Estuarine Restoration in San Francisco Bay: Design and Adaptive Management

National Conference On Ecosystem Restoration

Baltimore, Maryland

August 5, 2011

Eric Jolliffe, Bill Brostoff, and Fari Tabatabai

Presented by Pete LaCivita

U. S. Army Corps of Engineers

San Francisco District

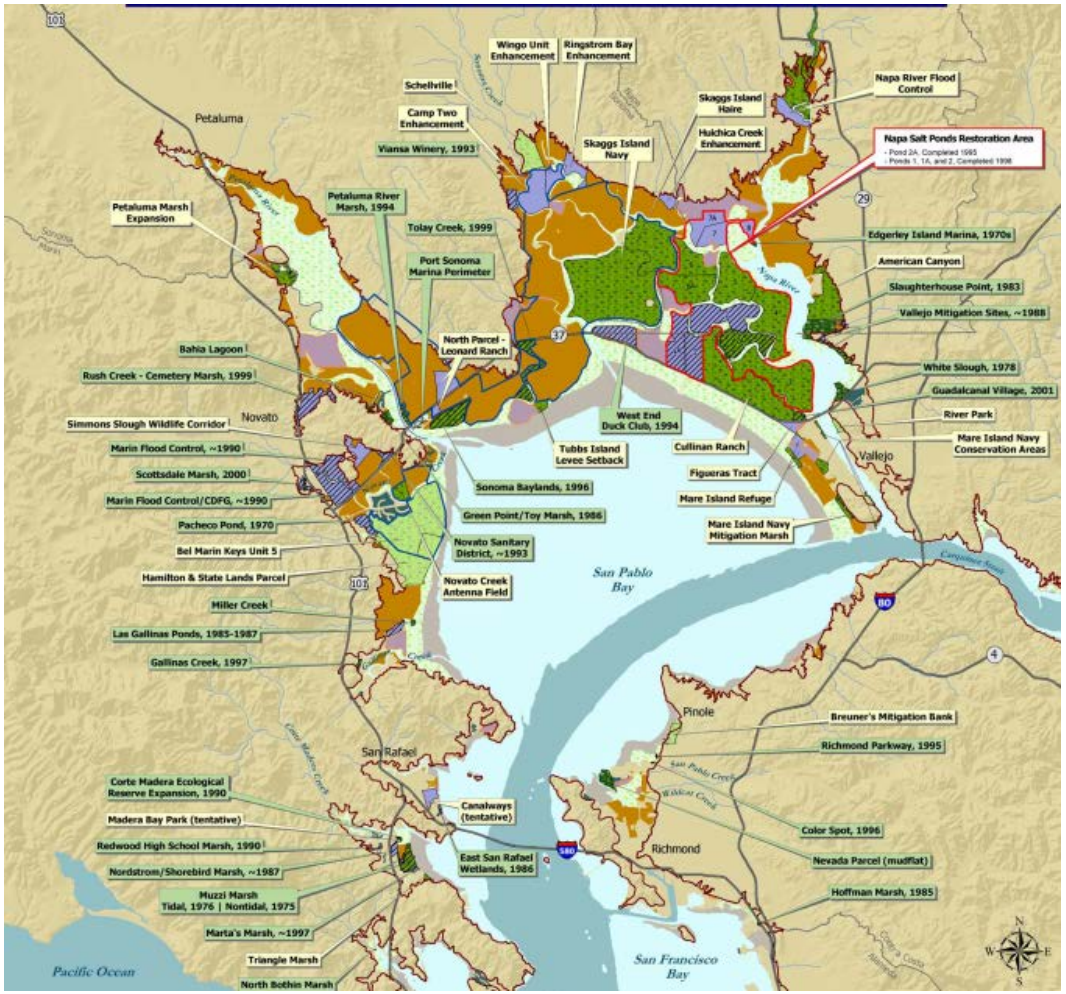
US Army Corps of Engineers ®
San Francisco District

Overview

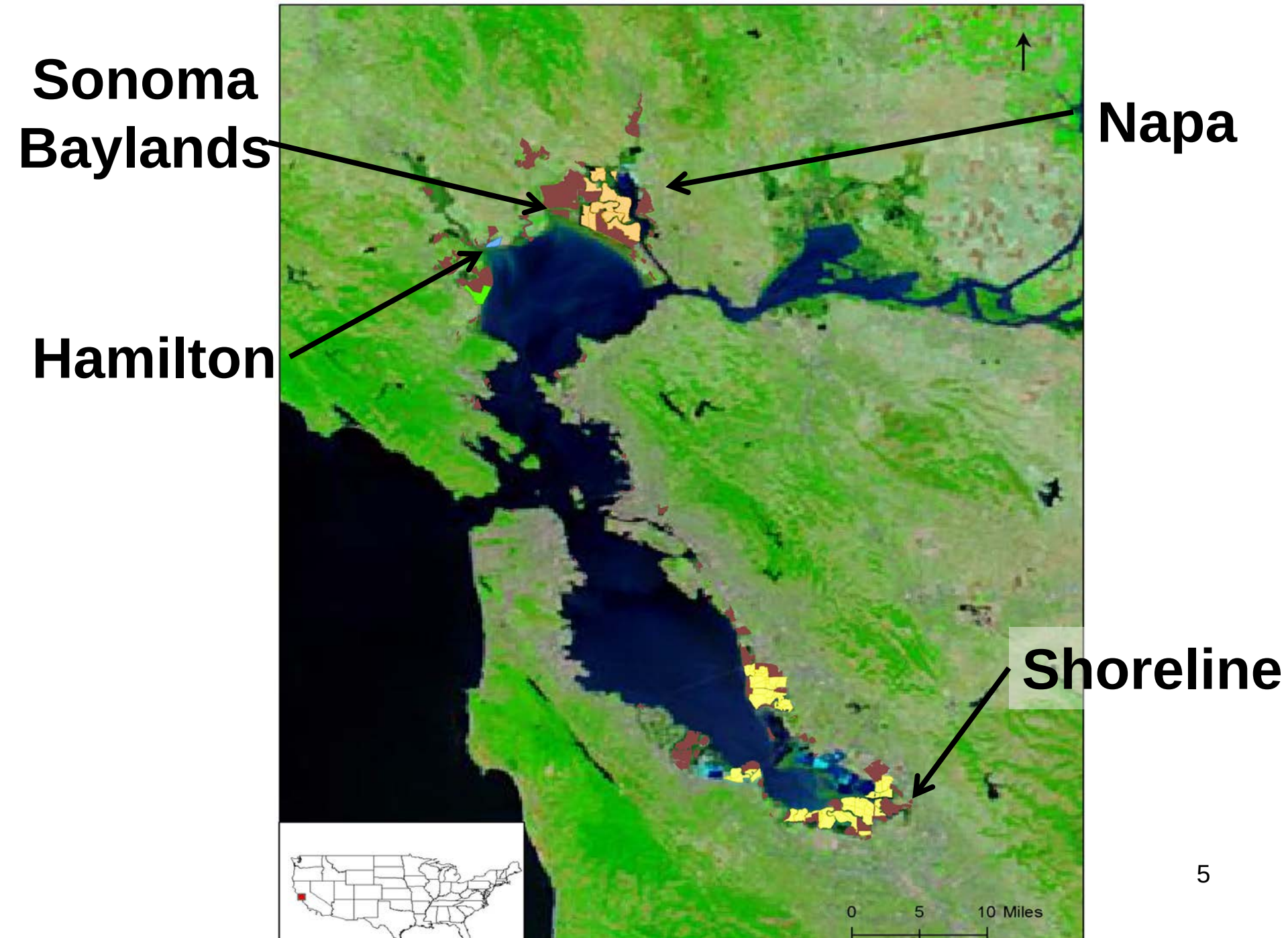
Sonoma Baylands	Monitoring
Hamilton Wetlands Restoration Project	Construction
Napa River Salt Marsh Restoration	Design
South San Francisco Shoreline Study	Planning

Many other non-Corps restoration projects in the SF Bay area

Northern San Francisco Bay

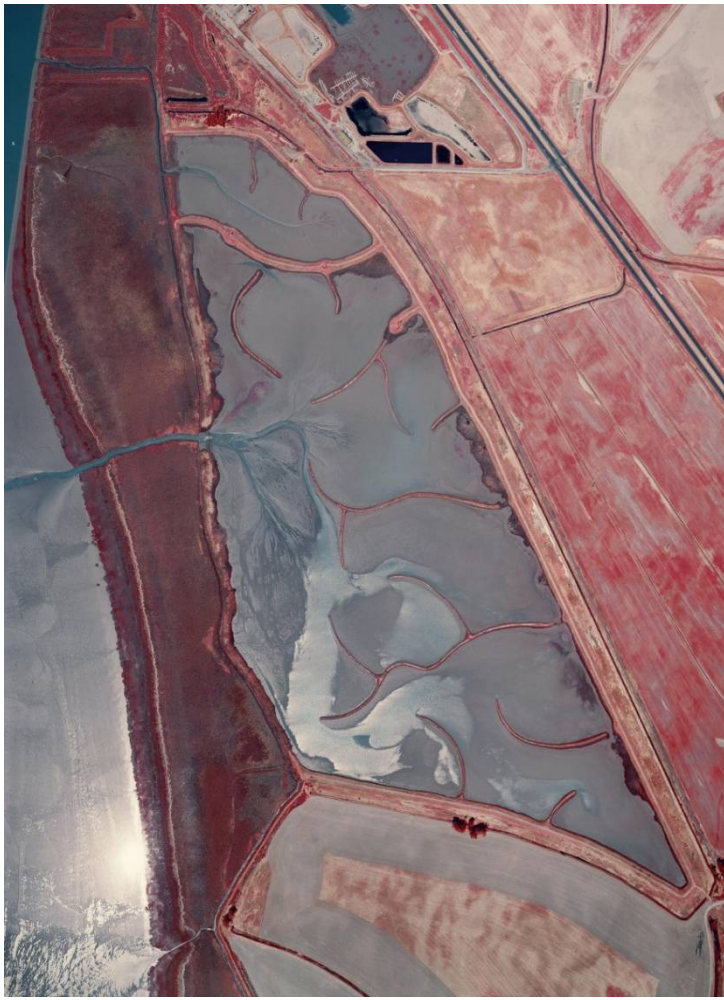


Southern San Francisco Bay


Sonoma Baylands
Napa
Hamilton
Shoreline
0
5
10 Miles

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

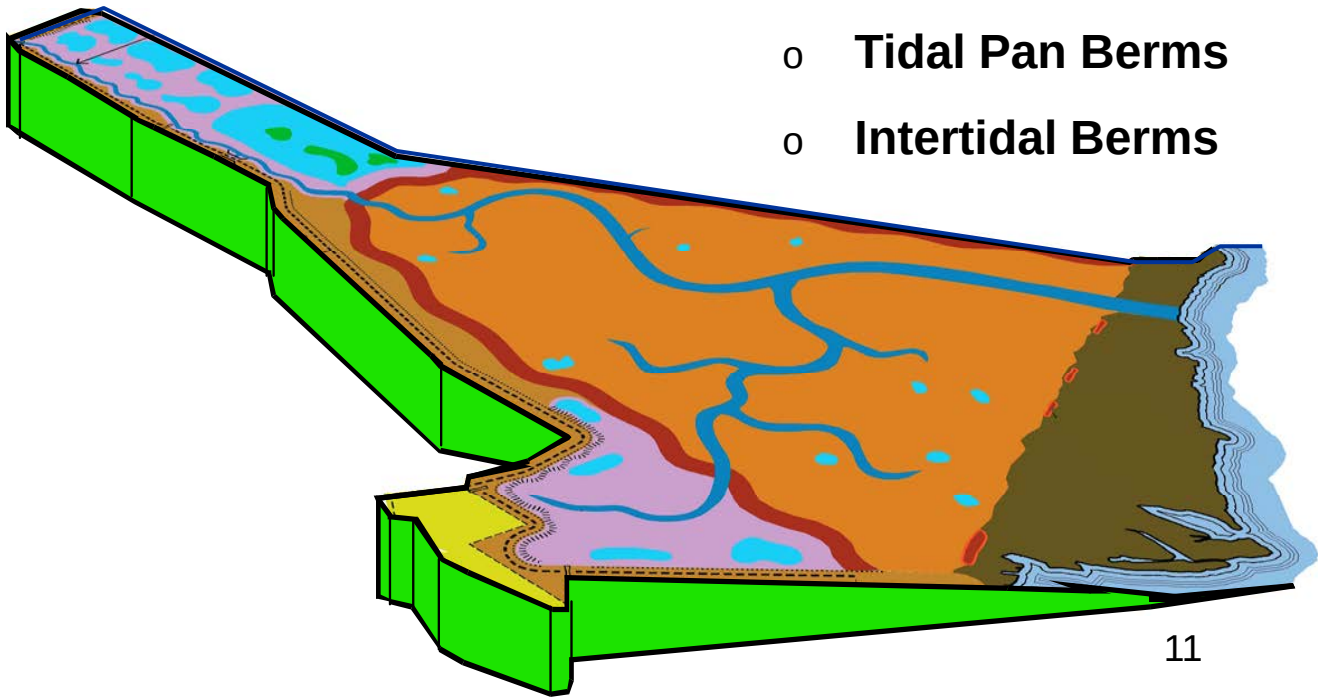
  - Benificial use (LTMS)

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

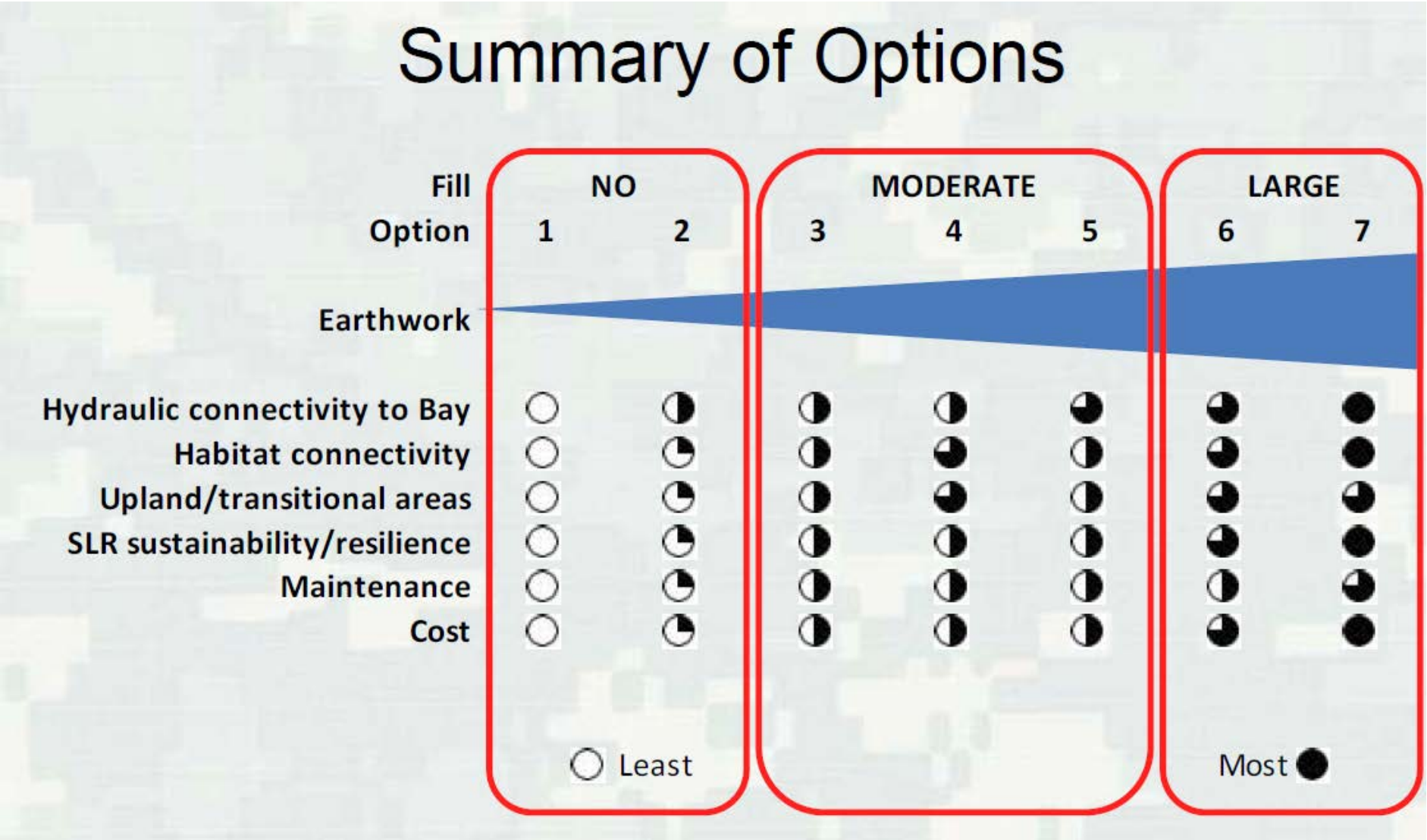
South San Francisco Shoreline Study Background

- 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



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