The Future of Restoration - The Low Hanging Fruit is Gone!

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The restoration of San Francisco Estuary wetlands is at a transition point. The more straight-forward restoration projects, although never "easy", have mostly been constructed. Projects that simply involve grading for elevation and channels, then opening levees have mostly been completed. The low hanging fruit has been picked.

As in the case of the South Bay Salt Pond Restoration Project now planning for Phase 2, we are entering an unofficial "Phase 2" of restoration planning and habitat delivery throughout the Estuary. Project planning, design, and implementation are becoming more complex as projects move inland from the margins of marsh and in closer contact with the developed Bay edge. These more complex projects have to account for subsidence and climate change as well work around or within existing infrastructure. The projects will require new restoration strategies and non-conventional partnerships.

This session will discuss some of the emerging challenges, as projects become more multi-habitat and multi-benefit. The Baylands Goals 2015 update called out the need to plan upland transition zones into projects. Many of the newly planned projects will require far more material than is available form dredging. Carbon farming is an option to accumulate peat and biomass, but it can only succeed in certain locations. Planning around important infrastructure can be an obstacle, or incorporating wetlands into infrastructure planning can be an opportunity. Some of the non-traditional projects might encroach into the Baylands in new ways, and will require vision, flexibility, and creativity from the regulators.

Much has been accomplished. However, to face the coming challenges of sea level rise, a whole new generation of projects is being planned that will test the limits of our traditional restoration methods and expectations.

Keywords: restoration, wetlands, sediment, transition zone, carbon

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Speaker Biography: Beth Huning is the Coordinator of the San Francisco Bay Joint Venture, a public-private partnership for wetlands protection and restoration. She has been actively involved in wetlands conservation in the Bay Area for 35 years, including 18 years with the National Audubon Society when she helped found, and then chair, the Joint Venture. She holds a BA in geography and was honored in 2001 as a Fellow by the Stanford Graduate School of Business Center for Social Innovation for non-profit management. In her free time, she hikes, kayaks, rafts rivers, dances, photographs, and travels the world. An accomplished photographer, she is the 2011 recipient of the North American Nature Photography Association's Philip Hyde Grant award for conservation photography.

Finding Opportunities at the Estuary's Margin

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The sea is projected to rise, expanding the San Francisco Estuary at a rate that may push tidal marshes both upslope and up-estuary in the long term. In the short to mid-term, land managers are working to expand or enhance tidal marshes to stabilize the ecosystem. To accommodate rising sea levels, managers will need to prepare the way for tidal marshes to migrate upslope by reconnecting upland transitional areas and adjacent open space to the estuary. To allow tidal marsh habitats to migrate up-estuary, from San Francisco and San Pablo Bays through the Carquinez Straits into Suisun Bay and eventually the Delta, marsh migration may require human assistance to move some species between wetland habitats that cannot be connected. Until recently, managers lacked information about the distribution and quality of connected and disconnected transition zones throughout the estuary. Now opportunities and constraints to current tidal marsh ecosystem stability and migration in the future are mapped and quantified throughout San Francisco, San Pablo and Suisun Bays to show relative conservation potential at specific locations.

Conservation planning must incorporate sea level rise projections and harness tidal marsh ecosystem functions to support mid and long-term dynamic equilibriums in landscape processes. Recent research indicates that complexes of contiguous ecosystems, though often novel in geomorphology and species composition due to human alterations, possess processes that support diverse and productive food webs. This research also suggests that habitat management is maximized by maintaining corridors, protecting existing productivity hotspots, and engineering new ones. The influence of upland transitional connectivity to aquatic ecosystem productivity is an area of active research, with case studies in Suisun Marsh and the Cache Slough Complex. The intersection of these considerations and emerging knowledge will lead to the most resilient and productive projects in the estuary.

Keywords: transitions, mapping, accommodation, migration, SLR, connectivity, hotspots, aquatic, priorities,

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Speaker Biographies:

David Thomson: David Thomson (MS in Biology from SE Louisiana U) is the Habitats Program Director for the San Francisco Bay Bird Observatory. He leads applied research projects on the management of estuarine-terrestrial transitional plant communities around San Francisco Bay, supporting large scale tidal marsh ecosystem restoration projects. He has been collaborating with Brian Fulfrost (Brian Fulfrost & Associates) to map the distribution of upland transitional habitats and predict their value to tidal marsh ecosystem conservation, both now and considering sea level rise scenarios.

Amber Manfree: Amber Manfree (PhD in Geography from UC Davis) is a Postdoctoral Researcher at the UC Davis Center for Watershed Sciences. Her dissertation detailed historical landscape change in Suisun Marsh and her research interests include landscape-scale physical geography, water management, and cartography. She has been collaborating with Denise Colombano (UC Davis Center for Watershed Science) to better understand how estuarine marshes function as fish nurseries. Colombano is currently studying how fishes use tidal habitats in Suisun Marsh.

Restoration Aspects of Carbon and Subsidence Reversal

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Coastal wetlands in the San Francisco Bay (SFB) Delta range from saline to freshwater, from mineral to organic soils, and across a range of Sea-Level-Rise affected hydrologies (from fully tidal to riverine deltas to floodplains). Opportunities for wetland restoration exist across all of these gradients, and each can have substantial ecosystem benefits, including wildlife habitat, estuarine foodweb support, storm surge protection, and recreation, as well as carbon (C) sequestration, a natural process of productivity and accretion in wetland soils. Promoting wetland carbon sequestration, is one option for national and state climate change mitigation policies. The relative strength and benefit of this climate change mitigation approach is a function of the net greenhouse gas (GHG) balance, which can vary strongly in both direction and magnitude. Over the past 20 years, multiple studies have improved our understanding of the net GHG balances of SFB-Delta wetland and upland ecosystems, and the relative strengths and timescales of wetland restoration opportunities. Subsidence reversal through belowground biomass accumulation (precursor to peat growth) shows the highest rates of carbon dioxide (CO_2) uptake, but also the highest rates of methane (CH_4) release, a more potent greenhouse gas than CO_2. Alternatively, sediment accretion in newly breached subsided lands can support wetland re-establishment through elevation gain but there is little evidence of GHG mitigation potential until the colonization of wetland vegetation on site. Complete documentation of the Net Ecosystem Carbon Balance (NECB) in a brackish tidal marsh (SFB-NERR's Rush Ranch, Suisun Marsh) shows a high degree of interannual variability in CO_2 uptake, consistently low CH_4 emissions, and likely a significant C export to the SFB-Delta through tidal exchange. Current GHG emissions from diked agricultural lands are significant for both CO_2 and N_2O, such that re-establishing wetlands can shift landscapes from net sources to net sinks of GHGs. Of the 30,000 acres proposed for wetland restoration through the EcoRestore program, tidal and floodplain wetlands are the dominant land cover habitats targeted, both of which may have a net climate mitigation benefit. We review available data and identify the data needed to monitor and verify the climate mitigation benefit of wetland restoration directly and through models.

Keywords: carbon dioxide, methane, tidal, brackish, restoration, wetland, soil, greenhouse gas

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Speaker Biography: Lisamarie Windham-Myers is a Research Ecologist in the USGS National Research Program, Menlo Park, CA, and Lead Scientist for Plant:Soil:Water Interactions in Wetland Ecosystems. She is the lead PI for a NASA Carbon Monitoring System project which synthesizes U.S. field datasets and leverages spatial data and remote sensing products to improve greenhouse gas inventory approaches for coastal wetlands. She is the lead author on the Tidal Wetland and Estuary chapter in the forthcoming 2nd State of the Carbon Cycle Report from the U.S. Global Change Research Program. Her research focuses on integrating wetland biogeochemistry into an ecosystem context, including high frequency atmospheric flux data, biomass and soil stock mapping, and geomorphic models. From CARB to IPCC, she serves in a range of local, national and international science advisory efforts to evaluate wetland management opportunities and modeling approaches to quantify wetland carbon sequestration, greenhouse gas budgets and/or mercury methylation and export.

Coping with Barriers to Marsh Restoration

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On the north shore of San Pablo Bay, many of the big and accessible tidal wetland restoration projects are underway or complete. While hard lessons have been learned about the cost of avoiding impacts to infrastructure, innovative designs have also resulted in unexpected outcomes such as seasonal wetland conservation as a compromise to reduced tidal wetland acreage. However, even these success stories must face the challenges of sea level rise and an inability for marshes to easily migrate. The same barriers that hamper marsh migration from near shore projects also increase the complexity of restoring diked baylands located further inland. This talk will showcase design challenges and ultimately the successes driven by barrier constraints at the Sears Point Restoration Project in Sonoma County as well as the challenges and potentially enormous opportunities associated with changes to State Route 37, the region's largest transportation artery which spans the northern arc of San Pablo Bay through existing and historic marshes.

Keywords: wetland, tidal, seasonal, infrastructure, migration, Sears Point

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Speaker Biography: Julian Meisler is the Baylands Program Manager at Sonoma Land Trust and has responsibility for overseeing the Trust's conservation planning, management and restoration work along San Pablo Bay, including the Sears Point Restoration Project. Prior to Sonoma Land Trust, Julian worked for the Laguna de Santa Rosa Foundation and the Solano Land Trust. He holds a BS from Colorado State University and a MS from the University of Vermont.