Overview of NJ marsh restoration to support coastal resilience

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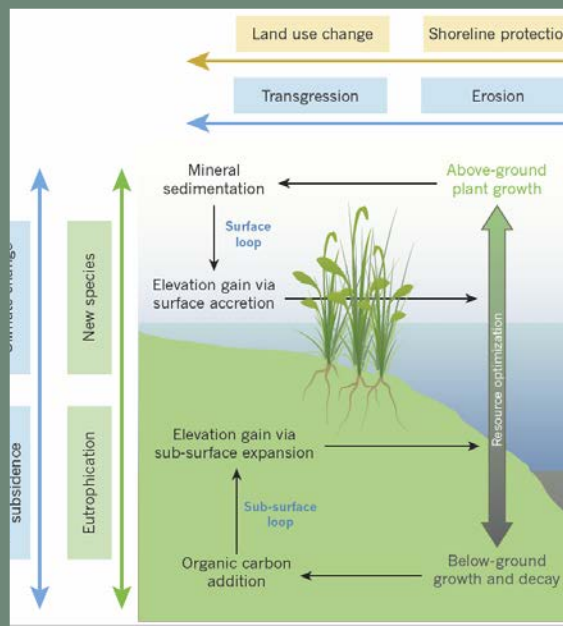

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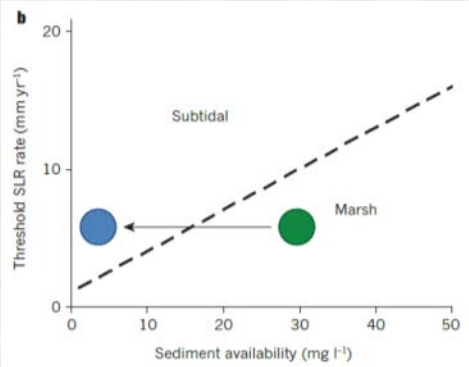
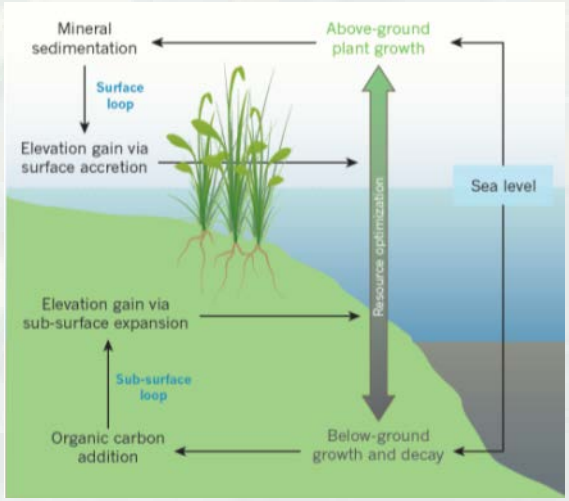
Primer: salt marsh dynamics

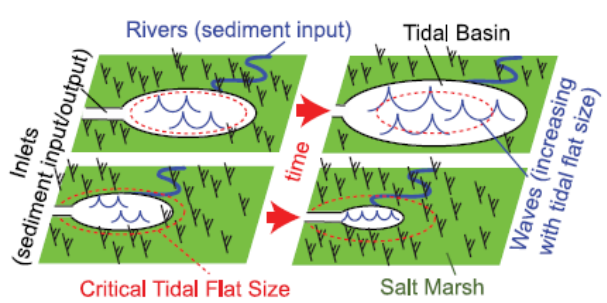
Submergence





Dynamic equilibrium

Fragmentation



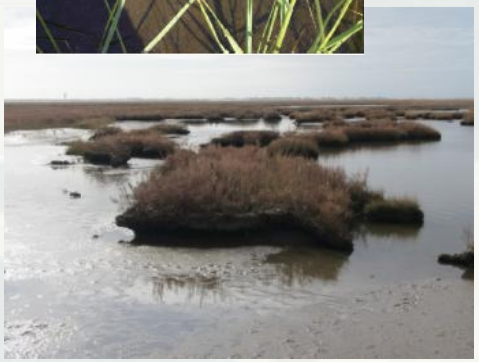
- Disruptions to ecological, hydrological, & sedimentation processes can alter the morphology & function of salt marshes
- Signs of distress in salt marsh can manifest differently depending on the site

Salt marshes in NJ: what is the cause of distress?

Active edge erosion

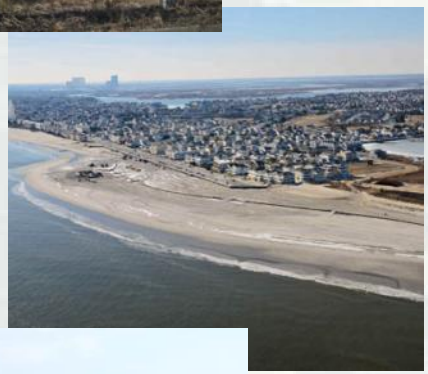
Patches of subsidence in marsh interior

Extensive pools and pannes – actively growing



A brief history of dredged material management in coastal NJ

- ***Before 2002:*** remove shoals from channels as quickly as possible, place in CDFs
- ***2002:*** NAP engages with Regional Sediment Management program
- ***2002-2012:*** slow progress towards more sustainable approaches to managing sediments
- ***October 2012:*** Superstorm Sandy
- ***2012-present:*** rapid advancement of beneficial use practices resulting in multiple wetland restoration projects



Mordecai Island: marsh island restoration

- Shoals historically dredged and placed in Parker Island CDF
- Hurricanes Irene and Sandy led to critical shoaling in NJIWW
- November 2015, 30K CY dredged from federal NJIWW as part of post-Sandy recovery efforts placed in Mordecai Island breach area
- 2016: marsh vegetation planting to accelerate revegetation and stabilize bare sediments

Persistent wave action and boat wakes led to ongoing edge erosion despite stabilization actions

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New Jersey Department of Environmental Protection

mordecai land trust
mordecaimatters.com

Ring Island, NJ: black skimmer habitat and thin-layer placement

Deteriorating marsh, increasing inundation

- Post-Sandy emergency dredging
- Dredged 6K CY shoal from NJIWW federal channel
- Constructed August 2014
- Small (500 CY) thin layer placement demo with >96% sand
- Bird habitat creation
  - Shorebird usage (least terns, oystercatchers)
  - Also used by horseshoe crabs & terrapins
  - Phragmites control will be required

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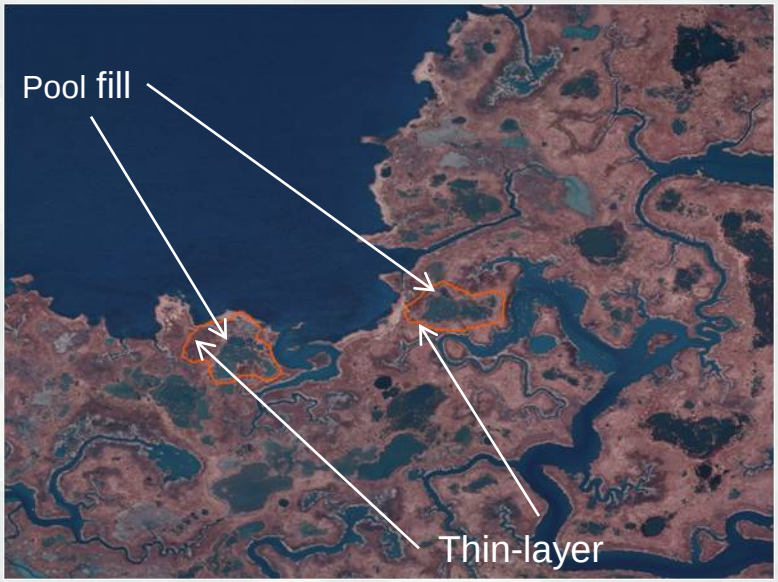
Avalon, NJ: 2014 restoration demo



- NAP Post-Sandy emergency dredging of NJIWW federal channel
- Pilot Project constructed Dec 2014
- Small thin layer placement demo with ~5K CY fine-grained DM (~6 acres)
- Filled pools and pannes to nourish deteriorating marsh

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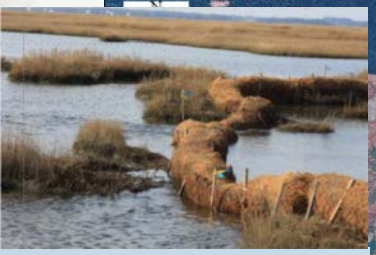
Avalon, NJ: 2014 assessing recovery

- Thin-layer areas
  - Vegetation regrowth occurred
  - Elevation changes difficult to quantify (consolidation)
- Pool fills
  - Increase in elevation (less standing water)
  - Some vegetation colonization

October 2014

May 2015

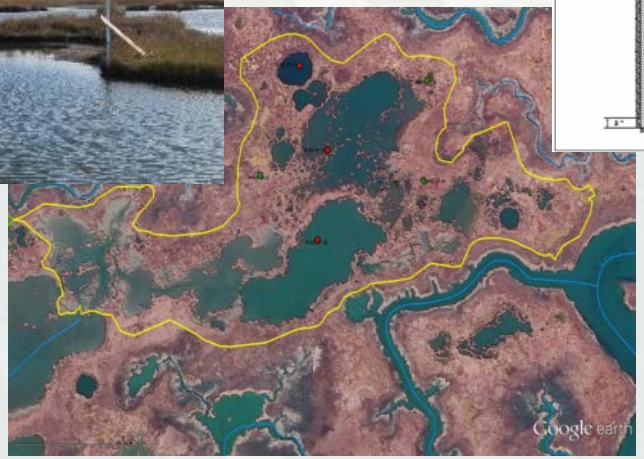
Avalon, NJ: 2015-2016 design and construction

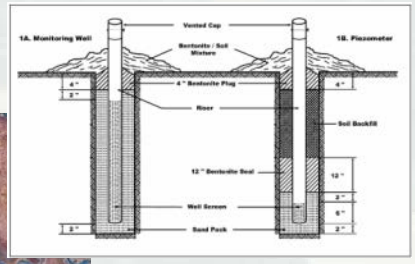


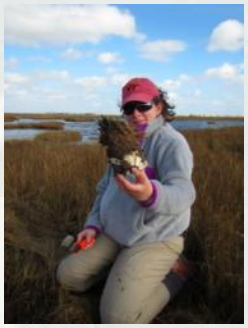
- NAP Post-Sandy emergency dredging of NJIWW federal channel
- ~6 acre pilot constructed Dec 2014
- ~ 35 acres of marsh received DM between Nov 2015 and Feb 2016
- Thicknesses ranged from just a few cm up to ~0.5 m in pools
- Defined target elevation based on vegetation community surveys
- Placed within hydrologically isolated areas on the marsh

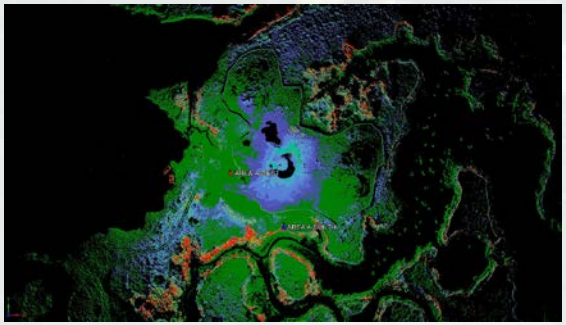
Avalon, NJ: 2015-2016 monitoring recovery

- Before-after control-impact monitoring design
  - Water levels (NFWF partners/ERDC)
  - Soil physical and biogeochemical properties (ERDC)
  - Vegetation and infaunal communities (NFWF partners)
- Post-placement elevation









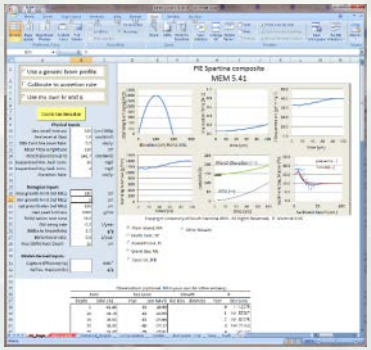
Avalon as an R&D test bed to advance marsh restoration practices

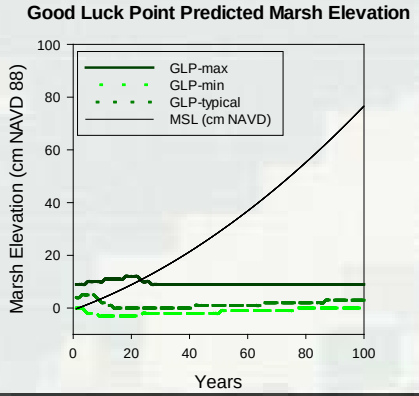
Bulking and consolidation of DM in marsh environments

- If material is hydraulically placed, elevation changes over time.
- Elevation change can be modeled.
  - Maximum volume: at end of placement
  - Elevation subsides during primary settling and drainage of ponded water (SETTLE)
  - Long term: consolidation of dredged material and underlying foundation (PSDDF).

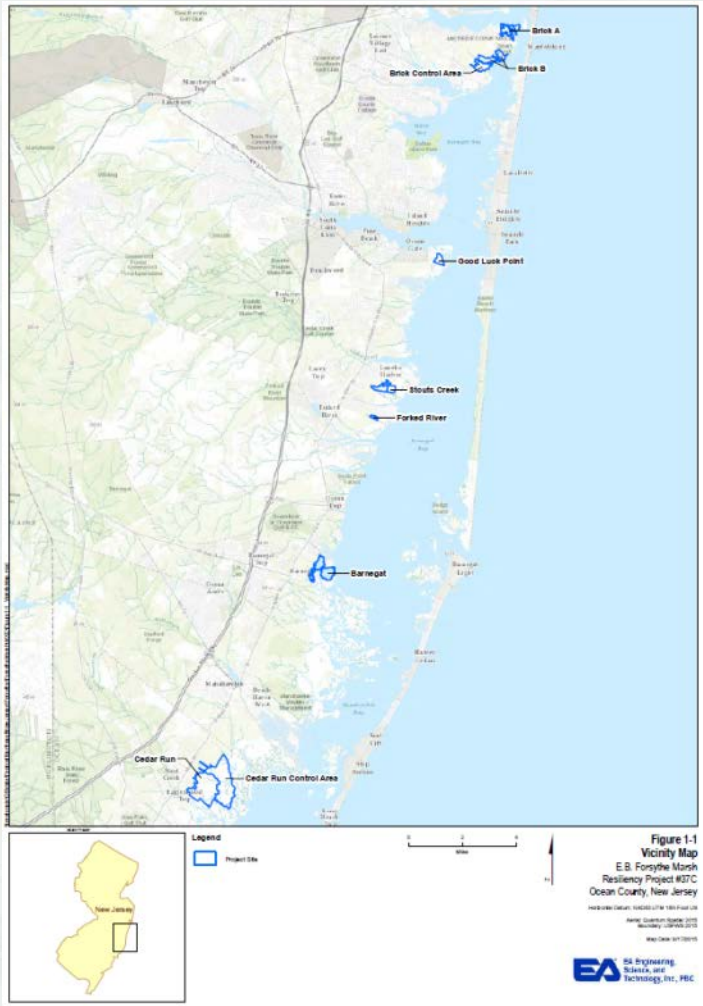
Long-term marsh elevation response to DM placement & SLR

- Marsh Equilibrium Model projects future conditions based on known interactions between biomass and accretion
- Developed at University of South Carolina by Dr. James Morris
- Goal: use MEM to predict the response of marshes to thin-layer and other episodic sediment deposition events





What's next?



- E.B. Forsythe National Wildlife Refuge marsh enhancement
- Monitoring and design of six targeted sites
  - Dike removal
  - Runnel excavation
  - Sediment enrichment (thin-layer)
  - Culvert replacement
- Work targeted to begin Fall 2016