Oral Abstracts

October 29-30,

2013

Abstracts for oral sessions presented at the 2013 State of the San Francisco Estuary Conference are compiled in this document. Abstracts are listed by Session Topic. Names of presenting authors are underlined.

State of the San Francisco Estuary Conference

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20/20 Vision: Past Reflections, Future Directions

Session Title: Day 1 Plenary Session

Moderator Biography: Andrew Gunther has studied the Bay since receiving his Ph.D. from UC Berkeley (1987). He was an environmental scientist (1986-1991) with the San Francisco Estuary Institute (then AHI), author for two Status and Trends Reports during development of the CCMP, and the original manager for the Regional Monitoring Program (1993-1996). He served as Assistant Chief Scientist for the Exxon Valdez Oil Spill Restoration Program (1992-2002), Program Coordinator for the Clean Estuary Partnership (2001-2006), and Project Leader for the 2011 State of the Bay report. He is now Executive Coordinator for the Bay Area Ecosystems Climate Change Consortium. He is Executive Director of the Center for Ecosystem Management and Restoration and a member of the Board of Directors of the Union of Concerned Scientists.

Speaker Biography: Julie Pierce is the ABAG Vice President, Mayor of the City of Clayton, and a member of the Contra Costa Transportation Authority (CCTA). She has worked on transportation and growth management policy issues for 25 years, beginning in 1987 when she was appointed to Central Contra Costa Regional Transportation Planning Committee. She has served on the Clayton City Council since 1995 and the CCTA since 1992, and chaired CCTA in 1995 and 2003. Julie was recognized by the Contra Costa Council for her leadership as chair of the CCTA in 1995 for the adoption of the very first Contra Costa Countywide Comprehensive Transportation Plan. The San Francisco Chapter of the Women's Transportation Seminar honored her with their 1998 Woman of the Year award. Julie currently serves as the CCTA delegate to the California Council of Governments (CALCOG). She also serves as the Northern California Transportation agencies representative on the Executive Committee for CALCOG. Julie was elected ABAG Vice President in January 2012. Julie is the Contra Costa Mayors' Conference delegate to the ABAG Executive Board. She also represents the Contra Costa cities on ABAG's Regional Planning Committee.

Speaker Biography: Jared Blumenfeld was appointed by President Barack Obama to serve as EPA Regional Administrator for the Pacific Southwest in November 2009. EPA Region 9 is home to more than 48 million people in California, Arizona, Hawaii, Nevada, the Pacific Islands, and 148 tribal nations. Mr. Blumenfeld has spent two decades on the front lines of protecting the environment both at home and internationally. His priorities at EPA include strong enforcement, environmental justice, protecting and restoring our air, land and waters, building strong federal, state, local and tribal partnerships, and taking action on climate change.

Speaker Biography: Steven Ritchie is Assistant General Manager of the San Francisco Public Utilities Commission (SFPUC), Water Enterprise, responsible for overseeing water system operations and planning from Hetch Hetchy through the Regional Water System to the City Distribution Division and managing SFPUC lands and natural resources. He was SFPUC's Manager of Planning from 1995 to 1998. Prior to that, he managed the South Bay Salt Pond Restoration Project, to restore 15,100 acres of habitat in South San Francisco Bay while providing flood risk management and public access. He has worked in management positions at the S.F. Bay Regional Water Quality Control Board (1987-1995), the CalFed Bay-Delta Program (1998-2000), and URS consultants (2000-2004). He has a B.S. and M.S. in Civil Engineering from Stanford University.

Climate-Smart Estuary: Nature-based Solutions to Secure Our Future

Ellie Cohen, President and CEO of Point Blue Conservation Science
Andrew Gunther, PhD, Bay Area Ecosystems Climate Change Consortium, gunther@cemar.org

Since the last State of the Estuary conference in 2011, atmospheric CO2 exceeded 400 parts per million for the first time in human history; Arctic summer ice was at its lowest extent and volume ever recorded; and, extremes such as heat waves, drought and storms continued to break records across North America. January- June 2013 was one of the driest ever in the Bay Area, stressing ecosystems already challenged by habitat degradation, development, pollution and other more.

With increasingly severe ecological changes projected, it will become ever more difficult for our region's ecosystems to sustain their many benefits including providing food and habitat for wildlife, water storage, flood control, carbon sequestration and recreational opportunities. To minimize the potentially severe ecological, economic and social consequences in the face of these hard to predict changes, natural resource managers and decision makers are urgently requesting guidance for adaptation planning and effective management. This is especially challenging with diminishing public budgets and traditional conservation focused on discreet acres disconnected from larger ecosystem processes.

Nature-based solutions—using natural processes to reduce the impacts of climate change while also sequestering carbon—are key to sustaining ecological communities and functions needed to make our region more resilient to climate change. We will discuss examples of this approach in a climate-smart conservation framework and what this means in practice. We will provide a vision for advancing the health and resilience of SF Bay Estuary ecosystems over the next 20 years to benefit wildlife and people in our rapidly changing world.

Keywords: Climate-Smart, Conservation, Nature-Based, Climate Change, Ecosystem Services, Economic, Future, Security, Resilience

Session Title: Day 1 Plenary Session

Speaker Biography: Ellie Cohen, President and CEO of Point Blue Conservation Science (pointblue.org), is a leader in catalyzing nature-based solutions to climate change. She along with Point Blue's 140 scientists work hand-in-hand with public and private resource managers to reduce environmental change impacts on nature for wildlife and people. An honors graduate of Duke University and Harvard's Kennedy School of Government, and recipient of the Bay Nature 2012 Environmental Hero Award for her climate change leadership, Ms. Cohen serves as vice chair of the California Landscape Conservation Cooperative (californialcc.org), co-founder and chair of the Bay Area Ecosystems Climate Change Consortium (baeccc.org), and chair of the Central Valley Joint Venture (centralvalleyjointventure.org). She is an invited member of the National Wildlife Federation's Climate-Smart Conservation Team (nwf.org) and serves on the SF Bay Joint Venture's Executive Committee. Ms. Cohen is a mother of 2, ages 8 and 11.

Bay Area: What's At Risk?

Carl Guardino, President and CEO Silicon Valley Leadership Group

San Francisco Bay is central to our economy and quality of life here in the Bay Area. Today, the reality of a rising bay and ocean is a risk to that economy, and business engagement is critical to protect the region from flooding.

The Bay Area is at particular risk due to our geography and infrastructure. Billions of dollars in assets are located right at the water's edge. The region is already dealing with the impacts from a rising ocean, from Ocean Beach to Richardson Bay and beyond. Scientists tell us we can expect this kind of flooding to not only continue, but that it will get worse and with more frequency due to global warming.

In the South Bay, the Bay itself may often be out of sight but a significant amount of critical Silicon Valley businesses, housing, transportation and other vital resources are at risk; many of the existing levees that protect the South Bay were built more than 100 years ago and were not engineered to meet federal flood standards. A major storm in the Bay Area could put hundreds of thousands of people and tens of billions of dollars in assets at risk, not only threatening the public safety of the region but also directly impacting the innovation economy.

Flooding catastrophes in New Orleans with Katrina and New York with Sandy have led national policymakers and business groups into a conversation about the benefit of natural flood protection. For New York City, a buffer of rebuilt wetlands is truly science fiction, but for significant parts of the Bay Area, it can be a reality.

The Silicon Valley Leadership Group is coordinating with a number of groups to engage the business community on these issues, and we have launched a business community taskforce that is collaborating on strategy and helping set direction for the next several years.

Keywords: Silicon Valley, Bay Area Economy, Flood Protection, Wetlands

Session Title: Day 1 Plenary Session: Wetlands, Flood Protection, and the Bay Area Economy

Speaker Biography: Carl Guardino, one of Silicon Valley's most distinguished business and community leaders, is the President and CEO of the Silicon Valley Leadership Group, a public policy trade association that represents more than 375 of Silicon Valley's most respected companies.

In February 2007, Governor Arnold Schwarzenegger appointed Guardino to a four-year term on the California Transportation Commission. He was reappointed by Governor Jerry Brown. He also serves on numerous other boards and is actively involved in a wide range of community organizations and projects. In 2000, the San Jose Mercury News named Guardino one of the "Five Most Powerful" people in Silicon Valley in a once-per-decade study.

Guardino has been the chief executive of the Leadership Group since 1997. He previously served as a vice president with the organization between 1991 and 1995. He also held an executive position in governmental affairs with Hewlett-Packard and he spent six years on the staff of Central Valley Assemblyman Rusty Areias, the last three as his chief assistant.

Guardino was born and raised in San Jose and received his Bachelor of Arts degree in political science from San Jose State University, where he is a Distinguished Alumnus. He is a member of Junior Achievement's "Silicon Valley Business Hall of Fame" and a recipient of the "Lifetime Achievement Award" from City Year, and is a second recipient of the American Public Transit Association's Business Executive of the Year.

The Strategy for the South Bay

Linda J. LeZotte, Director District 4, Santa Clara Valley Water District

Santa Clara County's shoreline is at great risk from flooding now due to extreme storm events combined with high tides, and in the future due to sea level rise. In its "Flood Future" Report, the Department of Water Resources identified Santa Clara County, along with Los Angeles and Orange Counties, as having the highest potential flood damages in the state. Portions of Santa Clara County near the Bay are below sea level, and many high-tech companies are located along the shoreline, along with residents and the largest wastewater treatment facility in the Bay Area.

To address this risk, the Santa Clara Valley Water District is working with the U.S. Army Corps of Engineers and the Coastal Conservancy on the South San Francisco Bay Shoreline Study, a congressionally authorized study to investigate and determine whether there is a Federal interest in providing flood risk management and ecosystem restoration improvements along the South Bay. 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 adaption 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, which includes the Alviso community and the San José-Santa Clara Regional Wastewater Facility. Additional areas, such as Palo Alto, Mountain View, and Sunnyvale, will be the subject of future studies. The water district's Safe, Clean Water measure, passed in 2012, includes $15 million to cost share construction of the project and another $5 million to conduct studies of additional areas

Keywords: Flood Risk Management, Ecosystem Restoration Improvements, Tidal Marsh, Sea Level Rise

Session Title: Day 1 Plenary Session: Wetlands, Flood Protection, and the Bay Area Economy

Speaker Biography: Linda LeZotte is a San Jose attorney with 30 years of practice specializing in land use and environmental and municipal law. Linda was elected to the Santa Clara Valley Water District Board in November, 2010, which she chaired in 2012. She represents the City of Campbell and portions of Willow Glen and San Jose (Cambrian, North Almaden and Blossom Hill).

For eight years, Linda served as a distinguished member of the San Jose City Council leading the green building/sustainability policy discussion. Linda is one of a select group of Silicon Valley and California attorneys who are accredited by the U.S. Green Building Council as a LEED AP (LEED Accredited Professional) in New Construction. Linda chaired the Joint Venture Silicon Valley Sustainable Buildings Initiative, and serves on the Advisory Board of Sustainable Silicon Valley.

Panel Discussion: Wetlands, Flood Protection, and the Bay Area Economy

Moderator: Carl Guardino, President and CEO, Silicon Valley Leadership Group

Session Title: Day 1 Plenary Session: Wetlands, Flood Protection, and the Bay Area Economy

Panel Members:
Linda J. LeZotte, Director District 4, Santa Clara Valley Water District
David Lewis, Executive Director, Save The Bay
Kerrie Romanow, Director of Environmental Services, City of San Jose
Lieutenant Colonel John Baker, Commander and District Engineer, US Army Corps of Engineers
Sam Schuchat, Executive Officer, State Coastal Conservancy

Moderator Biography: Carl Guardino, one of Silicon Valley's most distinguished business and community leaders, is the President and CEO of the Silicon Valley Leadership Group, a public policy trade association that represents more than 375 of Silicon Valley's most respected companies.

In February 2007, Governor Arnold Schwarzenegger appointed Guardino to a four-year term on the California Transportation Commission. He was reappointed by Governor Jerry Brown. He also serves on numerous other boards and is actively involved in a wide range of community organizations and projects. In 2000, the San Jose Mercury News named Guardino one of the "Five Most Powerful" people in Silicon Valley in a once-per-decade study.

Guardino has been the chief executive of the Leadership Group since 1997. He previously served as a vice president with the organization between 1991 and 1995. He also held an executive position in governmental affairs with Hewlett-Packard and he spent six years on the staff of Central Valley Assemblyman Rusty Areias, the last three as his chief assistant.

Guardino was born and raised in San Jose and received his Bachelor of Arts degree in political science from San Jose State University, where he is a Distinguished Alumnus. He is a member of Junior Achievement's "Silicon Valley Business Hall of Fame" and a recipient of the "Lifetime Achievement Award" from City Year, and is a second recipient of the American Public Transit Association's Business Executive of the Year.

Panel Member Biography: Linda LeZotte is a San Jose attorney with 30 years of practice specializing in land use and environmental and municipal law. Linda was elected to the Santa Clara Valley Water District Board in November, 2010, which she chaired in 2012. She represents the City of Campbell and portions of Willow Glen and San Jose (Cambrian, North Almaden and Blossom Hill).

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Accredited Professional) in New Construction. Linda chaired the Joint Venture Silicon Valley Sustainable Buildings Initiative, and serves on the Advisory Board of Sustainable Silicon Valley.

Panel Member Biography: As Executive Director of Save The Bay since 1998, David Lewis has been San Francisco Bay's top advocate for more than a decade. David was born and raised in the Bay Area, and prior to joining Save The Bay, he devoted 14 years to work for nuclear arms control in Washington, D.C., including in the U.S. Senate, and also worked on election campaigns across the country. He holds a B.A. in Politics and American Studies from Princeton University.

Panel Member Biography: Kerrie Romanow serves as Director of Environmental Services for City of San José; the nation's tenth largest city and the largest city in Northern California. The Environmental Services Department manages solid waste collection and recycling, watershed protection, pollution prevention, municipal drinking water, recycled water, community sustainability initiatives, and operation and planning for the San Jose-Santa Clara Regional Wastewater Facility. The department has over 500 employees, an annual operating budget of over $200 million, and a five-year capital budget of nearly $750 million. Prior to joining the City, Kerrie served as Chief Operating Officer for a national environmental, health, and safety management consulting firm, and as Manager of Facilities and Environmental, Health, and Safety for an international compound semiconductor manufacturing firm. She earned a BS Degree in Environmental Economics from UC Berkeley, an MBA from Santa Clara University and completed the Harvard University Senior Executives in State and Local Government certificate program.

Panel Member Biography: Lieutenant Colonel John K. Baker assumed command of the San Francisco District on June 28, 2012. As Commander and District Engineer, he leads an organization that has provided public engineering services in Northern California since 1866 supporting military contingencies and disaster response and managing the nation's water resource infrastructure for economic growth and environmental sustainability.

Raised in Texas, LTC Baker was commissioned in 1995 and served in a variety of engineer district and troop unit assignments across the U.S. and through three combat tours in Afghanistan and Iraq. LTC Baker earned a Bachelor of Science degree in Civil Engineering from Texas A&M University and a Master of Science degree in Civil Engineering from the University of Maryland. He is a registered Professional Engineer and a member of multiple professional organizations, including the American Society of Civil Engineers and the Society of American Military Engineers.

Panel Member Biography: Sam Schuchat became Executive Officer of the Coastal Conservancy in 2001. He was Executive Director of the Federation of State Conservation Voter Leagues, the trade association of 26 environmental Political Action Committees (PACs). For six years he was Executive Director of the California League of Conservation Voters, the nation's largest and oldest state environmental PAC with 25,000 members. Mr. Schuchat served on the California Fish and Game Commission (1999-2003), including a stint as vice president. He was deputy director of Sacramento AIDS Foundation in the late 1980s. He received his BA in Political Science at Williams College (1983) and his MA in Public Administration at San Francisco State University (1989).

Porpoises and Dolphins Find New Habitat in San Francisco Bay

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Harbor porpoises (*Phocoena phocoena*) have returned to daily, year-round use of SF Bay after an absence of approximately 65 years. Re-occupation of historical habitat in the central bay may be related to the health of the ecosystem. Our efforts are focused on the photo-identification of individuals, habitat use and behavioral observations. Photo-identification has not been successful with harbor porpoises in other locations because of their small size, timidity and lack of prominent markings. However, using a combination of platforms—bridge, shore, and boat—we have been able to catalog 600 animals, recognizable from scars and pigmentation patterns. By tracking known females over time we may be able to determine their birth rate, previously possible only through examination of carcasses. We use the Golden Gate Bridge as a platform to observe mating behavior heretofore unseen in wild harbor porpoises. Concurrently, we report a range extension of bottlenose dolphins (*Tursiops truncatus*) to SF Bay. The coastal stock's previous northern range limit of Pt. Conception was surpassed during the 1982-83 El Niño event, after which it occupied Monterey Bay, and more recently has become regular in SF Bay and the adjacent coast. Our efforts resulted in the photo-identification of 41 uniquely marked individuals, of which 93% (n =38) are matched to the Monterey Bay catalog. The dolphins using SF Bay Area comprise about 10% of the estimated California stock. Photo comparisons with Southern California Bight catalogs revealed that one dolphin sighted in Bodega Bay in 2012 was seen off Ensenada, Mexico in 2000. This longshore movement record of approximately 1000 km confirms previous research suggesting high mobility of the stock. Ecological effects of this northward range extension include predation on chinook salmon, previously unreported as prey for coastal bottlenose dolphins, and lethal aggression against harbor porpoises.

Keywords: Harbor Porpoise, *Phocoena*, Bottlenose Dolphin, *Tursiops*, Re-Occupation, Range Extension, Photo-Identification

Session Title: Native Wildlife and Invasive Species

Speaker Biography: William Keener is a former Executive Director of The Marine Mammal Center in Sausalito, California, and his experience includes work as a field observer on vessel-based transects for the harbor porpoise population census in the Gulf of the Farallones conducted by Cascadia Research Collective from 1987-1989. He was also on the expedition team that first surveyed birds and marine mammals at Cordell Bank, which helped lead to its establishment as a National Marine Sanctuary. He co-founded the nonprofit Golden Gate Cetacean Research in 2010 to focus on the scientific study of porpoise, dolphins and whales inhabiting the San Francisco Bay Area.

Distribution and Population Trends for the Endangered California Clapper Rail

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Habitat loss and degradation in San Francisco Bay has resulted in decreases in populations of tidal marsh birds over the past 150 years. The federally Endangered California Clapper Rail (*Rallus longirostris obsoletus*), historically abundant, now numbers less than 2,000. To better understand the status and drivers of the California Clapper Rail population, agencies and organizations have conducted standardized surveys since 2005. Using imperfect detection models we reduced errors due to failure to detect individuals when present ("false zeroes"). Our goal was to identify changes in abundance independent of any changes in detection probability among sites or among years. Factors affecting the probability of detecting Clapper Rails included time of season with peak probability of detection occurring mid-February and time of day which peaked c. 25 minutes before sunrise and c. 25 minutes after sunset. The California Clapper Rail population was relatively stable in 2005-2007, declined significantly in 2008 followed by low but relatively stable densities through 2011. The decline in the South Bay was steeper and, as a result, densities lower than in the North Bay during the period 2008-2011. At the landscape level, channel density was the most important feature favoring high Clapper Rail density which peaked around 75 m of channel length per hectare. The increases in density seen in response to tidal marsh restoration were dramatic occurring, on average, after 17-20 years. The fast pace of restoration in SF Bay offers the best hope yet for Clapper Rail recovery. With sea-level rise threatening long-term recovery efforts, decisions informed by the best available science and considering the full range of scenarios and potential outcomes will improve our chances of achieving resilient and functioning tidal marsh ecosystems. A monitoring program to assess impacts of climate change and track recovery of Clapper Rails is vital to achieving shared goals.

Keywords: Clapper Rail, Detection Probability, Imperfect Detection, Tidal Marsh

Session Title: Native Wildlife and Invasive Species

Speaker Biography: As the San Francisco Bay Program Leader at Point Blue, Julian develops and leads projects focused on understanding bird response to wetland restoration and helps develop and promote conservation actions that result in healthy bird communities and wetland ecosystems within the context of a rapidly changing environment.

Balancing the Eradication of an Invasive Ecosystem Engineer and Endangered Species Recovery

Drew Kerr, State Coastal Conservancy's Invasive Spartina Project (ISP), dwkerr@spartina.org

State Coastal Conservancy and USFWS began the ISP to coordinate regional control of this ecosystem engineer in the San Francisco Estuary and as a key first step in the South Bay Salt Pond Restoration Project. For 25 years, tidal restoration efforts have been continually pushed off native marsh development trajectories by hybrid cordgrass (*Spartina alterniflora X foliosa*), resulting in low biodiversity monocultures as loci of dispersal to pollute native marshes.

While the invasion engulfed fragmented marshes and destroyed habitat for a variety of tidal flora and fauna, populations of endangered California clapper rail found refuge in hybrid cordgrass. Detections at some sites soared beyond historical densities, often on previously unvegetated mudflat that could no longer perform its own ecological services. Eliminating hybrid *Spartina* from intact marshes did not have a substantial impact on rails, but it had the anticipated effect of returning populations to estimated pre-infestation levels where there was previously little habitat value. However, by 2013 winter call count surveys documented four consecutive years of stability, indicating that population-wide impacts from *Spartina* eradication have passed.

By 2012, through the use of highly-integrated monitoring and treatment, ISP reduced hybrid *Spartina* to 39 acres from over 800. Despite this success, ISP faces grave challenges towards achieving its goals. Ten sites are not permitted for treatment in ISP's Biological Opinion due to concerns about resident rails, allowing dispersal of propagules that move freely around the Estuary, undermining progress achieved by an enormous investment of public funds.

ISP is accelerating clapper rail habitat development through active enhancement, focusing on *Grindelia* along higher order channels, native cordgrass reintroduction where extirpated by the hybrid swarm, and earthen island construction. Over 165,000 plants have been installed and 90,000 are growing at Watershed Nursery for this winter.

Keywords: Hybrid Spartina, Cordgrass, Clapper Rail, Restoration, *Spartina Foliosa*, Salt Marsh

Session Title: Native Wildlife and Invasive Species

Speaker Biography: Drew Kerr is the Treatment Program Manager for the State Coastal Conservancy's Invasive Spartina Project (ISP). He joined ISP in 2005 when they began gearing up for Estuary-wide treatment. He moved to the Bay Area from Seattle where he had been the Aquatic Noxious Weed Specialist for the King County Department of Natural Resources. Drew attended the University of Michigan, receiving degrees in Natural Resource Management and Economics, and subsequently studied Wetland Science and Management at the University of Washington. In addition to work with invasive aquatic plants, wetland ecology, and land use policy, a primary area of focus for him has been lentic breeding amphibians.

Managing the Menace: Quagga and Zebra Mussels in California

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Quagga mussels (*Dreissena bugensis*) were first detected in California in January 2007 and are currently established in 25 southern California waterbodies supplied by the Colorado River. A single population of zebra mussels (*Dreissena polymorpha*) was discovered in 2008 in a small reservoir in Central California. Dreissenid mussels have impacted recreation (boating and fishing) and water management throughout the state. Quagga mussels heavily infest southern California water conveyance structures, and millions of dollars have been spent to maintain operations and contain the infestation. Given the existence of unregulated public access to some infested waters, water managers of uninfested waterbodies are taking action to prevent mussel introductions by implementing watercraft inspection programs and early-detection monitoring commensurate with their potential vulnerability to dreissenid mussel establishment and/or introduction. Concurrently, state agencies continue efforts to prevent over-land transport of dreissenid mussels on watercraft into the state at the borders, and between states through multi-state coordination. Integral in this effort is the Department of Food and Agriculture's Border Protection Stations, which in addition to dreissenid mussels, have intercepted a variety of potentially invasive aquatic species. The discovery and response to dreissenid mussels has underscored the importance of early recognition and preparation for invasive species, the need for scientists to effectively communicate issues and consequences in practical, understandable, and persuasive ways to non-scientists, the benefit of an organized response that draws on existing and outside expertise, the value of collaborative relationships based around common interests, and the necessity for any response to be multi-pronged, adaptive, and creative, if it is to achieve the desired goals given the limitations, boundaries, and authorities that must be worked within.

Keywords: Invasive, *Dreissena*, Mussel, Prevention, Response, Management, Collaboration

Session Title: Native Wildlife and Invasive Species

Speaker Biography: Ms. Volkoff is a Senior Environmental Scientist with the California Department of Fish and Wildlife's Invasive Species Program, and works to prevent and minimize the impacts of aquatic invasive species on the natural resources of the state. Ms. Volkoff is the lead scientist coordinating the Department's Quagga/Zebra Mussel Project, where efforts focus on containment, early-detection monitoring, outreach and education, and building partnerships within the state and beyond. In addition, she works on a variety of species including New Zealand mudsnail, snakehead, Asian carp, and didymo. Ms. Volkoff holds a B.S. and M.S. in Conservation Biology, and began her career as a fisheries biologist performing age and growth research on salmonids to help better inform fisheries management decisions.

Cache Slough and the Northern Ark of Native Fishes

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Cache and Lindsey Sloughs, together with the Yolo Bypass and Toe Drain, Sherman Island and Suisun Marsh, form a region of high fish diversity that includes many native species. Connectivity of heterogeneous habitats along this arc provides distinct regions that support spawning, juvenile fish rearing, and adult foraging for splittail and other important estuarine and freshwater species. Here we present early results on water quality, habitat structure, and fish abundance across the region, and speculate about the implications of our findings for restoration and native species preservation in the face of climate change, sea level rise, and future anthropogenic change in the region.

Keywords: Delta, Slough, Native Species, Fish, Water Quality, Restoration, Climate Change

Session Title: Sea Level Rise and the North Delta Ark

Speaker Biography: John Durand researches the community ecology of estuarine ecosystems. He has been working in the upper San Francisco Estuary for ten years at San Francisco State University and UC Davis, where he is completing his Ph.D.

Suisun Marsh, Past, Present, and Possible Futures

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Suisun Marsh, situated between the Sacramento-San Joaquin Delta and San Pablo Bay in the San Francisco Bay Estuary, is a productive and diverse habitat. It supports numerous native species, is a nursery for fishes, and is an important link for migratory waterfowl. In a forthcoming book (Moyle, Manfree, and Fiedler, UC Press), we analyze the many changes that have taken place in the Marsh over the decades and present alternative future states. Suisun Marsh is only about 6,000 years old, so had never been without human influence. Today the Marsh is a managed largely to support native wildlife and fish, but it is also a highly altered ecosystem with alien and native species functioning together in novel ways. In the next century, the Marsh will see dramatic changes wrought by sea level rise, climate change, subsidence, and reduction of tidal energy. Management decisions made in near future in response to these predicted changes will determine the nature of Suisun Marsh in the future, from being largely open water to being a tidal salt marsh. The management trajectory chosen will determine its importance for native species in the future.

Keywords: Wetland, Tidal Marsh, Sea Level Rise, Novel Ecosystem, Reconciliation

Session Title: Sea Level Rise and the North Delta Ark

Speaker Biography: Amber Manfree is a PhD candidate in Geography at the University of California, Davis. Her primary research interests include landscape change, biogeography, and cartography. Amber holds a BA in Environmental Studies from Sonoma State University and as previously worked on watershed management issues including restoration planning and invasive plant management with the Laguna de Santa Rosa Foundation.

Yolo Bypass Integrated Modeling for Fish, Fowl, Farming and Floods

Robyn Suddeth, UC Davis, rjsuddeth@ucdavis.edu

The Yolo Bypass is often cited as one of the more promising locations for habitat restoration in the Bay Delta system due to its large size and the benefits it already provides for many fish and waterfowl species. The Yolo Bypass also serves economic and social functions in Yolo County for farmers, duck hunters, and visitors to the state wildlife area. Finally, the Yolo Bypass is important for Sacramento Valley's flood control, able to carry many times the flow of the Sacramento River during floods. This talk presents an overview of past and present efforts to understand the many ecologic, hydraulic, and economic components of Yolo Bypass functioning, and suggests ways to translate this knowledge into promising management alternatives for future reconciliation efforts on the floodplain. A relatively formal method is used to explore promising environmental reconciliation solutions for Yolo Bypass.

Keywords: Yolo Bypass, Hydraulic Modeling, Optimization Modeling, Ecosystem Reconciliation, Floodplain Restoration

Session Title: Sea Level Rise and the North Delta Ark

Speaker Biography: Robyn Suddeth is a Ph.D. Candidate in Hydrologic Sciences at UC Davis. She received her master's degree in Physical Geography from UC Davis in 2009, with a thesis focused on levee decisions and policy for the Sacramento San-Joaquin Delta. She holds two B.A.s from UCLA (2004) in Political Science and Economics.

Trash: It's What's for Dinner

Carolynn Box, 5 Gyres, carolynn@5gyres.org
Anna-Marie Cook, US EPA, cook.anna-marie@epa.gov

Carolynn Box, Environmental Coordinator for 5 Gyres, and Anna-Marie Cook, Regional Coordinator for EPA's Region 9, will report on national and local efforts to better understand marine debris and the related environmental issues. Carolynn will give a quick overview of global distribution of marine plastic pollution based on 5 Gyres research and discuss local efforts to better understand trash inputs to the Pacific Ocean. Anna-Marie Cook will discuss marine debris's potential to hyperaccumulate, transport, and release pollutants within our oceans into marine species.

Keywords: 5 Gyres, Plastic Pollution, Gyres, Marine Pollution, Marine Debris

Session Title: Escape from Trash Mountain

Speaker Biography: Carolynn Box is the Environmental Coordinator for 5 Gyres Institute, where she helps run their environmental and education programs, and has participated in four research voyages to the South Atlantic, North Pacific, Western Pacific, and North Atlantic "Garbage Patches." She received a Master's from University of Rhode Island in Marine Affairs in 2005 and worked in the field of Coastal Management for seven years in San Francisco Bay until she met Anna Cummins and Marcus Eriksen, co-founders of 5 Gyres Institute. After her first voyage, she decided to change the course of her life and apply her science and organizing background to efforts to fight plastic pollution. Carolynn lives in San Francisco and can be found at one of the local beaches.

Speaker Biography: Anna-Marie Cook is the Regional Coordinator for EPA Region 9's Marine Debris Program and part of Superfund's Emergency Response Branch. She has been with the Agency for over 20 years, working in a variety of positions related to water protection and restoration. Prior to her Marine Debris assignment, Anna-Marie served as a Remediation Project Manager for some of the largest Superfund sites in the Southwest US, including the Base Realignment and Closure of Alameda Naval Air Station in the Bay Area. Prior to this she served as an Underground Injection Control inspector, permit writer and project officer in EPA's Groundwater Protection Program.

Getting To Clean: Regulating Trash and Gauging Success

Dale Bowyer, SF Bay Regional Water Board, dbowyer@waterboards.ca.gov
Chris Sommers, EOA, Inc., Managing Scientist, csommers@eoainc.com

Dale Bowyer will discuss the current Municipal Regional Stormwater Permit approach to trash reduction: mapping and verifying high trash generation areas of Permittees' jurisdiction, delineating trash management areas, and developing new trash management actions in key areas. A crucial aspect of this approach will be assessment and verification that progress is occurring in trash management areas. This assessment will take various approaches, including visual/photographic assessment of conditions of the streetscape, curb, gutter, and sidewalk.

Chris Sommers will discuss the actions of 72 municipalities in the San Francisco Bay Area that have begun implementing new and enhanced litter control actions in response to requirements in the municipal regional stormwater NPDES permit to significantly reduce the amount of litter entering local creeks and rivers from stormwater conveyances. To focus these efforts, municipalities conducted trash characterization studies, developed trash generation rates, and modeled trash generation from watershed source areas. As a result, each municipality has identified and mapped trash generating areas and management zones within their jurisdiction. Additionally, an outcome-based strategy for assessing progress towards trash reduction goals is currently under development. The presentation will provide an overview of the actions taken to-date by Bay Area municipalities, illustrate mapping of trash generating areas, describe trash assessment strategies currently under development, and share lessons learned to-date. Comparisons between Bay Area approaches to those taken in the Los Angeles region and via in the State Water Board's proposed Statewide Trash Control Plan will also be presented.

Keywords: Trash Reduction, Assessment of Successful Trash Reduction, High Generation

Session Title: Escape from Trash Mountain

Speaker Biography: Dale Bowyer has worked at the Water Board for 25+ years in varied capacities. He has a background in Chemical Engineering and a P.E. He currently works in the four large Bay Area urban counties on stormwater pollution and wetland and creeks preservation.

Speaker Biography: Chris Sommers, M.S. is a Managing Scientist at EOA, Inc. with 13+ years' experience designing and managing stormwater monitoring and management programs in California. At EOA, he manages the monitoring and assessment component for the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) and chairs the Trash Committee for the Bay Area Stormwater Management Agencies Association (BASMAA). Chris has worked with Bay Area cities and counties to develop trash generation rates for stormwater, create and test trash monitoring and assessment protocols, and implement trash controls. Chris received his BS in Environmental Science from Indiana University in 1994 and MS in Natural Resources Management from Humboldt State University in 2000, with a focus on aquatic ecology and indicators of environmental condition of freshwater systems.

Panel Discussion: Trash Reduction: Just Do It!

Moderator: Melody Tovar

Session Title: Escape from Trash Mountain

Panel Members:
Napp Fukuda, City of San Jose
Meri Soll, StopWaste.org
Rinta Perkins, City of Walnut Creek
Rebecca Tuden, City of Oakland

Moderator Biography: Melody Tovar is the Regulatory Division Manager with the City of Sunnyvale's Environmental Services Department. She has a Bachelor's Degree in Civil and Environmental Engineering from Stanford University. Ms. Tovar has been with Sunnyvale for nearly two years, leading compliance programming for wastewater and stormwater and sustainability initiatives. She has 18 years of experience in developing, implementing, and managing environmental programs for municipal agencies and leads a South Bay team of agency representatives collaborating to aim for zero litter in local waterways.

Panel Member Biography: Napp Fukuda is a Deputy Director of the City of San Jose's Environmental Services Department and has provided leadership in environmental compliance programs for San Jose for more than 19 years. He has a Bachelor's Degree in Mechanical Engineering from Santa Clara University and over 22 years of environmental compliance experience. Mr. Fukuda leads the City's Watershed Protection Division, which provides programmatic services that protect water quality in local creeks and the Bay. These services are integral to the City's management of both wastewater and stormwater and are comprised of four key functions: Stormwater Management, Environmental Enforcement, Laboratory Services, Pretreatment oversight, and Pollution Prevention.

Panel Member Biography: Meri Soll is a program manager with StopWaste.org of Alameda County. She joined StopWaste in 1996 with previous environmental experience in both the public and private sectors. Ms. Soll played an instrumental role in the implementation and enforcement of the Reusable Bag Ordinance in Alameda County, including serving as a liaison for the business community. She manages various green building projects including the development of comprehensive residential Green Building Guidelines for the construction industry. Ms. Soll also administers a number of grants and resource assistance programs for businesses.

Panel Member Biography: Rinta Perkins is the Stormwater Program Manager for the City of Walnut Creek. She has 14 years of experience in environmental programs. She has a Bachelor's Degree in Industrial Engineering and a Master's in Business Administration from CSU Fresno, and holds CPSWQ and QSD certifications. Ms. Perkins has worked on stormwater permit compliance, public education campaigns, standard operating manuals, staff training, and program tracking. In Walnut Creek, she leads the development of local watershed education programs. She represents

Walnut Creek and the Contra Costa Clean Water Program on various regional stormwater committees. Most recently, Ms. Perkins contributed to the development of the Long-term Trash Reduction Plan framework as a member of the BAASMA Trash Steering Committee.

Panel Member Biography: Rebecca Tuden is a watershed specialist for the City of Oakland. She has a Master's Degree in Environmental Policy from UC Berkeley. Ms. Tuden has worked on trash assessment and implementation of trash-reduction efforts during her three years with the City of Oakland. She came to Oakland after two years as an environmental conflict-resolution facilitator in the private sector and over 15 years with the US EPA working on wetlands, watershed management and water quality issues.

Central Valley Irrigated Lands Regulatory Program—Implementing the Pesticide TMDL

Joe Karkoski, California Regional Water Quality Control Board, Central Valley Region, Joe.Karkoski@waterboards.ca.gov

The Central Valley Water Board adopted basin plan amendments to address diazinon and chlorpyrifos in the Sacramento, Feather, and San Joaquin Rivers, as well as the Delta in the early 2000's. Those amendments included TMDL allocations, implementation provisions, and monitoring requirements that were primarily implemented through the irrigated lands regulatory program. The primary challenges and successes associated with these efforts will be discussed, including: collaboration with the Department of Pesticide Regulation and the county agricultural commissioners; establishing an effective monitoring and assessment program; the potential substitution of one set of impacts for another; and the significant role played by agricultural water quality coalitions. An overview of available water quality and other information (such as surveys of management practices implemented) will provide context for evaluating the effectiveness of the TMDL and implementation efforts.

Keywords: Irrigated Lands Regulatory Program, Central Valley, TMDLs, Pesticides

Session Title: Bay-Delta TMDLs: How Can We Accelerate Water Quality Restoration?

Speaker Biography: Joe is the program manager of the Irrigated Lands Regulatory program at the Central Valley Water Board, which regulates discharges from over 7 million acres of irrigated agriculture in the Central Valley. Joe and his staff develop regulations, conduct outreach, oversee monitoring efforts, and ensure compliance with Board requirements. Staff in Joe's group also work on the CV-SALTS program, which is developing policies to address salinity management in the Central Valley, and his staff oversee the Surface Water Ambient Monitoring Program (SWAMP). Joe has 20 years' experience in the water quality arena with both the U.S. EPA and the Water Board. Joe is a registered professional engineer with a Bachelor of Science degree in chemical engineering from Michigan State University. He also has a Master's in Public Policy and Administration from CSU, Sacramento.

Implementing the Urban Creeks Pesticide TMDL—Early Victories on the Long Road to Solutions

Kelly Moran, TDC Environmental, kmoran@tdcenvironmental.com

California water quality monitoring data, including data from San Francisco Bay Area urban creeks, revealed previously unrecognized gaps in pesticide regulatory procedures intended to prevent water pollution. A single Bay Area TMDL involving a collaborative implementation strategy has started to establish pesticide regulatory programs and processes that have the potential to provide long-term water quality protections.

In recent years, numerous studies documented toxicity in waterways throughout California, particularly in urban watersheds, including those in the San Francisco Bay Area. This toxicity is almost exclusively caused by currently used pesticides. In the late 2000s, in response to the cessation of most urban uses of diazinon and chlorpyrifos in 2004, pyrethroid insecticides came to dominate the market—and to create a new type of toxicity in urban watersheds. Anticipating this change, the San Francisco Bay Water Board integrated a pesticide toxicity management strategy into its 2005 Urban Creeks diazinon TMDL.

To implement the TMDL, Bay Area municipal stormwater management agencies and wastewater treatment plants joined together with the Water Board to work with Federal and California pesticide regulators towards the goal of eliminating pesticide-related water pollution in California. This multi-agency collaboration, which now includes diverse partners across the state, has led to landmark changes at both the state and Federal levels, including California regulations coupled with special restrictions placed on bifenthrin (the most environmentally persistent pyrethroid) that are together expected to reduce pyrethroid-caused toxicity by 80-90%.

California monitoring data show rapidly increasing concentrations of fipronil, another insecticide associated with water quality impacts; additional work will be needed to end pesticide-related toxicity in urban watersheds, prevent transitions to other harmful products, and ensure that pesticides do not harm San Francisco Bay and aquatic ecosystems in the Bay watershed.

Keywords: Water Quality, Pesticide, Urban, TMDL Pyrethroid, Fipronil

Session Title: Bay-Delta TMDLs: How Can We Accelerate Water Quality Restoration?

Speaker Biography: Dr. Kelly Moran is President of TDC Environmental, LLC, an environmental consulting firm specializing in water quality and pollution prevention. For the last 20 years, Dr. Moran has focused on linkages between consumer products and water pollution. She works with California water quality and pesticides regulators to address water pollution from urban pesticide use. Dr. Moran has served on the California Green Ribbon Science Panel and the City of San Mateo Planning Commission. Her work has been honored with numerous awards, including the U.S. EPA Region 9 Environmental Award for Outstanding Achievement (2004). She received a B.S. in Chemistry with Honors from Stanford University and a Ph.D. in Chemistry from U. C. Berkeley.

Watershed Restoration—Implementing the Napa River Sediment TMDL

Leigh Sharp, Napa County Resource Conservation District, leigh@naparcd.org

In 1990, based upon declining populations of steelhead and salmon and a threat to aquatic habitat, the Napa River and its tributaries were listed as water quality impaired for excessive sedimentation. In 2009, a TMDL to reduce sediment and enhance habitat was adopted by the San Francisco Bay Regional Water Quality Control Board. For over 20 years Napa County citizens, through local regulatory programs and voluntary efforts, have been working to protect and improve water quality and to enhance fisheries habitat. Local erosion control requirements are among the strictest in the nation for agricultural land uses and the benefit of those regulations is evident in the landscape today. In addition, local watershed and industry groups and County officials have taken a leadership role in developing and implementing plans, programs, and projects to meet and exceed requirements of the TMDL. Thirteen miles of predominantly privately-owned Napa River frontage is being restored through public-private partnerships, removal of fish migration barriers is providing improved access to high-quality aquatic habitat, farm and sustainability plans have been developed for tens of thousands of acres of property, and land managers are implementing priority erosion control projects in tributary watersheds that support threatened steelhead. Results from five years of out-migrant fisheries monitoring demonstrate that steelhead in the Napa River are relatively large and that smolt production is fairly consistent. These are good signs for the Napa River watershed, but with over two decades of work and a large amount of public and private investment, more is needed to track and account for progress in a meaningful and coordinated way. With that in mind, Napa County, EPA, and other partners are investing in development of a TMDL tracking and accounting system, the success of which will depend upon cooperation from stakeholders, regulatory agencies, funders, and policy makers.

Keywords: TMDL Implementation, Watershed Restoration, Public-Private Partnerships, Fisheries Monitoring

Session Title: Bay-Delta TMDLs: How Can We Accelerate Water Quality Restoration?

Speaker Biography: Leigh Sharp is Executive Director of the Napa County Resource Conservation District and has worked on water quality and habitat issues in the Napa River watershed since 2001. Before assuming the role of Executive Director in January 2006, Leigh was the RCD's Stewardship Facilitator, working with several watershed community groups to develop and implement water quality and habitat enhancement plans and programs. She and other RCD staff actively engage with public and private land managers in their efforts to implement cost-effective and scientifically sound projects and practices that conserve, protect and restore Napa County's natural resources in a landscape that supports agriculture, urban areas and wild spaces. Leigh has a Master of Science degree in Agricultural and Resource Economics from Oregon State University and a Bachelor of Science degree in Environmental Science from U.C. Riverside.

Future Solutions for the Bay—Introduction

Moderator: Letitia Grenier, Baylands Ecosystem Habitat Goals, letitiag@gmail.com

The first part of this double session will introduce the approach of using the historical context of local landforms and processes to develop solutions for the evolving Bay shoreline that provide for human needs while also conserving ecological functions. We will then focus in on ecological functions, by presenting key findings and recommendations from the Baylands Goals Update, which addresses how to restore and maintain Baylands plant and wildlife communities over the next century of change.

Keywords: Baylands Goals, Integrated Shoreline Solutions

Session Title: Future Solutions for the Bay (I)

Moderator Biography: Letitia Grenier is the Science Coordinator for the 2014 Update to the Baylands Ecosystem Habitat Goals. She was born and raised in coastal California and maintains a lifelong interest in conservation of our native ecosystems. She has been working in estuarine ecology for the past 15 years. She received her Ph.D. from the Environmental Science, Policy and Management Department at UC Berkeley, focusing on conservation biology and specializing in tidal marsh animal ecology. Her previous research has included tidal marsh food webs, the relationship of animal fitness and behavior to tidal marsh habitat structure, and bioaccumulation of contaminants in estuarine food webs. Currently, Dr. Grenier is working to enhance the impact of science on the conservation of California's estuaries by focusing on landscape-scale, collaborative, science syntheses for the San Francisco Bay and the Sacramento-San Joaquin Delta.

Integrating Nature and Engineering to Design a Resilient Bay

Robin Grossinger, San Francisco Estuary Institute, robin@sfei.org
Jeremy Lowe, ESA PWA, jlowe@esassoc.com

After a century dominated by engineering during which its size was reduced by nearly a third, the Bay has entered a more dynamic era. The seemingly permanent shoreline, whose position has changed little for generations, will need to be substantially redesigned in coming decades in response to accelerated climatic changes. With relatively large intertidal areas and a well-developed restoration ethic, however, we have an opportunity in the Bay Area to proactively create a new shoreline with greater integration between natural and engineered features.

Recent and ongoing research on the Holocene and historical evolution of the Bay suggests how Bay features responded to periods of rapid sea level rise in the past and provides the geomorphic setting and ecological palette for establishing new, more resilient shorelines. These approaches use an understanding of natural Bay processes and the opportunities provided by undervalued resources such as sediment and wastewater to create cost-effective flood protection systems and water quality benefits that also provide specific and sustainable ecological functions.

To sustain native ecological communities, these new green infrastructure approaches will need to be designed to explicitly maintain and enhance Bay ecosystems and provide other ecosystem services. This will require linking planning and engineering to landscape ecological and physical processes at a range of temporal and spatial scales, beyond standard project planning approaches. Efforts are underway to begin meeting these challenges/opportunities, but more pilot projects and new approaches will be needed to design, test, and scale up these strategies.

Keywords: Adaptation, Wetlands, Ecosystem Services

Session Title: Future Solutions for the Bay (I)

Speaker Biography: Robin Grossinger is a Senior Scientist at SFEI, where he directs the Resilient Landscapes program. For 20 years, Robin has analyzed how San Francisco Bay and other California landscapes have changed since European contact, using these data to highlight opportunities and guide landscape-scale restoration strategies. The innovative work of Robin and his colleagues has helped scientists, managers, and the public appreciate the dramatic transformation and the resilience of the state's ecosystems.

Speaker Biography: Jeremy Lowe is a Coastal Geomorphologist at ESA. He has 28 years of experience in coastal wetland restoration and flood protection, 14 of which are on the Pacific West Coast. His work has included the design of seawalls for Hong Kong airport; sea defenses for Venice, Italy; wetland restoration in Venice, California; and is the author of wetland design guidance for San Francisco Bay, Puget Sound and the Lower Columbia Estuary. More recently, Jeremy has been working on climate change adaptation in San Francisco Bay. He is co-chair of the Habitat Evolution workgroup for the Baylands Goals Update.

The Updated Baylands Goals: A Collective Vision of the Baylands for the Next Century

Letitia Grenier, Baylands Ecosystem Habitat Goals, letitiag@gmail.com

Over 100 members of the estuarine science and management community are producing a future vision for restoring and maintaining the ecological integrity of the Baylands for the next century. Collaborative teams have synthesized the current science on key drivers of change, how the Baylands habitats will evolve under future scenarios, interactions between the Baylands and the Bay and adjacent terrestrial areas, risks to plants and wildlife, and carbon sequestration. This Update to the Baylands Goals will present short- and long-term visions for the future Baylands and the actions required to achieve these visions. This presentation will cover the project purpose, collaborative process, key drivers of change, future scenarios analyzed, regional vision for 2030 and 2100, and overarching recommended actions.

Keywords: Climate Change, Baylands Goals Update, Drivers of Change, Recommended Actions

Session Title: Future Solutions for the Bay (I)

Speaker Biography: Letitia Grenier is the Science Coordinator for the 2014 Update to the Baylands Ecosystem Habitat Goals. She was born and raised in coastal California and maintains a lifelong interest in conservation of our native ecosystems. She has been working in estuarine ecology for the past 15 years. She received her Ph.D. from the Environmental Science, Policy and Management Department at UC Berkeley, focusing on conservation biology and specializing in tidal marsh animal ecology. Her previous research has included tidal marsh food webs, the relationship of animal fitness and behavior to tidal marsh habitat structure, and bioaccumulation of contaminants in estuarine food webs. Currently, Dr. Grenier is working to enhance the impact of science on the conservation of California's estuaries by focusing on landscape-scale, collaborative, science syntheses for the San Francisco Bay and the Sacramento-San Joaquin Delta.

Guided Q & A: How the Baylands are Projected to Change Over the Next Century and Recommended Actions to Increase Ecosystem Resilience

Moderator: Matt Gerhart, State Coastal Conservancy

This double-long presentation will be a guided question and answer session designed to communicate the key recommendations and findings of the Baylands Goals Update. The discussion will touch upon the broad range of topics that the Goals Update addresses, such as the following:

- What are the most important drivers of change that will affect the Baylands?
- Looking across the various modeling efforts, how are tidal marshes expected to change in elevation and extent over the next 100 years?
- How do we need to be thinking about the interaction between the Bay and the Baylands when it comes to climate change?
- What is the importance of the Terrestrial-Estuarine Transition Zone and what pressures will this area face over the next century?
- What are the most critical concerns for native plant and wildlife communities?
- How does carbon sequestration and greenhouse gas flux factor into restoration planning?
- What are the most important recommendations for the region coming out of the Goals update? For Suisun Bay? For San Pablo Bay? For Central Bay? For South Bay?

Session Title: Future Solutions for the Bay (I)

Panel Members: Chairs of the Baylands Goals Science Workgroups
Donna Ball, Co-chair of the Terrestrial-Estuarine Transition Zone workgroup
John Bourgeois, Co-chair of the Habitat Evolution workgroup
Josh Collins, Co-chair of the Terrestrial-Estuarine Transition Zone workgroup
Steve Crooks, Co-chair of the Carbon and Greenhouse Gas workgroup
Steve Herbold, Co-chair of the Wildlife workgroup
Wim Kimmerer, Co-chair of the Bay Interface workgroup
Marilyn Latta, Co-chair of the Bay Interface workgroup
Jeremy Lowe, Co-chair of the Habitat Evolution workgroup
Nadav Nur, Co-chair of the Wildlife workgroup

Panel Member Biography: Donna Ball has worked as the Habitat Restoration Director at Save The Bay since 2012, where she functions as the lead scientist and guides the Habitat Restoration Team to provide over 250 on-the-ground community-based habitat restoration events annually, specifically focused on restoring transition zone habitat. Donna has worked as a restoration ecologist for over 10 years and has worked on a variety of large and small-scale tidal restoration projects in San Francisco Bay and in estuaries along the West Coast. She earned a M.S. in Environmental Science from Western Washington University, with a focus on marine and

estuarine environments. She is co-chair of the Terrestrial-Estuarine Transition Zone workgroup for the Baylands Goals Update.

Panel Member Biography: John Bourgeois has worked in San Francisco Bay since 1999 where he currently serves as the Executive Project Manager of the South Bay Salt Pond Restoration. Previously, he worked as a restoration ecologist with the ecological consulting firm H. T. Harvey & Associates. Prior to coming to California, John worked at the USGS National Wetland Research Center, the Louisiana Department of Natural Resources, and the Institute of Pacific Islands Forestry. John has a M.S. from the University of Louisiana at Lafayette and a B.S. from Tulane University. He is co-chair of the Habitat Evolution workgroup for the Baylands Goals Update.

Panel Member Biography: Josh Collins is the Lead Scientist at SFEI. He oversees the development and integration of SFEI's scientific work. Dr. Collins is a landscape ecologist and regional ecological planner with special expertise in mapping and assessing stream and wetland ecosystems. He received his Doctorate in Entomological Sciences at the University of California at Berkeley and did post-doctoral work in Geography and Ecology at the UC Berkeley and UC Davis. Since joining SFEI, Dr. Collins has initiated continuing programs in wetland science, watershed science, historical ecology, and regional GIS. Dr. Collins chairs the technical team supporting California's new wetland and riparian area protection policy. He is co-chair of the Terrestrial-Estuarine Transition Zone workgroup for the Baylands Goals Update.

Panel Member Biography: Steve Crooks is the Climate Change Program Manager with Environmental Science Associates, working on the science and policy of wetlands restoration, climate change adaptation and mitigation. He is a founder of the International Blue Carbon Initiative, a member of the IPCC Expert Group developing guidance on the inclusion of wetlands management into national GHG inventory accounting, and an accredited advisory on wetland methodology and project development under the Verified Carbon Standard. He is co-chair of the Carbon and Greenhouse Gas workgroup for the Baylands Goals Update.

Panel Member Biography: Bruce Herbold has been working with fishes of the estuary since 1979, when he began graduate studies at UC Davis with Peter Moyle. He petitioned to add delta smelt to the list of California's threatened fish and wildlife. After getting his PhD, Bruce started work at USEPA to develop new water quality standards to protect estuarine habitat. These standards were eventually adopted into state law. Since then he has worked on a variety of tasks to improve the scientific basis for management decisions in the estuary, largely through the Interagency Ecological Program. Bruce retired from USEPA in January 2013 and has begun consulting. He is co-chair of the Wildlife workgroup for the Baylands Goals Update.

Panel Member Biography: Wim Kimmerer is a Research Professor of Biology at the Romberg Tiburon Center of San Francisco State University. He received his PhD in Biological Oceanography at the University of Hawaii, and had a postdoctoral fellowship at the University of Melbourne, Australia. He has conducted studies in the San Francisco Estuary on effects of freshwater and tidal flow on habitat, abundance, and movement of plankton and fish; the influence of introduced species and human interventions; and population dynamics, reproduction, growth,

and mortality of foodweb organisms. He received the Brown-Nichols Science Award at the 2012 Delta Science Conference. He is co-chair of the Bay Interface workgroup for the Baylands Goals Update.

Panel Member Biography: Marilyn Latta is a California Coastal Conservancy Project Manager who works on the SF Bay Subtidal Habitat Goals Project, Invasive Spartina Project, Living Shorelines Project, and additional regional projects and collaborative planning efforts in San Francisco Bay. Marilyn has worked on various aspects of estuarine habitat restoration and environmental education since 1995 on the California Coast and San Francisco Bay. She holds a dual degree in Marine Biology/ Zoology from Humboldt State University, and has worked for multiple education and policy organizations, including the Catalina Island Marine Institute, Headlands Institute, The Watershed Project, The Ocean Conservancy, and Save The Bay. She is co-chair of the Bay Interface workgroup for the Baylands Goals Update.

Panel Member Biography: Jeremy Lowe is a Coastal Geomorphologist at ESA. He has 28 years of experience in coastal wetland restoration and flood protection, 14 of which are on the Pacific West Coast. His work has included the design of seawalls for Hong Kong airport; sea defenses for Venice, Italy; wetland restoration in Venice, California; and is the author of wetland design guidance for San Francisco Bay, Puget Sound and the Lower Columbia Estuary. More recently, Jeremy has been working on climate change adaptation in San Francisco Bay. He is co-chair of the Habitat Evolution workgroup for the Baylands Goals Update.

Panel Member Biography: Nadav Nur came to Point Blue Conservation Science (formerly PRBO Conservation Science) in 1989 as its first Quantitative Ecologist, having been trained as an ecologist (PhD, 1981) and as a statistician (MS, 1991). In 1996 he initiated Point Blue's tidal marsh bird project focusing on the habitat and landscape features needed to maintain and recover tidal marsh-dependent species of concern. Since that time he has focused on the design and monitoring of tidal-marsh and riparian habitat restoration, to understand the influences on the use and value of restored habitat by birds. In recent years he had studied the demography of tidal marsh birds and climate change impacts on seabirds. He is co-chair of the Wildlife workgroup for the Baylands Goals Update.

Nature-based Ideas for Shoreline Resilience: Current Status and Next Steps

Peter Baye, Coastal Ecologist, baye@earthlink.net
Sarah Richmond, San Francisco Bay Conservation and Development Commission, sarahr@bcdc.ca.gov
Roger Leventhal, Marin County, Department of Public Works, RLeventhal@marincounty.org

San Francisco Estuary shorelines are the leading edge of the Bay's response to rising sea level, increased storm wave energy, and resulting flooding and erosion. Conventional "hard" engineering responses to shoreline protection (e.g., armoring with rip-rap, dikes, seawalls) often perpetuate or increase degradation of shoreline habitats, esthetics, and public access and enjoyment. Shoreline responses to climate change impacts are influenced by adjoining parts of the baylands ecosystem, including the mudflat, marsh plain, and terrestrial transition zone, all of which can be modified to increase shoreline resilience. Different types of natural low-gradient shoreline systems efficiently dissipate wave energy, moderate erosion, or even promote vertical accretion. Using a geomorphic conceptual model as a framework to understand shoreline processes, we critically review examples of new engineering approaches such as submerged aquatic vegetation beds, estuarine beaches, redesigned stream mouths, alluvial fan-seep transition zones, among others. These approaches can be implemented in phases and in strategic locations, buying time for shoreline habitats to adapt to climate change and continue to provide ecosystem services such as flood risk reduction and biodiversity. New engineering approaches that take advantage of these natural wave attenuation and shoreline evolution processes can be integrated to form a climate change adaptation strategy. Emerging results from research and demonstration projects from different parts of the Estuary indicate potential wider application of these new engineering approaches. These approaches need to be further developed, refined, and critically applied within the context of specific sites and a future vision for the Estuary in light of accelerating sea level rise.

Keywords: Wave Attenuation, Shoreline Evolution, Engineering Approaches

Session Title: Future Solutions for the Bay (II)

Speaker Biography: Peter Baye, Ph.D. is a coastal ecologist and botanist with over 30 years of professional experience in conservation, restoration, management, and research on coastal ecosystems in California and northeastern U.S. and Canada. He specializes in coastal wetland, dunes, and beach ecosystems, and currently works as a consulting ecologist in California.

Sarah Richmond holds a Bachelor of Science in Geology from UC Santa Barbara and a Master of Science in Energy and Resources from UC Berkeley. She has considerable consulting experience as a Geomorphologist/Hydrologist leading surface-groundwater and sediment transport investigations and developing designs for wetland and stream restoration projects. At BCDC, she is the lead for the Corte Madera Baylands and Head of Tide studies and a key player on the Adapting to Rising Tides project team.

Aligning Regulation and Baylands Goals Implementation for Integrated Solutions and a Resilient Shoreline

Joseph LaClair, San Francisco Bay Conservation and Development Commission, joel@bcdc.ca.gov

The topic specific environmental laws and regulations governing habitat and species preservation and enhancement established in the 1970's (air, water, species, etc.) have served us well in controlling environmental degradation and facilitating modest and dramatic improvements. In the 21st Century, we confront the hairy problems of climate change and related sea level rise that cut across the silos we've established for management and regulation and threaten some of the successes we've achieved, emphasizing the urgency of effective action. The necessary solutions will require us to continue our march to overcome the compartmentalization and "siloing" inherent in our management structures and pursue integrated solutions that support adaptive management.

We've had tremendous success with non-regulatory collaborative efforts, like the 1999 Baylands Ecosystem Habitat Goals, as well as regulatory successes, such as the Long Term Management Strategy for dredging and the Regional Monitoring Program. Moving forward we need to build on these successes to manage uncertainty, cope with complexity and confront significant resource constraints by adapting our institutions.

What governance changes are needed to effectively address the many impacts of climate change on the San Francisco Bay Estuary? How can we accomplish implementation of the Baylands Ecosystem Habitat Goals and integrated solutions for a resilient shoreline? What changes in land use regulation and policy are needed to facilitate acquisition of lands for wetland migration, to allow re-routing of freshwater, and restoration and reuse of sediment sources? How can permit and policy conflicts be resolved to enable experimentation and rapid learning? Can we develop adaptive policy that addresses both anticipated and unanticipated futures? Which pilot projects should we pursue to teach us how to design and build more resilient shoreline habitats and communities? Could we develop a forum where we can discuss these new approaches holistically, rather than on a case-by-case, project-by-project basis?

Keywords: Governance Resilience, Sea Level Rise, Resilient

Session Title: Future Solutions for the Bay (II)

Speaker Biography: As BCDC's Chief Planning Officer, Mr. LaClair directs the Commission's planning program, serves as technical advisor to the Commission and staff and provides liaison with governmental and private agencies on planning matters. He holds a Bachelor of Arts degree in Economics from the University of Oregon, and a Masters in Landscape Architecture and a Masters in City and Regional Planning from the University of California at Berkeley. He joined BCDC's staff in 1992 and, he became BCDC's Chief Planner in 2007. Mr. LaClair recently completed a Bay Plan policy project to address climate change and sea level rise and is currently focusing his efforts on developing the Bay Area's regional climate change resilience strategy.

Ways Forward: Panel Discussion on Key Opportunities and Barriers

Moderator: Amy Hutzel, State Coastal Conservancy

Questions will be selected from the audience for the panel to discuss. Based on the previous presentations, what are the key opportunities and barriers to moving forward? The content would likely cover topics such as more flexible policies that allow change when thresholds are reached, ways that policies can accommodate experimentation to facilitate more rapid climate change adaptation, recognizing sediment as a precious resource as sea level rises, what opportunities exist for good regional sediment management, how to move and place dredged sediment more cost-effectively, how to define beneficial use of sediments, sediment management in streams (must in-stream sediment management always be constrained by TMDLs?), and whether and how to release sediment from behind dams.

Session Title: Future Solutions for the Bay (II)

Panel Members:
Joe LaClair, BCDC
Jason Brush, US EPA
Cay Goude, USFWS
Anne Morkill, USFWS
Bruce Wolfe, SF Bay Water Board

Panel Member Biography: Cay Goude oversees the Recovery and Conservation Planning programs at the Sacramento Fish and Wildlife Office and administers endangered species programs throughout the Coast/Bay/Forest foothills geographic area of California. Mrs. Goude has her Bachelor of Science degree from UCD in Renewable Natural Resources with an emphasis in fishery biology and a Master of Science degree from CSUS in biology (emphasis in fishery biology). She worked for 7 years for the Corps of Engineers before coming to FWS. Cay has worked in the Sacramento Field Office since 1984. Mrs. Goude is past president of the California Chapter of the California/Nevada Chapter of the American Fisheries Society, Western Division AFS Past President and Equal Opportunities Section AFS Past President. Mrs. Goude received the Agency Staff Person of the Year in 2007 from California Native Plant Society for her work on the University of California, Merced project.

Panel Member Biography: As BCDC's Chief Planning Officer, Joe LaClair directs the Commission's planning program, serves as technical advisor to the Commission and staff and provides liaison with governmental and private agencies on planning matters. He holds a Bachelor of Arts degree in Economics from the University of Oregon, and a Masters in Landscape Architecture and a Masters in City and Regional Planning from the University of California at Berkeley. He joined BCDC's staff in 1992 and, he became BCDC's Chief Planner in 2007. Mr. LaClair recently completed a Bay Plan policy project to address climate change and sea level rise and is currently focusing his efforts on developing the Bay Area's regional climate change resilience strategy.

Panel Member Biography: Anne Morkill is a Wildlife Refuge Manager overseeing the San Francisco Bay National Wildlife Refuge Complex. The Complex encompasses 7 refuges, including tidal marsh restoration areas, offshore islands, remnant dunes, vernal ponds, and riverine habitats. Prior to moving to the Bay area in October 2012, Anne has worked for 23 years as a refuge manager and wildlife biologist at the Florida Keys Refuges, the Alaska Maritime and the Arctic Refuges in Alaska, and the Alamosa-Monte Vista Refuges in Colorado, as well as the Bureau of Land Management in Alaska and Wyoming Game and Fish Department.

Panel Member Biography: Bruce Wolfe has been the Executive Officer of the San Francisco Bay Regional Water Quality Control Board since 2003. He oversees the 110 staff of the Regional Water Board in carrying out the Board's mission of protecting, enhancing, and restoring the Bay and the Region's waters. Prior to his appointment, Bruce had been the Board's division chief for implementing watershed management programs, including stormwater pollution control, control and restoration of impacts to wetlands and streams, nonpoint source control, implementation of wastewater reuse, and control of discharges of waste to land. Bruce started with the Regional Water Board in 1977, is a registered professional engineer in California, and holds a B.S in Civil Engineering and an M.S. in Environmental Engineering from Stanford University.

Sharing our Stories: Interpreting the Estuary—Introduction

Moderator: Will Travis, Climate Change Consultant, willtravis@sbcglobal.net

Key to the challenges facing the Bay-Delta Estuary is an engaged local community. Without understanding how the public perceives the Bay and Delta, and without actively finding ways to generate community involvement; restoration projects, decisions about water use, and developing a plan for sea level rise lack the broad support required to be successful. Despite wide-scale planning decisions having significant impacts on the future of the Bay and Delta, it's estimated that over 80% of Californians can't locate the Delta and few understand the extent of the Bay's lost tidal marsh.

The session focuses on both understanding and shaping human perceptions of the Estuary. Topics include tribal knowledge and conservation of the Bay and Delta; environmental history and people's perceptions of the Bay; outreach and engagement of the public through local museums; and public access and education through trails, recreation plans, and heritage areas. The session will reflect the overall theme of the conference, and provide an understanding of both past and future directions within the public community and decision-making. It will link to other efforts around the Estuary, such as the SF Bay Restoration Authority's ballot measure for a parcel tax increase for restoration projects (discussed in a separate SOE session), and will suggest the importance of people valuing a healthy Estuary to support similar efforts.

This session coincides with a number of opportunities for public engagement and interest in the Bay and Delta. 2013 has been designated as the Year of the Bay and marks the opening of the new Bay Bridge span, the 150th anniversary of the Port of San Francisco, and the 34th America's Cup Series taking place on Bay waters. Additionally, this year the Bay was designated a Ramsar Wetland of International Importance.

Keywords: Public, Community, Decisions, Estuary, Bay, Delta, Tribal, History, Education, Heritage

Session Title: Sharing our Stories: Interpreting the Estuary

Moderator Biography: Will Travis is a consultant on climate change. From 1995 to 2011, he served as the executive director of the San Francisco Bay Conservation and Development Commission and in 2012 served as the senior advisor to the Bay Area Joint Policy Committee, four regional agencies working to advance future economic prosperity and address climate change. He spearheaded the public acquisition of 10,000 acres of privately-owned salt ponds along the northern shoreline of San Francisco Bay, which are now being restored to wetlands. Will is a popular public speaker and has been a lecturer at universities throughout North America. He serves on the boards of directors of a number of professional and civic organizations. Will earned Bachelor of Architecture and Master of Regional Planning degrees, both from Penn State University. He is the 2009 recipient of the Jean Auer Environmental Award and the 2012 recipient of the Frank C. Boerger Award.

The Indigenous Bay: Tribal Knowledge, Conservation, and Challenges

Chuck Striplen, San Francisco Estuary Institute (SFEI), chuck@sfei.org

Over thousands of years, tribes living by the Bay and elsewhere in California have developed frameworks for resource management. This collective body of knowledge is today called Traditional Ecological Knowledge (TEK). These practices and principles have applications to modern resource protection and restoration beyond existing tribal lands, including landscape approaches to the protection of wildlife and water quality around the Bay.

However, the precise mechanisms by which TEK can complement scientific approaches to resource management and restoration have yet to be fully developed and tested, and there is a great need for more collaborative relationships between tribes and watershed scientists. Additionally, there is a tremendous deficit of representation of these topics in the region's interpretive and educational institutions.

SFEI is seeking to meet some of these challenges through development of a Cultural Landscapes initiative that is being designed to address facilitate connections between watershed science, local and State government, and California's Tribal governments. Cultural Landscapes at SFEI will incorporate a broader and more inclusive definition of watersheds, one that acknowledges the inherent sovereignty of tribal governments across the state. Other objectives include facilitating public and tribal engagement; partnering with museums and educational institutions to develop new interpretations; collaboratively developing information, data, and tools; and providing policy-oriented analysis and assessment.

Keywords: Indigenous Bay, Tribal Ecological Knowledge, Cultural Landscapes, Historical Ecology

Session Title: Sharing our Stories: Interpreting the Estuary

Speaker Biography: Chuck Striplen is an Environmental Scientist at the San Francisco Estuary Institute, where he works with the Resilient Landscapes Program. He is developing a Cultural Landscapes initiative, using early historical documents, oral histories, and other ethno-ecological sources to analyze Native resource management that shaped the landscape first encountered by European explorers. He is experienced in applying historical ecology and Traditional Ecological Knowledge (TEK) to contemporary landscape-scale resource management. Mr. Striplen is currently a PhD candidate in Environmental Science, Policy and Management at the University of California, Berkeley. He is also a Visiting Scholar in Anthropology at the University, and was a 2003 Switzer Fellow. He joined SFEI in 2002.

Above and Below: Stories from the Changing Bay

Ruth Askevold, San Francisco Estuary Institute (SFEI), ruth@sfei.org
Louise Pubols, Oakland Museum of California (OMCA), lpubols@museumca.org

Layers of human history intertwine with the region's natural processes to form a hybrid landscape—a landscape partly determined by water, wind, underlying soils and geology, plants and animals, and partly engineered by humans. The exhibition at the Oakland Museum of California (through February, 2014), *Above and Below: Stories from Our Changing Bay,* explores the dynamic stories of how humans have shaped and been shaped by this unique environment over the last 6,000 years. Several years in the making, this multidisciplinary exhibition highlights place-based stories about the Bay and engages viewers in discussion about the Bay's future.

The exhibit was developed through collaboration between the OMCA and SFEI and also involved a wide network of partners in the community, including local environmental organizations, artists, visualization experts, and science and management agencies.

Involving the community in environmental issues requires a nuanced approach, and collaboration between a science organization and a museum brings its own set of challenges. Louise Pubols (OMCA) and Ruth Askevold (SFEI) will discuss strategies used to engage visitors and the opportunities and challenges in this collaboration. Visualizing the Bay has been critical to the exhibit's success, and artifacts, art, maps, and other media used in the exhibit will be presented.

Keywords: Hybrid Landscape, Environment, Place-Based, Collaboration, Museum, Exhibition, Visualization

Session Title: Sharing our Stories: Interpreting the Estuary

Speaker Biography: Ruth Askevold is a Senior Project Manager at the San Francisco Estuary Institute, where she works with the Resilient Landscapes Program. She has over twenty years of experience in geographic information systems, cartography, and visualizations. Her experience includes spatial analysis, information design, and project management. Current and recent projects focus on the historical ecology of the Sacramento-San Joaquin Delta and the San Francisco Bay. She uses historical maps and photographs to assist in visualizing the past, and currently directs and designs historical ecology publications and educational material at SFEI. She has provided consultation to the Exploratorium and the Oakland Museum of California.

Speaker Biography: Louise Pubols is the senior curator of history at OMCA, where her projects included Coming to California, a reinstallation of the Museum's history galleries, and this major exhibition on the San Francisco Bay. Her 2009 book, The Father of All: The de la Guerra Family, Power, and Patriarchy in Mexican California, explores how patriarchy informed the economic and political systems of Mexican-era California. Prior to arriving at OMCA in 2008, Ms. Pubols was a historian at the Autry National Center's Museum of the American West, where she curated exhibitions on the Mexican North and on the fur trade.

Delta Gateways: Heritage and Habitat

Alex Westhoff, Delta Protection Commission, alex.westhoff@delta.ca.gov
Michael Moran, East Bay Regional Park District, mmoran@ebparks.org

A recent study found 80% of Californians are unaware of the Sacramento-San Joaquin Delta. Those who know the Delta often learned about water supply or Delta Smelt issues from the press. Yet the Delta is an ecological and cultural treasure of local up to international importance.

Westhoff will present the concept of the Delta as a cultural landscape and discuss the five themes proposed for the Delta National Heritage Area to showcase its role in the nation's story. These themes illustrate layers of history which uniquely contributed to the development of California and other parts of the nation and world. The center of one of the largest reclamation projects in the U.S., a multi-cultural rural landscape, and a world food supplier, the Delta's stories are vast and fascinating. The Delta Protection Commission's regional planning efforts seek to further promote historical and cultural significance to advance public understanding of the Delta.

Moran will discuss the East Bay Regional Park District's Big Break Visitor Center at the Delta, which strives to provoke in the individual the fascination, richness, and personal attachment that leads to a collective understanding and sense of place for the Delta. The interpreter's job for this important and delicate California landform is not to provide "***the*** answer," but to spark questions and quests for more information, understanding, attachment, and ultimately, a deeper stewardship of the Delta.

Keywords: Delta, Heritage, Habitat, Park, History, Culture, Interpretation, Stewardship, Big Break

Session Title: Sharing our Stories: Interpreting the Estuary

Speaker Biography: Alex Westhoff is an Associate Environmental Planner with the Delta Protection Commission, the State agency which oversees land use in the Sacramento-San Joaquin Delta and manages projects to enhance the region's economy and resources. Alex is project manager for the Delta National Heritage Area and led the program's Feasibility Study through conducting historical research, developing partnerships, undertaking resource inventories, and structuring comprehensive public involvement processes. He received a joint Masters of Landscape Architecture in Environmental Planning and Masters of City Planning from UC Berkeley. He also holds a B.S. in Animal and Plant Systems from the University of Minnesota.

Speaker Biography: Mike Moran has been a Naturalist for over 25 years, 19 with East Bay Regional Park District, interpreting the Delta and assisting to develop the Big Break Visitor Center at the Delta. Mike worked with the National Park Service, California State Parks, National Marine Sanctuary System, Yosemite Institute (now Nature Bridge) and led natural history/whale watch programs in the U.S. and Canada. He attended SFSU and U.C. Berkeley (MS, Wildland Resource Science, studying San Joaquin River basin salmon). Mike was awarded the national Master Frontline Interpreter Award in 2012 and the 2013 Robert G. Brownlee Award for Bay Discoveries.

Curating the Bay: Crowdsourcing a New Public History

Jon Christensen, UCLA Institute of the Environment and Sustainability, California Center for Sustainable Communities, and Department of History, jonchristensen@ioes.ucla.edu

This presentation will report on the results of an experiment in crowdsourcing in public history as a way to engage people in environmental history around the San Francisco Bay. The experiment was undertaken in a collaboration between Stanford University's Center for Spatial and Textual Analysis, the social technology nonprofit Historypin, the California Historical Society, and other public history institutions in San Francisco during 2013, the Year of the Bay. This is one of three experiments in crowdsourcing for the humanities funded by the Andrew W. Mellon Foundation to learn more about the conditions under which crowdsourcing is useful for research in the humanities. The Year of the Bay experiment was designed to take advantage of a large public event—2013 brings the high-profile America's Cup yacht races to the Bay, the opening of a new Bay Bridge span, and the celebration of the 150th anniversary of the Port of San Francisco, among other events—to work with libraries, museums, archives, and the media to bring a large, diverse crowd to engage with historical photographs that lack metadata, to help provide information about those photographs and other sources, and to contribute their own materials and memories at http://yearofthebay.org. The project also involved working with two museums—the California Historical Society and the Oakland Museum of California—to bring the crowdsourcing project into public exhibition spaces. Crowdsourcing and other interactive technologies afford innovative opportunities for public history in an era when many museums, libraries, and archives are experimenting with ways to remain publicly relevant. But these experiments also entail distinct costs, tradeoffs, and risks. I will share lessons from this experiment for engaging the public more deeply in the past, present, and future of the estuary.

Keywords: Crowdsourcing, Public History, Environmental History, Museums, Public Engagement, Humanities, Archives

Session Title: Sharing our Stories: Interpreting the Estuary

Speaker Biography: Jon Christensen is an adjunct assistant professor in the UCLA Institute of the Environment and Sustainability, California Center for Sustainable Communities, and History Department. He is a veteran environmental journalist and science writer whose work has appeared in The New York Times, Nature, High Country News, and many other newspapers, magazines, journals, and radio and television shows. Jon was a Knight Journalism Fellow at Stanford in 2002-2003 and a Steinbeck Fellow at San Jose State in 2003-2004, before returning to Stanford to work on a Ph.D. in History, and serving as executive director of the Bill Lane Center for the American West, an interdisciplinary center for research, teaching, new media, and journalism from 2009 to 2012. He is currently working on a book entitled "Critical Habitat: A History of Thinking with Things in Nature," and he is editor of Boom: A Journal of California, published by UC Press.

One Estuary, Many Plans: How Will They Work Together?

Moderator: Felicia Marcus, Chair, State Water Resources Control Board

Most Californians who track water issues feel that we are poised as a state to make monumental decisions on water allocation, habitat restoration, adaptation to climate change, and conveyance that will affect us and the next several generations. This session will discuss how these major planning and regulatory processes will work together and how they will support more resilient Delta farms and communities, a more robust future California water landscape, and a healthier estuary.

The following items will be discussed:

1) *What do the dual goals, "reliable water supply and ecosystem restoration", and the concept of the Delta as an evolving place, require the state to accomplish—i.e., what does success look like?*
2) *One of the key findings of our 2011 State of the Bay report is that the estuary is experiencing a chronic state of drought that has greatly impacted the health of the waters and habitats in the Bay Delta system; how do the current plans address this chronic drought condition? What are the barriers to addressing this realistically?*
3) *There are several significant processes underway including the DSC's newly completed Delta Plan, the BDCP activities, the work of the Delta Protection Commission, and the SWRCB's Bay-Delta Water Quality Control Plans update. As a body of plans, policies and projects, how will these efforts integrate? How will they collectively move the State of California toward a more water wise future that addresses the interdependency of the environment, economics and the geographic regions of the state*?

Keywords: Delta, Water Allocation, Ecosystem Restoration, Water Landscape

Session Title: Day 2 Plenary Session: Future Challenges: Water Quantity, Water Quality

Panel Members:
Charlton Bonham, Director Department of Fish and Wildlife
Mark Cowin, Director, Department of Water Resources
Randy Fiorini, Vice Chair, Delta Stewardship Council
Michael Machado, Immediate Past Executive Director, Delta Protection Commission
Felicia Marcus, Chair, State Water Resources Control Board

Speaker Biography: Charlton "Chuck" H. Bonham, Director of the California Department of Fish and Wildlife, was appointed September 6, 2011. Prior to his appointment as Director of Fish and Wildlife, Mr. Bonham served in a number of roles for Trout Unlimited over ten years, including since 2004 as the organization's California Director. Mr. Bonham also served on the Board of Directors of the Delta Conservancy. Mr. Bonham received his J.D. and Environmental and Natural

Resources Law Certificate from the Northwestern School of Law of Lewis and Clark College, in Portland, Oregon. Before his work at Trout Unlimited, he was a Peace Corps volunteer in Senegal, West Africa, and an instructor and guide at the Nantahala Outdoor Center, in Bryson City, N.C.

Speaker Biography: Mark W. Cowin, Director of the California Department of Water Resources, was appointed by Governor Brown in 2012. Mr. Cowin has extensive experience with California water resources management and has served as Director and Acting Director of DWR since 2010. Prior to becoming Director, Mr. Cowin served as Deputy Director of Integrated Water Management for DWR overseeing DWR's flood management and dam safety programs, implementing Integrated Regional Water Management, coordinating DWR's efforts related to climate change, and updating and implementing the California Water Plan. Mr. Cowin also served for five years as Chief of DWR's Division of Planning and Local Assistance and served as an Assistant Director for the CALFED Bay-Delta Program with responsibility for the Bay-Delta Program's water management planning activities. He received a B.S. in Civil Engineering from Stanford University in 1980.

Speaker Biography: Randy Fiorini**,** Board Member of the Delta Stewardship Council, comes from Turlock, CA, where he has been managing partner of Fiorini Ranch since 1975. Fiorini Ranch, established in 1909, produces peaches, wine grapes, almonds and walnuts. He is Past President and board member of the Association of California Water Agencies, Past Board President and Director of Turlock Irrigation District and Past President and Board Member of the California Farm Water Coalition. Mr. Fiorini holds a Bachelor of Science in Fruit Science from California Polytechnic State University, San Luis Obispo. He was appointed to the Delta Stewardship Council in March 2010.

Speaker Biography: Michael Machado is the Immediate Past Executive Director of the Delta Protection Commission, a position he has held since September 2010. Prior to his appointment, he served in the California State Senate, from 2000-2008, representing the 5th District; and in the California State Assembly, from 1994-2000, representing the 17th District. While in the Legislature, Senator Machado worked extensively on water issues. He served on the Natural Resources Water Committee in the Senate and chaired the Water, Park, and Wildlife Committee in the Assembly. Senator Machado earned a Master’s Degree in Agricultural Economics from UC Davis, and an undergraduate degree in Economics from Stanford University. He and his family own and operate a farm in San Joaquin County.

Speaker Biography: Felicia Marcus is Chair of State Water Resources Control Board.
Before her appointment to the Water Board, Felicia was the Western Director for the Natural Resources Defense Council (NRDC), a national environmental leader in bringing science, law, and policy expertise to solving our world’s pressing environmental and conservation challenges. Prior to joining NRDC, Felicia was the Executive VP/COO of the Trust for Public Land, a national non-profit devoted to conserving land for people. Before coming to TPL, Felicia served as the Regional Administrator of the U.S. EPA Region IX in the Clinton Administration where she was known for her work in bringing unlikely allies together for environmental progress and for making the agency more responsive to the communities it serves, particularly Indian Tribes, communities of

color, local government, and agricultural and business interests. While at EPA, Felicia worked extensively on the range of environmental issues under EPA's jurisdiction, most heavily in air quality, Bay-Delta water, tribal, and US-Mexico border issues. Prior to that, Felicia headed Los Angeles' Department of Public Works at a time when the City went from garnering lawsuits to garnering national awards for environmental excellence. Felicia came to Public Works after extensive experience as a public interest lawyer and community organizer in Los Angeles. She currently serves and has served in the past on many non-profit boards and Advisory Councils including the Public Policy Institute of California, Urban Habitat, Kesten Institute for Public Finance and Infrastructure Policy, and the Center for Diversity and the Environment. She is also currently an Obama Administration appointee to the Commission on Environmental Cooperation-Joint Public Advisory Council (US, Mexico, Canada) and was a Schwarzenegger Administration appointee to the Delta Stewardship Council prior to being appointed to the Water Board.

Signs that the Bay's Resistance to Nutrient Pollution is Weakening

James Cloern, U.S. Geological Survey, jecloern@usgs.gov

The world's estuaries have been enriched with nutrients derived from fertilizer runoff, fossil fuel combustion, and sewage discharge. Nutrient enrichment promotes fast production of phytoplankton biomass, and in places such as Long Island Sound and Chesapeake Bay the metabolism of that biomass depletes oxygen from water and creates dead zones devoid of fish and shellfish. San Francisco Bay receives higher nutrient loads than these estuaries, primarily from river inputs to North Bay and treated sewage in South Bay, yet it does not have problems of high phytoplankton biomass or low oxygen because it has attributes that give resistance to the harmful effects of nutrient enrichment such as strong tides, high turbidity, fast grazing by clams. However, signs of change after 1999 suggest that this resistance is weakening in South Bay: clam abundance has declined; a red tide developed in 2004; the phytoplankton community includes harmful species not present earlier; phytoplankton biomass has increased significantly. These changes suggest that the Bay could be on a trajectory toward the kinds of impairments seen in other nutrient-rich estuaries. However, there is great uncertainty about how the future will unfold. As a result, the San Francisco Water Board is developing a nutrient strategy for the Bay in partnership with the Regional Monitoring Program, wastewater dischargers, and the scientific community. Goals are to answer questions to guide nutrient-management policies: is the Bay on a trajectory toward nutrient impairment; what changes would indicate that an impairment threshold has been crossed; what levels of nutrient removal from municipal wastewater would be required to mitigate impairment? Much is at stake because the capital costs of nutrient removal are $5-10 billion. Keys to sound decisions will be continued surveillance, development of nutrient criteria, and use of models to project outcomes under scenarios of environmental change and nutrient reduction.

Keywords: Nutrients, Water Quality, Phytoplankton, Dissolved Oxygen, Regional Monitoring Program, Policies

Session Title: Day 2 Plenary Session: Future Challenges: Water Quantity, Water Quality

Speaker Biography: Jim Cloern is a senior research scientist at the U.S. Geological Survey where he has worked since 1976. His research addresses comparative ecology and biogeochemistry of estuaries to understand how they respond as ecosystems to climatic-hydrologic variability and human disturbance. He leads a team investigation of San Francisco Bay that has studied primary production, nutrient cycling, algal and zooplankton community dynamics, ecosystem metabolism and food web dynamics, disturbance by introduced species, Bay-Ocean connectivity, ecosystem restoration, and projected responses to climate change. Jim has been a Fulbright Research Scholar at the Centre d'Océanologie de Marseille, mentored postdoctoral scientists and graduate students, teaches scientific writing, is Consulting Professor at Stanford University, served as Co-Editor of Estuaries and Coasts, and received the 2010 B.H. Ketchum Award from the Woods Hole Oceanographic Institution and 2012 Brown-Nichols Award from the Delta Science Program.

Prioritizing Chemicals of Emerging Concern (CECs): Applying a Global Perspective to a Regional Strategy

Derek Muir, Dept. of Chemistry, University of Toronto, DMuir@chem.utoronto.ca

A Chemical of Emerging Concern (CEC) can be broadly defined as any synthetic chemical that is not regulated or commonly monitored in the environment but having the potential to enter the environment and cause adverse ecological or human health impacts. The potential for persistence, bioaccumulation, biodegradability, and adverse effects can be assessed from molecular structure by widely available quantitative structure-activity relationships (QSARs). Large lists of chemicals in commerce (i.e. "industrial" organic chemicals, pesticides, and pharmaceuticals) in Europe and the USA have been screened and categorized by QSARs. These studies, as well as ongoing priority setting by chemical regulators in the US EPA, individual US States, Canada, European Union, Japan and other countries have identified ~3% of about 100,000 substances which may be of concern. These screening exercises have generally not included possible degradation products, byproducts, and impurities and there is potential for false positives and negatives because the QSARs have been developed with a relatively small "training data set" of well-studied compounds. While screening and listing is useful, more detailed risk assessment can be challenging due to lack of information on use, properties, and on relevant toxicity information particularly for ecological effects such as impacts on microbial communities or endocrine disruption. Ionizable chemicals, such as those containing carboxylic or sulfonic acid groups, as well as organometallic chemicals, represent a high proportion of less studied commercial chemicals and are particularly difficult to assess. While deciding on what chemicals have the greatest potential for adverse effects is very challenging, it is worth noting that there is a relatively large international effort to develop new tools for rapid screening of chemical toxicity and improving QSARs. Also rapid advances in analytical capabilities are improving the ability to identify unknown chemicals and to assess biological effects of mixtures of chemicals isolated from environmental media.

Keywords: CECs, Commercial Chemicals, Adverse Effects, Emerging Chemicals, Screening, Risk Assessment

Session Title: Day 2 Plenary Session: Future Challenges: Water Quantity, Water Quality

Speaker Biography: Derek Muir is an Adjunct Professor in the Department of Chemistry, University of Toronto and the School of Environmental Sciences, University of Guelph and a Senior Research Scientist with Environment Canada. Identifying emerging chemicals of concern is a major focus of his research, and he has collaborated recently with Dr. Phil Howard (SRC Inc) on papers assessing persistent and bioaccumulative chemicals in commerce. Derek received the SETAC Founder's Award in 2000 and was awarded the Royal Society of Canada's Miroslaw Romanowski Medal in 2004 for work on persistent organic pollutants and mercury in Canada's North. Derek is author or co-author of about 500 peer reviewed papers, assessment reports, and book chapters, and is among the 10 most cited scientists in the Environmental Science/Ecology area of Science Citation Index for the period 2001-2011.

California's Safer Consumer Product Regulations: An Important Tool for Water Pollution Prevention

Debbie Raphael, Department of Toxic Substances Control, debbie.raphael@dtsc.ca.gov

On October 1st of this year California's groundbreaking Safer Consumer Product Regulations went into effect. More than five years have passed since the underlying law was enacted and many voices have contributed to the final form of this program. This presentation will summarize the framework of the regulations, explain their potential for preventing pollution in California's water bodies, and offer some critical insertion points for input by those interested in protecting water quality.

Specifically, the regulations identify a list of around 1,200 chemicals that are known to be problematic for human health or the environment. Many of the chemicals are contaminants of concern for California's water bodies. Using this list, the Dept. of Toxic Substances Control will identify specific "Priority Products" that are formulated using one or more of these chemicals. Manufacturers who wish to sell a "Priority Product" into California must either reformulate the product or justify the continued use of the chemical(s) of concern by submitting a robust Alternatives Analysis. Based on the outcome of the Alternatives Analysis, the Department has the authority to regulate the sale of Priority Products utilizing a variety of regulatory responses.

This framework for looking at the constituents of consumer products represents a potentially powerful tool for public agencies and nonprofits trying to achieve source control of water contaminants. Potential threats to the program on the horizon include resource limitations, lack of information on chemical hazards and exposure pathways, and pre-emption at the Federal level. Regardless, California is poised to implement a significant new chapter in pollution prevention… and the world is watching.

Keywords: Pollution Prevention, Safer Consumer Product Regulations

Session Title: Day 2 Plenary Session: Future Challenges: Water Quantity, Water Quality

Speaker Biography: Debbie Raphael joined the California Department of Toxic Substances Control as Director in May 2011. In her 20-years of public service at the local and state level she has demonstrated a dedication to scientific inquiry, engagement and transparency, and forging partnerships that pave the way for meaningful and practical change. As a scientist, innovator and pragmatist, she relies on the best available science, robust stakeholder interaction and fairness to drive policy development. Recognizing that environmental burdens are not uniform across the state, she believes government must take extra steps to engage our most impacted communities. Ms. Raphael applies these principles to her key goals for the department: Implementing the Safer Consumer Products regulations; Resolving critical foundational issues within DTSC; and Reduce the generation and disposal of hazardous waste in California.

A Decade of Progress for the South Bay Salt Pond Restoration Project

John Bourgeois, State Coastal Conservancy, jbourgeois@scc.ca.gov

The South Bay Salt Pond Restoration Project (www.southbayrestoration.org) is the largest wetlands restoration project on the West coast of the United States. It is unique not only for its size (over 15,000 acres) but for its location in the middle of one of the nation's largest urban areas. The Project is intended to restore and enhance wetlands in South San Francisco Bay while providing for flood management and wildlife-oriented public access and recreation.

Since the acquisition of the property in 2003, the Project has identified long-term alternatives representing a continuum toward different end-states: one end-state at 50% of the existing ponds converted to managed ponds for waterbirds and 50% restored to salt marsh habitat, and the other end of the continuum at 10% of the existing ponds converted to managed ponds and 90% restored to marsh habitat. The final mixture of managed ponds to salt marsh habitat will depend upon the outcome of the Adaptive Management Plan, which will be implemented over the next several decades and will allow for lessons learned from earlier phases and applied studies to be incorporated into subsequent stages as management plans and designs of future actions are updated.

This presentation will provide an overview of the restoration planning and actions completed over the past 10 years, and will include successes, challenges and lessons learned to date.

Keywords: Salt Pond Restoration, Wetlands, Adaptive Management

Session Title: Restoring the Baylands

Speaker Biography: John Bourgeois became Executive Project Manager of the South Bay Salt Pond Restoration project in December 2009. For over 12 years, he worked as a restoration ecologist with the Bay Area ecological consulting firm H. T. Harvey & Associates where he worked on the planning for the Project, as well as other closely related projects. Prior to coming to California, John worked on wetland issues at the USGS National Wetland Research Center, the Coastal Restoration Division of the Louisiana Department of Natural Resources, and the U.S. Forest Service's Institute of Pacific Islands Forestry. John has a M.S. from the University of Louisiana at Lafayette, a B.S. from Tulane University.

North Bay Wetland Restoration

Renee Spenst, Ducks Unlimited, rspenst@ducks.org

The San Francisco Bay is the largest estuary system on the Pacific coasts of North and South America and has tremendous value to birds, fish, other wildlife, and people. Prior to large-scale European settlement the entire San Francisco Bay was ringed by extensive, miles-wide tidal marshes. By the late 1950s, nearly 90% of these marshlands had been diked or filled bay-wide and 80% in San Pablo Bay. In the lower floodplains of San Pablo Bay's northern edge, several large tributaries including Petaluma River, Tolay Creek, Sonoma Creek, and the Napa River nourished tens of thousands of acres of mudflats and estuarine tidal wetlands. The vast majority of these low-lying areas were diked off for agriculture, development, and commercial salt production.

In the 1990's California Department of Fish and Wildlife purchased nearly 10,000 acres of former salt production ponds, creating an unprecedented restoration opportunity on a vast landscape scale. A second large acquisition of the Napa salt production facility known as Napa Plant Site added another 1,360 acres. Both the subsequent restoration of tidal hydrology to the salt production ponds and the pending addition of key parcels such as Cullinan Ranch, Sears Point, and Skaggs Island will make substantial progress towards restoring the San Pablo Baylands.

In partnership with Department of Fish and Wildlife, US Fish and Wildlife Service, and Sonoma Land Trust, Ducks Unlimited has had the unique opportunity to work with a broad suite of funding and regulatory partners, and other technical experts to help plan, design, and implement many of these projects. This talk will highlight the collaborative nature of these projects and will reflect on project challenges, key monitoring results, and emerging evidence of species utilization of restored habitats.

Keywords: San Francisco Estuary, Restoration, San Pablo Bay, Tidal, Wildlife, Monitoring

Session Title: Restoring the Baylands

Speaker Biography: Dr. Spenst has 13 years project management experience, including federal regulatory compliance, coordinating with various stakeholders, and writing and administering grants. Dr. Spenst currently oversees over $10 million in funding to restore, enhance, or conserve wetland and associated upland habitat on more than 8,500 acres. She coordinates and implements conservation and restoration in the greater San Francisco Bay region. She has extensive experience providing scientific expertise in project design and implementation, working collaboratively with landowners and partners, providing budget oversight for 15 projects, grant writing and management, preparation of permit applications and environmental documents, and regional planning and coordination. She has taught college courses in Biology, Ecology, and Habitat Restoration and Conservation.

Completing the Hamilton Wetland Restoration Project: Are We There Yet?

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The Hamilton Wetland Restoration Project is a joint project between the US Army Corps of Engineers, San Francisco District and the California State Coastal Conservancy. The project was authorized by Congress in 1999 as an ecosystem restoration project to be carried out by the Army Corps under its civil works authority. The entire project involves nearly 2,600 acres of land of which 744 acres constitutes the former Hamilton Army Airfield. The Airfield was closed in the 1980s and transferred to the California State Coastal Conservancy under the Base Realignment and Closure Act program. This land was once tidal marsh on the shore of San Pablo Bay that was "reclaimed' (diked and drained) for farming in the late 1800's. Then, in the 1920's, the Airfield replaced the farm and became a major base through the Korean and Vietnam conflicts. Due to natural oxidation of the peat soils, the ground surface has subsided some six feet below mean sea level. So in order to restore the tidal marsh, the site has been filled with nearly six million cubic yards of clean sediment from Bay Area dredging projects. Over a period of about three years (2008-2011), dredged sediment, which would have otherwise been dumped in the bay and ocean, was pumped ashore through a 5.5 mile-long pipeline, entirely covering up the long-abandoned runway. This fall the Army Corps will be grading some of the site to ponds and channels and then in early 2014 the outboard levee will be opened up to the tides and the project will be complete. In addition the Army Corps will be constructing a 2.7 mile trail along the western perimeter of the site. It will be a segment of the San Francisco Bay Trail, which is an effort to build a trail around the SF Bay.

Keywords: Hamilton, Army, Airfield, Wetland, Restoration, Corps of Engineers, Dredged Sediment

Session Title: Restoring the Baylands

Speaker Biography: Thomas Gandesbery, Project Manager, San Francisco Bay Conservancy, CA. State Coastal Conservancy. Tom has worked at the Coastal Conservancy on the Hamilton Wetland Restoration Project and other bay area projects for over a decade. Previously to his current position, he was employed at the Regional Water Quality Control Board, SF Bay Area, where he worked on dredging and contaminated sediment issues, creek restoration, and groundwater monitoring and remediation. He lives in the East Bay, has two teenage children and enjoys windsurfing and bicycling.

Nearshore Linkages: The Roles of Native Oysters and Eelgrass as Living Shorelines

Katharyn Boyer, Romberg Tiburon Center, San Francisco State University, katboyer@sfsu.edu

The San Francisco Bay Living Shorelines: Near-shore Linkages Project has the overarching goal of creating biologically rich and diverse shallow habitats, including eelgrass and oyster reefs, as part of a self-sustaining estuary system that restores ecological function and is resilient to changing environmental conditions. This project builds on our previous work that advanced restoration methodologies and understanding of constraints and opportunities for both eelgrass and native oysters. Such habitat features, if scaled up beyond previous projects, have the potential to positively influence physical processes (such as waves and sediment transport) that determine shoreline morphology. In this project, we are further testing restoration methods as well as evaluating effects on habitat values and shoreline processes. Plots (32 x 10 m) of oyster substrate (shell-bag mounds), eelgrass, or the two together, are being compared to an un-manipulated control plot along the San Rafael shoreline in the first phase of the project. Preliminary data show that restored habitat promotes increased abundance of numerous organisms, with several native invertebrates reproducing on the oyster substrates. Native oysters have recruited in large numbers to the shell bag mounds, particularly on north-facing, vertical, or lower-elevation surfaces that likely minimize thermal stress. Birds such as black oystercatcher and several wader species increased in density at treatment plots in comparison to pre-treatment and control densities. Two large wind-wave events in spring 2013 at the San Rafael site led to preliminary findings of reduced waves in plots with added structure at particular water elevations. Small plots (1-m^2) at San Rafael and Hayward testing various oyster restoration substrates are permitting comparisons of native oyster recruitment by substrate and by site. This project will advance our understanding of restoration methodologies with an eye towards both habitat creation and shoreline protection in an era of rising seas and increasing storm surges.

Keywords: Eelgrass, Oyster, Restoration, Living Shoreline, Birds, Sediment, Waves

Session Title: Restoring the Baylands

Speaker Biography: Dr. Katharyn Boyer is Associate Professor of Biology at San Francisco State University's Romberg Tiburon Center. Her research is focused on the ecology and restoration of coastal habitats, primarily submerged vegetation and salt marshes. She is particularly interested in how species interact to structure their environments and influence fundamental ecosystem processes. Her work includes comparisons of functioning (e.g., trophic interactions, nutrient dynamics) of natural and restored habitats, development and experimental testing of restoration techniques and nutrient pollution indicators, evaluation of the effects of biodiversity, and assessment and prediction of invasive species effects on native communities.

Salt Marsh Harvest Mouse Habitat Use in Suisun Marsh

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The California Department of Fish and Wildlife and the California Department of Water Resources conducted a 2-year mark-recapture study to investigate demographic performance and habitat use of the northern subspecies (*Reithrodontomys raviventris halicoetes*) of the endangered salt marsh harvest mouse in the Suisun Marsh. We examined the effects of different wetland types and microhabitats on 3 demographic variables: density, reproductive potential, and persistence. Our results indicate that microhabitats dominated by mixed vegetation or pickleweed (*Salicornia* spp.) supported similar salt marsh harvest mouse densities, reproductive potential, and persistence throughout much of the year. We found that densities were higher in diked wetlands, whereas post-winter persistence was higher in tidal wetlands. Our results emphasize the importance of mixed vegetation, where at least some vegetation is taller, for providing adequate salt marsh harvest mouse habitat and suggest that both diked and tidal wetlands support salt marsh harvest mouse populations by promoting different demographic attributes. The southern subspecies, *R. r. raviventris*, occupies South San Francisco Bay marshes. Marshes in the South Bay generally lack the attributes that contribute to relatively high densities of mice in Suisun. South Bay marshes have lost most of their high marsh and upland ecotones to development, so mice have little escape cover during high tides. Sea level rise, particularly peak flooding events by storms in combination with higher tides, is expected to contribute to declining populations in the South Bay. Northern populations will likely fare better since they occupy marshes with gentler slopes and more opportunities for habitat expansion. We recommend that habitat management, restoration, and enhancement efforts include areas containing mixed vegetation in addition to pickleweed in both diked and tidal wetlands, and in areas that will accommodate sea level rise.

Keywords: *Reithrodontomys raviventris*, Salt Marsh Harvest Mouse, Suisun, Tidal, Diked, Habitat

Session Title: Wildlife Responses to Restoration

Speaker Biography: Sarah Estrella has been a wildlife biologist with the California Department of Fish and Wildlife since 2000. She is a graduate of both UC Davis and CSU Sacramento, where she studied the invasive plant, perennial pepperweed. She currently conducts planning, research, and monitoring in the Suisun Marsh and elsewhere in the San Francisco Bay Area and Delta. She is primarily focused on California clapper rails, California black rails, salt marsh harvest mice, listed plants, invasive plants, and habitat restoration.

Bird Responses to Habitat Restoration—Progress, Challenges and Opportunities

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The San Francisco Bay Estuary provides critical habitat for over one million waterbirds annually and supports many other wildlife species in high abundance. Although the landscape has been altered for well over a century by increasing levels of urbanization, and by the historic establishment of evaporator ponds for salt production, it remains heavily used by a wide variety of bird species. The Estuary also hosts the west coast's largest tidal wetlands restoration project; the South Bay Salt Pond Restoration Project (the Project) is implementing a plan to convert thousands of acres of salt ponds into tidal and managed wetland habitat. We review the responses of several groups of birds to restoration in the Bay Estuary, with emphasis on the South Bay and responses to restoration efforts associated with the Project. Specifically, we discuss the response of gulls, plovers, waterfowl and shorebirds to ongoing restoration efforts. Not all birds are alike – restoration in the Estuary has different impacts on different species, and we will discuss these differences and the implications of this complexity for restoration planning and evaluating restoration success. We argue that given the complexity, and at times unpredictability, of bird response to restoration, ongoing monitoring and adaptive management of restoration sites across the Estuary is critical to the success of long-term restoration efforts.

Keywords: Birds, Restoration, Salt Pond Restoration Project, Plovers, Gulls, Waterbirds, Shorebirds

Session Title: Wildlife Responses to Restoration

Speaker Biography: Catherine Burns, Ph.D. is the Executive Director of the San Francisco Bay Bird Observatory. Cat has a B.S. in Biology from Emory University in Atlanta, Georgia, and a Ph.D. in Ecology & Evolutionary Biology from Yale University in New Haven, Connecticut. Her Ph.D. research focused on understanding the impacts of habitat loss and habitat alteration on wildlife populations in New England. Prior to working at SFBBO, Cat served on the Wildlife Ecology faculty at the University of Maine, and was the Director of Science at The Nature Conservancy in North Carolina. Throughout her career, Cat's interests have focused on applying science to achieve wildlife conservation in a rapidly changing world. This has included conservation work focused primarily on birds and mammals in several urban areas of the United States (e.g. San Francisco Bay Area, New York Metropolitan Area), South Africa, Belize and Australia.

Monitoring the Effect of Salt Pond Restoration on Fish Populations in South San Francisco Bay

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The objective of this study was to monitor the spatial and temporal variability of fish species composition and relative abundance in newly restored salt ponds and adjacent slough habitats using an otter trawl, which samples the bottom of slough habitats up to 1-meter of depth. Bimonthly to monthly monitoring was conducted from July 2010 up through March 2013, at 2-3 sites in Alviso Slough, 3-6 sites in Coyote Creek, and 3 sites in A21, and A19 and in 1 site in A6. During this period we collected over 13,000 individual fish from 38 species. In addition we have counted over 120,000 invertebrates from over 40 identifiable taxa including rank scoring of 4 taxa (mysid shrimp, amphipods and isopods) which are too numerous to count individually. For this summary we examined the seasonal variability of the 10 most abundant fish species and the most abundance invertebrates (mysid and Crangon shrimp). Distinct seasonal patterns fish assemblages were apparent with summer species assemblages comprised of juvenile Pacific staghorn sculpin, Northern anchovies and English sole, while the winter assemblage included Pacific herring, American shad and the State threatened longfin smelt. The mysid shrimp (comprised of several species) was in greatest rank abundance during the winter and into the early summer, while Crangon shrimp were abundant year round; however a clear pattern of recruitment of juveniles occurred during the spring-summer months. These patterns highlight the value of the Alviso Marsh system as a vital nursery area for several key species of the nearshore marine food web (Pacific herring and Northern anchovy), the estuarine food web (Pacific staghorn sculpin and Crangon shrimp), and winter feeding grounds for longfin smelt. This study also observed the greatest abundance of mysid shrimp in the estuary and documents the overall benefits of restoring former salt ponds to tidal marsh habitats.

Keywords: South Bay Salt Pond Restoration Program, Fish Monitoring Program, Davis

Session Title: Wildlife Responses to Restoration

Speaker Biography: Dr. Hobbs is the principal investigator for the South Bay Salt Pond Fisheries Research Monitoring Program. He has been a faculty research scientist in the Wildlife, Fish and Conservation Biology Department at UC Davis for the past 5 years. With Dr. Peter Moyle, this research team has been conducting fish monitoring in marsh habitats throughout San Francisco Bay and the Delta, recently focusing on developing methods for tidal marsh restoration and monitoring. Dr. Hobbs has also led development of otolith geochemistry to determine life history traits of fish throughout the west and is an associate director of the Interdisciplinary Center for Plasma Mass Spectrometry at U.C. Davis. Dr. Hobbs' research links different restoration activities in San Francisco Bay and the effect on native fish populations.

Managing Contaminants of Emerging Concern in the Bay

Thomas Mumley, San Francisco Bay Regional Water Quality Control Board, tmumley@waterboards.ca.gov

Regulating contaminants of emerging concern (CECs) is a challenge due to the ever increasing number of manufactured new chemicals and products coupled with limited information on the environmental risk of many chemicals. Fortunately, we have a number of regulatory tools available and in use in California, particularly in the Bay Area to respond to the challenge, and our Regional Monitoring Program includes monitoring and assessment of CECs in San Francisco Bay. The Bay Area regulatory, scientific, and stakeholder community has been proactive in putting together a framework to guide management and monitoring of CECs in San Francisco Bay. This approach provides a risk-based screening of CECs to identify possible bad actors, and then applies an appropriate management response. The goal is to prevent water quality impairment rather than waiting to react once adverse effects are observed. An overview and examples of implementing the framework will be presented.

Keywords: Contaminants, Monitoring, Pollution Prevention, Regulation

Session Title: Managing CECs: An Ounce of Prevention

Speaker Biography: Tom Mumley is Assistant Executive Officer at California Regional Water Quality Control Board, San Francisco Bay Region. He also serves as Vice Chair of the San Francisco Estuary Partnership Implementation Committee. He has worked at the San Francisco Bay Water Board for thirty years. He received his BS degree in Chemical Engineering from the University of Massachusetts, Amherst in 1976 and his Ph.D. in Chemical Engineering from the University of California, Berkeley in 1983.

Flame Retardants – Effects of Flammability Standards and Bans

Rebecca Sutton, San Francisco Estuary Institute, rebeccas@sfei.org

Flame retardant use is widespread in large part due to California's unusually strict flammability standards. Polybrominated diphenyl ethers (PBDEs) are a group of flame retardants added to thermoplastics, polyurethane foam, and textiles. A decade ago, California Environmental Protection Agency (Cal/EPA) studies of PBDEs in people and wildlife in the San Francisco Bay Area revealed extremely high levels, indicating the region is a global PBDE contamination "hot spot." Meanwhile, a growing body of literature suggests PBDEs have toxic properties.

In response to federal pressure, the major manufacturer of PentaBDE and OctaBDE, two of three commercial PBDE mixtures, ceased production in 2004, preceding a California ban effective in 2006. Also in 2006, the United States Environmental Protection Agency (USEPA) issued a significant new use rule ensuring any proposed uses of these chemicals would be reviewed for safety. Production of the last commercial PBDE mixture, DecaBDE, is to be phased out by the end of this year.

The Regional Monitoring Program for Water Quality in the San Francisco Bay (RMP) has monitored PBDEs for over ten years. These chemicals are widely detected in Bay water and sediment, as well as in Bay bivalves, fish, bird eggs, and seals. Declining contamination of Bay sediment and organisms over the last decade is likely linked to the state ban and federal phase-outs. Declines are expected to continue, and should diminish potential impacts of PBDEs on the Bay.

As PBDEs are removed from the market, manufacturers are increasing use of alternative flame retardants. The RMP has detected a number of these chemicals in Bay matrices, and is conducting additional monitoring in 2014. Proposed revisions to state flammability standards could eliminate the need to incorporate these substances into upholstered furniture and many items for infants and young children.

Keywords: Flame Retardants, PBDEs, Flammability Standards, Environmental Monitoring

Session Title: Managing CECs: An Ounce of Prevention

Speaker Biography: Rebecca Sutton received her B.S. in Environmental Resource Science from the University of California, Davis and her Ph.D. in Environmental Chemistry from the University of California, Berkeley. Her dissertation explored molecular-scale interactions of ions and natural organic matter with clay mineral surfaces using molecular modeling techniques. Prior to joining SFEI in 2013, Dr. Sutton was a senior scientist with research and advocacy non-profit Environmental Working Group, where she conducted research on chemicals of concern in air, water, soil, consumer goods, and people. At SFEI, Dr. Sutton works on various projects for the Regional Monitoring Program, with an emphasis on emerging contaminants. She also leads SFEI's green chemistry focus area.

Perfluorinated Compounds in San Francisco Bay Seals and Birds

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Since the late 1940s**,** perfluorooctane sulfonate (PFOS) has been widely used as a stain repellant for textiles, furniture, and carpets; as a surfactant in fire-fighting foams and metal finishing processes; as an ingredient in the production of fluoropolymers; and as an insecticide. PFOS repels both water and oil and is highly stable. Consequently, it is used extensively and has been widely detected in the global environment, including in San Francisco Bay birds and seals and to a lesser extent in Bay fish and bivalves.

The RMP in collaboration with the USGS has monitored PFOS in cormorant eggs since 2006 on a triennial cycle. Concentrations in the southern portion of the Bay have been higher than the northern portion of the Bay. Eggs collected in the southern portion of the Bay in 2006 and 2009 contained levels of PFOS above a threshold for impacts on offspring survival in birds (greater than 1,000 ppb). The most recent PFOS egg results in South Bay (2012) were 70% lower than prior levels and are now well below this threshold.

The RMP has also collaborated with The Marine Mammal Center to analyze harbor seal blood for PFOS since 2006. While concentrations of PFOS exhibit similar spatial trends as the bird eggs, concentrations in seals have not shown declines like the bird eggs. The pathways by which these compounds enter the Bay are not fully understood.

Keywords: PFOS, Seals, Bird Eggs, Monitoring, Bay, Emerging Contaminants

Session Title: Managing CECs: An Ounce of Prevention

Speaker Biography: Meg Sedlak received a B.A. degree in Geology from Carleton, College in Northfield, MN and a M.S. degree in Water Chemistry from the University of Wisconsin-Madison. Her master's thesis examined the dehalogenation of polychlorinated biphenyls in sediments. Prior to joining SFEI in 2004, Ms. Sedlak held positions at several engineering consulting firms; the Swiss Federal Institute of Environmental Science and Technology; Resources for the Future; and the US Forest Service where she served as a trail ranger in the Chugach National Forest (Alaska). At SFEI, Ms. Sedlak thoroughly enjoys working with scientists, stakeholders, decision-makers, and SFEI staff on the Regional Monitoring Program; her particular areas of interest are water chemistry and emerging contaminants.

Pharmaceuticals and the Bay: A Cradle to Cradle Approach

Francesca Vietor, San Francisco Public Utilities Commission, tjue@sfwater.org

A report by San Francisco Estuary Institute shows that 44 different pharmaceutical compounds or metabolites have been detected in San Francisco Bay sediment or mussel samples. These compounds include harmful endocrine disrupters that can severely alter marine reproductive cycles. A big contributor to this problem is related to the lack of funding for convenient and safe disposal options. Today, people flush expired medications into the sewer system or throw them in the trash. Both are still potential pathways to the Bay, given sewer facilities are not specifically designed to remove these compounds and compounds in landfill can result in leachate.

Education alone will not help without a sustainable safe disposal solution. Just who is responsible for dealing with the problem? If the responsibility falls to the government and the utilities, then public resources are forced to pay for solutions. On the hand, non-profits and non-governmental organizations have provided a voice to the problem, but do not have the necessary resources. This leaves the private pharmaceutical companies that are making billions of dollars in profit each year.

Simply put, we need to adopt a new approach that promotes extended producer responsibility with a cradle-to-cradle design.

Keywords: Pharmaceutical, Vietor, Medicine Disposal

Session Title: Managing CECs: An Ounce of Prevention

Speaker Biography: Francesca Vietor serves as the program officer for the Environment at The San Francisco Foundation, focusing on efforts to improve the environmental health and wellbeing of vulnerable communities, building community resilience in the face of climate change, and protecting the natural environment. Francesca is also a Commissioner on the San Francisco Public Utilities Commission, where she leads policymaking for the City and County of San Francisco's water, wastewater, and municipal power services. Before that, she was executive director of the Chez Panisse Foundation, where she advanced nutrition education and food justice issues. Previously, she was president of the Urban Forest Council, president of the Commission on the Environment, and the chair of the Mayor's Environmental Transition Team. She has worked for several non-profits, including Rainforest Action Network and Greenpeace, and she has served on many boards, including the Center for Environmental Health, Commonweal and Environmental Working Group.

Nutrients in San Francisco Bay: Science to Inform Policy

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San Francisco Bay has long been recognized as a nutrient-enriched estuary, but one that has exhibited resistance to some of the classic symptoms of nutrient overenrichment, such as high phytoplankton biomass and low dissolved oxygen. The Bay's resistance to high nutrient loads results from its high turbidity, strong tidal mixing, and large filter-feeding clam populations, all of which limit the efficiency with which abundant nitrogen and phosphorous are converted into phytoplankton biomass. However, recent observations indicate that the Bay's resistance to high nutrient loads is weakening, and that conditions are trending toward increased productivity and potential impairment. To address growing concerns about the Bay's changing response to nutrient loads, regulators, dischargers, stakeholders, and regional scientists are working collaboratively to develop and implement the San Francisco Bay Nutrient Strategy. The Nutrient Strategy lays out an approach for building the scientific foundation to inform upcoming, and potentially costly, nutrient-related management decisions. This presentation will discuss recent activities related to the Nutrient Strategy: conceptual model development and identification of highest priority science questions and data gaps; estimates of external nutrient loads; and monitoring program, modeling program, and assessment framework development.

Keywords: Nutrient Science, Priorities, Bay

Session Title: Nutrients: Managing a Changing Bay

Speaker Biography: David Senn is a Senior Scientist at the San Francisco Estuary Institute (SFEI). He received his PhD in environmental engineering from MIT, where he studied the interactions between nitrogen pollution and iron and arsenic cycling in contaminated urban lakes. Subsequently, as a researcher at the Harvard School of Public Health, he conducted contaminant fate, transport, and exposure studies, including investigating mercury cycling, bioaccumulation, and human exposure in the Gulf of Mexico. Prior to joining SFEI in 2011, he worked at the Swiss Federal Institute of Aquatic Science and Technology (Eawag), studying the impacts of large dams in the Zambezi River Basin in southern Africa.

Counting Calories in the Bay: What is the Recommended Daily Allowance?

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San Francisco Bay is a nutrient-rich ecosystem that has not traditionally been considered at risk of impairment due to nutrients. Many of the wastewater treatment plants constructed in the early years of the Clean Water Act were not required to address the discharge of nitrogen or phosphorus. In fact, the 1975 Basin Plan for San Francisco Bay identified other factors in the Bay, lack of light penetration and high turbidity, as principally limiting algal growth in the Bay. However, the ecosystem is changing. Since 1999, suspended sediment concentrations have been decreasing and phytoplankton abundance, as measured by chlorophyll, has been increasing. A changing ecosystem, renewed national and regional interest in the development of nutrient criteria, the acknowledgement that there is significant loading of nutrients from treated wastewater to the Bay and the expense of nutrient removal, are creating a pressing interest and need to think proactively about nutrients in San Francisco Bay. The goal of the Water Board's effort is to develop regulatory strategies that adapt to the Bay's changing conditions in order to avoid the potentially significant effects of harmful algal blooms, hypoxia, shifts in phytoplankton assemblages and the resulting impacts to aquatic life. The Water Board is working collaboratively with wastewater dischargers, the Regional Monitoring Program and other interested parties to implement a Nutrient Management Strategy that takes a proactive approach to improve our understanding of the Bay Ecosystem. Important steps include development of an assessment framework to evaluate beneficial use impairment, continued surveillance of the Bay's response to nutrients and modeling to help us answer the question, "What is the recommended daily allowance of nutrients?"

Keywords: Nutrients, San Francisco Bay Nutrient Management Strategy, Wastewater, Nutrient Standards

Session Title: Nutrients: Managing a Changing Bay

Speaker Biography: Naomi Feger is the Chief of the San Francisco Bay Water Board's Planning Division. She is responsible for a number of Board programs, including water quality standards, TMDLs and policy development. She has a lead role in the Water Board's Nutrient Management Strategy, the Water Boards' Bay-Delta Team, and the San Francisco Bay Regional Monitoring Program. She previously worked at the Water Board overseeing CERCLA cleanups, specializing in human health and ecological risk assessment to support in-Bay and upland cleanups, and wetland restoration projects. Prior to the Water Board, she worked as a Senior Project Manager for the consulting firm SAIC.

Nutrient Management: A Statewide Perspective

Martha Sutula, Southern California Coastal Water Research Project, Marthas@sccwrp.org
California State Water Resources Control Board (SWRCB) is developing nutrient water quality objectives for the State's surface waters, using an approach known as the Nutrient Numeric Endpoint (NNE) framework. The NNE establishes a suite of regulatory endpoints based on the ecological response of an aquatic waterbody to nutrient over-enrichment (eutrophication, e.g., dissolved oxygen, algal biomass, etc.). It uses models to link these response indicators to nutrients and other waterbody specific management controls. The first step in developing the NNE framework is to develop science plan to govern technical studies that will support policy decisions. The approach is similar whether the target is an estuary, lake, river, or for particular waterbodies such as San Francisco Bay. This talk will link elements of the San Francisco Bay nutrient management strategy to technical approaches being used to develop nutrient objectives and nutrient management strategies statewide, highlighting common themes, challenges, data gaps and scientific uncertainties, and opportunities to leverage efforts.

Keywords: Nutrients, NNE, SWRCB

Session Title: Nutrients: Managing a Changing Bay

Speaker Biography: Dr. Martha Sutula is head of SCCWRP's biogeochemistry department, where she oversees projects related to eutrophication and harmful algal blooms in streams, estuaries and nearshore waters, tracking sources and fate of contaminants including stormwater and atmospheric deposition, remote sensing, and water quality modeling. Her most recent work includes providing technical support to the California State Water Board to develop nutrient objectives for California waterbodies. Dr. Sutula received her undergraduate degree in Chemistry from Purdue University in 1987, her Master's in Public Health from Tulane University in 1994, and her Ph.D. in Coastal Ecology from Louisiana State University in 1999. She joined SCCWRP in March 2001.

Panel Discussion: Perspectives on Delta Economic Futures

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The Bay Delta Conservation Plan (BDCP) recently released a Statewide Economic Impact Report which will be presented by Jerry Meral of California Natural Resources Agency. Impacts of BDCP implementation were estimated through measuring the BDCP's incremental costs and benefits to state and federal water contractors, Delta-dependent economic activities, non-market environmental amenities, and statewide income and employment. This analysis concluded that the BDCP would have positive economic benefits for California through increasing economic welfare, business activity, and employment.

Dr. Jeffrey Michael of the University of the Pacific will provide a counter discussion surrounding the cost-benefit analysis. Dr. Michael's points include the need to analyze other alternatives which may include options focused on seismic levee upgrades as advocated by the Delta Protection Commission, as well as the Delta corridors plan through-Delta alternative. Additionally, Dr. Michael will discuss the necessity of placing an economic value on environmental impacts, such as the Delta's special status fish species.

Panelists will be asked a series of questions by session moderator Campbell Ingram, to further articulate some of the differences in perspectives that the impacts of the BDCP and other alternatives will have on the economic future of the Delta. Key assumptions of each panelist's perspective will be a primary discussion point. Audience members will also be given the opportunity to pose questions to the panelists.

Keywords: Delta, Economics, BDCP, Levee, Water, Business, Employment, Fish, Impacts

Session Title: Delta Economics and Managing Multiple Stressors

Speaker Biography: Gerald Meral, Ph.D. was appointed Natural Resources Agency deputy secretary for the Bay Delta Conservation Plan (BDCP) on Jan. 19, 2011. Dr. Meral will be charged with guiding completion of the BDCP to restore the Bay-Delta ecosystem and create water supply reliability for California. In addition, he will also be responsible for the development of any revenue and funding proposals necessary to complete the plan.

Dr. Meral was executive director of the Planning and Conservation League from 1983 to 2003. He previously served as deputy director of the California Department of Water Resources from 1975 to 1983 under Governor Brown, and director of the western water program of the Environmental Defense Fund from 1971 to 1975. Dr. Meral holds a Ph.D. in zoology from the University of California, Berkeley. He received a Bachelor of Science degree from the University of Michigan. He lives in Inverness, Calif. with his wife Barbara.

Dr. Jeffrey Michael is Director of the Business Forecasting Center at the University of the Pacific in Stockton, CA. The Center produces quarterly economic forecasts for California and ten Northern California metro areas in addition to special reports on current business and public policy issues impacting the region. Jeff's areas of expertise include regional economic forecasting and environmental economics including work on the economic impacts of the Endangered Species Act, climate change, and regulation on land use, property values and employment growth. Before coming to Pacific in 2008, he spent nine years as faculty, Associate Dean, and Director of the Center for Applied Business and Economic Research at Towson University in Maryland. Jeff received his Ph.D. from North Carolina State University, M.S. from the University of Maine, and B.A. from Hamilton College.

Scientist and Stakeholder Views on Delta Ecosystem Management

Ellen Hanak, Public Policy Institute of California, hanak@ppic.org

Despite broad scientific recognition that a wide range of ecosystem stressors are responsible for the declines in the Delta's native fish populations (NRC 2012), significant tensions have arisen between science and policymaking regarding the relative roles of different stressors and the potential of various management actions to improve ecosystem health. This talk summarizes results from a study designed to inform the policy process through the use of confidential surveys of scientific researchers (those publishing in peer-reviewed journals, n=122) and engaged stakeholders and policymakers (n=240). The surveys, conducted in mid-2012, sought views on the sources of ecosystem stress and priority management actions. The scientist survey is an example of the growing use of expert elicitation to address gaps in the scientific literature, particularly where there is uncertainty about priorities for decisionmaking. The stakeholder survey is a useful complement, enabling the identification of areas of consensus and divergence among stakeholder groups and between these groups and scientific experts. The results suggest such surveys are a promising tool for addressing complex water management problems. We found surprisingly high agreement among scientists on the relative roles of stressors and the most promising management actions; they emphasized restoring more natural processes through habitat and flow actions within the watershed, consistent with "reconciliation ecology" approaches. In contrast, scientific consensus was far lower on the potential of infrastructure and technology tools (e.g. tunnels, gates, hatcheries)—underscoring the importance of building knowledge on such efforts. Also surprisingly, stakeholders from groups with widely diverging public positions broadly agreed with scientists that multiple stressors are responsible for the Delta's plight, and most agreed with scientists on management priorities. However, individual groups were more likely to prioritize actions unrelated to their own uses of Delta resources. Building shared understanding on Delta science can contribute to a more constructive policy process.

Keywords: Ecosystem Stressors, Delta Science Policy, Survey Methods

Session Title: Delta Economics and Managing Multiple Stressors

Speaker Biography: Ellen Hanak is a senior fellow at the Public Policy Institute of California (PPIC). Her career has focused on the economics of natural resource management and agricultural development. Since joining PPIC in 2001, she has built an influential, multi-disciplinary water policy research program involving scholars from across California. Other areas of expertise include climate change and infrastructure policy. She has also held research positions with the French agricultural research system, the U.S. President's Council of Economic Advisors, the World Bank, and the Brookings Institution. She holds a Ph.D. in economics from the University of Maryland.

Managing Delta Ecosystem Reconciliation Adaptively

Jay Lund, UC Davis, jrlund@ucdavis.edu

The Delta is a diverse and evolving place, subject to a wide range of intense interests and numerous governmental and management authorities. Many of these governmental authorities and programs have advocated "adaptive management" as part of their work, and many have begun to develop their own independent "adaptive management" programs. Rhetorical consensus has been achieved in this regard. Some ideas are presented on how adaptive management might be implemented for the Delta to achieve greater ecosystem management effectiveness, focusing on the uniqueness and developmental potential of different places within the Delta and the importance of developing computational models to integrate and test knowledge. At its best, adaptive management will be an imperfect and awkward process. However, if properly structured and led, it might prove to be less imperfect and controversial, but more effective than current management.

Keywords: Adaptive Management

Session Title: Delta Economics and Managing Multiple Stressors

Speaker Biography: Jay Lund is the Director of the UC Davis Center for Watershed Sciences and a Professor of Civil and Environmental Engineering. He is also a member of the Delta Independent Science Board and has been mired in Delta issues for several years.

One Delta—One Science

Peter Goodwin, Ph. D., Lead Scientist, Delta Science Program, Delta Stewardship Council, pgoodwin@deltacouncil.ca.gov

The 2009 Delta Reform Act established a new oversight and coordination entity in the Delta (the Delta Stewardship Council or DSC), and directed the DSC to develop a management plan (the Delta Plan) that would use science to achieve the coequal goals of water supply reliability and to protect, restore and enhance the Delta ecosystem. The Delta Plan is a long-term management plan that recognizes the important role of science to inform implementation of actions and includes recommendations and requirements for the expanded use of best available science and adaptive management. It also acknowledges the need for improved science coordination.

The Delta Plan recommends that a Delta Science Plan be developed to organize shared learning and integrate ongoing science in the Delta. This Delta Science Plan, developed by the Delta Science Program, lays the foundation for achieving the vision for Delta Science as '*One Delta, One Science'* – an open Delta science community that works together to build a shared body of scientific knowledge. The Delta Science Program would augment and build on already existing efforts and work with others to improve the existing science infrastructure by identifying where synergies within the science community can be achieved.

The Delta Science Plan is the first element of a three-part planning, implementation and reporting strategy. The overall Delta Science Strategy includes three elements: 1) *The Delta Science Plan,* 2) *The Science Action Agenda (Action Agenda),* and 3) *The State of Bay-Delta Science (SBDS)*.

The Delta Science Plan creates a framework for making scientific information relevant and available to decision makers. It addresses several key needs: synthesis of research and data into useful scientific information, improved communication among scientists, managers and policy makers, guidance for the use of science in adaptive management, and the "infrastructure" needed to support the science enterprise.

Keywords: Delta Science Plan, Science Action Agenda, State of Bay-Delta Science

Session Title: The Delta Science Plan—Working Together to Build an Open Science Community

Speaker Biography: Peter Goodwin is the Lead Scientist for the Delta Science Program (DSP). He works with DSP staff, the Delta Independent Science Board, and others to promote and coordinate the use of peer-reviewed science. The DeVlieg Presidential Professor in Ecohydraulics and professor of civil engineering at the University of Idaho, he also founded and directs the Center for Ecohydraulics Research. He is recognized internationally for his research in the field of modeling flows, sediment transport, and river channel evolution. He is a former CALFED Independent Science Board member and the director of Idaho's Experimental Program to Stimulate Competitive Research (EPSCoR), a federal-state partnership intended to build research infrastructure. He earned his undergraduate degree in civil engineering from the University of Southampton, England, and his Master of Science degree and Ph.D. from UC Berkeley.

Panel Discussion: Moving Forward with a Joint Science Agenda

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Anke Mueller-Solger, Ph.D., Interagency Ecological Program, anke.mueller-solger@deltacouncil.ca.gov
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Michael Chotkowski, Ph. D., U.S. Fish and Wildlife Service, Michael_Chotkowski@fws.gov
Maria Rea, NOAA Fisheries, Maria.Rea@noaa.gov
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Carl Wilcox, California Department of Fish and Wildlife, Carl.Wilcox@wildlife.ca.gov

Successful implementation of the Delta Science Plan will require a commitment by all parties involved in scientific activities in the Delta to increase collaboration and integration. Current efforts by programs such as the Interagency Ecological Program, the Ecosystem Restoration Program, My Water Quality Portal, State Water Resources Control Board workshops and others provide an excellent foundation. However, despite the close working relationships of many individual scientists and collaborative efforts, it is difficult to track all activities related to data generation, model development and calibration, or new results and insights gained.

The Delta Science Plan is proposing a framework that will enable scientists to engage in greater interagency collaboration, integration and the use of common tools. The Plan builds on existing organizational structures to provide coordination, synthesis and communication. Key issues addressed by the Plan include a shared process for prioritizing research, managing conflict, building trust, science synthesis, science-policy communications, effective adaptive management, and identifying, maintaining, and advancing the state of Delta knowledge.

Implementation of the Delta Science Plan will rely on the cooperation and partnership of the Delta policy, science and management communities. This panel discussion between scientists actively working in the Delta and agency managers (state and federal) will focus on processes for defining the critical issues ("grand challenges") that need to be addressed and how work priorities can be established, available funding can be leveraged, and other resources can be shared to maximize the effectiveness of scientific efforts in the Delta.

Keywords: Delta Science Plan, collaboration, coordination, integration, synthesis, building trust, priorities

Session Title: The Delta Science Plan—Working Together to Build an Open Science Community

Moderator Biography: Rainer Hoenicke has been Deputy Executive Officer for Science at the Delta Stewardship Council since March 2013. Prior to working for the Council, he was Executive Director at the San Francisco Estuary Institute, lead scientist for the Santa Monica Bay Restoration Project at the Regional Water Quality Control Board in Los Angeles, and a lecturer and postdoctoral fellow at Moss Landing Marine Laboratories. A native of Germany, he received a

Bachelor of Science degree at the University of Bonn. He then moved to the United States and received a Ph.D. in ecology working with zooplankton at the University of California at Davis.

Panel Member Biography: Dr. Anke Mueller-Solger serves the Delta Stewardship Council as Lead Scientist for the Interagency Ecological Program (IEP), a 42-year old State and Federal program that conducts cooperative monitoring and research in the Delta and, in collaboration with the Delta Science Program and others, provides ecological information and scientific leadership for use in management of the San Francisco Estuary.

Panel Member Biography: Paul Helliker has worked in environmental and resource management programs for 26 years, with experience at the federal, State and local levels. He is currently Deputy Director, Delta and Statewide Water Management at the Department of Water Resources (DWR). In that role, he oversees DWR's Bay-Delta Office, FloodSAFE Environmental Stewardship and Statewide Resources Office, and Division of Environmental Services. He holds a Bachelor of Arts degree in Philosophy, a Bachelor of Science degree in Civil Engineering, and a Master of Science degree in Environmental Engineering, all from Stanford University. He is a registered civil engineer in California.

Panel Member Biography: Carl Wilcox is the Delta Policy Advisor to the Director of the California Department of Fish and Wildlife, which includes directing the Department's involvement in the Bay Delta Conservation Plan. Prior to his assignment as Policy Advisor, he managed the Department's Bay Delta Region and was responsible for fisheries and wildlife management, lands management, and habitat conservation planning and permitting programs. He has a Master of Science in Biology from New Mexico Highlands University and a Bachelor of Science in Biological Conservation from California State University Sacramento.

Panel Member Biography: Mike Chotkowski has more than a decade of experience working on fish and wildlife issues in the Delta. He is currently Field Supervisor for the San Francisco Bay-Delta Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS). Prior to working for USFWS, he worked for the Mid-Pacific Region of the Bureau of Reclamation, the California Department of Fish and Wildlife, and the Illinois Natural History Survey. He has a Ph.D. in Biology and a Master of Science in Mathematical Ecology from the University of California, Los Angeles.

Panel Member Biography: Maria Rea has over 14 years of experience in managing environmental issues and natural resources at the federal and State levels. She is currently supervisor of the Sacramento Area Office for the National Marine Fisheries Service. Prior to her current assignment, she served as Senior Policy Adviser at the U.S Environmental Protection Agency in San Francisco, overseeing a number of complex water quality investigations, cooperative agreements, and regulatory decisions. She holds a Master's Degree in Public Policy from the Goldman School of Public Policy/U.C. Berkeley and a Bachelor of Arts in Environmental Studies from Brown University.

Panel Member Biography: Susan Fry, the Bureau of Reclamation's Mid-Pacific Region Manager for the Bay-Delta Office (BDO) in Sacramento, manages numerous critical programs for the San

Francisco Bay/ Sacramento-San Joaquin Delta Estuary including implementation of the current biological opinions and development of new biological opinions for the coordinated operation of the CVP and SWP, implementation of the Suisun Marsh Preservation Agreement, management of the Bay Delta Conservation Plan process, and engagement with the Science Task Force and Interagency Ecological Program. Prior to becoming the BDO Office Manager, Fry was the Area Manager for the Region's Klamath Basin Area Office in Klamath Falls, Oregon, served as the Mid-Pacific Region's Environmental Officer and Special Assistant to the Regional Director, worked as a private consultant, and spent 12 years with the U.S. Army Corps of Engineers. Fry holds a Bachelor of Science degree in Wildlife Biology from the University of California at Davis.

Stream Level: Steelhead Populations as Indicators of High Functioning Stream Habitats

Jonathan Koehler, Napa County Resource Conservation District, jonathan@naparcd.org

The Napa River has been designated as an anchor watershed for steelhead (*Oncorhynchus mykiss*) in the San Francisco Bay Area. Excepting the Sacramento/San Joaquin River system, the Napa River has more than twice the number of stream miles accessible to steelhead than any other stream draining directly to the San Francisco Estuary. Recently completed and ongoing habitat restoration efforts aim to improve conditions for steelhead and other native fishes within the watershed. In order to track ecological responses to these restoration efforts, and to collect current information on steelhead population trends and life history details, the Napa County Resource Conservation District (RCD) and our partners have been conducting outmigrant monitoring with a rotary screw trap in the Napa River for the past five years (2009-2013). During this period we have observed relatively consistent steelhead smolt catch rates, with a five-year average of 2.1 smolts captured per day of operation. Steelhead smolt size, commonly used as an indicator of physiological condition, has been relatively large with an average fork length of 189mm (std. dev. ±24mm), despite significant variation in precipitation patterns between sampling years. Steelhead outmigration from the Napa River appears to peak consistently in early April with increased activity during storm flows. Steelhead spawning occurs from January through May and appears to peak in early March in most years. To explore movement patterns and residence times of steelhead in the Napa River watershed, RCD initiated a PIT tagging program in 2013. A stationary PIT tag antenna was installed in the lower Napa River to detect smolts tagged from upstream tributaries as well as returning adults in future years. We PIT tagged 59 steelhead smolts in 2013, and aim to tag 80-90% of future captures. RCD plans to continue this monitoring indefinitely, and annual reports are available at www.naparcd.org.

Keywords: Monitoring, Assessment, Aquatic, Fish, Indicator, PIT, Smolt, Steelhead

Session Title: Scaling up to Sustainable Watershed Management

Speaker Biography: Jonathan Koehler has been with the Napa County RCD since 2001 where his work has focused on issues combining aquatic ecology and geomorphic processes within the Napa River watershed. He currently oversees the RCD's fisheries monitoring program, which includes outmigrant trapping, spawner surveys, and snorkeling. A Bay Area native, Jonathan has a Master's degree in Biology from Cal State University East Bay.

Reach Level: The Case for Reach-Scale Restoration and Habitat Enhancement

Gordon Becker, CEMAR, becker@cemar.org

Surveys of San Francisco Estuary tributaries over more than 50 years have provided extensive information about the distribution of the region's cold water habitat. These areas capable of supporting native fish assemblages are recognized widely as valuable resources deserving protection and improvement through water quality regulation, limitations on nearby land use and funding support for restoration projects in riverine/riparian corridors. The Endangered Species Act listing of steelhead trout has further increased incentives to understand and appropriately manage the Bay Area's stream networks.

Recent and proposed outmigrant trapping studies in important streams around the Bay are allowing researchers to gauge key steelhead population characteristics (*i.e*., abundance, productivity, spatial structure and diversity), thereby informing the questions: *Are our streams healthy? In which stream reaches are actions most needed?* and *What actions will have the greatest effect?* A program can be envisioned that builds on these efforts to: 1) look at previously unexamined streams and 2) generate a regional conservation and rehabilitation plan for aquatic habitat. Such a plan offers the opportunity to apply limited resources efficiently, focus the attention of the restoration community and the interested public, and advance toward attaining water quality and steelhead recovery goals. Addressing intractable issues such as dry season streamflow impairment and channel and bank modifications at the reach scale also would be less controversial than a blanket approach. Finally, tracking these basic traits provides a reliable indicator of watershed health status and trends.

Keywords: Steelhead, Stream Health, Reach Scale, Aquatic Habitat

Session Title: Scaling up to Sustainable Watershed Management

Speaker Biography: Gordon Becker is Senior Scientist at CEMAR, where he researches steelhead resources and analyzes restoration opportunities. Gordon prepared steelhead distribution studies for streams tributary to the San Francisco Estuary, the Eel River watershed, and the California coast south of the Golden Gate. He also developed prioritization reports for each of these regions. Recent projects include smolt trapping in Sonoma and Pescadero creeks, and fish passage barrier modifications in six Bay Area watersheds. Gordon studied fisheries science at Cal State East Bay, and holds a master's degree in water resources management from the University of Wisconsin-Madison and a bachelor's from Williams College in Geology and Environmental Studies. Whenever possible, Gordon rafts western rivers.

Reach Level: Watershed Assessment Methods—The Challenges of Assessing Watershed Health

Josh Collins, SFEI-ASC, Josh@sfei.org

Watershed health care can be improved by advances in environmental science and technology that support coordinated environmental planning, regulation and management across government agencies at the landscape scale. The concept of ecosystem services is fundamental to the emerging watershed health care system. The central question is about the levels of services that watersheds should provide. Tools are being developed to rectify the target levels of different services by predicting their inter-relationships. These tools will help decide difficult tradeoffs in services within and among watersheds, and help develop resilient landscape designs, best management practices, and inter-agency governance. Watershed-based management of ecosystem services can be incentivized by bundling permits and stacking mitigation credits at the watershed scale. This will require tracking the effects of health care actions, including a common base map of habitat types and the built environment. The California Aquatic Resource Inventory (CARI), statewide vegetation mapping (VegCAMP), digital elevation data, Wildlife Habitat Relationships (WHR), and National Land Cover Dataset (NLCD) are elements of the needed base map. Standardized ways to map health care actions, such as Wetland Tracker and Online 401 tool, are also needed. Some standardized methods for assessing levels of service relative to targets are available through the Surface Water Ambient Monitoring Program (SWAMP) and other statewide monitoring efforts. Tools that forecast likely future conditions, such Our Coast Our Future and various hydrological models, are needed to assess alternative manage actions. Tools like EcoAtlas and its Landscape Profile Tool can compile environmental data from various sources at user-defined scales of time and space without costly centralized data management. These advances in science and technology should support better coordination across environmental policies and programs to realize more effective watershed health care.

Keywords: Watershed Management, Ecological Health, Watershed Assessment, Climate Change, Watershed Stewardship

Session Title: Scaling up to Sustainable Watershed Management

Speaker Biography: Josh Collins is the Chief Scientist at the San Francisco Estuary Institute and Aquatic Science Center, where he coordinates scientific and technological work across programs. Dr. Collins is a landscape ecologist with special expertise in stream and wetland ecosystems. He received his Doctorate in Entomological Sciences at UC Berkeley and did post-doctoral studies in Geography and Ecology at the UC Berkeley and UC Davis. As an ecologist in the public utilities industry, Dr. Collins assessed the impacts of power plants on marine, estuarine, and riverine ecosystems. As a consulting ecologist in private practice, he designed restoration projects and developed methods to assess their performance. At SFEI-ASC, Dr. Collins has initiated continuing programs in wetland science, watershed science, historical ecology, and GIS. He has led efforts to set long range ecological goals in multiple regions and has developed environmental monitoring and assessment methods for California and the nation.

Watershed Level: Integrating Watershed Assessments in Multi-Objective Projects—San Francisquito Creek

Len Materman, San Francisquito Creek Joint Powers Authority, len@sfcjpa.org

Because it forms the dividing line between cities and counties on the San Francisco Peninsula, no single agency has significantly altered San Francisquito Creek and it remains one of the only major natural channels in the area. The San Francisquito Creek Joint Powers Authority (SFCJPA.org) is a regional agency created to address the Creek's frequent flooding, preserve its ecological function, and promote recreational opportunities along it.

The SFCJPA is using its understanding of how the hydrology and habitat of the Creek relate to San Francisco Bay in order to make decisions that will shape them both for decades. In making these decisions, we must ask ourselves if we should design a fluvial-tidal interface that restores historic conditions, one that maintains -- for the short term -- existing conditions, or one that can adapt to an environment influenced by climate change that we can model but not reliably predict. In its first capital project to go to construction, the SFCJPA is answering this question by attempting to accomplish all three.

The multi-objective project from San Francisco Bay to Highway 101 is designed to protect against concurrent Creek and tidal 100-year floods with over two feet of Sea Level Rise. This long-term approach to reducing flood risk depends on recreating an outlet for the Creek into Bay marshlands during a high flow and tide. Because this may affect endangered species currently at the site, we are creating new habitat nearby. Perhaps most importantly, this project and plans for an adjacent Bay levee may eventually allow us to fully restore the historic connection between the freshwater Creek and saltwater marsh which would provide the sediment input necessary to ensure the long-term viability of the marshland habitat. The science and policy considerations that inform this project should inform efforts elsewhere around the Bay.

Keywords: Watershed, Integrate Science Policy, Multi-Objective Projects, San Francisquito Creek, Adaptation

Session Title: Scaling up to Sustainable Watershed Management

Speaker Biography: Len Materman is the Executive Director of the San Francisquito Creek Joint Powers Authority, responsible for programs, operations and finances. The SFCJPA plans and implements projects to enhance flood protection, disaster response, ecosystems, and recreational opportunities within a 50-square mile area on the San Francisco Peninsula. Prior to joining the SFCJPA, Len worked at Stanford University; as a consultant to nonprofits, foundations, and the U.S. State Department; and as executive producer of a documentary film broadcast nationally on PBS on Earth Day. During the Clinton Administration, he served as advisor to FEMA Director James Lee Witt and as FEMA's representative on two White House Task Forces. Prior to his work in Washington, Len served as the director of government affairs for UC Berkeley, and he received degrees in political science and biological sciences from UC Davis.

Watershed Level: Urban Watershed Planning—What Does Sustainable Management Mean?

Joshua Bradt, San Francisco Estuary Partnership, josh.bradt@waterboards.ca.gov

In public policy, "sustainability" often refers to meeting the needs of the present without compromising the needs of future generations; it also entails balancing the Three Es (Environment, Economics, and Equity). In a pragmatic sense, "sustainability" means ensuring the financial and personnel capacity to keep programs and operations running effectively.

Several Bay Area cities have begun developing watershed management plans to address water quality impairments, flood management, ecosystem restoration, and stormwater drainage improvements. Challenges to watershed planning in the urban context include the severity of watershed ailments, the wide variety of stakeholders, and the lack of available municipal staff and money to generate meaningful momentum. Faced with increasing regulatory requirements and deteriorating stormwater infrastructure, cities seek cost effective strategies with multi-objective, long-term benefits. Green Infrastructure (GI) is gaining traction, as it preserves and mimics natural watershed processes. GI includes protecting open spaces, urban forests, creeks and wetlands, as well as retrofitting existing developed parcels and the public right-of-way to intercept, treat, infiltrate, and/or detain stormwater while improving neighborhood aesthetics (and other benefits). Broad and strategic deployment of GI complements "grey infrastructure" (conventional collection and conveyance into centralized pipe networks) by relieving hydraulic loading and treating polluted run-off before entering storm pipes and receiving waters.

Watershed management plans use the findings of various assessment types (i.e. habitat, water quality, hydraulic modeling, community concerns, and physical conditions of infrastructure assets) to develop a comprehensive suite of recommended actions and policies, and their associated costs for addressing identified problems. These plans can satisfy both definitions of sustainability by prioritizing actions that improve watershed health and providing the public with the rationale for approving adequate financial resources.

Keywords: Green Infrastructure, Low Impact Development, Watershed, Management, Planning, Natural, Drainage

Session Title: Scaling up to Sustainable Watershed Management

Speaker Biography: Josh Bradt is a Watershed Specialist and Project Manager for San Francisco Estuary Partnership. He manages a multi-city green infrastructure demonstration project, the San Pablo Avenue Green Stormwater Spine and supports SFEP's Watershed Program and regional green infrastructure efforts. Before that, Josh spearheaded the creation of a citywide Watershed Management Plan for the City of Berkeley. Prior to that, he was Executive Director and Restoration Director of the Urban Creeks Council. He has also worked as a Watershed Specialist for the Contra Costa Countywide Clean Water Program. Josh has a B.A. in Political Science from the University of North Carolina and lives in Richmond, CA with his urban farming family.

Regional Level: Developing Next Generation Technology and Management Tools for Sustainable Watersheds

Bill Eisenstein, University of California, Berkeley and ReNUWIt, weisenstein@berkeley.edu

This talk will summarize ongoing and forthcoming research activities to develop next generation technology and management tools for sustainable urban water infrastructure, and suggest some implications that these tools may have for watershed management and integrated regional water management. This research includes projects to develop decision support tools to identify the optimal scale for implementation of recycled water infrastructure, to analyze full life cycle emissions and energy use models for urban water, and to innovate methods to incorporate non-technical planning criteria into site suitability and feasibility analyses for stormwater capture and recharge projects. The talk will identify certain challenges that these innovative technologies and methods may pose to existing planning and financing practices, and further research that will be necessary to overcome these challenges.

Keywords: Urban Water Infrastructure, Planning, Innovation, Watershed Management

Session Title: Scaling up to Sustainable Watershed Management

Speaker Biography: William Eisenstein is the executive director of the Center for Resource Efficient Communities at UC-Berkeley and the leader of the Urban Systems and Integration research thrust of the NSF Engineering Research Center on Renewing the Nation's Urban Water Infrastructure (ReNUWIt). He has also previously served as a consultant to Delta Vision, the Delta Conservancy, the Delta Protection Commission, and the Department of Water Resources.

Regional Level: Current Trends and Future of Integrated Water Management—Combining Water Resource Governance Structures

Steven Moore, California Water Resources Control Board, Steven.Moore@waterboards.ca.gov

The natural water cycle intertwines water supply, flood management, wastewater collection treatment and reuse, urban runoff pollution control and recapture, stream and wetland restoration, and groundwater recharge and use, but these functions are institutionally isolated to various degrees and unable to raise funding commensurate with future infrastructure capital investment needs for multi-benefit projects. Water governance evolved in the 20th century based on specific issues as they arose. Integrated Regional Water Management (IRWM) legislation of 2002 has increased watershed-based alignment of water planning and multi-benefit projects, but it is match-funded by voter-approved bonds that are an unreliable source of public funding going forward, and is implemented by a fragmented governance structure lacking needed flexibility for revenue generation and expenditures. This year the Department of Water Resources has engaged IRWM program participants to define goals and objectives for IRWM's second decade. Looming large is the finite nature of the supplemental funding for this program and the need to consider structural changes to water governance.

What if existing fragmented water supply, flood management, wastewater and storm water management agencies, districts and private organizations could *voluntarily* opt in to become a 'Unified Water Authority' of a given watershed and/or groundwater basin just as they would join a Joint Powers Authority under the IRWM structure, but capable of raising revenue for a greater variety of water-related investments under the Prop 218 category of water or wastewater that requires greater than 50% protest to overturn proposed rate changes? Such consolidation of authority would require commensurate public processes and transparency to have checks and balances on potential misuse of power. Regional Unified Water Authorities could build on partnerships and experiences of existing integrated water agencies to improve the governance for all aspects of water – ensuring California can meet its sustainability goals into the 21st century.

Keywords: Governance, IRWM, Structure, Sustainability, Funding, Watershed Planning, Multi-Benefit Authority, Regional

Session Title: Scaling up to Sustainable Watershed Management

Speaker Biography: Since 2012, Steven has served as a Board Member on the California Water Resources Control Board, and was previously a member of the San Francisco Bay Regional Water Board for four years. He has a B.S. in biology and an M.S. in civil engineering, both from Stanford University. He has worked 8 years as a civil engineer for water projects, two years as a biologist doing CEQA documents, and 12 years in clean water regulatory programs, including chief of basin planning at the SF Bay Water Board. He also has two years' experience as a director of a nonprofit for water education and restoration. And he performs as a bass player and vocalist for the Bay Area bands D'Amphibians and Dredgetown.