South Bay Salt Pond Restoration Project

Science Symposium 2022

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DAY 1: WEDNESDAY, MAY 11

Session 1: Project Overview

Phase 2 Project Status

Dave Halsing, California State Coastal Conservancy

In this introductory presentation, Executive Project Manager Dave Halsing will discuss the origin, purposes, history, and progress of the South Bay Salt Pond Restoration Project. He will provide an overview of how the Project's multiple objectives and constraints have been advanced while balancing different restoration actions along with flood management and public access features. Finally, he will summarize the Project's successful completion of Phase 1 actions and the development and early implementation of Phase 2 actions in each of the three main Project locations, as well as plans for future phases and collaborations with external partners.

Science Program Update

Donna Ball, South Bay Salt Pond Restoration Project/San Francisco Estuary Institute

In the Science Program Update, Lead Scientist Donna Ball will provide an overview of the Adaptive Management Plan, an update on the current status of the Science Program by describing the work that has been done since the last Science Symposium including a review of the Phase 1 Science, science planning for Phase 2 and beyond, and strategies to take climate change, new technologies, and opportunities for collaboration into consideration. Updates on individual Phase 2 studies will be presented by individual scientists over the course of the two-day Symposium.

Session 2A: Pond-Dependent Birds

Migratory Waterbird Monitoring in Salt Ponds: Recent Trends and Future Directions

Gabbie Burns; San Francisco Bay Bird Observatory

San Francisco Bay is a significant site along the Pacific Flyway, supporting over a million migrating and wintering waterbirds each year. Current and former salt evaporation ponds are a major component of existing waterbird habitat and support a wide array of species . While 50-90% of salt ponds are to be converted to tidal marsh, the South Bay Salt Pond Restoration Project is committed to managing the remaining ponds so as to support existing avian populations. Beginning in 2002, SFBBO and USGS have conducted regular monitoring of waterbird abundance, diversity, and habitat use in order to inform management and restoration plans. Counts of most guilds have increased compared to pre-restoration baselines, with many doubling or tripling in number, while a select few have declined. This talk will report on recent waterbird trends and look to the future as Phase 2 restoration commences.

Phalarope Migration and Use of South Bay Salt Ponds

Gabbie Burns; San Francisco Bay Bird Observatory

The conversion of salt evaporation ponds to tidal marsh and managed ponds has provided increased habitat for many waterbird species, but there are a few species that do not not necessarily benefit. Phalaropes are known to prefer high-salinity habitats and utilize the Bay Area salt ponds as a migration stopover point. A 2017 analysis of salt pond survey data showed that phalarope numbers had decreased by 78% compared to the pre-restoration baseline, which triggered the need for further investigation. Due to the nature of phalarope migration through the Bay Area, the existing waterbird monitoring protocols were insufficient for accurately understanding their abundance trends and usage of salt ponds. In 2019, the San Francisco Bay Bird Observatory (SFBBO) analyzed salt pond data and eBird sightings to devise a new survey protocol targeted at detecting phalaropes during their summer/fall migration windows. In conjunction with regional efforts by the International Phalarope Working Group, SFBBO piloted surveys in 2019, conducted them at a partial set of sites in 2020, and fully implemented the protocol in 2021. During 2021, a total of 14,480 phalaropes (1,047 Wilson's, 12,484 red-necked, and 1,309 not identified to species) were counted across seven surveys from early July through late September. Wilson's phalaropes peaked at 738 birds on July 6 and red-necked phalaropes peaked at 6767 birds on September 13. Surveys will continue in 2022, along with analysis efforts to meaningfully compare numbers from the new methods with the baseline data and to understand how Bay Area data compare to regional trends.

Breeding Waterbird Ecology and Management for the South Bay Salt Pond Restoration Project

Josh Ackerman, Alex Hartman, Mark Herzog, and Carley Schacter
U.S. Geological Survey, Western Ecological Research Center, Dixon, CA

The South Bay Salt Pond Restoration Project plans to convert 50%-90% of former salt ponds, now ponds managed for wildlife, into tidal marsh. A primary goal is to maintain the populations of breeding birds within the project area, many of which nest upon islands within managed ponds. Using long-term nest monitoring surveys, we found that nest abundance declined by 53%, 71%, and 36% for Avocets, Stilts, and Forster's Terns, respectively, from 2005 to 2019. Separate, region-wide population surveys confirmed these declines, finding population decreases of 14% for Avocets and 30% for Stilts from 2001 to 2019. In 2019, managed ponds accounted for only 26% of habitat area, but contained 54%, 39%, and 66% of Avocet, Stilt, and Forster's Tern observations, respectively. Conversely, tidal marsh and tidal mudflats accounted for 43% of habitat area, but contained only 18%, 10%, and 20% of Avocet, Stilt, and Forster's Tern observations, respectively. Management

options to increase waterbird nesting are to construct islands within the remaining managed ponds and use social attraction techniques to establish and build breeding colonies. By modeling factors influencing nest abundance and nest survival, we constructed a 'recipe' for island construction, which provides recommendations for the number, location, size, and shape of nesting islands within managed ponds. Using decoys and call systems, we established two of the three largest Caspian Tern colonies in San Francisco Bay at enhanced Ponds SF2 and A16, and we re-established the Forster's Tern colony at A16. Another stressor to breeding bird populations is the rapid population increase of California Gulls, an important predator of waterbirds. We demonstrated that gull movements and diets were largely dictated by local landfills and that gulls were responsible for 11% of depredated eggs and >54% of Avocet and Forster's tern chick deaths. Conducting landscape scenario planning, retaining more managed ponds that contain nesting islands, applying social attraction methods to establish colonies, and hazing gulls are potential management options to limit further declines in breeding waterbird populations.

Session 2B: Pond-Dependent Birds

Characterizing Drivers of Macroinvertebrate and Biofilm Food Resources for Waterbirds using the South Bay Salt Pond Restoration Project

Susan E. W. De La Cruz[1], Laurie A. Hall[1], Isa Woo[1], Alison Flanagan[1], Lacy M. Smith[1], Stacy M. Moskal[1], Tanya Graham[1], Kristin Byrd[2], Sherry Palacios[3], Niky Taylor[2], Mark Marvin-DiPasquale[4]

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4. USGS Water Science Center, Menlo Park, CA

The South Bay Salt Pond Restoration Project (Project) faces the key challenge of balancing the needs of species that require vegetated tidal marsh with those of waterbirds that depend on unvegetated mudflats and managed ponds. To inform managers about Project outcomes and management options for migratory waterbirds, we conducted two studies focused on drivers of waterbird food resources in and around the South Bay Salt Ponds. First, using data collected in experimental ponds managed to enhance food resources in the Eden Landing Ecological Reserve Unit, we examined the effects of environmental characteristics, including water quality, water depth, sediment chemistry, and grain size, on waterbird invertebrate prey. Model results indicated invertebrate abundance was best explained by water depth, salinity of the previous month, and dissolved oxygen; whereas invertebrate biomass was best explained by water depth and time since the ponds were flooded.

Foraging small shorebird abundance in experimental ponds was best explained by invertebrate biomass, the percent exposure of a foraging mound, and distance to levees. Next, we addressed one of the key uncertainties identified in the Project Adaptive Management Plan regarding whether adjacent mudflats will be a sediment source for the restoration, potentially leading to erosion and impacts to resources such as biofilm. Microbial biofilm communities, composed of bacteria, diatoms, protozoa and fungi, inhabit mudflat sediments and are an important component of Calidrid shorebird diets. Our objectives were to identify seasonal and spatial variations in biofilm distribution, quantity and quality, and to understand the drivers and stressors that influence its distribution. We used a multi-scalar approach to measure biofilm parameters via mudflat sampling, Unoccupied Aerial Systems (UAS), airborne hyperspectral and satellite imaging. We are now mapping biofilm distribution and modeling relationships among biofilm biomass and sediment characteristics, inundation, landscape features, methylmercury concentrations, and invertebrates. Collectively, our results will assist managers with the goals of maintaining and enhancing trophic support for waterbirds while restoring tidal marsh to support threatened and endangered species.

Keeping dry ponds as part of wetland restoration? A summary of Snowy Plover recovery efforts in the South Bay Salt Pond Restoration Project

Ben Pearl, San Francisco Bay Bird Observatory

Western snowy plovers (plovers) likely were breeding residents in natural salinas and salt panne habitat in the South San Francisco Bay prior to large scale conversion of tidal marsh to salt production ponds. This conversion provided alternative habitat for plovers at a time when coastal habitat was lost to beach development and disturbance. Currently, former salt production and stormwater retention ponds in the San Francisco Bay support as much as 10% of the entire Pacific Coast population, with most in the south bay but some also found in San Pablo and Suisun Bays. Tidal marsh restoration throughout the bay area poses a major challenge to meeting the USFWS Recovery Unit 3 (RU3; San Francisco Bay estuary) goal of 500 breeding plovers, as they are a semi-colonial species that requires a large amount of open space and rely upon crypsis to evade predators. Thus, reducing overall habitat size and promoting more dense nesting may impact their ability to evade predators and limit reproductive success. The South Bay Salt Pond Restoration Project (the Restoration Project) has committed to supporting at least 250 breeding plovers on project lands, and has implemented a number of different measures to achieve this goal. The San Francisco Bay Bird Observatory (SFBBO) has conducted research and monitoring on the south bay plover population since 2003, working closely with the Restoration Project to identify challenges to recovery and strategies to help plovers overcome these obstacles. Some progress has been made towards meeting project and RU3 population goals, however the Restoration Project, SFBBO, and other landowners must continue to work together to support plover recovery throughout the Bay Area.

Motus: western expansion, new taxa and scalable science in CDFW

Levi Souza, California Department of Fish and Wildlife

Motus is a worldwide network of stationary radio telemetry receivers used to track continental scale movements of wildlife. The receiver network is scalable and stations are relatively simple and inexpensive to assemble. The tags used are low cost and lightweight, permitting scientists to attach them to small-bodied birds, bats and insects; taxa whose movements are notoriously difficult to study. The California Department of Fish and Wildlife, along with a variety of partners, has started work augmenting the Motus network in California. This talk will generally describe station components, the Motus network and its growth in the west and then provide details of the Department's current and future efforts. Katie LaBarbera will also briefly discuss the San Francisco Bay Bird Observatory's progress installing three Motus towers in the South Bay and their vision for how these towers will contribute to avian research

Session 3: Wildlife

California Ridgway's Rail Range-Wide Surveys and Population Estimate

Julian Wood, Megan Elrod, Nadav Nur, and Leo Salas

Point Blue is developing a range-wide population estimate for the federally endangered California Ridgway's Rail (Rallus obsoletus obsoletus) by applying rigorous statistical methods to on-the-ground call count survey data and using remote-sensing data and machine learning models to predict rail densities in un-surveyed areas. A coordinated multi-partner effort comprising Point Blue, USFWS, CDFW, and the Invasive Spartina Project developed and implemented a standardized survey protocol based on the North American Secretive Marsh Bird Protocol. The data contributed by all partners is hosted and managed in the Avian Knowledge Network, a FedRamp certified environment. This collaborative multi-partner approach to range-wide monitoring is key to informing rail recovery. The updated population estimate, led by Point Blue, will be based on 2019-2021 survey years and will be comparable to the previous estimate developed 10 years ago (2009-2011). The analysis of survey data will apply hierarchical statistical models to correct for factors known to influence survey results such as time of year. Density estimates from un-surveyed areas will be modeled using the most currently available habitat and landscape characteristics known to influence rail numbers. The new population estimate, site-specific estimates, and related results will inform Bay-wide recovery efforts for the species.

Assessing the Aquatic Health of San Francisco's Tidal Wetlands

Levi S. Lewis, University of CA, Davis

Habitat restoration and improved water quality have become management priorities in the San Francisco Estuary (SFE); however, few studies of fish and fish habitat have been conducted in the lower estuary, resulting in a limited understanding of the status, trends, and responses of aquatic communities to human impacts and restoration. To address this, the Otolith Geochemistry & Fish-Ecology Laboratory (OGFL) at UC Davis has sampled fish and invertebrates in wetland habitats in Lower South San Francisco Bay (2010-present) and San Pablo Bay (2015-2019). These comparative studies have allowed us to assess the responses of common species to environmental variation and to examine how human activities (e.g., eutrophication, restoration, etc.) might impact the health of wetland ecosystems.

This research program has uncovered a diverse community of fishes and invertebrates in the lower estuary, with many exhibiting unique ecological niches and utilizing restored wetland habitats. Relative to the northern estuary, wetlands in Aviso Marsh supported an exceptionally high density and diversity of aquatic organisms. Furthermore, we discovered aggregations of adult Longfin Smelt during most winter breeding seasons, and larvae in years of high freshwater outflow (e.g., 2017 and 2019). Based on these data, it appears that aquatic communities in Lower South Bay are abundant and diverse, that natural and restored brackish wetland habitats appear important to many native species, and that freshwater outflow is likely key to supporting estuarine species in these habitats.

Results of this work are being used to inform numerous efforts to assess the ecological health of the SFE, including (1) direct responses of aquatic communities to wastewater effluent by the San Jose-Santa Clara Regional Wastewater Facility (SJSCRWF), (2) ecological effects of hypoxia for the SFE Nutrient Management Strategy (NMS), (3) development of standard operating procedures for the Wetland Regional Monitoring Program (WRMP), (4) population models and abundance estimates for Longfin Smelt as part of the CDFW-DWR Longfin Smelt Science Program, and (5) assessments of the effectiveness of wetland restoration conducted by the South Bay Salt Pond Restoration Program (SBSPRP). Nevertheless, long-term funding for the collection of empirical data remains limited, thus threatening the persistence of the research program and the availability of data for each of these data-dependent management efforts.

Nests, Nests, Everywhere: Adaptive Management in Action at Pond A19

Rachel Tertes, US Fish and Wildlife Service, and Laura Coatney, Alluvion Biological Consulting

New features were added to Ponds A19 and A20 of the Island Ponds as part of Phase 2 of the South Bay Salt Pond Restoration Project. Enhancements included two new breaches to Mud Slough, ditch blocks to direct water and sediment into A19, and levee lowering and removal to improve marsh connectivity. In October 2021, construction began. It was apparent that vegetation had increased within Ponds A20 and A19 during the 5 years of Phase 2 design and planning, much more so than in the first 10 years post breach (2006). Prior to construction, during vegetation clearing, as is required by permits, small mammal nests and small mammals were discovered. Working closely with the Bay Delta FWO, Alluvion Biological Consulting and WRA, Inc. biologists documented Salt Marsh Harvest Mice individuals and nests, in addition to other rodents. Results of these activities will be presented, including rodent species observed, vegetation type surrounding rodent nests, nest placement along marsh gradient, galleys, and pictures of in situ nests. We'll also present changes to the original project design to address this new, exciting, but unexpected development.

DAY 2: THURSDAY, MAY 12

Session 4: Habitat

Mapping Marshes and Mudflats from Space: Preliminary Results (2019 & 2021) from the Habitat Evolution Mapping Project (HEMP) 2.0.

Brian Fulfrost, Brian Fulfrost and Associates

The Habitat Evolution Mapping Project (HEMP) is an effort to assist the South Bay Salt Pond Restoration Project (SBSPRP) by mapping and monitoring the extent and distribution of tidal marshes and mudflats using semi-automated classification of high-resolution satellite imagery. The tidal marshes and mudflats south of the San Mateo bridge were first mapped on a yearly basis between 2009 and 2011 using multispectral Ikonos imagery at approximately one meter resolution. A two year update to the original HEMP study ("HEMP2") to map the same area using satellite imagery from Worldview-2 at half meter resolution, has now been completed for 2019 and 2021. We used supervised classification and extensive ground truthing as the core method to map dominant vegetation types representing salt, brackish and freshwater marshes. We also mapped the full extent and distribution of mud flats using methods developed in 2016. We will present our preliminary results for 2019 and 2021 for salt, brackish, and freshwater marshes, and mudflats. Our final report and datasets, which will include change analysis between 2009-11 and 2019-2021, will be released in August 2022.

Large transition zone, large equipment: Employing heavy farming equipment as one of many tools to revegetate high-acreage transition zone slopes

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Save The Bay brings extensive experience growing and outplanting locally collected native plants for transition zone projects around the Bay, overtime scaling up the size of our projects since the initiation of our habitat restoration program in 2001. Utilizing new revegetation techniques and knowledge gained from previous large-scale sites, such as the Oro Loma Horizontal Levee Demonstration Project, we completed our first year of revegetation along the R4 transition zone slope of the Ravenswood project.

Rhizomatous, perennial native plant material, collected from nearby South Bay populations, was planted into an on-site division bed nursery adjacent to the project site and Bedwell Bayfront Park and constructed in partnership with the West Bay Sanitary District. Clonal meadow species, the most extensive in the project assemblage, were outplanted primarily with mechanized, heavy equipment run by an experienced operator with support from staff and volunteers. Rhizomatous material was pulled from the nursery beds in large sod pieces, which were disced into the newly graded slope by a tractor. Additional native plant species were outplanted to make up diversity patches and refuge patches, intended to provide founder populations for seed and clonal spread and to provide thick, dense vegetative cover adjacent to channelized areas of the marsh where those channels connect to the t-zone levee. Bulk native seed mixes, comprising species historically dominant in t-zones and diked Baylands, were employed to outcompete weedy and invasive species already present on the slope and in the seed bank at Bedwell Bayfront Park. The seed mix species are intended to dominate the assemblage in year one and two after grading, eventually becoming colonized by spreading, clonal, perennial species. Preliminary monitoring indicates successful first-year establishment of native species on the slope regardless of outplanting method.

Breach it and they will come: Invasive plants are the uninvited guests to the South Bay Salt Pond restoration party

Drew Kerr, Kerr Ecological Solutions & Treatment Program Manager for Invasive Spartina Project

Once sufficient sediment has accreted to produce the right tidal elevation for emergent plant establishment, recently breached ponds are like a new canvas poised for the tides to paint a tidal marsh community on the open mud. But these open aquatic systems receiving twice daily

tidal exchange are also vulnerable to colonization by invasive plants. At these early stages in their development and maturation, they have low biotic resistance and aggressive invaders can spread rapidly and own the space at the expense of the invited guests.

Three invasive tidal marsh plants with impacts to SBSP will be discussed. Hybrid Spartina alterniflora, a powerful ecosystem engineer normally of the low marsh and mudflats, once infested thousands of acres in the San Francisco Estuary and has been the focus of a coordinated USFWS/Coastal Conservancy project for nearly 20 years. In contrast Paspalum vaginatum, a mid-elevation invader, was only recently detected within SBSP but has already clearly demonstrated its ability to thrive in this harsh environment and dominate where it establishes. Limonium ramosissimum invades the high marsh and estuarine-terrestrial transition zone. The many levees and edges around the SBSP can harbor invasive Limonium, creating loci of dispersal to the extant marshes of the Estuary that are mature enough to have the high marsh component that is still developing within younger sites.

All three of these invasive plants can alter the trajectory of development of a restoration marsh, hampering the establishment of a more diverse native plant assemblage and the intended wildlife habitat. They demonstrate how essential long-term stewardship is to the success of tidal marsh restoration around the Estuary. Both to manage existing threats and to detect new introductions early enough to prevent widespread establishment and allow for rapid response while costs and management impacts are much lower.

Session 5: Mercury and Water Quality

South San Francisco Bay Salt Pond Restoration Project – A Synthesis of Phase-1 Mercury Studies

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As part of Phase 1 (2010–2018) of the South Bay Salt Pond Restoration Project, a series of studies were focused on restoration activities along Alviso Slough and within adjacent former salt-production ponds (ponds A5–A8); a pond complex in West Alviso known to have high levels of total mercury (THg) and methylmercury (MeHg) contamination. These studies focused on various aspects of two specific management actions (the breaching of pond A6 and the gradual opening of pond A8 to Alviso Slough via a tidal control structure (TCS)) and how these management actions may have affected mercury and sediment dynamics within the study area. A synthesis of findings from individual studies was conducted to integrate the collective results into a more comprehensive assessment focused on quantifying the extent to which each management action resulted in demonstrable changes in mercury speciation, mobilization, and(or) bioaccumulation. This presentation highlights the key findings associated with the synthesis, which include: a) short-term spikes in THg concentrations in both bird eggs and prey fish, b) increased scour of slough bed-sediment and THg remobilization near pond A6, c) a decrease in Alviso Slough surface-water THg and MeHg concentrations (volumetric basis), but a corresponding increase in the mean daily flux of both THg and MeHg in the bay-ward direction, as the opening of the TCS progressed, and d) pond A8 being a net sink for particulate THg and MeHg, and a net source of dissolved THg and MeHg by the end of the study period.

The link between nutrient dynamics and water quality in the Lower South Bay

Ariella Chelsky, Derek Roberts, Kristin Art, Lilia Mourier, David Senn, San Francisco Estuary Institute

Lower South San Francisco Bay (LSB) is a highly altered system that exhibits conditions often associated with nutrient impairment, including low oxygen concentrations and elevated phytoplankton biomass. This may be due, in part, to high rates of nutrient loading via treated wastewater effluent from dischargers that service San Jose and the densely populated surrounding region. The goal of the Nutrient Management Strategy (NMS) is to investigate the impacts of these nutrient inputs on water quality to inform management decisions. Unlike the Open Bay, dissolved oxygen often drops below 5 mg/L in the sloughs in the summer, so understanding the driver of these conditions is particularly important. The complexity of the system, including connections between sloughs and salt ponds at different stages of the restoration process, makes it difficult to isolate the impacts of individual drivers. Our emerging conceptual model is that LSB's strong tides transport nitrogen-rich water into ponds on flood tides, via water control structures and intentional levee breaches, fueling high primary productivity in the shallow, less-light limited pond systems. Ebb tides then transport organic- and phytoplankton-laden water back to adjacent sloughs and down-

estuary habitats, leading to high DO consumption rates and thus lower DO concentrations. The NMS program is working to better understand the link between wastewater nutrients, salt pond habitats and water quality through a combination of modeling, synthesis and fieldwork. We are also using fish abundance and environmental data to identify DO levels that are protective of biota in the habitat.

Session 6: Sediment

Temporal variability in sediment delivery to Whale's Tail South marsh in South San Francisco Bay

Jessie Lacy, USGS Pacific Coastal and Marine Science Center (presenter), jlacy@usgs.gov
Karen Thorne, USGS Western Ecological Research Center, kthorne@usgs.gov

The transport of suspended sediment from bay shallows into marshes is critical both for restoring subsided areas and to offset marsh drowning as sea level rises. Sediment transport to and retention on marshes is influenced by numerous interrelated factors, including suspended sediment concentration (SSC) in adjacent waters, tidal stage, wave conditions, marsh plain elevation, vegetation type and density, and morphology. These factors vary over time and between marsh sites. Wave energy at the marsh edge can influence the sediment budget in two ways. Wave-driven sediment resuspension increases SSC in the shallows and sediment flux into tidal creeks and across the bay-marsh interface. Waves can also erode the marsh edge, reducing marsh area, but potentially increasing the amount of mobilized sediment available to deposit on the marsh plain. We are investigating the influence of season, spring-neap tidal cycle, and wave energy on sediment transported to, deposited on, and eroded from the wave-exposed Whale's Tail South marsh in the Eden Landing Ecological Reserve in South San Francisco Bay. During two study periods (summer 2021 and winter 2021/22), we measured hydrodynamic conditions and SSC in the shallows, sediment flux in a tidal creek, SSC and water level over the marsh, sediment deposition on the marsh, and vegetation density. We are monitoring erosion of the steep unvegetated scarp at the bay edge seasonally, using aerial imagery. Our goal is to inform marsh restoration and preservation by improving understanding of the conditions and processes influencing marsh accretion, erosion, and resilience to sea level rise.

Understanding marsh characteristics to inform sea-level rise vulnerability in South San Francisco Bay

Karen Thorne, U.S. Geological Survey

Tidal wetlands are a critical part of the San Francisco Bay estuary ecosystem and provide habitat for protected species of wildlife and fish, recreation opportunities, flood protection from storms and sea-level rise, and carbon sequestration. Accelerating sea-level rise threatens existing tidal

wetland ecosystems if accretion processes are not great enough. Previous studies in the estuary have highlighted the sea-level rise vulnerability; however, south San Francisco Bay tidal wetlands are unrepresented in the literature. Wetland accretion rates are driven by local geomorphic setting, suspended sediment availability, and dominant vegetation. Understanding wetland soil properties and accretion rates can help inform restorations that sit within a similar estuary setting. We will present on a field campaign done for 3,000 hectares of wetlands in south San Francisco Bay to inventory elevations and vegetation communities. Next steps include 2022 collection of accretion data and plans for modeling to inform sea-level rise vulnerability of these wetland habitats. This information will help managers and others to envision the range of possible futures under sea-level rise to inform ongoing restoration planning and actions, sea-level rise adaptation, and other management decisions.

Continuous Suspended Sediment Concentration and Wave Monitoring in South and Lower South San Francisco Bay

Lilia Mourier, San Francisco Estuary Institute

Suspended sediment dynamics are relevant to a diversity of San Francisco Bay (SFB) water quality and morphological processes. Despite decades of studies pointing to the importance of sediment dynamics to South and Lower South SFB (SB and LSB) management concerns, continuous SSC data are currently available at only a single station. In January 2022, the South and Lower South San Francisco Bay Sediment Monitoring Project (SMP) began the expansion of continuous suspended sediment (SSC) and wave monitoring to shallow areas (shoals and sloughs) of the South and Lower South San Francisco Bay (SB and LSB respectively) as a collaboration between the Nutrient Management Strategy (NMS) and the South Bay Salt Pond Restoration Project (SBSPRP). Continuous suspended sediment data are now monitored at an additional eight stations (4 shoal and 4 slough) and wave characteristics are monitored at one shoal station. The SMP will provide information essential to understanding suspended sediment dynamics in the South Bay and Lower South Bay. Quantified wave characteristics will enable differentiation of wave-resuspension versus inflow driven elevated-SSC events. Water-column sediment dynamics directly influence marsh accretion/erosion and breached-salt pond restoration processes. Successful planning and management of large-scale marsh and wetland restoration projects in the SB and LSB depend on accurate understanding of these dynamics. By significantly increasing the available data to support sediment-related studies in SB and LSB, this project will broadly improve the toolkit available to researchers for evaluating marsh and wetland restoration projects.

Session 7: Science Collaboration

Using a Nature-Based Approach to Connect Creeks to Baylands in South San Francisco Bay

Judy Nam, Sr. Water Resources Specialist, Valley Water

Santa Clara Valley Water District (Valley Water) has completed a feasibility study for the Calabazas/ San Tomas Aquino Creek -Marsh Connection Project (Project), formerly known as Calabazas and San Tomas Aquino Creek Realignment Project, which would restore the historic connections between Calabazas and San Tomas Aquino (STA) Creeks and tidal marshes. Project would be the first creek to marsh reconnection project in the lower South San Francisco Bay (Lower South Bay). The South Bay Salt Pond Restoration Project (SBSPRP) is the largest wetland restoration project on the West Coast and Valley Water has been one of major partners of the SBSPRP along with the California State Coastal Conservancy (SCC), and the U.S. Fish and Wildlife Service (USFWS).

Connecting the Calabazas and STA Creeks to former salt production ponds named "A8 Ponds", which SBSPRP has been restoring tidal marsh since 2010, will assist the SBSPRP restoration effort by bringing additional sediment supplies to accelerate tidal marsh establishment. Furthermore, Valley Water has received $3.37M Measure AA and $0.5M Proposition 1 grant funding to explore integrating SBSPRP's planned restoration of full tidal regime to the A8 Ponds with Valley Water's Project.

Starting in the latter 1800s, natural creek-marsh connections at the Project area were removed due to development activities associated with establishment of agriculture in the area. By early 1900's tidal marshes in the area had been converted to diked ponds and natural creeks had been converted to artificial channels bypassing the diked salt ponds.

Recent modeling suggests that if we can reestablish tidal marsh in these former salt ponds next 5-10 years the established tidal marsh will be able to accrete and keep pace with sea-level rise (SLR), maintaining the marsh's viability, and provide resilient flood protection to shoreline development, preventing significant human and economic losses. The formerly connected creeks once supplied the needed sediment and nutrients inputs to the tidal marsh and can once again fill this critical role if we restore the hydraulic connections of the creeks and tidal marsh. Potential Project benefits include:

- Restoration of up to 1500 acres of Tidal/Brackish/Freshwater Marsh and several miles of riverine habitat,
- Natural flood protection that is resilient against sea-level rise,

- Restoration and enhancement of habitat for critically endangered species like California Ridge Rail, Salt Marsh Harvest Mouse and Central California Coast steelhead,
- Creation of new and expanded rare plant species habitat,
- Improvements to creek flow conveyance and sediment transport,
- Improved public access and recreation, and
- Reduced environmental impacts from repetitive creek maintenance.

However, the Project also faces the following significant challenges:

- Potential to mobilize legacy mercury contained in pond and slough sediments,
- Species displacement due to changes in habitat,
- Potential localized reductions in flood protection,
- Impacts to energy transmission infrastructure,
- Funding challenges,
- Multiple property ownership, and
- Significant coordination efforts needed for this multi-partner project.

This presentation will provide an overview of Feasibility Study findings and Valley Water's successful Measure AA and Proposition 1 grant application effort. The presentation will describe the complex hydrologic, biological, water quality, and regulatory project setting, explain the challenges and opportunities arising from the setting, and describe the monitoring and analysis approach taken by Valley Water and our partners to move this project forward. The presentation will expertly summarize many lessons learned from the Project work performed to date and Valley Water's plan to maximize benefits and overcome constraints as the Project advances into formal planning.

Implementing a large-scale, multi-benefit wetland restoration project: The South San Francisco Bay Shoreline Project Phase 1

Evyan Borgnis Sloane, California State Coastal Conservancy

The South San Francisco Bay Shoreline Phase I Project is a multi-benefit flood protection, wetland restoration, and public access project in San Jose, CA. The project is a multi-agency effort between Valley Water, the State Coastal Conservancy, U.S. Fish and Wildlife Service, and the Army Corps of Engineers (USACE). The project will manage flood risk for 5,500 residents and 1,100 structures, restore 2,900 acres of tidal wetlands, and improve public access in the area by providing key

connections to the San Francisco Bay Trail. Similar to the South Bay Salt Pond Restoration Project, the project will restore and enhance 2,900-acres of tidal marsh and related habitat that was lost due to former salt pond production activities. The tidal restoration will incorporate sea level rise resiliency by building wetland-upland transition zone habitat for marsh migration space. USACE is currently building the first portion of the project's 4-mile coastal flood protection levee, known as Reaches 1-3, which begins at the Alviso Marina County Park and ends at the Artesian Slough. Since this area of San Jose is prone to flooding as a result of storm events and rising sea levels, the completed South San Francisco Bay Shoreline Phase 1 Project will reduce that risk significantly. Construction of Reaches 1-3 is scheduled to finish in January 2024.

Clean Soil for New Tidal Wetlands – An Overview of the Soil Quality Assurance Process

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The South Bay Salt Pond Restoration Project (SBSPRP) needs hundreds of thousands of cubic yards of clean soil imported from uplands to maintain levees and construct tidal marsh-upland transition zone habitats planned for the Alviso and Ravenswood Pond Complexes. These transition zone habitats are an important design feature providing high tide refugia for special status tidal marsh species and sea level rise resilience for restored tidal marshes. Transition zone design criteria and regulatory agency permits require import of soils with contaminant concentrations that protect wetland and aquatic organisms in the restored ecosystem. Therefore, the Master Quality Assurance Project Plan for the Don Edwards National Wildlife Refuge (QAPP), was prepared in close collaboration with the Regional Water Quality Control Board, SBSPRP project management, and soil import experts, to provide practical methods to evaluate, approve, and track soil from upland sources for use in the SBSPRP. Use of the QAPP has resulted in import of approximately 175,000 cubic yards of soil to the Ravenswood pond complex since 2018 and a similar volume of soil to the South San Francisco Bay Shoreline Project Reach 1 to prepare for restoration of Ponds A9-13 in the Alviso Pond Complex. We anticipate the QAPP will continue to be refined to streamline import of clean soil needed to build tidal wetland and transition zone habitats in the face of rising seas and a bay-wide sediment deficit.