

Observations from Rhode Island salt marshes at risk to SLR. Indicators, metrics, measurements.

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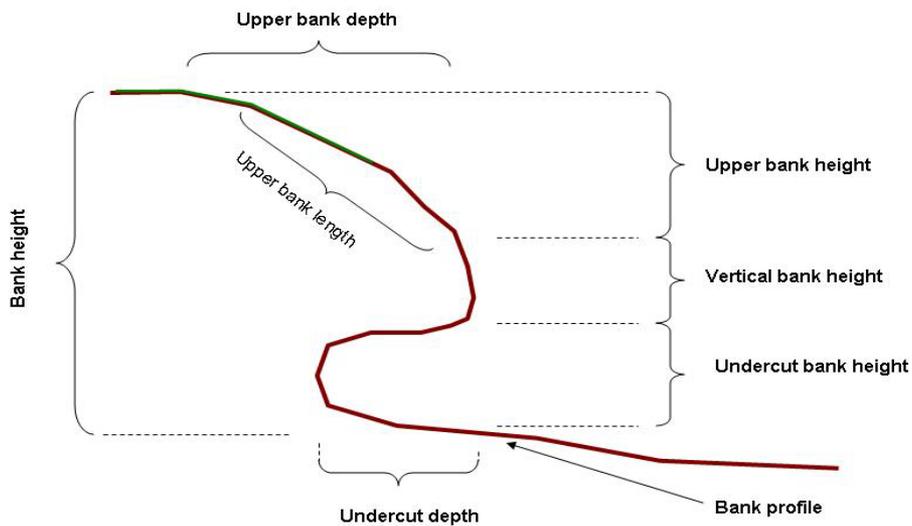
Rhode Island Complex Coastal Restoration



Initial observations - Shoreline Erosion

- Unstable Banks, Narrow River
 - Sections of marsh slump into river
 - Wind driven waves, boat wakes, crabs (green/fiddler)

Cross sectional view of typical saltmarsh riverbank, Lower Narrow River







Initial observations – Impounded Water on Marsh

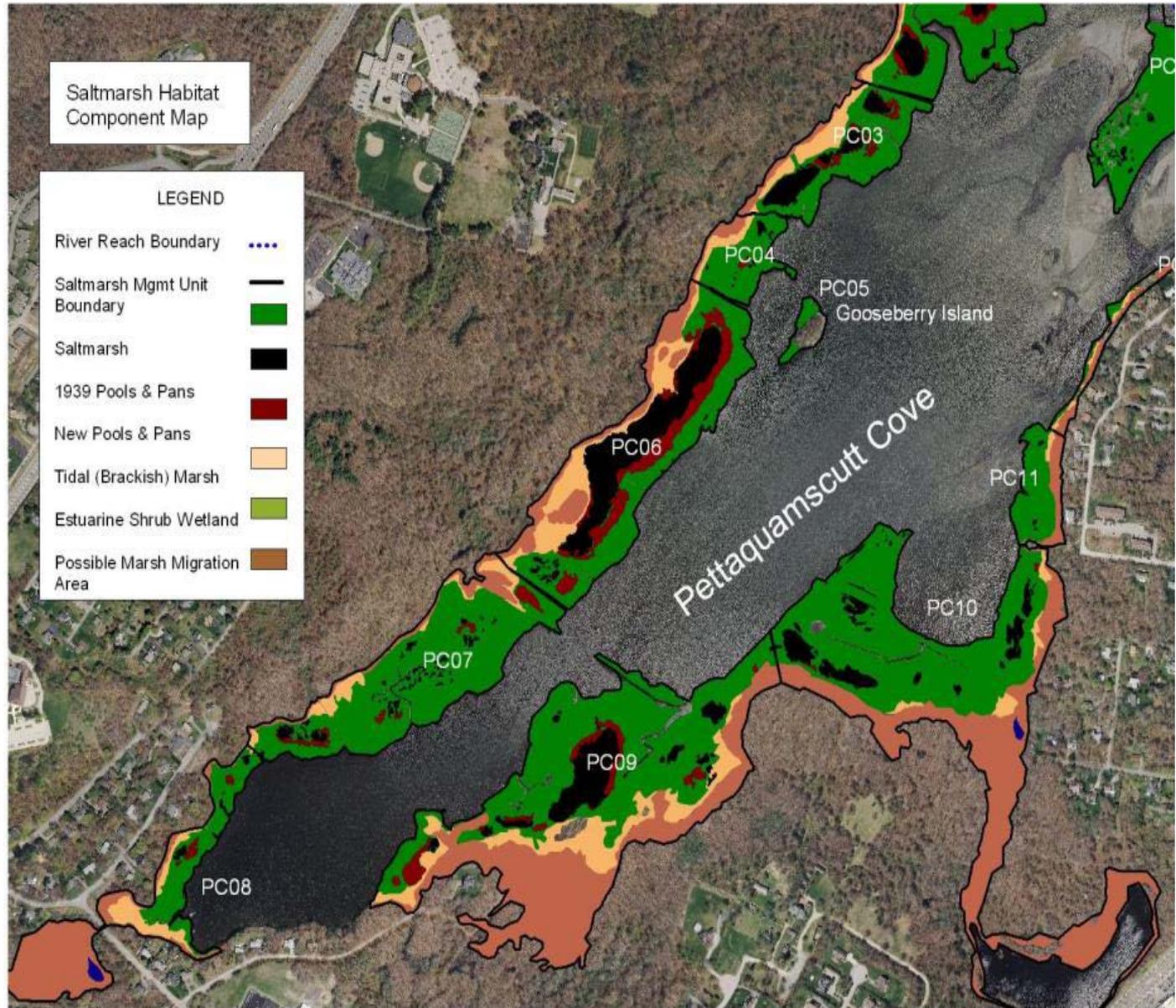
- Standing water on marsh
- Panne expansion (low plant density, stunted growth)
- Pool expansion





Pan and Pool Expansion

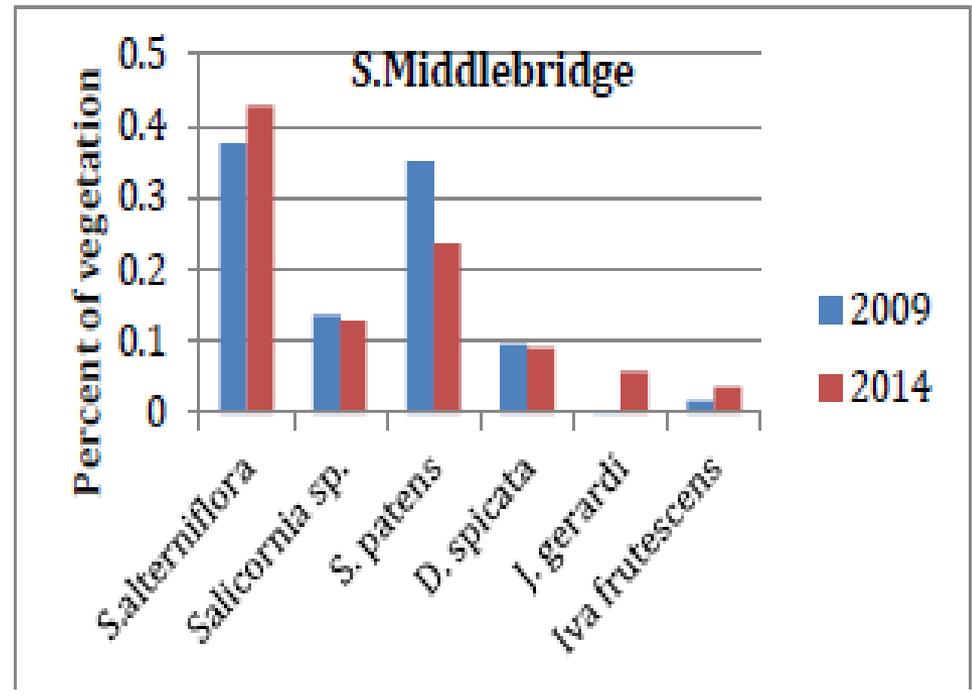
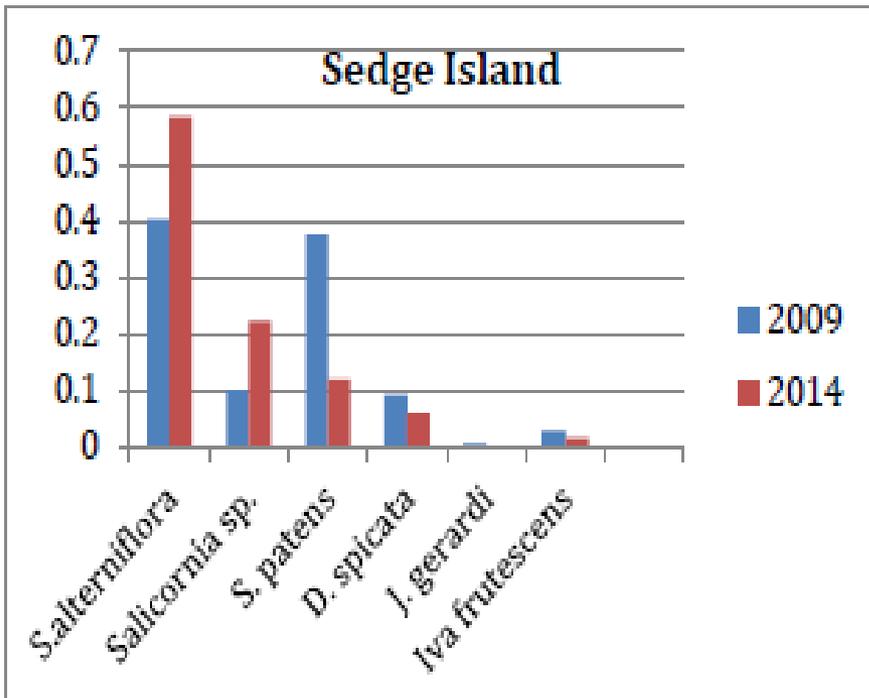
- Black = 1939 pool
- Rust = new pool





Initial observations - Vegetation Transition

- Saltmarsh Sparrow occupancy study (S. Paton, 2009)
- Loss of *Spartina patens* (high marsh species)
- Increase in *S. alterniflora* (low, mixed marsh species)



Initial observations – Sea Level Rise Faster than Accretion

- Raposa et al. 2016. Regional Environmental Change
 - Salt marsh elevation growth = 2 mm/year (Surface elevation tables (SETS) and horizon markers)
 - Sea level rise
 - 1930 – 2015 = 2.78 mm/year
 - 1999 – 2015 = 5.26 mm/year

Save The Bay –
Monitoring restoration
sites and documenting
rapid change in RI salt
marshes.



Photos: Save The Bay

Assessing Salt Marsh Health

- Salt Marsh Integrity (SMI) Index (USFWS)
 - Rhode Island NWR Complex 2009, 2011-2014
 - Historical cond. (ditches)/surrounding land use, elevation
 - Scored on
 - Tidal marsh bird abundance
 - Nekton density & richness
 - Percent native vegetative cover
 - Flood duration, salinity
 - Herbicide use
- Scores range from 0 (low) to 1 (high), each metric is weighted based on relative importance.

Assessing Salt Marsh Health

- Rhode Island Salt Marsh Rapid Assessment (RISMA)
 - 39 salt marsh units in Narragansett Bay and Coastal Ponds assessed in 2012 & 2013
- Narragansett Bay National Estuarine Research Reserve (NBNERR)
 - Sentinel sites (Veg, SETs, RTK elevation)

Rapid Assessment

- Belt transect
 - Plant species
 - Marsh zonation



Photos: Save The Bay

Marsh Zonation

- Marsh Communities (15 described)
 - Perennial turf grasses (“high marsh”)
 - Perennial turf grasses (“high marsh”) with *S. alterniflora*
 - Short form *S. alterniflora* with high marsh species
 - Short form *S. alterniflora*
 - Developing panne (shallow open water)
 - Tall form *S. alterniflora* (“low marsh”)

Rapid Assessment

- Soil Bearing Capacity (soil penetrometer)
 - High marsh had greatest capacity
 - Low marsh and pannes had lowest capacity



Photos: Save The Bay

Early Studies & Assessments

- Documented...
 - Rapid loss of *S. patens*, increase in *S. alterniflora* and transition of high marsh to low marsh
 - Dominant plant *S. alterniflora* (low, mixed marsh species)
 - Accretion not keeping up with SLR (low sediment in system, accretion due to biomass)
 - Dieback due to impounded water, loss of below ground biomass exacerbates pool & panne formation

Health of Refuge Complex Salt Marshes

- Narrow River
 - RISMA: 2 units moderate, 3 units poor
 - SMI score ranged from 0.344 – 0.584
- Maidford River
 - RISMA: north unit = moderate
 - SMI: north unit = 0.54, south unit = 0.466



Acknowledgments



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