Mercury in Motion: Using Bathymetric Surveys to Estimate Mercury Mobilization from Scour of Alviso Slough

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South Bay Salt Pond Restoration Project — Restoring the Wild Heart of the South Bay

Coastal Conservancy

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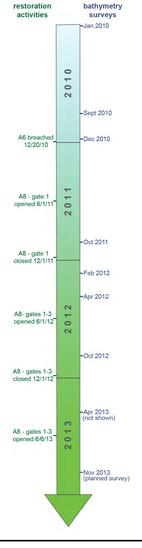
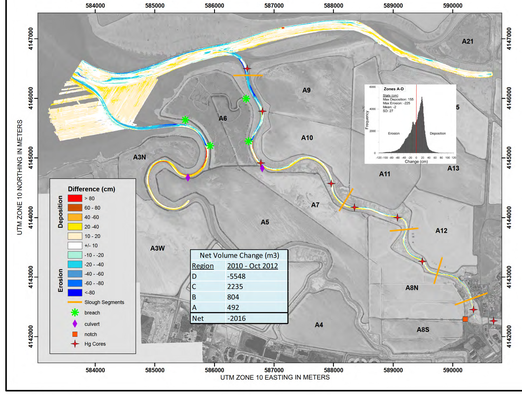
Introduction

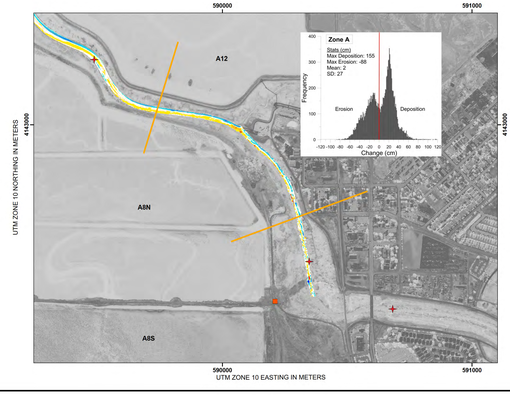
A large concern for restoration of the salt ponds bordering Alviso Slough is mercury (Hg) mobilization from buried sediment, a legacy of the New Almaden Quicksilver mines (established in 1847), which ceased operation in 1976. The levee breach of Pond A6 and the opening of adjustable Notch gates at Pond A8 have caused sediment scour in Alviso Slough. The combination of erosion and Hg data allows calculation of the volume of Hg remobilization. We calculated the volume of eroded sediment by differencing a 2012 interferometric swath bathymetric survey taken after breaching and gate opening with one taken in 2010 before breaching or opening. This data was coupled with 200 cm deep sediment core data collected during 2006 and 2012 that was subsampled for total Hg.



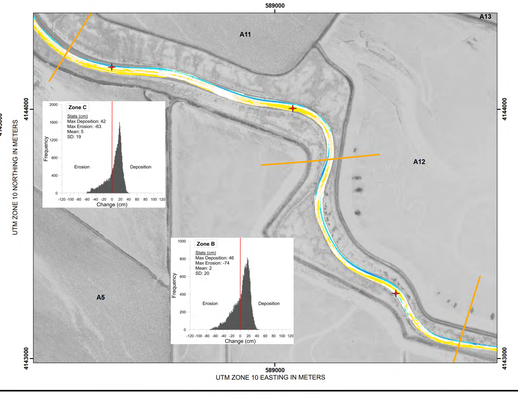
Bathymetric Change 2010 - October 2012



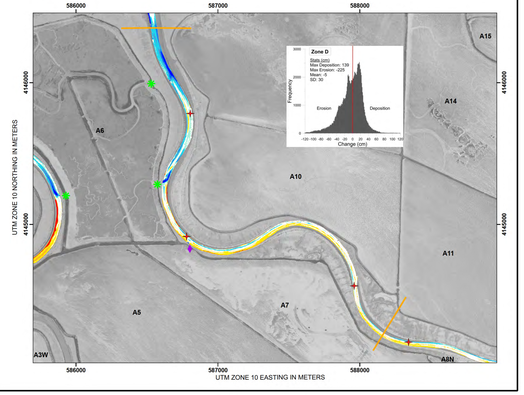
Zone A



Zones B and C



Zone D



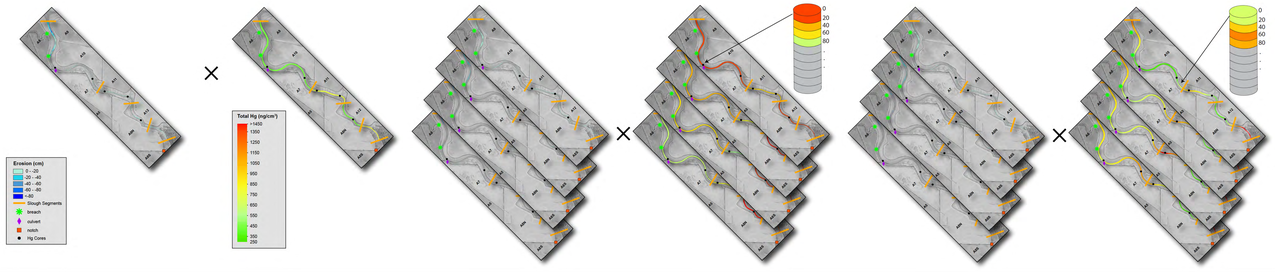
Methods

This study used three different methods to estimate the total Hg mobilized by the scour. Method A assigned a zone - and depth-averaged Hg value to each of the four zones along the length of the slough and multiplied those by the observed volume of erosion in each zone. Method B used zone averaged Hg values for each 20 cm sediment depth interval and multiplied this concentration by the corresponding observed volume of erosion for each 20 cm interval. Method C used interpolated values of Hg along the length of the slough for each 20 cm depth interval and multiplied each interval by its corresponding observed volume of erosion.

Approach 1
Observed volume of erosion X depth averaged THg per zone

Approach 2
Observed volume of erosion X THg for each 20 cm depth increment, per zone

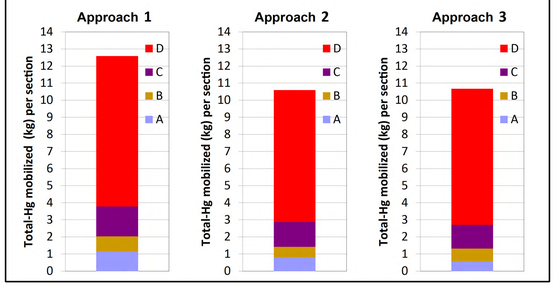
Approach 3
Observed volume of erosion X THg for each 20 cm depth increment interpolated along slough



Results

Calculated Mobilization of Total Mercury (kg)

	Approach 1	Approach 2	Approach 3
Bathy Change Dec 2010 - Oct 2012	**12.6**	**10.6**	**10.7**



References

Foxgrover, A.C., Finlayson, D.P., Jaffe, B.E., and Fregoso, T.A., 2011, Bathymetry and Digital Elevation Models of Coyote Creek and Alviso Slough, South San Francisco Bay, California (Ver 2, August X, 2013): U.S. Geological Survey Open-File Report 2011-1315, 21 p., available at: http://pubs.usgs.gov/of/2011/1315

Marvin-DiPasquale, M., Cox, M.H., 2007, Legacy Mercury in Alviso Slough, South San Francisco Bay, California: Concentration, Speciation and Mobility: Menlo Park, CA , U.S. Geological Survey, Open-File Report number 2007-1240, 98p