

## Flood Protection Meets Climate Change

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Climate change – along with regulatory trends and shifts in public expectations – is one of several drivers leading flood protection agencies to more aggressively pursue nature-based flood management approaches. Projections for more intense and/or unpredictable storms, greater proportions of rain falling as precipitation on snowmelt systems – as well as increasing recognition of the potential for “atmospheric rivers” – are necessitating the consideration of higher flows. At the same time, the current drought and projections of future water shortages are increasing pressure to shift the design of our flood protection systems from maximizing drainage towards emphasizing capture of local stormwater. Finally, we are beginning to recognize how the design of our flood protection systems has diminished the resilience of the associated riverine ecosystems to climate change and other stressors.

These pressures are leading communities to more seriously consider how natural processes may be substantially re-integrated into our flood protection and stormwater systems to increase resilience to climate change. Many of our cities lie above natural aquifers that were recharged through stream floodplains and distributaries, reducing flood peaks while capturing winter flows. Efforts are underway to analyze how these natural buffers to flood and drought can be recovered through distributed systems of recharge, re-established floodplains, tree cover, and other elements. These changes will be challenging to design and implement but may be essential to making our communities less vulnerable to climate change. Fortunately, many of these innovations that can increase the resilience of flood protection systems can also improve the resilience of the associated riverine ecosystems, by reducing excessive flood scour of riparian habitats and maintaining groundwater levels and base flows during drought. As aging infrastructure is replaced in the coming decades, the next generation of flood protection can contribute to groundwater recharge, ecosystem resilience, and more sustainable flood management.

**Keywords:** Natural flood protection, ecosystem resilience, climate change

**Session Title:** Critters and Communities: New Approaches to Flood Management I

**Speaker Biography:** Robin Grossinger is a Senior Scientist at the San Francisco Estuary Institute, where he directs SFEI’s Resilient Landscapes program. For over twenty years, Robin has analyzed how California landscapes have changed since European contact, using these data to guide landscape-scale restoration strategies. Robin and his team lead efforts throughout the state to reintegrate natural processes within our highly modified landscapes, creating healthier and more adaptive neighborhoods, cities, and surrounding landscapes. Robin’s many publications include the Napa Valley Historical Ecology Atlas, released by the University of California Press in 2012, and his work has been featured by NPR, KQED’s QUEST, Saving the Bay, and The New York Times. He has been recognized with a Local Hero award from Bay Nature magazine and the Carla Bard Bay Education Award from The Bay Institute.

## **Flood Protection Meets Ecosystem Restoration: A New Vision for Managing Channels at the Bay Margin**

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Throughout the San Francisco Bay region, flood control channels at the Bay margin are aging and in need of replacement. Many of these channels do not pass flood waters and sediment loads effectively because they were designed decades ago when watersheds were less developed and the Bay elevation was lower. In addition, the building of these channels often resulted in the fragmentation, disturbance, or complete destruction of important bayland habitats as well as disruption of the physical processes that maintained these habitats over time. Flood control managers currently have a rare opportunity to redesign new flood control projects at the Bay margin that can help meet current and future flood control needs and improve bayland habitat conditions, provided they have the right tools and knowledge base to develop resilient, multi-benefit designs.

Flood Control 2.0 is an EPA-funded project involving several agency partners that is aimed at developing tools and providing information that can be used in designing multi-benefit flood control channels at the Bay margin. This presentation will provide an overview of the technical work being done under Flood Control 2.0 to assist the flood control management community, including the development of a regional channel morphology and sediment delivery synthesis, a management concept framework for flood control channels at the Bay margin, and a long-term, landscape scale management “vision” for a single flood control channel at the Bay margin.

**Keywords:** flood control, bayland habitat resilience, multi-benefit management tools, design

**Session Title:** Critters and Communities: New Approaches to Flood Management I

**Speaker Biography:** Scott Dusterhoff is a geomorphologist at the San Francisco Estuary Institute with a background in fluvial geomorphology, watershed hydrology, and estuarine/tidal wetland dynamics. For two decades, Scott has been working in coastal and upland watersheds throughout California, Oregon, and Washington, as well as in the Mid-Atlantic, on projects that use in-depth scientific investigations to inform sustainable ecosystem management approaches. He specializes in understanding the impacts of land disturbance and flow regulation on geomorphic processes and aquatic habitat for a variety of endangered species. He has extensive experience using a combination of field-based data, numerical modeling, and geospatial tools to characterize fluvial and coastal sediment transport dynamics, assess hydrologic/hydraulic processes in watershed and estuarine environments, and construct watershed and estuary water and sediment budgets.

## **Flood Protection Meets Ecosystem Restoration: A New Approach to Regional Planning in the Delta**

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California Eco Restore creates an expectation of at least 30,000 acres of habitat restoration be completed within the next 5 years. It also directs the Delta Conservancy to facilitate locally led regional planning processes to identify priority projects. Working with large partnership of restoration experts we have developed a three step process, to be piloted this fall and winter called the Northeast Delta Landscape Restoration Framework. It aims to engage the best available science for restoration design by connecting science and stakeholder experts to advanced analytical tools in a real-time analysis and decision support environment. The Framework helps scientists, stakeholders, and agencies envision how complex ecosystem restoration alternatives can be integrated with flood protection, the agricultural economy, and heritage values of the Delta. **Step 1. Implement Data, Modeling, and Decision-Support Tools.** First, the Framework integrates diverse data from physical and ecological processes to economics and demographics within an advanced data analytics and visualization platform. The goal is to produce modeling, data, visualization and decision-support tools that can be used in real-time by stakeholders and system experts alike as alternative futures are deliberated. **Step 2. Develop a Vision of Regional Ecological Potential.** Second, using the data and modeling tools, the Framework will produce a science-based vision of northeast Delta ecological potential as a guide to assure that individual restoration actions yield high-functioning landscapes in the future. The vision will represent our best data-driven current understanding of ecosystem function and potential while providing an overarching reference tool to guide restoration actions. **Step 3. Develop Multi-Benefit Alternatives and Facilitate Decisions.** The Framework ultimately supports co-development of broadly acceptable landscape restoration strategies using the best available tools and scientific understanding. Moreover, the Framework provides a decision support environment that facilitates clarification of tradeoffs between alternatives to promote informed decisions among all stakeholders.

**Keywords:** Ecosystem Restoration Planning, Data Analytics, Data Visualization, Interoperable Models, Collaboration

**Session Title:** Critters and Communities: New Approaches to Flood Management I

**Speaker Biography:** Campbell Ingram became the first Executive Officer of the Sacramento-San Joaquin Delta Conservancy in March of 2011. The Conservancy is tasked with being a lead agency for ecosystem restoration in the Delta and supporting efforts that advance environmental protection and the economic well-being of Delta residents. Previously, Campbell was an Associate Director of The Nature Conservancy's California Water Program where he participated in the Bay-Delta Conservation Plan effort as a Steering Committee member. Campbell previously worked for the U.S. Fish and Wildlife Service where he was responsible for implementing several CVPIA restoration programs and the CALFED Environmental Water Program; and prior to that was employed by the U.S. Bureau of Reclamation working directly for the CALFED Ecosystem Restoration Program.

## **Levees Meet Habitat Creation: A New Strategy for the Delta**

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The Delta Stewardship Council is leading the development of a new levee strategy to guide state investments that reduce flood risk while contributing to long-term improvement of river corridors that provide for fish and wildlife migration. This investment strategy will be developed in collaboration with state agencies, local reclamation districts, Delta landowners and businesses, and other important stakeholders. It will be based on the best available data, research, and lessons learned from other state and local programs and planning efforts. This presentation will focus on the Council's efforts to ensure that levee investments result in net benefits for channel-margin, floodplain and wetland habitats.

**Keywords:** floodplain, flood management, habitat, restoration, enhancement, investment, levees

**Session Title:** Critters and Communities: New Approaches to Flood Management I

**Speaker Biography:** Cindy Messer serves as the Deputy Executive Officer for Planning at the Delta Stewardship Council. She previously served as Interim Executive Officer of the Delta Conservancy. Prior to that, Cindy worked for several years at the Department of Water Resources.

## **Delta Case Study: Integrating Flood Protection, Habitat Enhancement, and Agriculture in the Yolo Bypass**

Kris Tjernell, California Natural Resources Agency, Kristopher.Tjernell@resources.ca.gov

A new task force of wildlife agencies, flood planners, and local governments has come together to develop a common project that integrates multiple goals in the Yolo Bypass. This new partnership is attempting to integrate state flood protection objectives, which include a potential 10,000 to 18,000-acre expansion of the Yolo Bypass; ecological restoration objectives, which include improved fish passage and enhanced floodplain habitat for salmon; and local and regional objectives, which include maintaining agricultural productivity and waterfowl habitat. The Yolo Bypass Partnership is seeking accelerated permitting and broader sources of financing for this integrated multi-benefit project.

**Keywords:** floodplain, integrated, multi-benefit, Yolo Bypass, salmon, habitat, restoration

**Session Title:** Critters and Communities: New Approaches to Flood Management II

**Speaker Biography:** Kris Tjernell is the Special Assistant for Water Policy at the California Natural Resources Agency. Tjernell previously served as a policy consultant at the Conservation Strategy Group from 2007 to 2014, in the areas of integrated water management, water supply, ecosystem conflict resolution and public finance.

## **Bay Case Study: Integrating Flood Protection, Habitat Enhancement, and Groundwater Recharge in an Urbanized Watershed**

Norma Camacho, Santa Clara Valley Water District, [ncamacho@valleywater.org](mailto:ncamacho@valleywater.org)

The Santa Clara Valley Water District has operated under a guiding principle of using an integrated and balanced approach in managing a sustainable water supply, effective natural flood protection, and healthy watersheds.

Santa Clara County's shoreline is at great risk from flooding due to extreme storm events combined with high tides, and sea level rise. To address this risk, the Santa Clara Valley Water District has been working with the U.S. Army Corps of Engineers, the Coastal Conservancy, and the U.S. Fish and Wildlife Service on the South San Francisco Bay Shoreline Study. The purpose of this multi-objective study is to provide one-percent tidal flood protection, restore and enhance tidal marsh and related habitats, and provide recreational and public access opportunities for the Santa Clara County shoreline area. The Shoreline Study takes into consideration the potential need for adaptation resulting from climate change, the primary consideration being sea level rise.

The current phase of the Shoreline Study is focusing on the San Jose shoreline area located between Alviso Slough and Coyote Creek. The recommended project includes a horizontal levee feature, which would be constructed bayside to the proposed flood risk management levee. Although this design approach increases fill in the waters of the U.S., it creates habitat connection between the tidal marsh and upland levee, buffers the flood risk management levee from wave action, and provides areas for restored marsh to retreat as sea levels rise. Because the federal civil works design and construction approach as well as the state and federal regulatory framework were both developed from a single-purpose project lens, many issues such as the calculation of project benefits, mitigation for temporal losses, and current policies prohibiting bay fill needed to be re-examined under this new multi-purpose project paradigm.

**Keywords:** Shoreline Study, multi-benefit, flood control

**Session Title:** Critters and Communities: New Approaches to Flood Management II

**Speaker Biography:** Norma Camacho is the Chief Operating Officer of Watersheds Operations for the Santa Clara Valley Water District. She joined the district in March 2012. As COO, Ms. Camacho is responsible for an operational and capital program at the District of over \$200 million in FY15. She has more than 25 years of long-range planning, program development, finance, and capital projects experience. She previously worked as the Director of the Ventura County Watershed Protection District and prior to that position she served in the Ventura County Executive Office as deputy executive officer for finance and budgets. Ms. Camacho holds a bachelor's degree in civil engineering (structural) from Stanford University. She currently serves on the Board of Directors for the National Association of Flood & Stormwater Management Agencies and is a Board member of the American Red Cross of Silicon Valley. She was also co-chair of the 2014 Annual Floodplain Management Conference.