Below the Surface: Fish Response to Hamilton Restoration

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The Hamilton Wetland Restoration Project, located in Marin County, California, restores a former Army airfield (648 acres) to a mix of tidal and seasonal wetland, transitional ecotone and upland habitats. The project is being implemented by the U.S. Army Corps of Engineers (USACE), San Francisco District, in partnership with the California State Coastal Conservancy (Conservancy). The site was constructed and opened to tidal inundation in the spring of 2014. The USACE and Conservancy are monitoring a variety of physical and biological parameters to provide information on the development of the project. Fish species assemblages were surveyed in the spring of 2015 utilizing a combination of otter trawl and beach seine techniques at multiple sample sites to assess the distribution and relative abundance of juvenile and adult fish species in the restored marshes, mudflats, and associated unvegetated shallow water areas. Captured fish were identified to species and statistical summaries were generated to document species diversity and relative abundance by sample site. A total of 20 different fish species were captured; 70% were species native to the Bay and 30% nonnative. Relative abundance of native species was dominated by Northern anchovy (*Engraulis mordax*) and topsmelt (*Atherinops affinis*); relative abundance of nonnative species was dominated by Shokihaze goby (*Tridentiger barbatus*). Additionally, Olympia oysters (*Ostrea lurida*), at least three species of shrimp (*Crangon* spp.), two species of crab, and copepods were observed in the catch. These encouraging results represent the first year monitoring and document initial fish response to the very young restoration site. Additional sampling will be carried out each year for the first five years of the restoration and then every other year for the remainder of the 13 year monitoring period to document fish response trends to the evolving site over time.

Keywords: Hamilton restoration, fish, monitor, wetland, tidal, native oyster, USACE, Conservancy

Session Title: Wildlife Responses to Change

Speaker Biography: Chris Fitzer is a senior aquatic ecologist and fisheries program manager with Environmental Science Associates. Chris has over 18 years of experience in working on a diverse range of projects involving fisheries and aquatic ecology, aquatic ecosystem assessment, restoration, and enhancement, and comprehensive water resource planning and management for local, state, and federal agencies. He received a Bachelor's degree from Texas Tech University and Master's degree from University of Colorado.

Below the Surface: Bugs and Fish in the South Bay

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The Lower South San Francisco Bay, the portion of the Bay south of the Dumbarton Bridge, started a significant salt pond circulation and restoration process in 2004. Since then, the South Bay Salt Pond Restoration Project has opened at least 16 former salt ponds in the Alviso Complex to circulate Bay water in over 3500 acres of recovered shallow water, including 1200 acres under full tidal, or managed, restoration. How has this changed the Lower South Bay ecology?

It is easiest to observe the apex of the eco system, the top predators and birds. But the food web is built from bottom up. The animals we can't easily see are the most important units: plankton, benthic invertebrates, shrimp, and fish. The strange and slimy things that people usually don't want to think about are food to many of the fish, mammals and birds we do like. How do we observe the underwater ecology? And, what are we seeing as a result of a decade of salt pond restoration?

This presentation will provide a synopsis of benthic studies and fish research efforts currently under way in the Lower South Bay. Results from this work will be summarized along with some comparison to other results from similar work in other parts of the Bay.

The opened ponds have become habitat to an increasing abundance of invertebrates which in turn is food for fish. Diversity of fish populations appear to be increasing, albeit based on comparison to sparse historical data sets. Anecdotal and systematic surveys of migratory bird populations additionally suggest that restored and recovering marshes are providing a lot of food for birds. So, far, the Alviso Complex appears to be transitioning into a healthy estuarine system.

Keywords: San Francisco Bay Salt Pond Restoration Fish Benthos Mysids

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Speaker Biography: Jim Ervin is the Compliance Manager for the San Jose-Santa Clara Regional Wastewater Facility, the largest wastewater facility in the San Francisco Bay area. He has worked for the Facility for 20+ years on wastewater analysis, collection system and stormwater protection, and, over the past decade in research and evaluation of past and present impact of treated wastewater on Bay marshes. Jim also represents the City of San Jose and the Facility as an executive board member to the Bay Area Clean Water Agencies (BACWA).

Up in the Air: Bird Response to Restoration

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The urbanized San Francisco Bay (SFB) is a critically important wintering and stop-over area for migratory waterbirds. Federal and state agencies in SFB are working together to restore 50 to 90% of former salt production ponds to tidal marsh while maintaining the rest as foraging and roosting areas for migratory birds. Since 1999, the USGS Western Ecological Research Center has evaluated migratory waterbird use of pre and post-restoration salt ponds in both North and South SFB. Our approach has been to use monthly surveys, applied studies and modeling to evaluate avian response to this changing habitat. To date, tidal flow has been restored to over 2,000 ha of ponds across SFB. In the North Bay prior to breaching, ponds were unoccupied by shorebirds at low tide, but annually supported tens of thousands of shorebirds, dabbling and diving ducks at high tide. Post-restoration, high tide water levels within the ponds have displaced roosting shorebirds; however, waterfowl densities have increased or remained similar to pre-breach values. In the South Bay, small shorebird and dabbling duck densities increased significantly in restoration pond complexes from 2003-2013. Dabbling duck increases corresponded strongly with salinity declines and this guild had significantly higher densities in low salinity circulation ponds and breached ponds compared with other pond management types. Small shorebirds had highest densities in shallow ponds managed as seasonal wetlands. Preliminary results from on-going modeling and applied studies suggest that the importance of different habitat features varies among waterbird guilds, indicating that a suite of management methods may be needed to maintain species diversity. Transitional post-breach habitat appears to provide important foraging and roosting areas for some waterbird guilds; however, continued efforts to optimize the performance of managed ponds will be imperative to maintain migratory bird numbers as breached habitats transition to tidal marsh.

Keywords: salt ponds, shorebirds, waterfowl, transitional habitats, migratory bird conservation, monitoring

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Speaker Biography: Susan De La Cruz has over 20 years of wildlife research experience in San Francisco Bay Delta and along the Pacific and Central Flyways. As a senior researcher, she directs research priorities and direction at the San Francisco Bay Estuary Field Station. With Federal, State, University, non-profit, and local partners, Susan conducts research on foraging and migration ecology, responses to habitat restoration, climate change effects, winter habitat use, and survival and contaminant effects in nearshore avian species. Susan has a B.S. in Biological Sciences from University of California, Davis, an M.S. in Wildlife and Fisheries Sciences from Texas A&M University, and Ph.D. in Ecology from University of California-Davis.

River Otters: Back on the Bay Area Map

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The River Otter Ecology project launched in 2012 to address a critical data gap in the understanding of North American River Otter (*Lontra canadensis*) population abundance, range, prey species, migration corridors and health issues in the SF Bay Area.

Historically extirpated from the region, wild populations of this sentinel carnivore appear to have made a recovery in recent years. Utilizing a citizen-science network paired with field investigations in 2012 and 2013, we documented 1374 River Otter observations across 8 of 9 San Francisco Bay Area counties. We found that River Otters are reproducing, and reported on the first sightings in decades in Alameda, San Francisco, and Santa Clara counties, indicating a possible gradual expansion of the species' range southward.

Within our Intensive Study Area in coastal Marin County, conservatively estimated densities ranged from 0.21 to 0.32 River Otters/km, with otters inhabiting a range of habitats from freshwater to marine. A pilot assessment of disease and mortality indicates that otters are being exposed to pathogens such as Vibrio and that observable mortality was largely due to car-strikes.

Despite large-scale ecosystem restoration actions underway across the San Francisco Bay Area, River Otters have been overlooked by resource managers. Because they not only benefit from restoration actions but also may play a significant role in the outcome of recovery actions focused on endangered salmonids and waterfowl, we recommend attention to their potential role as a keystone species in the San Francisco Bay Area.

River otters, as highly charismatic predators, make ideal ambassadors for public interest in and support for watershed restoration and conservation. Their return to the SF Bay Area can be seen as a hopeful result of restoration efforts.

Keywords: citizen science, ecosystem restoration, Lontra canadensis, SF Bay Area, sentinel species

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Speaker Biography: Megan Isadore is the Co-founder and Executive Director of the River Otter Ecology Project. Little did she know that her degree in English and Philosophy was the precursor to a career in science. She began her study of ecology 17 years ago, working on recovery of the critically endangered salmon of Lagunitas Creek. There she saw her first river otters, was smitten and was moved to found ROEP. Her passions also include environmental education, writing and painting. For her work with the River Otter Ecology Project, she was honored with a Congressional Certificate of Excellence, Gold Medal Environmental Leader of Marin Award and the John Muir Nonprofit Award in 2014. "Watersheds, with their complicated constancy, fascinate and inspire me every day," according to Megan.