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

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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

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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.