Appendix 1. Summary of Researcher/Manager Meeting, Milpitas, California, March 15, 2016

South Bay Salt Pond Restoration Project

Restoring the Wild Heart of the South Bay

South Bay Salt Pond Restoration Project

Annual Researcher/Managers Meeting

Sobrato Center, Milpitas CA

March 15, 2016

Notes prepared by: Kurt Zias and Laura Valoppi

AMP questions and expanded stoplight scores are highlighted in yellow
Red text are suggested Phase 2 studies
Italic text are Action Items
AMP = Adaptive Management Plan

Welcome by Ariel Ambruster

Phase 2 Overview Session–John Bourgeois and Laura Valoppi

- John Bourgeois
  - Provides summary of phase 2 actions
- Laura Valoppi
  - Overview of timeline
    - Can't go below threshold of NEPA/CEQA
  - Expanded stoplight
    - Green = meet/exceeding expectations
    - Lime green = uncertainty, trending positive
    - Yellow = uncertain
    - Orange = uncertainty, trending negative
    - Red = not meeting expectation
      - Below NEPA/CEQA threshold of significance
  - Researchers and managers will be asked to score AMP questions using expanded spotlight system

Sediment Session–Laura Valoppi, Chair
Presentations by Thomson, Downing-Kunz, Byrd, Jaffe

Is there sufficient sediment available in the South Bay to support marsh development without causing unacceptable impacts to existing habitats?

Maintenance or increase of current vegetated marsh is essential to key species

- Target–No long-term net loss of vegetated tidal marsh throughout the South Bay.
- Trigger–Observed net loss of tidal salt marsh (area of outboard fringe marsh losses > greater area of tidal marsh in restored ponds) than the range of natural variability + observational variability/error.

- Thomson presentation
  - Habitat Evolution Mapping Project
  - Developed spectral library to see if habitat can be mapped
    - 33,000 acres mapped–baseline
    - Need repeat mapping after five years (initial study in 2011)
    - Recommend GEOEYE1 or Worldview satellite imagery
  - Qualitative: gaining ground towards goal
    - Trending positive, no long term veg loss
    - Need to repeat veg mapping and compare to baseline

Marsh Habitat Score: Lime-Green–marsh habitat is increasing

- Discussion/Suggestions for Phase 2 Studies
  - Satellite imagery/resolution issues
  - LIDAR fringe marsh assessment
    - Could use drones/fixed flight plane
    - Need higher resolution, but no funding identified yet; USGS planning fly over in Alviso Slough this Spring (latter changed to Fall)
    - Karen Thorne–USGS
      - Sea level rise mapping match with NASA drone proposal submitted

Rate of accretion indicates trajectory toward vegetated marsh

- Target–Accretion rate of the restored ponds is sufficient to reach vegetation colonization elevations.
- Trigger–Projections based on the rate of inboard mudflat accretion suggest vegetation colonization elevations are not likely to be achieved within the planning time frame

- Downing-Kunz presentation
  - Dry years: landward flux
  - Wet years: bayward flux
    - Suspect drought-related cause
      - Will be helpful to see 2016 data
    - Spring-neap variability
  - Sediment supply into South Bay
  - Most recent data looked at Suspended Sediment Concentration (SSC) at 3 sites over 7 month time period
    - Dumbarton–Increased SSC at Dumbarton Station during drought period of last few years compared to other areas around SF Bay, indicative of high SSC in South Bay
    - Coyote Creek–showed variability in SSC with spring/neap tides–higher during spring tides
    - Alviso–also saw increase in SSC during spring tides
- Callaway presentation (by Valoppi)
  - Sediment accretion studies A21 and A6
    - Over 3 years post breach for each pond, saw rapid sedimentation
    - Accretion occurred quicker on the south side of Pond A21 breach area
    - A6: more rapid sedimentation than seen at Pond A21 due to lower initial elevation

Accretion Score: Green–Rate of accretion indicates trajectory towards vegetated marsh is occurring

- Discussion/Suggestions for Phase 2 Studies
  - Given the data we have, we don't know how other ponds will accrete
    - But qualitatively it seems other marshes will have high accretion rates as well, at least south of the Dumbarton
  - We don't know the effect of drought or the source of sediment coming into South Bay
  - We don't understand the interaction of restoring ponds and mudflat maintenance

Reduction in Mudflat Habitat

- Target–No significant decrease in South Bay intertidal and subtidal habitats (south of San Bruno shoal), including restored pond mudflat, intertidal mudflat, subtidal shallow and subtidal channel areas.
- Trigger–Outboard mudflat decreases greater than the range of natural variability + observational variability/error

- Byrd presentation
  - Mapping mudflat edge using Worldview 2/3
  - Some ground truth data, need more verification, but look promising
- Jaffe presentation
  - Bathymetry change
    - Sediment depositing into pond
  - Lots of areas of deposition at SF2 mudflats
  - Interested in quality of mudflat as well as extent

Mudflat Score: Lime-Green–data from A6 and SF2 mudflats do not show a decrease

- Discussion/ Suggestions for Phase 2 Studies
  - We don't know how bird use/benthos are being affected by sedimentation
  - Quality of mudflat and role of biofilm is uncertain
  - Assess sediment accretion in mudflats outboard of Eden Landing and/or Ravenswood
  - Shouldn't feel confined by current studies–e.g. 3D mapping with lidar, analysis of convex/concave mudflat, etc...
  - Continue tracking sediment through Dumbarton Bridge
- *Action item (Mudflat Working Group)*
  - *Reconvene mudflat working group to evaluate:*
    - *Concave VS convex of mudflat*
    - *What do we want to do for accessing mudflats?*
      - *Quality of mudflats*
      - *LIDAR/Structure for motion*
      - *Time series/spatial distribution across bay*
  - *Also obtain/review SCVWD 10 year monitoring data at Pond A21 (Lisa Porcella)*
  - *John Krause also has data on Eden Landing sediment accretion*

Mercury Session–Laura Valoppi, Chair
Presentations: Ackerman, DiPasquale, Slotton, Jaffe

Will mercury be mobilized into the food web of the South Bay and beyond at a greater rate than prior to restoration?

Within Ponds–*Will pond management increase MeHg levels in ponds and pond-associated sentinel species?*

- Target–Levels of Hg in sentinel species do not show significant increases over baseline conditions; Levels of Hg in sentinel species are not higher in target restoration habitats than in existing habitat
- Triggers–One or more sentinel species show higher levels of Hg in target habitats than existing habitats; One or more sentinel species show higher than ambient levels of Hg in Pond A8 or Alviso Slough

- Ackerman presentation
  - Forster's Tern eggs
    - Forster's Tern eggs had huge increase in 2011 after construction, then decreased starting in 2013 and thereafter to levels similar to reference areas
    - There is a year to year fluctuations in mercury; tern egg mercury concentrations are still well above toxicity benchmarks, so species is at risk;
  - Fish (mudsuckers, sticklebacks)
    - Initially pond fish had much higher mercury in restored ponds than in reference areas, but once gates were opened in 2011, pond fish mercury levels decreased.
  - Avocet eggs
    - Increase in mercury in 2011, after notch opened.
    - Thereafter, mercury levels tracked those of reference areas
  - Will pond management increase MeHg levels in ponds and pond-associated sentinel species? Short-term: Yes, demonstrated increases in MeHg during tidal marsh restoration as well as regular pond management activities. Long-term: No?, maybe ok

- DiPasquale presentation
    - Water column data for mercury, 2006 to 2015
    - Pond A3N: negative control
    - Pond A16: positive control
    - After A8 complex opening:
        - Decrease in mercury for the most part once gates were opened
        - Increasing in partitioning coefficient mercury once gates open
            - Mercury has moved into particles
                - Maybe algae (bad)
                - Maybe minerals (good)
            - Unsure which kind of particles mercury is onto
        - Overall decrease in mercury in water since 2011 gate opening

Pond Score: Red–during/just after construction inside ponds, lime green after first year

- Discussion/ Suggestions for Phase 2 Studies
    - Considered splitting score into three categories:
        - Short-term, mid-term, long-term, Within 1–3 years after construction, should return to baseline levels
    - Considered splitting score into bird, fish, water categories; terns forage more widely than avocets or stilts; Hg comes through maternal transfer about 2 weeks before eggs are laid.
    - Regional monitoring approach in restored areas and managed ponds–monitor MeHg in birds and fish over a larger area and look for regional trends.
    - Look for drivers of MeHg–salinity, turbidity, etc. in managed ponds and evaluate pond management practices to reduce MeHg in biota.
    - Should do flyover/satellite imagery of "on the ground" data in restored ponds–once per year at least. See recent paper on this technique deployed in the Delta.
    - Should sample fish inside Pond A8, but consider changing species collected.
    - Statistical analysis for relationship between water, fish, bird MeHg
    - Study the effects of MeHg on terns, stilts, black skimmers, snowy plovers–i.e., birds with elevated Hg levels.
- *Action Item (Pond Management Working Group)*
    - *Do robust stats analysis to figure out where excess mercury in water went*
    - *Look for relationship between fish/water*

Sloughs–*Will tidal habitat restoration and associated channel scour increase MeHg levels in marsh and bay-associated sentinel species?*

- Target–Levels of Hg in sentinel species do not show significant increases over baseline conditions; Levels of Hg in sentinel species are not higher in target restoration habitats than in existing habitat
- Triggers–One or more sentinel species show higher levels of Hg in target habitats than existing habitats; One or more sentinel species show higher than ambient levels of Hg in Pond A8 or Alviso Slough

- DiPasquale presentation
    - Alviso slough upper
        - Comparing pre and post A6 breach
        - Total unfiltered mercury increased in water
        - Particulate and partitioning mercury decreased in water
    - Alviso slough lower
        - Unfiltered mercury increased in the short term in water

- Jaffe presentation
    - Scour of the Alviso Slough
        - Erosion in slough happening predominantly near A6 breaches
        - Scour is highest in winter
        - Erosion has relationship with Guadalupe River discharge–during high flow/storm events, erosion is increased
        - When 5 gates opened in Fall of 2014, the rate of erosion picked up over last winter 2015, but then stabilized over spring/summer despite 5 gates remaining open for the duration.
        - Summer patterns are more telling of influence of gates since we don't typically get large runoff events between April to October
        - Have developed a short-term scour model that is being updated to model long term conditions.
- Slotton presentation
    - Slough Fish
        - Measured in Alviso slough with Guadalupe slough and Mallard slough as reference locations
            - Sticklebacks and silversides
        - Spike in mercury after gate opens in June 2011
        - Overall levels comparable to reference locations since the end of 2011
        - Sticklebacks higher mercury levels than as the summer progresses, but this trend is seen at reference locations as well

Slough Score: Lime Green–after initial opening of Pond A8 gates, slough fish mercury returned to reference levels, and scour and remobilization of mercury in sediment is not as extensive as predicted

- Discussion/Suggestions for Phase 2 studies
    - A6 breaches had a larger impact on the scour of Alviso Slough than the opening of small gates at A8
    - A8 had less of an effect on mercury than possibly A6 breaches, since most of the erosion occurred near the A6 breaches; however there are higher concentrations of mercury in the sediments near the A8 gates than lower in Alviso Slough, so as the upper slough erodes over time, more Hg may be mobilized.
    - We don't know how Pond A8 data will translate when other ponds are breached
    - We don't know where mercury is ending up that is remobilized in Alviso Slough
        - Hg likely going into A8 from Alviso Slough–could do a Hg flux study at the A8 notch to determine
        - Need full bathymetric survey within A8 to evaluate sediment accumulation
    - Potential to study MeHg using hyperspectral imagery over a larger area as was done recently in the Delta
    - Could analyze Salt Marsh Harvest Mouse hair collection (archived) to understand baseline mercury data–also connects with marsh topics
    - Could collect rail prey items in Pond A21 to assess Hg risk
    - Maybe also marsh wrens or song sparrows
    - Bat samples could also be used for assessing mercury accumulation

Marsh, Mice, Rails Session–John Bourgeois, Chair
Presentations: Thomson, McBroom, Tertes

How do Ridgway's rails (aka California clapper rail) and/or other key tidal habitat species [salt mouse harvest mouse] respond to variations in tidal marsh habitat quality and what are the habitat factors contributing to that response?

Where not adequately eradicated, does invasive Spartina and hybrids significantly reduce aquatic species and shorebird uses?

Tidal Marsh Habitat Establishment

- Target–Tidal marsh vegetation/habitat mosaic (including vegetation acreage and density, species composition, acreage of mudflat, channels, marsh ponds and transition area) is on a trajectory toward a reference marsh and/or other successful marsh restoration sites in South San Francisco Bay.
- Trigger–Vegetation deviates significantly (30–50%) from projected trajectory after colonization elevations are achieved. Channel and marsh pond formation does not occur as predicted. Non-native Spartina present on the site.

- Strong presentation
    - Habitat Evolution Mapping Project (HEMP)
        - 33,000 acres mapped using satellite imagery, but need to remap at 3-5 year intervals
        - Identifies low/high marsh habitat associations
        - Large area to make sure all marshes included
    - After Island Ponds breached in 2006
        - Pond A21, has 165 acres of vegetation created, 76% of area has vegetation establishment and has exceeded expectations
        - Pond 20 is filling slower than 21, has 33 acres of vegetation established
        - Pond 19 is taking longer to restore, trajectory is lagging
- McBroom presentation
    - Spartina invasion began in 1970's
    - 97% reduced bay-wide over the past ten years
        - Not including 11 sites that are not being treated
    - Native S. foliosa coming in to restored marshes, lots of revegetation being done in controlled sites also
    - Ponds A19 and 17 have only native Spartina, whereas Ponds A21 and A6 have some hybrid

Marsh Habitat Score: Lime-Green–There was concern with hybrid Spartina coming in to newly restored area, but management is underway for controlling most sites; otherwise marsh establishment has exceeded expectations. So split the score by giving a lime green.

- Discussion/Suggestions for Phase 2 studies
    - Continue coordination with Invasive Spartina Project
    - Look at other areas beside Islands Ponds for marsh development/species presence
    - Assess quality of marsh that is developing in newly restored areas, using analog marshes are reference areas.
    - Assess mouse hair Hg levels in young versus older marshes (see also Hg studies).
    - Monitor/evaluate the ecotone revegetation, quality

        - Aerial mapping for vegetative cover (see Fulfrost/HEMP study repeat)
        - Track best practices for marsh restoration from ISP, STB, SFBBO revegetation, marsh mounds, etc. to implement in Phase 2

Clapper Rail

Rail Habitat

- Target–Meet recovery plan criteria for clapper rail habitat within the SBSP Restoration Project Area
- Triggers–Observed net loss of tidal salt marsh (area of outboard fringe marsh losses > greater area of tidal marsh in restored ponds) than the range of natural variability + observational variability/error (same as in sediment dynamics objective)

Rail Numbers

- Target–Meet recovery plan criteria for clapper rail numbers (0.25 birds/ac over 10-year period) within the SBSP Restoration Project Area
- Triggers–Numbers drop below 0.20 birds/ac in any given year for Project Area as a whole; Rate of increase in clapper rail numbers deviates significantly from projection

- Tertes presentation
    - Breeding rails have been heard at A21 post-restoration
        - Only restoration site to have rail use so far
        - 1 decade earlier than expected
- McBroom presentation
    - Birds at Mt Eden as well, post-restoration
    - Population trend south of San Mateo Bridge is up
        - Rails surveyed over 6 years, 2010 to 2015
            - Raw data, not estimate; 6 year average is 300 rails
            - 43 rails above the average in 2015, trend is upward
            - Below Recovery Plan target of 600

Rail Habitat Score: Lime-Green

Rail Numbers Score: Lime-Green–Below recovery plan objectives but upward trend

Salt Marsh Harvest Mice

Mouse Habitat

- Target–Meet recovery plan criteria for salt marsh harvest mouse habitat within the SBSP Restoration Project Area
- Triggers–Vegetation deviates significantly (30–50%) from projected trajectory after colonization elevations are achieved. Channel and marsh pond formation does not occur as predicted. Non-native Spartina present on the site.

–Tertes presentation

- Habitat
    - Caught mice at A21 this year

Mouse Habitat Score: Lime-Green

Mouse Numbers

- Target–75% of viable habitat areas within each large marsh complex with a capture efficiency level of 5.0 or better in five consecutive years
- Triggers–Rate of increase deviates significantly from projection

- Tertes presentation
    - Current trapping efforts are not able to sufficient to determine if above is met.

Mouse Numbers Score: Lime-Green

- Discussion/Suggestions for Phase 2 studies for rails, mice
    - Qualitative assessment of marsh is needed, use existing criteria
        - Consider Point Blue characterization of marsh quality
        - Great opportunity for collaboration to analyze mice hair for mercury
    - Measure re-vegetation efficacy and ecotone qualities of upland transition zones
    - Need to keep Invasive Spartina monitoring efforts up even after contracts and funding ends–issue of when can IS monitoring be stopped.
    - Rail surveys could be conducted once the Invasive Spartina Project ends
- *Action Items*
    - *Consider updating AMP approach to marsh establishment to consider target/triggers for Invasive Spartina*
    - *Consider revising targets/triggers for rails*
- *Information: Restoration implementation team for the Tidal Marsh Recovery Plan*
    - *USFWS-led; Groups set up for each category within Plan (i.e. mice, rails, plants)*

Bird Session–Cheryl Strong, Chair
Presentations: DeLaCruz, Tokatlian, Ackerman, Strong

Can the existing number and diversity of migratory and breeding shorebirds and waterfowl be supported in a changing (reduced salt pond) habitat area?

Migratory Birds

Will pond and panne habitats in restoring tidal habitats provide habitat for significant numbers of foraging and roosting shorebirds and waterfowl over the long term?

Will the habitat value and carrying capacity of South Bay for nesting and foraging migratory and resident birds be maintained or improved relative to current conditions?

Diving Ducks

- Target–Maintain numbers of diving ducks using the South Bay at pre-ISP baseline numbers–104648 (mid-winter survey average 2001-2003); range: 58849 (2003)- 174953 (2001)
- Trigger–two years of decline in numbers below baseline conditions in South Bay as a whole out of any consecutive three years

- De La Cruz presentation
    - Trends
        - Divided by Fall, Winter, Spring
        - Increasing winter trend, mean is 60,000 birds
        - Below target number

Diving Ducks Score: Lime-Green–On upward trend, but hasn't met target

- *Action Items*
    - *Have to revise mid-winter data and recalculate*
    - *May need to change target (SBSP survey vs. Midwinter waterfowl data for S. Bay)*

Ruddy ducks

- Target–Maintain numbers of diving ducks using the South Bay at pre-ISP baseline numbers 97,172 (2005-2007 winter USGS/SFBBO data); range: 79,962-10,709.
- Trigger–two years of decline in numbers below baseline conditions in South Bay as a whole out of any consecutive three years

- De La Cruz presentation
    - Known salt pond users, don't use open bay
    - Haven't hit target , but increasing

Ruddy ducks Score: Lime-Green

- *Action Items:*
    - *Need to revise target in AMP*
    - *Some future (Phase 2) restoration ponds are currently used by ruddy ducks, so need to evaluate numbers before restoration*

Migratory Shorebirds

Will shallowly flooded ponds or ponds constructed with islands or furrows provide breeding habitat to support sustainable densities of snowy plovers while providing foraging and roosting habitat for migratory shorebirds?

- Target–Maintain numbers of migratory shorebirds at pre-ISP baseline numbers, if known, or as close to that baseline as can be determined. Separate winter/fall, spring, and November survey target numbers.
- Trigger–two out of three consecutive years when the South Bay shorebird abundances fall below the baseline in any given season; three consecutive years in which the percentage of S.F. Bay small shorebirds using the South Bay is below the baseline (60.6%)

- De La Cruz presentation
    - Small shorebirds
        - Same pattern as diving ducks
        - 2004 = 75,000; now = 100,000
    - Medium shorebirds
        - Same trend
        - 2004 = 20,000; now = 40,000

Shorebirds Score: Lime-Green -Maintaining numbers

- *Action Item–*
    - *Could separate seasons into different stoplights*
    - *Susan De la Cruz to remove breeding stilts/avocets from abundance estimates in bird synthesis report.*

Snowy Plovers

- Target–250 breeding adults (RU3 recovery goal, half)
- Trigger–rate of population change declines substantially from projected trajectory toward target, and South Bay population <112

- Tokatlian presentation
    - Post-restoration at Eden
        - Using dry pan habitat
    - The current trend for plovers is on a trajectory to meet the Recovery Unit 3 goal of 500 birds, and the SBSP-specific goal of 250 birds, by 2046. So the current trend is well above expectation

Plover Score: Green

- *Action Items*
  - *Need more conservative mean for trigger/target goals; maybe use harmonic mean*
  - *Retire plover question in AMP–plovers don't use other habitat; instead focus AMP question on habitat enhancement and how many acres are needed to meet goal.*

Islands–Focusing on terns, avocets, stilts

To what extent will the creation of large isolated islands in reconfigured ponds maintain numbers (and reproductive success) of terns and other nesting birds in the South Bay, while increasing densities of foraging birds over the long term compared to ponds not managed in this manner?

- Target -Maintain numbers and breeding success of breeding avocets, stilts, and terns using the South Bay at pre-ISP baseline numbers, if known, or as close to that baseline as can be determined.
- Trigger–Decline in numbers (in the South Bay as a whole) or reproductive success of breeding stilts, avocets, and Forster's and Caspian terns below baseline for two out of any three years

- Ackerman presentation
  - Forester's Terns = slight increase in nests initiated in 2009–2010, but a long-term decline
    - Terns are moving to new sites as ponds are restored full tidal flows, but they are not moving to newly created pond habitat with islands.
  - Avocets and stilts
    - Decline
    - Loss of nesting islands, they are not moving as ponds are restored so South Bay is losing avocet nesting populations
    - Terns are more mobile, more resilient
  - 95% of terns nesting on islands in managed ponds, 70% for avocet, 25% for stilts; stilts are nesting mostly in marsh habitat like in New Chicago Marsh
  - Islands are very important for breeding habitat, but newly built islands are not being used
  - Recipe for perfect island breeding habitat
    - Few islands per pond, spread islands among more ponds
    - Linear is better than round, have abundant area close to water's edge
    - Place islands away from levee boundaries
    - Smaller islands are better (<2 ha)
    - Have areas 0.5 to 1.5 m above water surface
    - Flat to moderate slopes of 15 degrees
    - Keep vegetation short

Score: Red due to decline in numbers and loss of habitat

- *Action Item: (Pond Management Working Group)*
  - *Pond Management Working Group to take New Chicago marsh bird abundances out of breeding bird data to get a better idea of bird use of islands in ponds*
  - *Pond Management Working Group to re-evaluate score of red versus orange*

CA Gulls

Will California gulls, ravens, and crows adversely affect (through predation and encroachment on nesting areas) nesting birds in managed ponds?

- No target or trigger
- Ackerman presentation
  - In A6 , large CA Gull breeding colony, and found many dead tern chicks due to gull predation
  - 54% tern chick deaths caused by gulls
  - 90 dead tern chicks within gull colonies
  - Most deaths occur within first days of hatching
  - In 2010, we breached A6 and gulls relocated, resulting in a forced relocation of gulls
    - 900% increase in chick survival in tern colony adjacent to relocated gull colony
  - Twice as many avocets nesting than stilts, but stilts fledge ~ 3 times more chicks
    - Avocets more prone to gull predation, stilts nest in vegetation so less prone
  - Gulls are voracious predators of waterbird chicks and eggs
  - Gulls also displace birds from preferred nesting sites
  - Gull numbers no longer increasing in as of the last 2 years

Gull Score: Yellow

- *Action item: Pond Management Working Group*
  - *Come up with question(s), monitoring, target and trigger, or perhaps a maximum number, for gulls to be added to the AMP*

Phalaropes, eared grebe, Bonaparte's gull

Will ponds reconfigured and managed to provide target water and salinity levels significantly increase the prey base for, and pond use by waterfowl, shorebirds and phalaropes/grebes compared to existing ponds not managed in this manner?

- Target–Maintain these species' use of SBSP Project Area; Minimize declines in the South Bay relative to pre-ISP baseline
- Trigger–two out of three consecutive years more than 25% below NEPA/CEQA baseline, or any single year more than 50% below NEPA/CEQA baseline
- De La Cruz presentation
  - Fall, Winter, Spring data
  - Eared grebe
    - Decline in project ponds, then increase in recent years
  - Bonaparte's gull
    - Declining in recent years, but uncertain of true direction
  - Phalaropes
    - Not much data, birds are only in area for about 2 weeks, so counts have low confidence

Phalaropes, eared grebe, and Bonaparte's full Score: Lime Green

- *Action Item: Pond Management Working Group*
  - *Need to re-evaluate targets for eared grebes, Bonaparte's gull, and phalaropes (Pond Management Working Group).*
  - *Also re-evaluate survey methods. Need to know how these species are using the ponds.*

CA Least Tern

- Target–Maintain numbers of post-breeding California least terns in the Project Area at multi-year average levels including natural variation in numbers; avoid negative effect of SBSP Restoration Project on Bay-area least tern breeding bird numbers (multi-year average levels with natural variation)
- Trigger–decline in total number of birds using South Bay as post-breeding foraging area in any two out of three consecutive years

- Strong presentation
  - no nesting terns in ponds, but post-breeding use
  - Target is 206 birds, baseline is 63 birds in 2/3 consecutive years
  - 2010 to 2012, numbers are well below baseline (but sampling is likely inadequate given their brief time on the ponds)
    - Are declines resulting from restoration?

CA Least Tern Score: Yellow

- *Action Item*
  - *Re-evaluate survey methods and triggers and targets in the AMP*

- Bird session discussion/ Suggestions for Phase 2 Studies
  - Need to know where birds are/what areas are being utilized. What effects are restoration-related?
  - Pond bathymetry at Cargill ponds is lacking–data needed to do a full analysis of pond depth effects on Cargill bird abundances.
  - Refine pond management to optimize bird numbers in small areas using De La Cruz analysis
  - Assess bird survey protocols for efficiencies
  - What is the best management for diving ducks in restoration areas? How to increase carrying capacity/food resources?
  - Restoring ruddy duck ponds–look at effect on displacement/decreased abundance after tidal restoration actions
  - Understand requirements for roosting capacity of shorebirds (losing this habitat with restorations)
  - Breeding bird population surveys are needed to get a real estimate of bird nesting in South Bay. Current data shows population decline for avocets, maybe stilts.
  - Redo PRBO 2000 south-bay wide survey for breeding avocets and stilts
  - Understand tern/gull proximity by further study of egg and chick predation by gulls after landscape changes and landfill hazing actions.
  - GPS study of relocated waterbird and gull movements from restoration actions. Especially for A16 islands, which are between the landfill and new gull colony (A9/10/11/14 levee)
  - Gulls: Local production or immigration? Need gull nest and chick survival study to assess which–important for assessing management options.
  - Gull diet study–percentage of diet to sources such as landfills. Gulls may shift diet to predation during full breeding, which would increase depredation on other breeding birds
  - Susan de la Cruz's data–pull out resident vs. migrants abundances to estimate breeding shorebird abundances (AMAV, BNST).
  - How to maximize islands for terns, avocets, stilts
  - Nest monitoring studies are critical for evaluating productivity trigger/targets in AMP
  - Social attraction actions/studies for terns/avocets are critical, especially since they are not yet using the constructed islands for nesting.
  - No need to consider nesting islands for plover habitat–can revise AMP

- AMP: look at alternative methods for estimating plover fledge success and species recovery metrics–harmonic metric for plovers instead of current target/trigger?
- Investigate long term effects of oyster shell enhancement on plover breeding success; also test alternatives substrates
- Study plover–predator pressures; increase nest cameras deployed; direct versus potential pressures; individual predator or population pressure; ID predator species of concern
- Consider use of VHS or GPS to track brood movement and estimate fledging rates
- Consider use of Unmanned Aerial Vehicles (UAVs, drones)–negative impacts on species as well as potential for monitoring plovers, other birds
- Monitor breeding success in ponds adjacent to high quality foraging transitional mudflats, study impact of their transition to marsh
- Study higher nesting densities as nesting habitat declines with increased restoration; quantify a carrying capacity or density limit
- Understand plover movement/migration out of historical areas as a result of habitat restoration.

- *Action Items*
  - *Pond Management Working Group to reassess bird survey protocols–how to maintain comparability with prior data and reduce effort if possible.*
  - *Use Bird Survey Synthesis report (De La Cruz) to assess changes to pond management in order to increase bird use of ponds*

Fish and Water Session–Laura Valoppi, Chair
Presentations: Strong, Krause, Downing-Kunz, Bresnahan/Senn, Hobbs

Will restoration adversely affect water quality and productivity?

- Targets–Water quality parameters in ponds will meet RWQCB standards; South Bay water quality will not decline from baseline levels; DO levels meet Basin Plan Water Quality Objectives
- Triggers
  - Annual data review to determine variation from past trends
  - Review of RMP results indicate abnormal conditions
  - Other indication of abnormal conditions such as fish kills
  - Increases in chlorophyll-a to levels indicating eutrophic conditions
  - Increases in sediment oxygen demand to levels indicating risk of low DO
  - Low dissolved oxygen in ponds or receiving waters

Water quality–Regulatory objectives

- Not decline below baseline
- Triggers: are water quality standards–Monitoring water quality standards: salinity <44 ppt, 10th percentile DO >3.3 mg/L, pH 6.5-8.5
- Strong/USFWS
  - SF2 dissolved oxygen
    - Fluctuates below trigger at certain tides and time of day
- Downing-Kunz presentations
  - Alviso Slough
    - The range in salinity values decreased in 2015, indicating stabilizing of salinity in the slough with the opening of the gates year round. However,

looking in just August, each year there has been a steady increase in salinity in the slough, which may be partially due to the drought of the last few years.

- When gates open in winter starting in 2015, DO within the pond increased in winter, and DO conditions in the pond in August did not reach the extreme lows of previous years, suggesting an improvement even in the summer when gates are kept open in the winter
- In summary, Pond A8 is productive, and the opening of the gates at A8 all year improved the salinity and DO conditions in the Pond and the adjacent slough.

Water Quality–Regulatory Objectives Score: Yellow

Water Quality–Algal composition and abundance

- Targets–Nuisance and invasive species of algae are not released from the Project Area to the Bay; Algal blooms do not cause low DO within managed ponds
- Triggers–Nuisance macrophytes are observed; Harmful exotic species of phytoplankton are characterized in Bay

- Senn presentation
  - Make sure we don't cause algal blooms
  - Water Quality Standards from the RWQCB may not reflect the larger role of nutrients in the South Bay creating unfavorable water quality conditions throughout the area. The SFEI/USGS study may provide more insight into what is happening and what are feasible standards to achieve in this area.
  - Lots of variability spatially and temporally in water quality measures of DO, algal composition, salinity, etc.
  - Complex effects of DO, nutrients and algal blooms interacting in shallow habitats in South Bay, including the managed ponds. More work is needed to understand spatial variability within ponds, especially for biogeochemical rates: primary productivity, (de)nitrification, etc. Still need to understand how ponds could be managed to optimize for water quality, while still meeting bird habitat goals.

Water Quality–Algae Score: Orange

Can restoration actions be configured to maximize benefits to non-avian species both onsite and in adjacent waterways?

To what extent will increased tidal habitats increase survival, growth and reproduction of native species, especially fish and harbor seals?

Steelhead

- Targets–Enhance numbers of salmonids and juvenile in rearing and foraging habitats relative to NEPA/CEQA baseline numbers
- Triggers–Reduction in number of upstream-migrating salmonids

Steelhead Score Offline, questions will get answered by another group

Estuarine fish

- Targets–Enhance numbers of native adult and juvenile fish in foraging and rearing habitats relative to NEPA/CEQA baseline numbers

- Triggers
  - Detection of a fish die-off – they occur every year, but are monitored poorly
  - Absence of detections of surfperch using restored tidal marsh
  - Increase in percent of individuals sampled in restored marshes that are non-native
  - Detectable reduction in water quality (as determined by monitoring described under "Water Quality" Key Category)
  - Deviation from expected trajectory of native fish use of restored marshes and associated unvegetated shallow water areas

- Hobbs presentation
  - Detection of die-off
    - Chinook salmon in A16 (only in 2014)
    - Striped bass in Pond A8 In summer of 2014 and 2015
  - Tidal, restored former ponds support more diverse, native community than sloughs
  - More natives in restored ponds than in managed ponds
    - A19/ A21: 90% native species (tidal ponds newly restored)
    - A16: 16% native (managed pond)
  - Increase in silverside (non-native)
    - Comprise 1/3 of terns diet
  - Longfin smelt (State listed species)
    - In Alviso marsh, not clear if they are just overwintering feeding area or if the area is a source/sink
  - Water quality between ponds and sloughs is different, managed ponds are subject to diel cyclic hypoxia–with low DO periods during nighttime/early morning. Fish could be moving away from Alviso area into open bay as summer conditions result in decrease oxygen.

Estuarine Fish Score: Lime-Green; should we separate score into managed ponds vs. tidal areas?

Harbor Seals

- Targets–Maintain or enhance numbers of harbor seals using the South Bay
- Triggers–
  - Decline in overall South Bay numbers and pup production, if known, at haul-out sites below 2006 baseline levels for 2 consecutive years
  - Reduction in frequency of use and pup production, if known, of Mowry Slough and adjacent haul-out/pupping areas

- Strong presentation
  - Newark and Mowry slough have large haul out sites for which we have counts
  - Lots of fluctuation over the past 10 years
  - Compared to 2006, doing OK
    - Don't know if weekly sampling is necessary, or enough

Harbor Seal Score: Lime-Green

Fish and Water Discussion and Phase 2 Studies

- Uncertainty about mechanisms/cause of water quality impairment–is poor water quality coming in with the flood tide into the ponds, or is poor water quality exiting the ponds into the bay on the ebb tide. An issue for the entire South Bay.

Action Item–

- *Since we ran out of time to discuss needed Phase 2 studies; Water Quality Working Group to discuss and make suggestions. Specifically look at SBSP impact on receiving water compared to water that is entering SBSP ponds*
- *Continue discussions on SFEI/USGS research on nutrients in South Bay*
- *Consider revising harbor seal targets/triggers and sampling/data collection*
- *Clarify estuarine fish targets/triggers–now it is defined as marsh habitat, but consider whether there could be managed pond targets/triggers.*

Public Access Session–Cheryl Strong, Chair
Presentations: Trulio, Sokale
Will trails and other public access features / activities have significant negative effects on wildlife species?

Visitor experience

- Targets–High quality visitor experience is maintained and facilities are not degraded by over usage
- Triggers–
  - Survey results show dissatisfaction
  - Overcrowding at staging areas
  - Conflicts between users (recorded incidences)
  - Maintenance costs exceed budget
- Trulio/Sokale presentation
  - Visitor experience is not degraded by usage
  - Visitors are overall happy
  - Surveyed what visitors wanted
    - More connectivity to trails around the area
    - Comfort features (bathrooms)
    - Drinking fountains
    - Better maintenance
      - Lack of maintenance an issue if location is not near well used municipality
    - More maps/trail names
    - Consider maintenance agreements with municipalities; locate trails where people live and work.

Visitor experience Score: Lime-Green

- Discussion/Suggestions for Phase 2 studies
  - Social carrying capacity study; study ethnic groups use

Species impact of public access

- Targets–Public use does not prevent reaching restoration targets as measured by significant impacts to target species
- Triggers–
  - For species or guilds without specific population targets: statistically significant abundance, species richness or behavioral changes compared to control sites
  - For species with population targets: reduction in abundance or density of breeding and/or non-breeding animals due to public access
- Trulio/Sokale presentation
  - Compared bird use between areas with and without trails

- Shorebirds
    - Not bothered by existing trails
    - Opening new trail has effects
        - 30-50 m buffer to avoid impact
- Wintering ducks
    - Fewer after trail walkers stopped by; scaup and ruddy ducks most affected
        - 100 m buffer to avoid impacts
- Plovers
    - Best to avoid public access in plover nesting areas
    - The longer walkers stayed in are, the longer birds stayed off of next
    - 150 m buffer to avoid impacts

Species impact from public access Score: Lime Green

- *Action Item:*
    - *Pond Management Working Group discuss and make suggestions for public access studies in phase 2–Include Lynne Trulio and Laura Choledenko at those meetings.*
- Discussion/Suggestions for Phase 2 studies
    - Study responses of tidal marsh species; where displaced populations are going
    - Study boat launch impacts on species
    - Have further discussion for Phase 2 studies with the Pond Management Working Group.

Closing Statements and Next Steps–John Bourgeois, Laura Valoppi and Yiwei Wang

- *Action Item–re-evaluate metrics used in the AMP for targets and triggers; consider making management triggers based on trends, not triggers.*
- Need backup for data, data repository
    - USGS has multiple options
    - Data sharing/archival group
    - Ensure data is not lost
    - Can be very expensive
        - USFWS-I&M opportunity–already has money put toward this system
    - Raw data has not been given to project
- *Action Item: Setup a Database Working Group (USFWS/I and M, SFBBO, Laura) to solicit comments and make recommendations*
- Funding issues
    - Prop 1 doesn't fund monitoring; Clean Safe Water program = funds

Summary of Phase 2 Study Ideas

Sediment Dynamics

Current Vegetative Marsh

- Repeat Fulfrost study–vegetation mapping (HEMP) using satellite imagery to track change in vegetation since 2009-2011 baseline
- Connect with NASA about doing drone/satellite data gathering
- Satellite data–resolution is an issue–other options for collecting images include:–vessel-mounted LiDAR; structure in motion to obtain DEM's. Plane/drone to get targeted species or higher resolution of areas such as Alviso Slough.
- Karen Thorne at USGS is doing related to collect data for sea level rise model.
- Lowered elevation of invasive Spartina may be detected

Accretion for New Marsh

- AMP: need to build in long-term drought into thinking? (Sediment/drought relation hypothesis)
- We don't have accretion data on Eden Landing and Ravenswood
- When a larger acreage is breached–will it still support accretion?

Mudflats

- Quality of mudflat needs to be understood, and how that changes with restoration actions
- Biology–benthic invertebrates, etc.
- Kristen's work on mapping mudflat habitat is good–could expand to 3-D lidar modeling
- Should AMP be updated to capture quality of mudflat? Need baseline first–gather/utilize existing possible baselines
- Lidar convex/concave analysis can be useful for determining erosion/accretion
- Continue to track sediment through Dumbarton Bridge

Mercury

Within Ponds

Discussion

- AMP target could be revised–during construction versus post, specific time frame (1-3 years after construction Hg should return to baseline levels)
- Terns forage more widely than avocets or stilts
- Eggs: mercury comes through maternal transfer about two weeks before eggs are laid

Possible Studies

- Considered splitting score into three categories:
  - Short-term, mid-term, long-term, Within 1–3 years after construction, should return to baseline levels
- Considered splitting score into bird, fish, water categories; terns forage more widely than avocets or stilts; Hg comes through maternal transfer about 2 weeks before eggs are laid.
- Regional monitoring approach in restored areas and managed ponds–monitor MeHg in birds and fish over a larger area and look for regional trends.
- Look for drivers of MeHg–salinity, turbidity, etc. in managed ponds and evaluate pond management practices to reduce MeHg in biota.
- Should do flyover/satellite imagery of "on the ground" data in restored ponds–once per year at least. See recent paper on this technique deployed in the Delta.

- Should sample fish inside Pond A8, but consider changing species collected.
- Statistical analysis for relationship between water, fish, bird MeHg
- Study the effects of MeHg on terns, stilts, black skimmers, snowy plovers–i.e., birds with elevated Hg levels.

In Sloughs/Marshes

- We don't know how Pond A8 data will translate when other ponds are breached, could study other area after breaching to assess impact on adjacent sloughs
- We don't know where mercury is ending up that is remobilized in Alviso Slough
    - Hg likely going into A8 from Alviso Slough–could do a Hg flux study at the A8 notch to determine
    - Need full bathymetric survey within A8 to evaluate sediment accumulation
- Potential to study MeHg using hyperspectral imagery over a larger area as was done recently in the Delta
- Could analyze Salt Marsh Harvest Mouse hair collection (archived) to understand baseline mercury data–also connects with marsh topics
- Could collect rail prey items in Pond A21 to assess Hg risk
- Maybe also marsh wrens or song sparrows
- Bat samples could also be used for assessing mercury accumulation

Marsh, Rail & Mice

Marsh Established

- Continue coordination with Invasive Spartina Project
- Look at other areas beside Islands Ponds for marsh development/species presence
    - Assess quality of marsh that is developing in newly restored areas, using analog marshes are reference areas.
- Assess mouse hair Hg levels in young versus older marshes (see also Hg studies).
- Monitor/evaluate the ecotone revegetation, quality
- Aerial mapping for vegetative cover (see Fulfrost/HEMP study repeat)
- Track best practices for marsh restoration from ISP, STB, SFBBO revegetation, marsh mounds, etc. to implement in Phase 2

Birds

- Need to know where birds are/what areas are being utilized. What effects are restoration-related?
- Pond bathymetry at Cargill ponds is lacking–data needed to do a full analysis of pond depth effects on Cargill bird abundances.
- Refine pond management to optimize bird numbers in small areas using De La Cruz analysis
- Assess bird survey protocols for efficiencies
- What is the best management for diving ducks in restoration areas? How to increase carrying capacity/food resources?
- Restoring ruddy duck ponds–look at effect on displacement/decreased abundance after tidal restoration actions
- Understand requirements for roosting capacity of shorebirds (losing this habitat with restorations)
- Breeding bird population surveys are needed to get a real estimate of bird nesting in South Bay. Current data shows population decline for avocets, maybe stilts.
- Redo PRBO 2000 south-bay wide survey for breeding avocets and stilts

- Understand tern/gull proximity by further study of egg and chick predation by gulls after landscape changes and landfill hazing actions.
- GPS study of relocated waterbird and gull movements from restoration actions. Especially for A16 islands, which are between the landfill and new gull colony (A9/10/11/14 levee)
- Gulls: Local production or immigration? Need gull nest and chick survival study to assess which–important for assessing management options.
- Gull diet study–percentage of diet to sources such as landfills. Gulls may shift diet to predation during full breeding, which would increase depredation on other breeding birds
- Susan de la Cruz's data–pull out resident vs. migrants abundances to estimate breeding shorebird abundances (AMAV, BNST).
- How to maximize islands for terns, avocets, stilts
- Nest monitoring studies are critical for evaluating productivity trigger/targets in AMP
- Social attraction actions/studies for terns/avocets are critical, especially since they are not yet using the constructed islands for nesting.
- No need to consider nesting islands for plover habitat–can revise AMP
- AMP: look at alternative methods for estimating plover fledge success and species recovery metrics–harmonic metric for plovers instead of current target/trigger?
- Investigate long term effects of oyster shell enhancement on plover breeding success; also test alternatives substrates
- Study plover–predator pressures; increase nest cameras deployed; direct versus potential pressures; individual predator or population pressure; ID predator species of concern
- Consider use of VHS or GPS to track brood movement and estimate fledging rates
- Consider use of Unmanned Aerial Vehicles (UAVs, drones)–negative impacts on species as well as potential for monitoring plovers, other birds
- Monitor breeding success in ponds adjacent to high quality foraging transitional mudflats, study impact of their transition to marsh
- Study higher nesting densities as nesting habitat declines with increased restoration; quantify a carrying capacity or density limit
- Understand plover movement/migration out of historical areas as a result of habitat restoration.

Fish & Water

- Uncertainty about mechanisms/cause of water quality impairment–is poor water quality coming in with the flood tide into the ponds, or is poor water quality exiting the ponds into the bay on the ebb tide. An issue for the entire South Bay.
- Follow-up with Water Quality Working Group as Lower South Bay Nutrient Study is completed to determine other needed studies.

Public Access

- Study responses of tidal marsh species; where displaced populations are going;
- Study boat launch impacts on species
- Social carrying capacity study; study ethnic groups use of public access areas
- Bring to Pond Management Working Group to address other studies needed.

Summary of Action Items

- Reconvene mudflat working group to consider quality, convex/concave of mudflats; also structure for motion/Lidar and time series/spatial distribution across bay
- Get 10-year SCVWD Lisa Porcella data for Pond A21 (JB)
- Get John Krause's Eden Landing accretion data
- Pond Working Group: reassess bird survey protocols; also assess changes to pond management to increase bird use using De La Cruz analysis
- Consider updating AMP approach to marsh establishment: target/triggers for invasive Spartina vs. vegetation establishment
- AMP: Consider revising rail target/triggers
- AMP: Have to revise mid-winter diving duck data and recalculate baseline; May need to change target for diving ducks(SBSP survey vs. Midwinter waterfowl data for S. Bay)
- AMP: consider revising ruddy duck target
- Some future restoration ponds are currently used in high numbers by ruddy ducks, so evaluate numbers before restoration actions for Phase 2
- For shorebirds, could separate stoplight score by separate seasons
- Susan De La Cruz to remove breeding stilts/avocets from abundance estimates in bird synthesis report
- Pond Management Working Group to re-evaluate target/triggers for snowy plovers–consider Yiwei's harmonic metric approach
- AMP: retire plover question–we know they don't use other habitats; focus AMP triggers/targets on habitat enhancement and acres needed to meet goals
- Pond Management Working Group to take New Chicago marsh bird abundances out of breeding bird data to get a better idea of bird use of islands
- AMP: Establish question, monitoring, management plan, target and triggers for CACU
- AMP: reevaluate target and triggers for eared grebe, Bonaparte's gull and phalarope
- For eared grebes, Bonaparte's gull and phalaropes–re-evaluate survey protocols, we need to know how these species are using the ponds.
- Pond Management Working Group look at survey protocols, ensuring we maintain comparability with prior data and reduce effort if possible
- Pond Management Working Group to use De La Cruz bird synthesis study to recommend pond management changes to increase bird use
- Water Quality Working Group: continue discussions on SFEI/USGS research on nutrients in South Bay; look at target/triggers–what is our impact versus water we receive?
- Assess harbor seal data strategy, and AMP target/triggers
- Clarify estuarine fish target/triggers–defined as marsh habitat; consider whether there are any pond target/triggers
- South Bay Salt Pond Restoration Project seek public access Phase 2 studies from researchers
- AMP: Reevaluate metrics across the board–targets and triggers–make decisions on trends; triggers not effective
- Setup Database Working Group (USFWS I and M; SFBBO, Laura) to solicit comments and make recommendations