How Long Will it Take? Factors Affecting the Schedule for Salt Pond Restoration from Land Acquisition through Salinity Reduction to Completion of Construction

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Restoration scientists are frequently asked to predict how long it will take before construction of restoration features can be completed. Correctly predicting the overall time required to take a project from the planning stage to completion of restoration construction is critical in developing credibility with stakeholders including funders, regulatory agencies, and the public. In addition to the numerous other factors that must be considered, the salinity reduction process can present special challenges and has the potential to delay implementation of the restoration effort. This talk compares and contrasts two North Bay salt pond restoration projects, including their salinity reduction challenges, management considerations, and planning factors influencing the time required to complete the projects. The appropriate salinity reduction approach depends on the form and quantity of salt or brine remaining in the pond to be restored. The experience with these two projects shows that the appropriate process, salinity reduction can be accomplished within months, even where large quantities of salt remain in the site. Salinity reduction, therefore, becomes only one factor in determining in the overall time required to complete construction of a restoration project, and the importance of management and planning factors increases. Understanding the various factors as they apply to a specific project allows the project team to focus on those elements that have the greatest potential for delaying or accelerating the implementation of restoration construction, and thereby increase the credibility of the project with its stakeholders and continue to build support for restoration activities as a whole.

Keywords: Salinity reduction, salt ponds, crystallizers, management factors, restoration schedule, planning

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Access, Airspace, and Avocets – Crafting a Solution

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Wetland restoration is often near one of the Bay Area's three major airports, 2 Federal airports, or 16+ general aviation airports. The California Department of Fish and Game's restoration of North Unit of Napa Plant Site is so close to the Napa County airport that runway 6/24 safety area and safety zone are situated in Pond 10. The FAA told Napa County Airport authority staff there had been 32 bird strikes, not the 5 in 6 years reported to them. These birds had a relative hazard rating of between 5 and 55, according to the FAA Circular on Wildlife Hazard Management at Airports. DFG's response to the concerns regarding public safety at the airport included eliminating the managed pond as part of plan, adding dredged material to raise surface elevation and to be a good neighbor, during construction DFG placed fill the size and shape of a runway safety area in the corner of Pond 10.

To reduce bird strike potential, dredged material was used to raise the marsh plain surface by 1 to 2 feet, closer to an elevation at which emergent vegetation grows. A revegetation model was developed that predicted within 10 years the area would be growing emergent plant cover, reducing bird strike hazards. Tidal action was restored to the North Unit on October 13, 2008, approximately 3 and a half years ago and a 10 to 20 foot wide band on the edges of the site and the lowered levee footprints are becoming vegetated with pickleweeed, bulrush and cordgrass. In addition to birds and airplanes, trail advocates were seeking a route north to connect American Canyon with Napa, also using the edge of the runway safety zone. The airport was concerned and there was no rail crossing to allow safe access from Green Island Road

Keywords: wetland restoration, dredged material reuse, bird strikes, public access

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Trajectory of Early Tidal Marsh Restoration: Elevation, Sedimentation and Colonization of Breached Salt Ponds in the Northern San Francisco Bay

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Tidal marsh restoration projects that cover large areas are critical for maintaining target species, yet few large sites have been studied. A tidal marsh restoration project in the northern San Francisco Bay consisting of three breached salt ponds (≥300 ha each; 1175 ha total) is one of the largest on the west coast of North America. These diked sites were subsided and required extensive sedimentation for vegetation colonization, yet it was unclear whether they would accrete sediment and vegetate within a reasonable timeframe. We conducted bathymetric surveys to map substrate elevations using digital elevation models and surveyed colonizing Pacific cordgrass (*Spartina foliosa*). The average elevation of Pond 3 was 0.96 ± 0.19 m (mean ± SD; meters NAVD88) in 2005. In 2008–2009, aver-age pond elevations were 1.05 ± 0.25 m in Pond 3, 0.81 ± 0.26 m in Pond 4, and 0.84 ± 0.24 m in Pond 5 (means ± SD; meters NAVD88). The largest site (Pond 3; 508 ha) accreted 9.5 ± 0.2 cm (mean ± SD) over 4 years, but accretion varied spatially and ranged from sediment loss in borrow ditches and adjacent to an unplanned, early breach to sediment gains up to 33 cm in more sheltered regions. The mean elevation of colonizing *S. foliosa* varied by pond ($F = 71.20$, $df = 84$, $P < 0.0001$) and was significantly lower in Ponds 4 and 5 compared with Pond 3 which corresponded with greater tidal muting in those ponds. We estimated 16% of Pond 3, 13% of Pond 4, and 24% of Pond 5 were greater than or equal to the median elevation of *S. foliosa*. Our results suggest that sedimentation to elevations that enable vegetation colonization is feasible in large sites with sufficient sediment loads although may occur more slowly compared with smaller sites.

Keywords: bathymetry, elevation, marshplain development, salt marsh, salt pond, *Spartina foliosa*

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Monitoring and Supporting Listed, Ground Nesting Birds in a Environment

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California Least Tern (LETE) have been sited periodically in the Napa-Sonoma Marshes Wildlife Area (NSMWA) since 2006 (via USGS bird data). Confirmation of LETE nesting in NSMWA, was first identified in 2008 at the NPS in the South Unit. Passive, detailed nesting surveys began in 2009 for the NSMWA LETE colony. The colony is considered a loose colony where the majority of the nests occur at the Napa Plant Site, but a small portion of the colony also nest on the internal levee of Ponds 7/7A in the Huichica Creek Unit of the NSMWA two miles away. To date, three detailed nesting surveys have been conducted:

Pre-construction in 2009 (salt ponds)

During construction in 2010 (where habitat islands were formed, but construction outside the buffer area was active and the area not tidal), and

Post-construction in 2011(fully tidal)

A fourth survey will be conducted in 2012.

In addition to LETE, a small number of Western Snowy Plover (SNPL) have also utilized the NSMWA for breeding. The four years of detailed nesting surveys have provided surveyors with valuable observations about LETE, SNPL, and associated species.

Keywords: Habitat Restoration, Nesting, DFG lands, Least Tern, Snowy Plover,

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Progression of Fisheries Use in Restored Salt Ponds at Napa Plant Site

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California Fish and Game's goal was to restore a mosaic of wetland habitats for estuarine fish, waterbirds, and small mammals on 1,460-acres of former salt ponds in the Napa River floodplain. Three sequentially restored units breached in 2008, '09 and '10 were monitored to answer questions regarding the progression of fish use on the newly constructed site. Beach seine and otter trawl surveys were conducted seasonally in 2010 and 2011. Less than a month after the August 2010 South Unit breach, topsmelt were collected a mile inland from the breach, using a beach seine in the former crystallizer beds where salinities had exceeded 350 ppt prior to breaching. Topsmelt are planktovores, water column foragers, 7 months later, staghorn sculpin a demersal (bottom) foraging fish was collected, after benthic invertebrates had time to establish; potentially related to dissolution or silt deposition on the salt crust. Twenty-six species: 16 natives and 14 of those were listed in Goals Report as "Key Fish Species" representing the complexity of the San Francisco Baylands Ecosystem. Inland silversides was most abundant, Sacramento splittail population doubled between years, perhaps due to water year or vegetation growth facilitated spawning. Chinook salmon smolts came in for rearing. This monitoring frequency shows immediate and diverse fish use of restored high salinity salt ponds.

Keywords: fish, restoration, salt ponds, Napa River

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