



South Bay Salt Pond Restoration Project

Restoring the Wild Heart of the South Bay

SBSPR Project Researchers and SBSPR Project Management Team Summary Meeting Notes

Monday, November 25, 2014, 9 a.m. – 4:30 p.m.
Room 1, Sobrato Center, 600 Valley Way, Milpitas, CA

Objectives: This South Bay Salt Pond Restoration (SBSPR) Project annual meeting seeks to bring all researchers up to date on latest studies/results, foster collaboration among researchers, seek ideas for funding for science/applied studies, and foster direct dialogue between researchers and managers on proposed management actions.

Meeting Attendance: Attachment 1 lists meeting participants

Session 1: Summary of Phase 2 Alternatives

David Halsing, URS Corporation, presented updates to the range of Phase 2 Alternatives, which are generally the same as those presented at the 2013 researchers and managers meeting. John Bourgeois, SBSPR Executive Project Manager, later said much of the input received at last year's meeting guided the final Alternatives' details.

Alviso island ponds (A19, A20, and A21)

- The alternatives focus on modifying the existing breaches in the ponds to improve habitat complexity and conductivity in A19.
- Other alternatives involve breaches on the northern sides of A20 and A21 as well as the breaches in A19.

Discussion of the island ponds

Alviso A8 ponds (A8 and A8S)

- Phase 2 will add an upland transition zone/ecotone in one or two corners of A8S near San Tomas Aquino Creek and the Baylands Community Park. The ecotone size will largely depend on the available material at the time of construction, but URS assumes they will build a 30 to 1 slope.
- There could be a space between ecotones in A8S, because SCVWD may connect the San Tomas Aquino Creek to the A8 complex in the future.

Alviso Mountain View ponds (A1 and A2W)

- The primary difference between the alternatives is whether to include Charleston Slough. The City of Mountain View is required to eventually transition Charleston Slough to tidal marsh –
 - If Charleston Slough is excluded from Phase 2, then the levee along the western and southern corner of A1 will need enhancements to compensate for flood protection loss once tides are allowed into A1.
 - An action alternative including Charleston Slough would involve lowering the current levee between the slough and A1, enhancing the west levee in the Slough and wrap it around the area to high ground. URS staff also recommends moving the saline lake intake valve, which is between the Slough and A1, to a location near the breach.

Discussion of Alviso A8 Pond and Mountain View ponds

Ravenswood ponds (R3, R4, R5, and S5)

- All the alternatives would enhance the All American Canal to offset the flood protection R4 currently provides. R4 will become tidal marsh, and R3 will remain as a salt panne for plover nesting habitat.
- The major difference among the alternatives is the outcome for R5 and S5 –

- R5/S5 could become traditional managed ponds,
- managed ponds for receiving peak stormwater from Redwood City, or
- a tidal mudflat and managing for regular tidal flows (basically functioning similarly to Charleston Slough).

Discussion of Ravenswood ponds

Eden Landing southern ponds

- Phase 2 would focus on the ponds between Alameda Creek Flood Control Channel and Old Alameda Creek. The alternatives primarily differ in how they provide the primary flood control as the ponds ultimately become tidal marsh. URS proposes using either a traditional, a phased, or a managed pond approach.
 - The traditional ("Flood Control") approach would include building a large permanent backside levee, then breaching other ponds and excavating to allow more flow for tidal marsh restoration. The Bay Trail would be completed on Alameda County and CDFW land.
 - A phased approach follows an adaptive management methodology and involves using a landmass and ecotone sloping east into the bay ponds, building barrier islands the backside ponds, and building a (temporary) mid-complex levee. Based on future conditions, managers can continue to restore ponds to tidal or decide whether to make the mid-complex levee permanent to retain "Inland" managed ponds because there may be compelling reasons to maintain more ponds.
 - The "managed ponds" approach would reserve the inland ponds as managed ponds, with a land mass on the bayside and tidal restoration of the bayfront ponds. There would also be upland transition zones on the bayside (and mainland-side) of the pond complex. If the inland ponds are managed (long-term) then there would not be an upland transition zones on the mainland-side along the inland managed ponds, but rather could be on the mid-complex levee.

Discussion of Eden Landing ponds

EIR/S Timeline

- The Project Management Team (PMT) can currently review an internal draft for the Alviso and Ravenswood draft EIS/R. Only PMT members can comment on the internal draft. The public draft will likely be available in April 2015 and finalized in August. Once the PMT selects the Preferred Alternative, URS will complete the designs and construction applications in late fall of 2015.
- URS will circulate the Eden Landing Phase 2 draft EIS/R for internal PMT review around April 2015.

Session 2: Pond A8 and Alviso Slough – Summary of Mercury Results from 2013

Laura Valoppi explained that mercury contamination and remobilization has been a major concern for salt pond restoration. The SBSPR project received EPA grants to conduct several mercury studies in 2013.

Waterbird Mercury Concentrations in Response to Wetland Restoration

- Alex Hartman, USGS, presented the USGS study results of mercury concentrations in waterbird eggs at the Pond A8 complex (Ponds A8/A7/A5).
- Researchers collected American avocet and Forster's tern eggs in 2010, 2011, and 2013 at A8 complex ponds and reference ponds (no restoration actions) to track the mercury concentrations before and after the restoration management actions began.
- The study's results indicate a region-wide decrease in mercury in waterbird eggs from 2010 to 2013. The egg mercury concentrations at restored ponds are currently at levels similar to the expected levels had there been no restoration action.
- Since mercury varied so dramatically in response to restoration actions, the researchers emphasized the importance of adaptive management.
- Avocet eggs experienced a similar, but less dramatic, increase in mercury concentrations in 2011 and decrease by 2013.
- A remaining major question is whether the egg mercury concentrations will continue to decline in restored ponds.

Discussion of Mercury in Bird Eggs

Mercury Levels in Slough Fish

- Laura Valoppi presented Darrel Slotton's study on mercury levels in threespine sticklebacks and Mississippi silversides in and near Alviso Slough and A8.
- Mr. Slotton's research team collected fish in 2010 and 2011 before and after the A8 notch was opened, and then again in 2013.

- In 2013, mercury concentrations in Alviso Slough sticklebacks increased before managers opened the notch, indicating that the increase was unrelated to opening the gates. Researchers do not know why there was a pre-opening spike in mercury.
- Silverside mercury levels in 2013 varied dramatically in the original control site (Mallard Slough) likely due to the A16 breach and an upstream wastewater treatment plant source. Conversely, mercury levels corresponded closely in silversides from Alviso Slough at the A8 notch and Guadalupe Slough. Researchers suggest Guadalupe Slough as a more appropriate control site for future work.
- Since mercury concentrations in 2013 was not related to the gate operation, and fish and egg Hg concentrations were comparable to pre-restoration conditions, managers opened 5 gates in September 2014 and will keep the gates open during the winter of 2014/2015. Slotton's research team plans on sampling three times between April and October 2015 and twice during the winter of 2015-16.

Discussion of Mercury in Slough Fish

Mercury Remobilization Assessment

- Bruce Jaffe provided an overview of his research team's work measuring how Alviso Slough changed in response to the A8 notch opening and A6 pond breaches.
- They tracked the bathymetric changes, scouring locations, and mercury levels using core samples, to calculate the total mercury remobilization in Alviso Slough. These additional samples helped improve upon 2006 estimates (which had predicted 66 kg of mercury would be mobilized with a 20 foot notch opening and 125 kg with a 40 foot opening).
- From 2010-2013, they calculated about 20 kg of mercury remobilized in from the A8 notch to the mouth of Alviso Slough, but most of the mercury remobilization and eroded material originated from the A6 area.
- Researchers are developing a scour model to estimate the mercury remobilization impact of opening additional gates. The model can also explore the Guadalupe River discharge effect and remobilized mercury's destination. Mr. Jaffe said modeling is a crucial tool for understanding the dynamics of mercury remobilization. The model will be especially important in predicting sea level rise impacts.

Discussion of Mercury Remobilization

Sediment Flux and Hydrology in Alviso Slough

- Gregg Shellenbarger, USGS, presented the results of his research team's monitoring study on sediment flux and hydrology in Alviso Slough.
- Their monitoring station (mid-slough - downstream of the A8 notch and upstream of the A6 breaches) collected continuous near-bottom flux and hydrology data such as water flow, velocity, salinity, suspended sediment concentration (SSC), and dissolved oxygen concentration from 2012 to the present. They measured vertical gradients in the water column in 2014.
- Sediment flux is generally landward, or upstream (except during rainfall events). These strong fluxes are generated by a salt wedge, which moves far up Alviso Slough during incoming (flood) spring tides.
- Mr. Shellenbarger said the range in salinity also stabilized and decreased after the A8 gates opened (2 to 20 ppt before opening vs. 11 to 18 ppt after opening). The monitoring station detected both freshwater and Bay water prior to the March opening. Once the A8 notch opens, the highly saline A8 water mixes and increases the average salinity to approximately 16 ppt.

Discussion of sediment flux and hydrology

Alviso Slough Mercury Studies, Pond A6

- Mark Marvin-DiPasquale, USGS, presented the results of his research on mercury accumulation within Pond A6, in collaboration with John Callaway, USF, to analyze the quantity and rates of sediment accumulation into Pond A6 after A6 was breached.
- Based on surface sediment samples, they found no statistical difference between total mercury concentrations prior to the A6 breach and post-breach, despite accumulating sediment into A6.
- Using sediment accumulation data as an estimate of the amount of mercury accumulating into Pond A6, they calculated approximately 132 kg of mercury moved into A6 between pre-breach in 2010 and 2012. Since Mr. Jaffe calculated 10 kg of sediment was scoured near the A6 breach points, so there is a large amount of sediment and mercury coming in from sources other than the scour near the A6 breach areas.
- Overall, the data shows the environment changes very quickly after major perturbations, but the vast majority of re-suspended mercury became quickly reburied. Mark estimates that the vast majority of the mercury is not available for methylation, only about 1% or so is available for methylation.

Alviso Slough Diel Mercury Study

- Mr. Marvin-DiPasquale then presented a study where they collected water samples over a 24 hour period for mercury, during each season as well as a "first-flush" rainfall event at a location near Mr. Shellenbarger's continuous monitoring sediment flux station in mid-Alviso Slough. This collaborative effort enabled them to calculate the concentrations and net flux of mercury moving through Alviso Slough.
- Mercury concentrations peaked during extreme low tides. Suspended sediment particles were also more enriched with mercury during the winter. Net movement of mercury is landward during the spring and summer, but then begins to switch to bayward movement in the fall and winter. Over the course of 336 days, they calculated a net 0.25 kg of mercury moved bayward. Mr. Marvin-DiPasquale said these estimates offer an idea of the order of magnitude and direction of mercury in the system.

Discussion of Pond A6 and Diel Study

Steelhead Study and Pond A8 Management

- Laura Valoppi provided an overview of UC Davis researcher Jim Hobbs' steelhead study and how it, along with mercury studies, informed management of Pond A8.
- Mercury researchers have been recommending opening the ponds earlier and keeping them open all year to stabilize water levels and minimize mercury methylation. However, steelhead (anadromous rainbow trout) out-migrate during the winter months, and there was concern steelhead might become "trapped" in A8. The National Marine Fisheries Service (NMFS) said a steelhead smolt study was necessary before it would allow managers to keep A8 open during winter months.
- Jim Hobbs' research team PIT tagged over 70 steelhead smolts between December 2013 and March 2014. Researchers could then detect any tagged smolt migrating past antennae placed upstream and at the A5, A7, and A8 gates.
- Researchers detected 6 smolts out-migrating past the upstream antenna. 1 fish was detected moving into A8, but it swam out approximately 3-6 days later.
- However, the data have limitations: Tagged fish may be rainbow trout or steelhead, steelhead may not have out-migrated yet, tagged fish may die before out-migrating (e.g., predation), and the antennae had malfunctioning problems.

Discussion of steelhead study

Pond A8 Management

- Managers and researchers developed a draft decision tree based on mercury remobilization studies, waterbird egg mercury concentrations, and the steelhead study results to inform how many gates to open every year. For example, managers used the studies in deciding to open five gates at A8 at the end of September, and keep them open in December.
- Funded A8 mercury studies for 2015 include mercury concentrations in waterbird eggs, slough fish and water, sediment flux in Alviso Slough, bathymetry in the spring and fall, and the Alviso Slough scour modeling.

Questions and Discussion of Results and Change in Operation/Management

Session 3: Social Attraction

Bird Social Attraction Project

- Cheryl Strong, USFWS, provided an overview of the US Army Corps of Engineers' (ACE) three-year social attraction project for Caspian terns and western snowy plovers. ACE will deploy bird decoys and sound systems broadcasting bird calls on islands in Ponds SF2 and A16 (6 plover decoys/island and 50-75 tern decoys/island).
- Plover decoys will be placed on one island in both SF2 and A16; Tern decoys will be placed on two islands in A16 and three islands in SF2. If a snowy plover nests on a tern island, ACE must remove tern decoys and the sound system.
- Plover islands will have 3/8 inch size gravel, while tern islands will have 3/4 inch size gravel.
- USFWS will also deploy 50 Forester's tern decoys at an island in SF2, but there will be no sound system.
- ACE will also conduct predator management such as trapping mammals and hazing/removing avian species.
- San Francisco Bay Bird Observatory (SFBBO) and researcher Josh Ackerman will monitor birds from a distance.

Discussion of Social Attraction Project

Session 4: E12/E13 and E6A/E6B Studies and Results to Date: Waterbird Data Analysis/Synthesis

Assessing Initial Response of Waterbirds to the SBSPR Project Using Historical Data

- Susan De La Cruz, USGS, reviewed USGS efforts to assist USFWS and the SBSP management board in assessing waterbirds' initial responses to the SBSPR Project by creating a master survey database from data collected by USGS (2002-13) and SFBBO (2005-13).
- Then USGS researchers can conduct modeling exercises to relate avian species and guild abundances to pond characteristics and management/restoration events.
- They hope to complete these analyses by December 2015.

Diving Duck Response to Mixed-Species Pond Management

- Ms. De La Cruz provided preliminary results from a study by her research team in collaboration with John Krause, CDFW, on diving duck response to mixed species pond management at the Eden Landing Ponds E6B, E6A, and E8. These ponds are managed for wintering diving ducks and snowy plover nesting in the summer.
- The study began in fall 2013 and focused on identifying pond characteristics that enhance diving duck abundance. The study also measured diving duck densities and behavior as well as evaluated their diet in mix management ponds compared to reference ponds (year-round circulation).
- Researchers are studying diving duck abundance, foraging behavior, invertebrate densities and species richness in different seasons, and duck diets.

Shorebird Response to Varying Salinity and Water Depth in an Experimental Design in Salt Pond Management.

- Lacy Smith, USGS, provided an overview of another collaborative project among USGS, CDFW, and Ducks Unlimited that established different salinities and water depths in salt ponds to assess the effects on waterbirds and their prey.
- The research team subdivided Ponds E12 and E13 into 3 cells each to create different salinity gradients (Low, Mid, and High), then they added foraging mounds to create more topography for the birds. Their goal was to determine what salinities and topography benefits shorebirds and invertebrates, which can inform future management designs.
- Researchers began the bird surveys and core sampling in January 2014. Researchers will study bird abundance, bird foraging behavior, benthic invertebrate abundance and species richness, and water quality and habitat characteristics that influence these.

Discussion of Eden Landing Shorebird Studies

Session 5: Living Shoreline, and ISP Vegetation and Rail Islands Update

Marilyn Latta, SCC, provided an overview of the preliminary work on two SCC projects related to the SBSPR Project - the Invasive Spartina Project (ISP) and Living Shoreline Project - which aim to enhance ecosystem function and services, especially at habitat transition zones. These projects highly support the SF Bay Subtidal Habitat Goals and Bayland Habitat goals and can inform the design of future projects.

Invasive Spartina Project Vegetation and Rail Islands

- The Invasive Spartina Project (ISP) first began in 2003 to remove invasive *Spartina*. The ISP team began actively planting native marsh species in 2011 to provide ecosystem benefits such as resiliency to erosion and climate change and habitat for species like the endangered Ridgway rail.
- To date, ISP team members have planted 240,000 propagated native cordgrass (*Spartina foliosa*) and gum plant (*Grindelia stricta*) seedlings at 34 sites around San Francisco Bay. They found excellent *S. foliosa* survivorship near the Alameda Flood Control Channel, and they are addressing areas with lower survivorship where the seedlings succumbed to herbivory and elevation issues. They hope to plant 500,000 seedlings by 2017.
- The ISP team also developed high tide refuge islands with planted *G. stricta* to support rail nesting habitat. Islands are 25 feet long, 10 feet wide, and 1.5 feet above mean high tide. Gum plant survival corresponds with higher elevations, therefore SCC is planting *G. stricta* at 1.7 feet above mean high tide (to account for soil settling).

Discussion of ISP revegetation and rail islands

- Ms. Latta said SCC is collaborating with groups like Point Blue to develop the rail response monitoring design. The vegetation needs to mature more before SCC staff will begin monitoring rail use.

- Several group members said the project has many useful future applications (e.g., method for developing seed sources to repopulate restored areas and mitigation tool for creating rail habitat).
- Ms. Latta said they have not observed invasive species at the refuge islands to date.
- The two-year monitoring report will be available at www.spartina.org.

Living Shoreline Project

- This project follows an experimental approach to explore using natural processes, such as eelgrass and oyster beds, to provide mutual physical and biological benefits (e.g., attenuate wave action, minimize coastal erosion, and build habitat for wildlife).
- In 2012, project team members established four large plots of oyster shell bags and eelgrass at a large project site offshore of San Rafael and Eden Landing to measure the biological and physical effects of the large-scale treatment plots.
- They observed highly successful oyster recruitment at San Rafael with about 3 pulses of recruits in a year with a total 1.5 million oysters surviving steadily in multiple age classes. At Eden Landing, there were 25,000 oysters at peak levels, but there was minimal survival due to a non-native oyster drill
- The project team is also conducting a substrate experiment at San Rafael and a smaller site in Eden Landing to test oyster and eelgrass recruitment/survivorship on shell bags compared to different types of artificial reef structures.
- Next steps include more replicated sites (possibly near R1 and R2) to help create an integrated edge offshore from restored salt ponds and help protect restoration efforts.

Discussion of Living Shorelines

Session 6: Science and Funding

Mr. Bourgeois and Ms. Valoppi invited input on the research projects and future directions. They also provided updates on project funding, discussions of the Mudflat Working Group on assessing methods for tracking changes in mudflat quantity and quality over time, and how to assess and document results from Phase 1 Studies.

There was also a discussion of potential public access studies at Eden Landing, improving communication between researchers and managers, and documentation of changes in pond management actions over time.

Attachment 1: November 25, 2014 Meeting Attendance

Name	Organization/Affiliation
Joy Albertson	USFWS
Melisa Amato (teleconference)	USFWS
Donna Ball	Save The Bay
John Bourgeois	SCC, SBSPR Executive Project Manager
Catherine Burns	San Francisco Bay Bird Observatory (SFBBO)
Brenda Buxton	State Coastal Conservancy (SCC)
Kristin Byrd	USGS
John Callaway	University of San Francisco (USF)
Susan De Le Cruz	USGS
David Halsing	URS
Alex Hartman	USGS
Janell Hillman	Santa Clara Valley Water District (SCVWD)
Stephanie Horii	SBSPR Facilitation Team
Bruce Jaffe (teleconference)	USGS
John Krause	CDFW
Marilyn Latta (teleconference)	State Coastal Conservancy
Mark Marvin-DiPasquale	USGS
Anne Morkill	USFWS
Stacy Moskal	USGS
Greg Shellenbarger	USGS
Lacy Smith	USGS
Cheryl Strong	USFWS
Rachel Tertes	USFWS
David Thomson	San Francisco Bay Bird Observatory
Karine Tokatlian	San Francisco Bay Bird Observatory
Laura Valoppi	USGS, SBSPR Lead Scientist
Sam Veloz (teleconference)	Point Blue
Julian Wood	Point Blue