



Inventory and Monitoring (I&M) Initiative Happenings

Surface Elevation Tables and Sea-level Rise on Refuge Coasts

May 2015

Surface Elevation Tables (SETs) are portable mechanical leveling devices that measure the relative elevation change of wetland sediments. Knowledge of sediment and organic matter dynamics are critical to informing these efforts and to assess how well a marsh is keeping up with sea level rise. If accretion rates do not keep pace with elevation losses from sea level rise and land subsidence, marshes convert to mudflat or open water.

Pacific Coast

Giselle Block

The Refuge System I&M and USGS have partnered to study the potential impact of sea level rise and other climate-related threats to coastal tidal marsh refuges in Regions 1 and 8. A network of SETs has been established on west coast refuges to monitor the long-term vertical accumulation (or loss) of a marsh and to calibrate and validate sea level rise models.

Since 2013, a total of 20 SETs have been established among five Pacific Coast National Wildlife Refuges: Tijuana Slough, Seal Beach, San Pablo Bay, Humboldt Bay, and Nisqually. Four SETs were installed at each refuge, two near tidal source and two in high marsh.



USGS technician measures surface elevation change at Humboldt Bay NWR, Mad River unit

These SETs help managers assess marsh adaptation to sea level rise and inform larger landscape decisions on how to preserve tidal marsh ecosystems in light of climate change.

Preliminary data show marsh elevation

changes within and across refuges and other sites. Long-term monitoring is needed to fully understand how these marsh systems respond to sea level rise, and to assess the success of management strategies intended to sustain tidal marsh over time.

Gulf Coast

Jena Moon, Nicole Rankin, Sue Wilder



Douglas Head installs a SET on the Texas Gulf Coast

Sea level rise, subsidence, and anthropogenic hydrological alterations have changed the environmental parameters that historically regulate coastal marsh function on the Gulf Coast. Global climate change poses significant long-term threats to coastal marsh habitats and species that are dependent on those habitats along the Gulf Coast. These current and future impacts are a concern to refuges and partners across the United States.

Since 2012, Regions 2 and 4 have collaborated in order to begin understanding rates of elevation change on coastal wetlands on Gulf Coast refuges. I&M and refuge staff have recently begun monitoring coastal wetland surface elevation by establishing 42 SETs along the Texas coast and 3 SETs along the Big Bend of Florida.

As part of these efforts, I&M works with partners including the USGS, NPS, LCCs, NERRS, universities, state agencies, and others to identify monitoring gaps, collect and share data, develop and use consistent protocols, and assist with developing a sentinel site monitoring network along the Gulf Coast.

Atlantic Coast

Laura Mitchell

The Northeast I&M program is working with Coastal Refuges to develop a network of SETs from Maine to Virginia to gauge the capacity of Refuge salt marshes to maintain themselves in the face of local rates of sea level rise. By 2016, Region 5 plans to install a network of over 400 SETs on 15 refuges along the north- and mid-Atlantic coast. Over time, we will determine which Refuge salt marshes are not keeping pace with sea level rise and likely to reach the tipping point for deterioration sooner than other sites. This will allow FWS managers to focus restoration efforts, such as restoring full tidal function, or enacting thin layer deposition, on the most vulnerable wetlands.

All SETs will be connected to the National Spatial Reference System so direct comparisons can be made with local tidal data. The Northeast I&M network is also part of a Regional Salt Marsh Integrity monitoring program. This multi-year project is developing a refuge and regional-scale salt marsh integrity index to assess how well refuge salt marshes meet Refuge System integrity and health objectives.

Surface elevation change and shallow accretion rates derived by SETs are part of a larger suite of metrics of salt marsh health being collected, including breeding bird, nekton, vegetation, and water quality and quantity data.



Dan Stotts, Biologist at Bombay Hook NWR, reads a SER