Evaluation of Tidal Hydraulics and Geomorphic Change under different Restoration Alternatives (progress report)

Joint Science Panel and Strategic Planning Team Meeting

June 14, 2007
Work Completed or Underway

• Literature review of observed marsh loss elsewhere and management responses

• Description of restoration actions for consideration at Elkhorn Slough

• Construction of a hydrodynamic model, which will be used in the evaluation of alternatives
Literature Review

Final version (Feb 12, 2007) included:

- Summary of observed changes at Elkhorn Slough and plausible causes

- Case studies of marsh loss and management actions elsewhere

- Review of tools used to assess channel scour & inlet stability
Case Studies

Louisiana (historic dieback and ‘brown marsh’)
Jamaica Bay, NY
U.K marshes in southeast England

Each case study covers:
• Description of Site and Observations
• Causes of Wetland Loss
• Management Actions
Highlights of Case Studies

Numerous projects have tested a variety of approaches at restoring coastal marshes, including:

- Manage marsh hydrology
- Placement of dredge material
- Diversions and sediment delivery (LA)
- Spray dredging (Jamaica Bay)
Case Study: Louisiana

Lack of sediment input has lowered marsh elevations and increased stress from tidal flooding and salinity.
Case Study: Louisiana

The Small Sediment Diversion Project was designed to mimic natural crevasses and associated marsh-building processes.
Case Study: Jamaica Bay

Reductions in sediment supply, altered hydraulics, and/or decadal variations in sea level rise are hypothesized to have contributed to marsh loss.

Elders Point, 1974 (97 acres)

Elders Point, 1999 (21 acres)
Case Study: Jamaica Bay

A 1-acre pilot project at Big Egg Marsh consisted of spraying a thin layer of locally-borrowed sediment on the marsh.

First growing season after spraying

Spraying locally borrowed material on Big Egg Island
Case Studies: Key Conclusions

Restoration efforts have had mixed results.

- Sediment placement has achieved short-term success, but it’s often difficult to achieve target elevations.
- Managed marsh hydrology often diminishes sediment accumulation.
- Long-term sustainability requires addressing sediment budget.
Restoration Alternatives

Compare effectiveness of ‘action’ alternatives at reducing habitat erosion and marsh loss.

Alternative 1: No Action
Alternative 2: New Ocean Inlet
Alternative 3: Highway 1 ‘sill’
Alternative 4: Parsons Slough Marsh Restoration
Alternative 2

- Excavate 1575 foot channel

Alternative 4

Legend:
- Sediment Fill
- Water Control Structure

Legend:
- Excavated channel
- New highway alignment
- Highway 1 Center
- Excavated oyster inlet

excavate 4156 foot channel and connect through Bennett Slough
Hydrodynamic Modeling

• Model Construction
  – Build model grid
  – Incorporate bathymetry (sonar + LiDAR)
  – Select boundary conditions (tides at Monterey Bay)

• Calibration & Validation
  – Water levels and velocity (Stanford and LOBO)
  – Compare bottom bed shear stress (one station only)

• Scenario modeling (ongoing)
Key Model characteristics

- Extends into Monterey Bay (open boundary)
- Includes muted tidal areas
- 10-m nominal grid space
Model Calibration / Validation

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Output for Scenario Modeling

Process Primary output

• elevation-inundation characteristics
• percent exceedance curves
• tidal prism
• tidal asymmetry
  – ratio of peak values
  – duration of tides
Next Steps

Continue ‘year 0’ runs

Assess inlet stability (Alt 2 only)

Project future morphology

Develop 10%-level drawings for most promising alternatives
END