Engineering With Nature
Project Fact Sheet

San Francisco Bay Wetland Restoration Evaluation

Internal berms for decreasing wave energy in San Francisco Bay restoration: are circular or linear berms more effective?

Background

Restoration of degraded, damaged or destroyed salt marsh and mudflat ecosystems is critical to the resilience of functioning estuaries and coastal communities, but formerly diked restoration sites are often subsided to the point that they won't support marsh species without the import or accretion of sediments to raise the marsh plain. Wetland restoration projects often lack monitoring and evaluation of design approaches, and thus best practices are not documented and communicated. San Francisco Bay wetland restoration projects often use internal berms to increase sediment accretion and decrease wind-wave erosion in developing intertidal marshes. Two divergent approaches are currently used. One approach, in use at the Hamilton Wetlands Restoration Project, employs long, linear berms; the other, used at Sears Point, utilizes an array of round to oblong berm-like mounds. Each approach has adherents and theoretical basis, but few data are available to evaluate and analyze outcomes and establish best practices. The San Francisco District has voiced this is an area of need for their projects, especially as beneficial use of dredged material becomes a larger aspect of the regional sediment management plans (Figure 1).

Figure 1: Placement of dredged material for beneficial use at Hamilton site

Objectives

This Engineering With Nature project will test the efficacy of linear versus round berms for decreasing fetch across a restoration site, thereby promoting accretion. The results will be used to develop guidelines and best practices in the design of berms intended to speed accretion and habitat development in bay restoration projects.

Approach

The approach is four fold: literature review, field data collection, modeling, and scenario testing. A review of similar projects will be performed to aggregate existing information on berm performance and inform the data collection design. Construction of each project is paid under separate funds. Thus, the precise design and timing of the restoration, as well as monitoring associated with this study, will be opportunistic. Bathymetry, topography, and supplementary data (e.g., aerials, winds, wave height, wave energy, currents, temperature, etc.) will be collected. Wave energy in the Hamilton site will be evaluated using the phase-averaged, spectral wave model STWAVE, based on as-built bathymetry and validated with field data. Numerous scenarios will be addressed, including a no-berm "control" and mounds based on LiDAR data from Sears Point, mid construction (Figure 2). The different approaches will be evaluated in the model to assess wave energy reduction associated with linear berms versus mounds, and habitat complexity based on elevational ranges and interspersion. Extension of the project would allow similar modeling for Sears Point, and direct comparison of habitat and channel morphology once that site has also become open to tidal flooding.

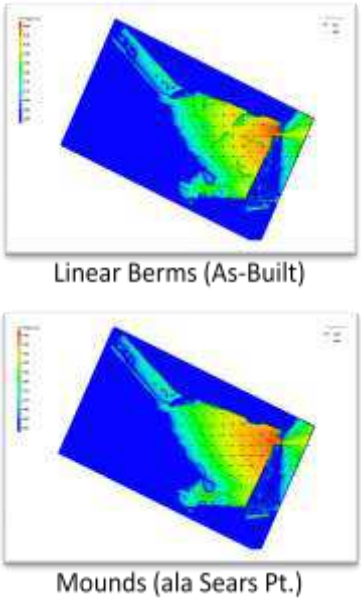

Figure 2: Preliminary wave energy modeling for linear berms and mounds scenarios within the Hamilton Wetlands wave model.

Outcomes

We will write a tech note or tech report and other publications as appropriate detailing the effectiveness of the two berm types for and any tradeoffs between them. We will tie any differences to potential benefits, and make any recommendations consequent recommendations regarding best practices for salt marsh and mudflat restoration using berms to affect geomorphic processes.

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