Quantifying and Characterizing Bird Response to Tidal Restoration: A Multi-Species Approach

Julian Wood, Point Blue Conservation Science, jwood@pointblue.org
Nadav Nur, Point Blue Conservation Science, nnur@pointblue.org
Megan Elrod, Point Blue Conservation Science, melrod@pointblue.org
Dennis Jongsomjit, Point Blue Conservation Science, djongsomjit@pointblue.org
Sam Veloz, Point Blue Conservation Science, sveloz@pointblur.org

Restoring tidal exchange to low-lying areas in the San Francisco Bay Estuary has helped mitigate historic losses of tidal wetlands. Tidal restoration projects often seek to restore the ecological attributes and functions of tidal systems including restoring the avian community. Because most restoration projects do not assess avian community response during latter stages of restoration it is often not known how and when tidal marsh-dependent birds respond to restoration projects. Assessing restoration depends on identifying the expected trajectory of avian response to restoration, and relating the response to the associated change in habitat. Millions have been invested in restoring tens of thousands of acres throughout the Estuary yet the cumulative impact of these investments on the avian community has not been assessed. Not all restoration projects will follow the same trajectory over time: how does the ultimate outcome of a restoration project depend on conditions at the site and in the matrix of surrounding habitat? We used models of bird distribution and abundance developed using on-the-ground surveys to quantify bird response to restoration for six tidal marsh-dependent at-risk bird species: California Ridgway's Rail, California Black Rail, Salt Marsh Common Yellowthroat, and three subspecies of Song Sparrow. We characterize the timing of response to restoration and identify factors that may influence restoration outcome. We summarize the impact of restoration in terms of numbers of individuals gained, increase in species diversity and trends in density. Results confirm that, overall, restoration aids the recovery of tidal marsh-dependent bird populations. We provide recommendations for land managers and restoration practitioners to develop effective assessment programs. Information collected in this context will help improve habitat quality and accelerate tidal marsh bird recovery. Monitoring a suite of tidal marsh-dependent birds is more informative than relying on a single species, such as the Ridgway's rail.

Keywords: San Francisco Bay Estuary, restoration, monitoring, tidal marsh, salt marsh
Session Title: Habitat Restoration and Conservation
Session Time: Tuesday 1:35 PM – 3:15 PM, Room 308-310

Avian Response to Restoration of North Bay Salt Ponds: Managed vs. Breached Ponds

Tanya Graham, U. S. Geological Survey, tgraham@usgs.gov
Susan De La Cruz, U. S. Geological Survey, sdelacruz@usgs.gov

San Francisco Bay (SFB) is important habitat for migrating and wintering waterbirds, with over a million shorebirds and 40-50% of Pacific Flyway scaup and scoter visiting San Francisco Bay each winter. As much as 15% of SFB wintering waterfowl are found in North Bay salt ponds (Richmond et al. 2014). The areas surrounding the Napa-Sonoma Marshes Wildlife Area, (including Napa Plant Site, and Cullinan Ranch) comprise over 5100 ha of wildlife habitat, and thus are the focus of intense multi-agency efforts to achieve restoration and wildlife management goals. The challenge central to the restoration is to balance the needs of marsh species with migratory shorebird and waterfowl populations. We examined the waterbird response to restoration efforts comparing use of managed ponds to breached ponds. We conducted high-tide surveys of 14 ponds in winter (Dec – Feb) from 2008 – 2016. Surveys included pre- and post-breach abundance at three ponds, including low tide surveys. Overall waterbird abundance at high tide has increased since 2008. Managed ponds supported higher waterfowl and shorebird abundances than breached ponds at high tide; however, breached ponds were important habitats for shorebirds at low tide. Prior to restoration, breached ponds served as high tide refuge for shorebirds, but were unoccupied by shorebirds at low tide. Post-restoration, high tide water levels within the breached ponds displaced roosting shorebirds; however, waterfowl densities on breached ponds have increased compared to pre-restoration values and remain on the breached ponds throughout the tidal cycle. In summary, restoration efforts have been successful at providing high and low tide habitat for waterfowl, but habitat for shorebirds at high tide appears to be limited. As the breached areas continue to transition to tidal marsh, the reduction in available habitat may present challenges for managers, particularly in maintaining migratory shorebird populations.

Keywords: salt ponds, waterfowl, shorebirds, restoration, habitat
Session Title: Habitat Restoration and Conservation
Session Time: Tuesday 1:35 PM – 3:15 PM, Room 308-310

Salt Marsh Harvest Mouse Habitat Past, Present, and Future: Our Evolving Understanding of the Habitat Requirements of this "Habitat Specialist"

Katie Smith, UC Davis CA Department of Fish and Wildlife, ratsmith@ucdavis.edu

For decades the salt marsh harvest mouse has been managed as a habitat specialist, dependent on pickleweed dominated tidal marshes. However, more recent research and monitoring has revealed a much more adaptable rodent than previously believed. As we face an increasingly uncertain future of climate change, sea level rise and the challenges of tidal restoration, what do we need to keep in mind? In this talk I will discuss the historical state of the salt marsh harvest mouse range, how we currently perceive and manage habitat, and directions we need to consider as we manage this species in the face of future uncertainty.

Keywords: salt marsh harvest mouse, *Reithrodontomys raviventris*, marsh, wetland, habitat, pickleweed
Session Title: Habitat Restoration and Conservation
Session Time: Tuesday 1:35 PM – 3:15 PM, Room 308-310

Restoring Saline Tidal Wetlands: 20 years of Physical and Biological Monitoring at the Sonoma Baylands Restoration

Michelle Orr, Environmental Science Associates (ESA), morr@esassoc.com
Lindsey Sheehan, ESA, LSheehan@esassoc.com
Steven Crooks, ESA, SCrooks@esassoc.com
Gavin Archbald, H.T. Harvey & Associates, GArchbald@harveyecology.com
Max Busnardo, H.T. Harvey & Associates, MBusnardo@harveyecology.com
Annie Eicher, H.T. Harvey & Associates, AEicher@harveyecology.com
Jules Evens, Avocet Research Associates, avocetra@gmail.com
Eric Jolliffe, US Army Corps of Engineers, Eric.F.Jolliffe@usace.army.mil

In 1996, a 120-ha (300-acre) site in San Francisco Bay received 1.5 M cubic meters (1.9 M CY) of dredged material, becoming one of the first to beneficially reuse dredged material to create coastal wetlands. We present 20 years of physical and biological monitoring data showing how the site, the Sonoma Baylands Restoration, has evolved and lessons learned that can be applied to current restoration efforts.

Summary of findings:

- The decision not to excavate larger outboard channels meant that tidal exchange to the site was initially very limited. Tidal scour of these channels accelerated after 4-7 years, resulting in a 50-fold increase in channel size (from approx. 2 m^2 to 100 m^2). Monitoring and adaptive management were used to identify and remove erosion-resistant barriers to outboard channel evolution.
- The site has converted from open water to intertidal flats and emergent marsh. With placement of dredged material and 0.3 – 0.6 m of estuarine sedimentation, much of the site is at elevations suitable for colonization by emergent vegetation. Marsh vegetative cover is 72% of the tidal area.
- Tidal channel erosion into the placed dredged material has resulted in an interior channel system similar in extent to natural reference marshes. Channel down-cutting into the former agricultural surface (beneath the dredged material) has been slower.
- 25 species of fish and 83 species of birds use the site; this number increased over time as tidal exchange improved. With open water converting to tidal flats over time, avian use has shifted away from waterfowl towards shorebirds (as expected), which now comprise 87% of avian use of the site.

The Sonoma Baylands Restoration was funded by the U.S. Army Corps of Engineers and the California State Coastal Conservancy.

Keywords: saline wetland, restoration, monitoring, adaptive learning, beneficial reuse, tidal channel.
Session Title: Habitat Restoration and Conservation
Session Time: Tuesday 1:35 PM – 3:15 PM, Room 308-310

If You Build It, Will They Come? Fish Response to Hamilton Wetland Restoration Project

Christopher Fitzer, Environmental Science Associates, cfitzer@esassoc.com
Garrett Leidy, Environmental Science Associates, gleidy@esassoc.com
Damien Kunz, Environmental Science Associates, dkunz@esassoc.com
Andrew Hatch, Environmental Science Associates, ahatch@esassoc.com
Mark Bowen, Environmental Science Associates, mbowen@esassoc.com
Steve Crooks, Environmental Science Associates, scrooks@esassoc.com
Eric Jolliffe, U.S. Army Corps of Engineers, Eric.F.Jolliffe@usace.army.mil

Substantial investments are being made in large-scale restoration of tidal wetland habitats in the Bay-Delta to restore ecological processes and aid in the recovery of native plants, fish, and wildlife. Understanding species response to restoration is critical in determining whether or not goals and objectives are being met and also to provide lessons to inform the design of future projects. 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 USACE, San Francisco District, in partnership with the Coastal Conservancy. The site was constructed and opened to tidal inundation in the spring of 2014. Fish species assemblages were surveyed in the spring of 2015 and 2016 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 23 different fish species were captured; 70% were species native to the Bay and 30% nonnative. Additionally, Olympia oysters, at least four species of shrimp, three species of crab, and copepods were observed in the catch. These encouraging results represent the first and second year monitoring and document a robust 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: Restoration Bay Fish, USACE Conservancy, Hamilton Wetlands, Monitoring Tidal Oyster
Session Title: Habitat Restoration and Conservation
Session Time: Tuesday 1:35 PM – 3:15 PM, Room 308-310