Bathymetric change within Alviso Slough as salt pond restoration progresses: 2010 - March 2017

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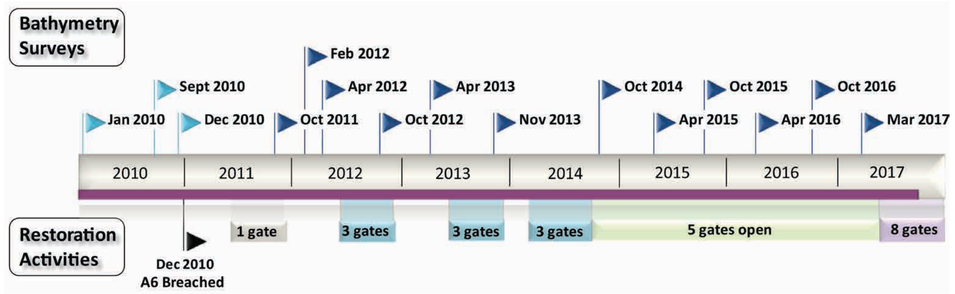
Introduction

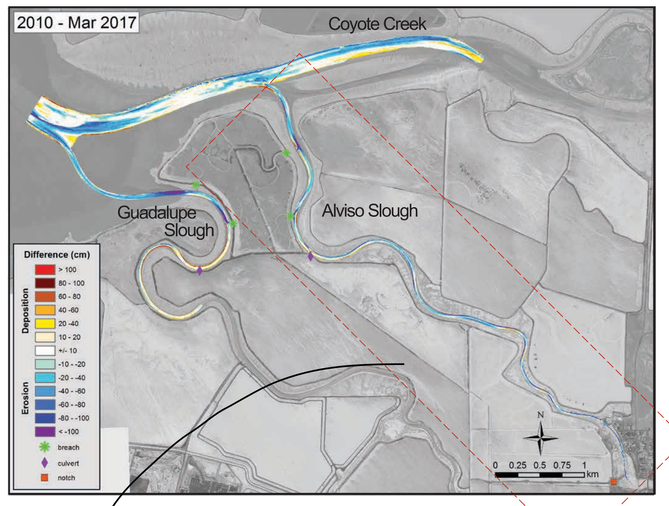
In 2010 the USGS collected bathymetry of the far South Bay in the vicinity of the Alviso pond complex to establish baseline bathymetry prior to the breaching of Pond A6 levees and opening of gates at Pond A8 (Foxgrover et al., 2011). Interferometric sidescan swath mapping was used to generate high resolution (1 m cell size) bathymetric grids of the far South Bay extending east of Calaveras Point and into Alviso and Guadalupe Sloughs. Between October 2011 and March 2017 an additional twelve surveys were conducted to monitor bathymetric change in this region as restoration progresses.




Collecting swath bathymetry in Alviso Slough


Alviso Slough at high tide

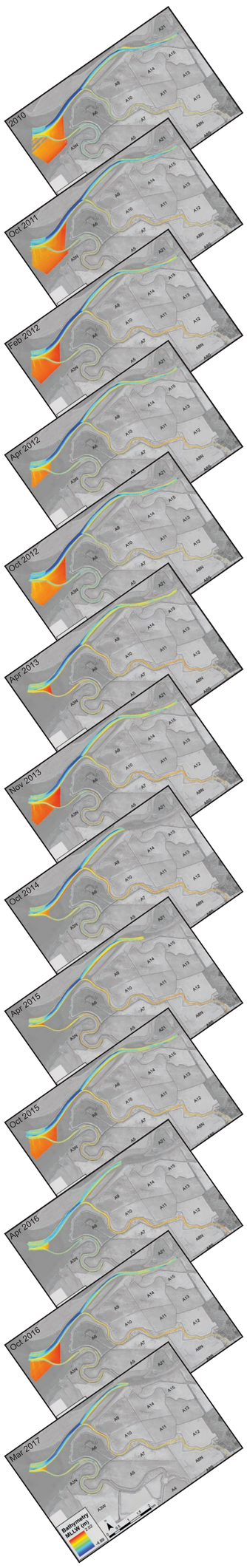
Bathymetric Change



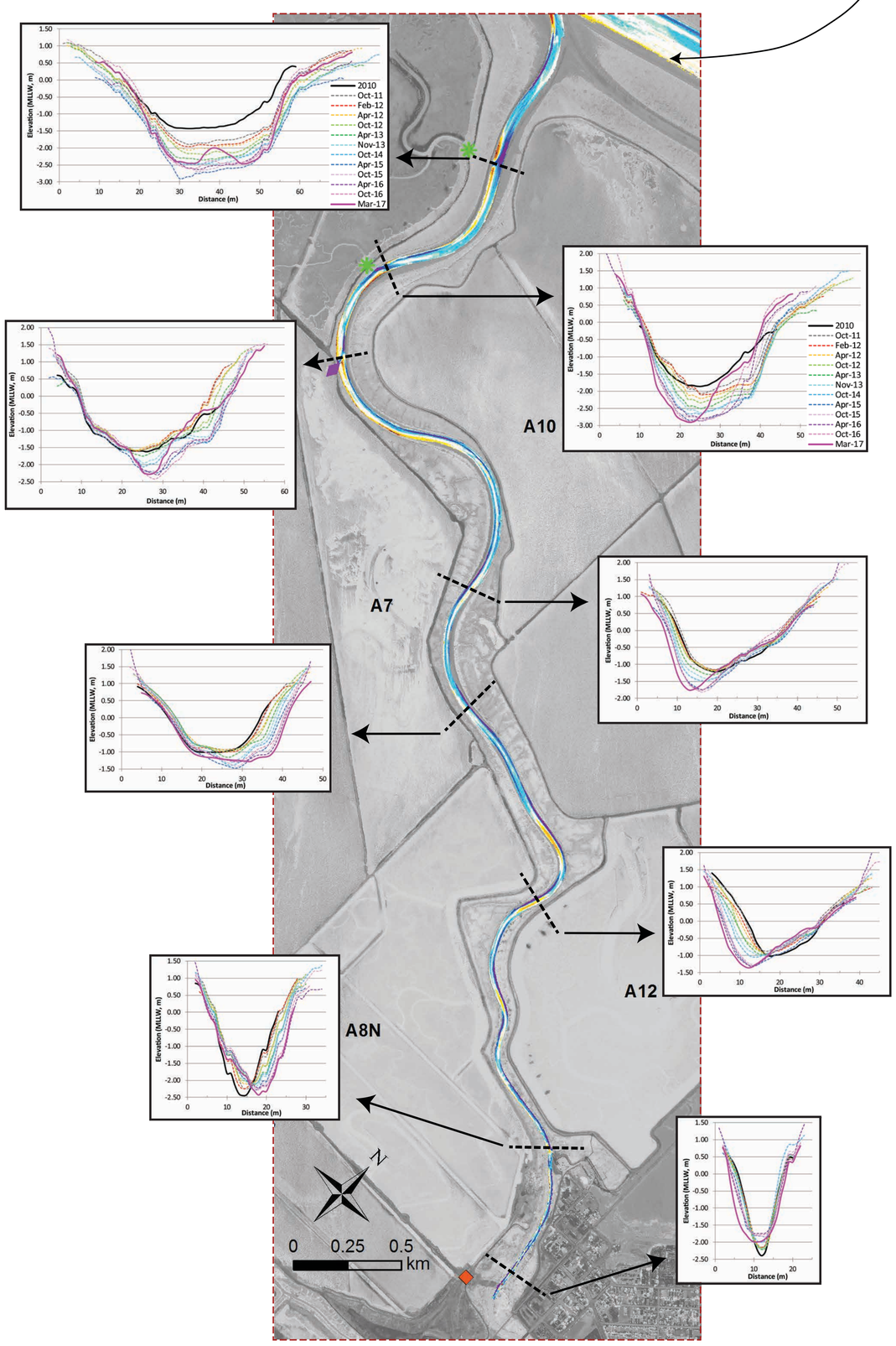

A6 breach at high tide


Flow-control structure at pond A8 (A8 notch)

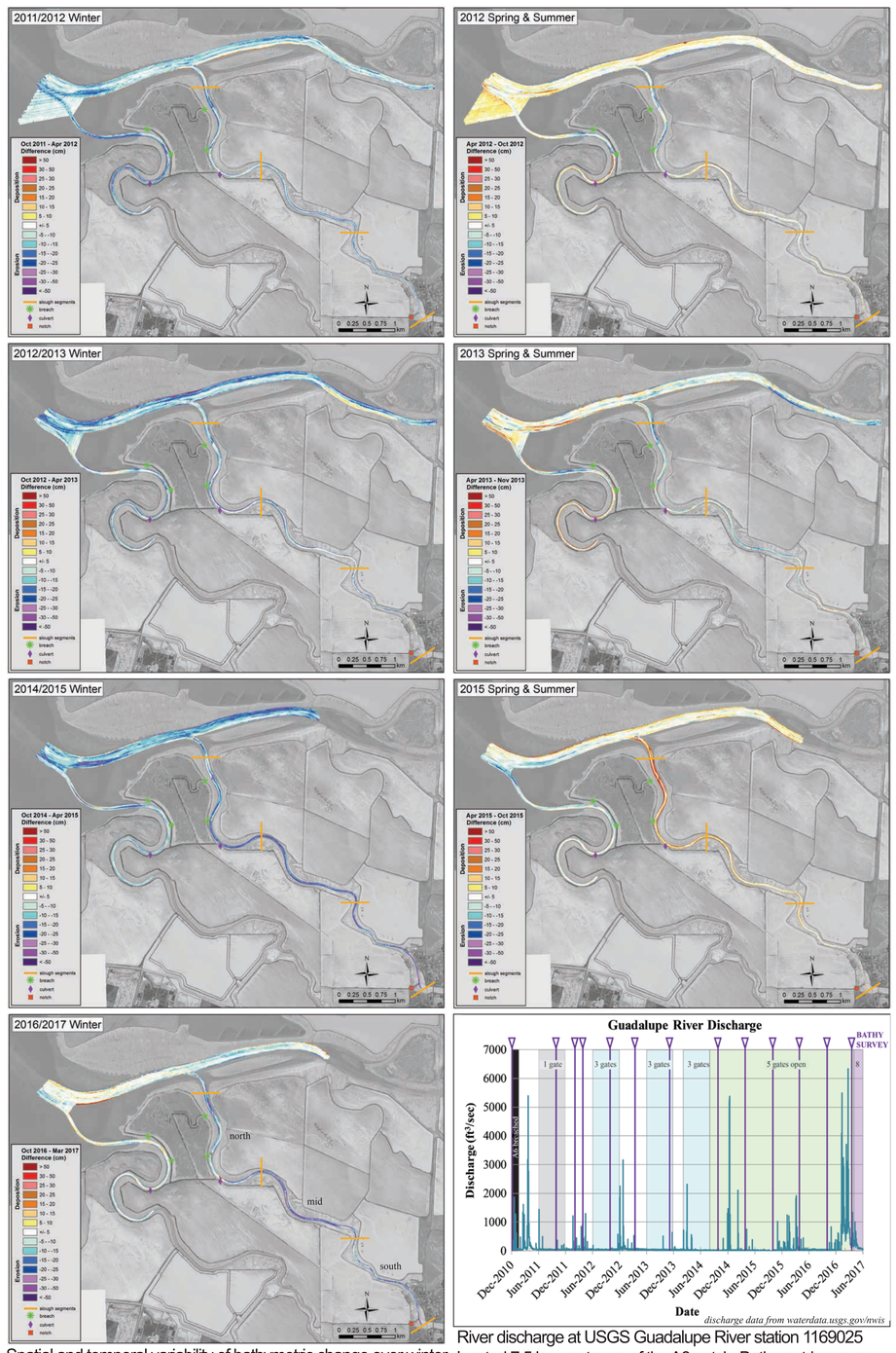
Bathymetry Surveys



Alviso Slough Cross-Sectional Profiles



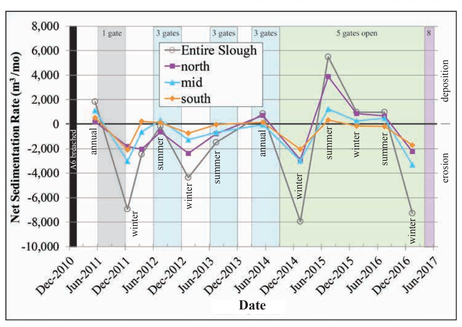
Seasonal Change

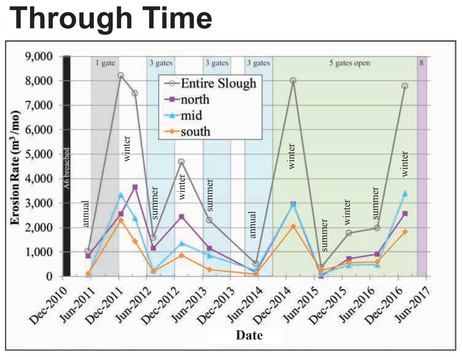


Spatial and temporal variability of bathymetric change over winter months (above) versus spring and summer months (right). Orange lines denote subsections used in the graphs below.

River discharge at USGS Guadalupe River station 1169025 located 7.5 km upstream of the A8 notch. Bathymetric survey dates are indicated by purple lines and A8 gate operations by color shading.

Sedimentation Through Time





Alviso Slough net sedimentation rates through time by slough segment. A8 gate operations indicated by color shading.

Alviso Slough erosion rates through time by slough segment. A8 gate operations indicated by color shading.

Conclusions

From December 2010 through March 2017 there has been a net sediment loss of approximately 60,000 m^3 within Alviso Slough. Despite net erosion within the slough, the nearby intertidal mudflats have either maintained their elevation or even been slightly depositional. Although patterns of deposition and erosion vary along the distance of the slough and also through time, there has been a dominant pattern of erosion in the winter and either no change or slight deposition with only localized areas of erosion during spring and summer months. Our measurements of bathymetric change provide critical insight into morphological evolution of slough/intertidal mudflat/bay systems as levees are breached and the tidal prism increased

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. 3, Sept, 2015): U.S. Geological Survey Open-File Report 2011-1315, 23 p., http://pubs.usgs.gov/of/2011/1315/.