Estuarine Restoration in San Francisco Bay: Design and Adaptive Management

Environmental Management of Enclosed Coastal Seas

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Overview

Sonoma Baylands Monitoring

Hamilton Wetlands Restoration Project Construction

Napa River Salt Marsh Restoration Design

South San Francisco Shoreline Study Planning

Many other non-Corps restoration projects in the SF Bay area
Northern San Francisco Bay
Southern San Francisco Bay
Sonoma Baylands Background

- Site diked for agriculture and subsided ~ 6 ft
- Goal: establish a tidal wetland
- 2.1 mcy of dredged material placed to 0.5 ft below marsh plain
- Levee breached in 1996
- Sponsor: California State Coastal Conservancy
- Partners: Sonoma Land Trust and Port of Oakland
Sonoma Baylands
Monitoring & Adaptive Management

• Physical: dredged material fill elevations, chemical constituents, channel morphology, tidal regime, peninsula crest elevations, tidal sedimentation, and water quality
• Biological: Vegetation, birds, fishes, endangered species, and benthic macroinvertebrates
• Monitoring (O&M funds & the local sponsor) will continue until success criteria are met
Sonoma Baylands  
Monitoring & Adaptive Management

• Monitoring Results
  – Establishment of tidal connection and vegetation slower than expected
  – Slow development on predicted trajectory
  – Planned management intervention to increase tidal connection not needed

• Status
  – Vegetation representative of SF Bay establishing (*Spartina foliosa*, *Salicornia virginica*)
Hamilton Wetlands Restoration Project

Background

- Site originally wetland/intertidal salt marsh
- Diked and drained mid- 19th century
- Converted to Army Air Base in 1932
- BRAC in 1980’s
- Project intent
  - “ecosystem restoration”
  - dredged material placement
    ≈ 630 ac of wetland
    ≈1000 ac total project
- Sponsor: California State Coastal Conservancy
Hamilton Wetlands Restoration Project

Goals

- Restoration goals developed by sponsor & stakeholders
  - Diverse array of wetlands and habitat types
  - Replace habitat/function of disused agricultural fields for shorebirds
  - Sustainability
    - Minimal site maintenance
    - Habitat independent of sea-level rise
  - Biodiversity, wildlife, TES
- Placement for dredged material
  - Beneficial use (LTMS)
Hamilton Wetlands Restoration Project

Goals

Three broad habitat types:

- Intertidal marsh and mudflat
- “Seasonal” wetland
- Upland

- Seasonal Wetland
- Tidal Wetland
- Wildlife Corridor
- Tidal Pan Berms
- Intertidal Berms
Hamilton Wetlands Restoration Project Status

- Dredged material placement complete (6 mcy)
- Tidal portion: Elevations raised to 4.5 ft (1.5 ft below marsh plain elevation) -- natural sedimentation will bring site grades to marsh plain elevation
- Seasonal wetland: Being dried and contoured
- Native plant nursery being built on site
- Levee to be breached in Fall 2012
- USACE will monitor for 13 years, then local sponsor assumes responsibility
Hamilton Wetlands Restoration Project
Adaptive Management

• Different approaches for each habitat type
  – Certainty of outcome
  – Availability of BMPs

• Uplands
  – Low levels of uncertainty associated with creating upland habitat
  – Existing tools for improving upland habitat quality are well developed and readily implemented
  – Monitoring emphasis on founder plantings and invasive plant control efforts
Hamilton Wetlands Restoration Project
Adaptive Management

• Tidal Wetlands
  – Available reference sites and restoration successes
  – Monitoring will compare results to reference sites
  – Specialized monitoring will be developed in response to any uncertainties as needed
  – Basic monitoring for
    • Basic coastal salt marsh function
    • Birds: winter use be similar to reference sites
    • Fish: ‘general suitability”
    • Endangered spp.: presence & extent habitat
    • Benthic inverts: “appropriate” colonization
Hamilton Wetlands Restoration Project
Adaptive Management

• **Seasonal Wetlands**
  – Original concept: unvegetated areas with ponds ranging from brackish to near freshwater
  – Do not exist in nature
  – High levels of uncertainty
    • Engineering underpinnings may not work
    • Invasive spp.
    • Predators
    • Response to sea level rise
    • Reference sites rare, poorly understood
    • Restoration successes very limited
  – Science-driven approach -- testing hypotheses in the monitoring plan
Hamilton Wetland Restoration Project
What’s Next?

• Bel Marin Keys (adjacent) 1600 acres
• Restoration plan is under development.
• Funding issues
  – particularly long-distance transportation of dredged material
  - Aquatic Transfer Facility vs. unloader & scow
  - WRDA changes cost sharing ratio
Napa River Salt Marsh Restoration

Background

- Site diked (9,500ac), used for agriculture, and later salt ponds (7,200 ac)
- Current problems include water quality and deterioration of levees
- Goals
  - Restore habitat for terrestrial and aquatic species of concern
  - Manage ponds for resident and migratory shorebirds & waterfowl
  - Improve water quality
Napa River Salt Marsh Restoration
Monitoring and Adaptive Management

• Monitoring: water quality, sedimentation, THg and MeHg, pelagic and benthic inverts, algal productivity, plants, and fishes

• Adaptive management: Possible conversion of ponds to tidal marsh
Napa River Salt Marsh Restoration Status

• In cooperation with related efforts (Cal DFG)
  – Restored 7 southern ponds in 1995 - 2006

• USACE
  – Final design stage - preparing construction plans for northern ponds
  – Levee maintenance, salinity reduction, replacement of water intake structures, habitat restoration
South San Francisco Shoreline Study

Background

- Examining restoration and Flood Risk Management opportunities
- Coordinating with “South Bay Salt Pond Restoration Project”
- Sponsor: California Coastal Conservancy
- 25 sq mi dominated by former salt ponds
- Goal: 15,100 acres of various kinds of coastal wetland habitats (total study area = 25 sq mi)
- Largest wetland restoration project on the west coast of the U.S.
South San Francisco Shoreline Study Opportunities

• Planning centered around establishing geomorphic features not being created by natural processes (e.g., high marsh and upland)
  – Strategy for breaching levees (e.g., where, number?)
  – Lowering outboard levees (where, how far?)
  – Creating marsh, transitional, and upland habitats (proportions, dredged material use?)
## South San Francisco Shoreline Study

### Summary of Options

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- ○ Least
- ● Moderate
- Most
South San Francisco Shoreline Study

Status

• Feasibility phase
• Funding uncertainties
• Sponsors: California Coastal Conservancy, Santa Clara Valley Water District
• Partners: US Fish and Wildlife, California Department of Fish and Game
Conclusion & Reflections

• Subsided land suggests dredged material placement – USACE involvement
• Protracted monitoring for HWRP & Sonoma Baylands
• Many potential restoration sites, scenarios, in SF Bay Estuary
  – USACE involved with large projects, majority of area
• Sea level rise presents a challenge – limited areas for wetlands to move up