operations models. Talks come from a range of scenario-based projects spearheaded by agencies and the academic community.</p>

Session Name	Abstract
Food Webs 1 & 2	Research that provides new insights into ecological processes governing and connecting food webs in the Bay-Delta, including interactions between phytoplankton and zooplankton or effects of contaminants, sediments, nutrients, species invasions, and climate on food web connections.
Assessing the drivers and impacts of the August 2022 <i>Heterosigma akashiwo</i> bloom in San Francisco Bay, California 1 & 2	Harmful algal blooms (HABs) are increasing in frequency and severity in inland and coastal waters worldwide due to environmental changes such as increased nutrient run-off, warming temperatures, and stratified water columns. San Francisco Bay is in the 87 th percentile of nitrogen loading for estuaries worldwide, indicating a great potential for seasonal HABs, yet phytoplankton growth is thought to have been limited by a combination of tidal mixing, light limitation from high turbidity, and benthic grazing pressure. However, in August 2022 there was an unprecedentedly large bloom of the raphidophyte <i>Heterosigma akashiwo</i> (200-400 µg chlorophyll <i>a</i> /L, >20x typical summer values), leading to widespread low dissolved oxygen concentrations and fish mortality. <i>H. akashiwo</i> has been previously documented in California but has never been associated with a fish kill. Although previous <i>H. akashiwo</i> blooms in various settings where it is found worldwide seem to be associated with seasonal freshwater inputs, the mechanisms of the 2022 bloom remain unclear. In this special oral session, we seek to examine the dynamics of this bloom, assessing bottom-up and top-down drivers, impacts to the San Francisco Bay ecosystem, and potential regulatory implications. This knowledge will help managers understand the likelihood of a HAB event of this magnitude occurring again as well as the early warning signs, and whether actions can be taken to prevent large HAB events and protect public and ecosystem health in the future.
Perspectives on science supporting decision-making under deep uncertainty	<p>Uncertainty surrounding future environmental, social, and economic conditions has significant impacts on the ways in which decisions are made and how well those decisions hold up over time. Decisions made without sufficient information on how changing factors will impact a system can lead to under-preparedness for and increased vulnerability to shocks. Rapidly changing conditions and increasing uncertainty of future projections associated with climate change highlight how extreme and hard-to-predict conditions challenge effective management of the Bay-Delta. Similarly, changing conditions can alter resource use and desirable management approaches. When conditions change rapidly and unexpectedly, managers are forced to prioritize some goals at the expense of others and may not have time to consider all management options or elicit stakeholder preferences.</p> <p>The Delta Independent Science Board (ISB) is conducting a review on decision-making under deep uncertainty (DMDU) to build understanding of the scientific tools that can increase the capacity to anticipate and adapt to growing uncertainty of future conditions in the Bay-Delta. This review explores techniques and recommendations that could be applied to the Delta to better characterize and prepare for uncertainty and improve the decision-making processes. The session will begin with a presentation on DMDU and will present preliminary findings from the ISB review. Findings will cover an analysis of how scenarios are being used in the Delta region to prepare for change and opportunities to advance scenario analysis to improve their practical uses for managing uncertainty during decision making. The ISB will also distill lessons learned from presentations by experts, the literature and their own experiences on the benefits and limitations of using DMDU tools to adapt to change. The presentation will be followed by a panel discussion where representatives from various organizations will provide their perspectives on the ISB's findings, including challenges and opportunities of using elements of DMDU.</p>