Beneficial Use of Dredged Material to Restore Salt Marsh Resiliency: A New Jersey Case Study

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Photo credit: TNC

Pilot project overview

- **Objective:** Three trial projects to test marsh enhancement through beneficial use of dredged material concept
- **Landowner:** NJ DEP Division of Fish & Wildlife
- **Funding source:** Hurricane Sandy Coastal Resiliency grant (3-years); USACE and NJDOT dredging funds
- **NJDEP Project Team:**
  - Landowner
  - State regulator
  - Wetland ecologists
  - Engineers

Photo credit: TNC

Objectives

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- Implement a range of projects on multiple sites
- Collaborate with other resource agencies to best use limited resources
- Monitor projects to document success and challenges
- Disseminate lessons learned to facilitate future projects

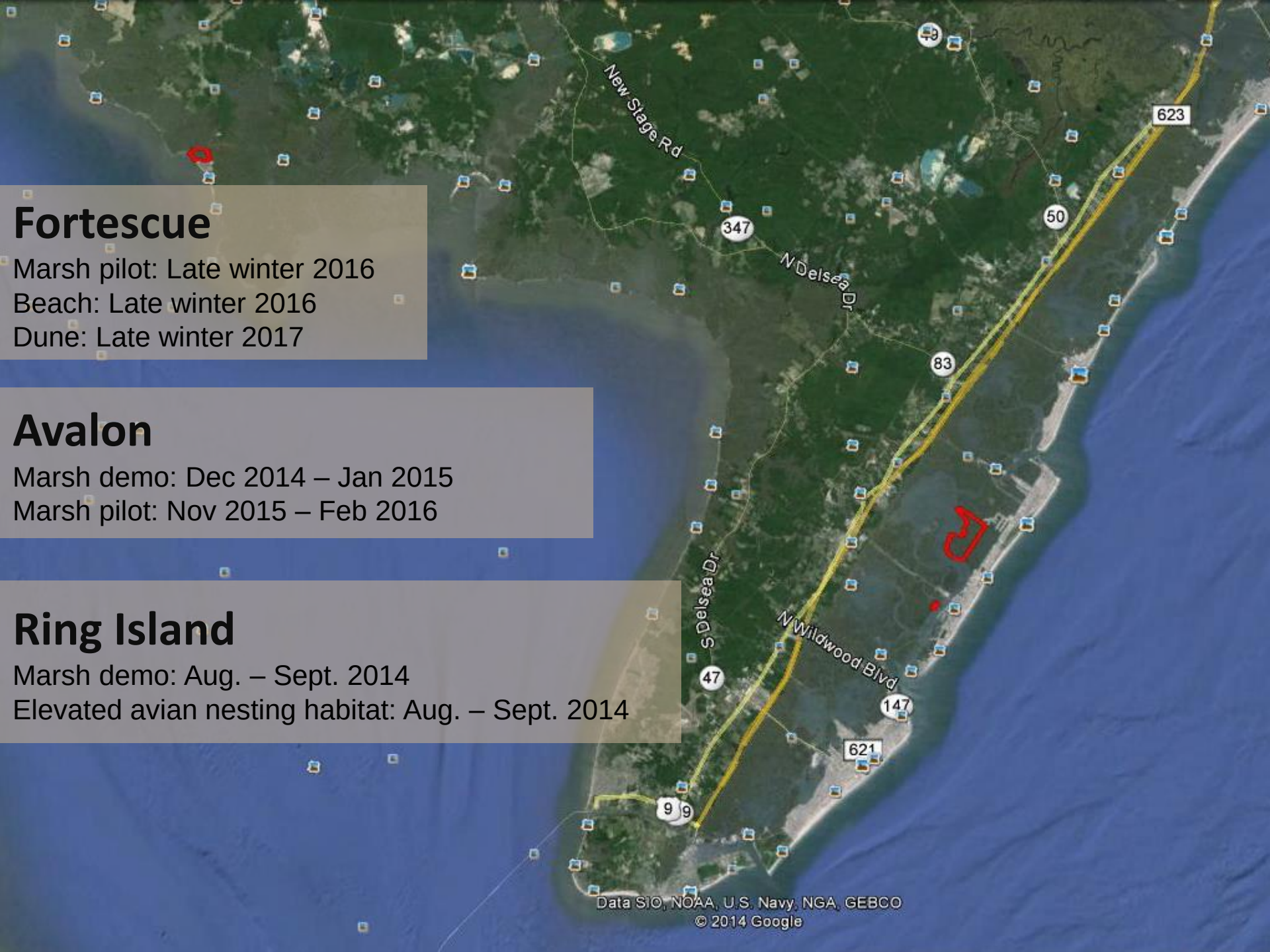
Enhancement project goals and assessment

Enhancement project goals:

1. Test the idea that the application of dredged sediment on existing, stressed salt marshes would provide ecological enhancement and help them persist into the future in the face of sea level rise, erosion, and subsidence.
2. Test out a variety of different sediment types, placement methods, and thicknesses on a range of baseline conditions.

Project assessment:

1. Track how the ecology responds initially
2. The methods would be deemed successful if there was
   a. Return to baseline conditions for all metrics*
   b. Lasting elevation increase
   c. More robust native salt marsh vegetation



Fortescue

Marsh pilot: Late winter 2016
Beach: Late winter 2016
Dune: Late winter 2017

Avalon

Marsh demo: Dec 2014 – Jan 2015
Marsh pilot: Nov 2015 – Feb 2016

Ring Island

Marsh demo: Aug. – Sept. 2014
Elevated avian nesting habitat: Aug. – Sept. 2014

Monitoring

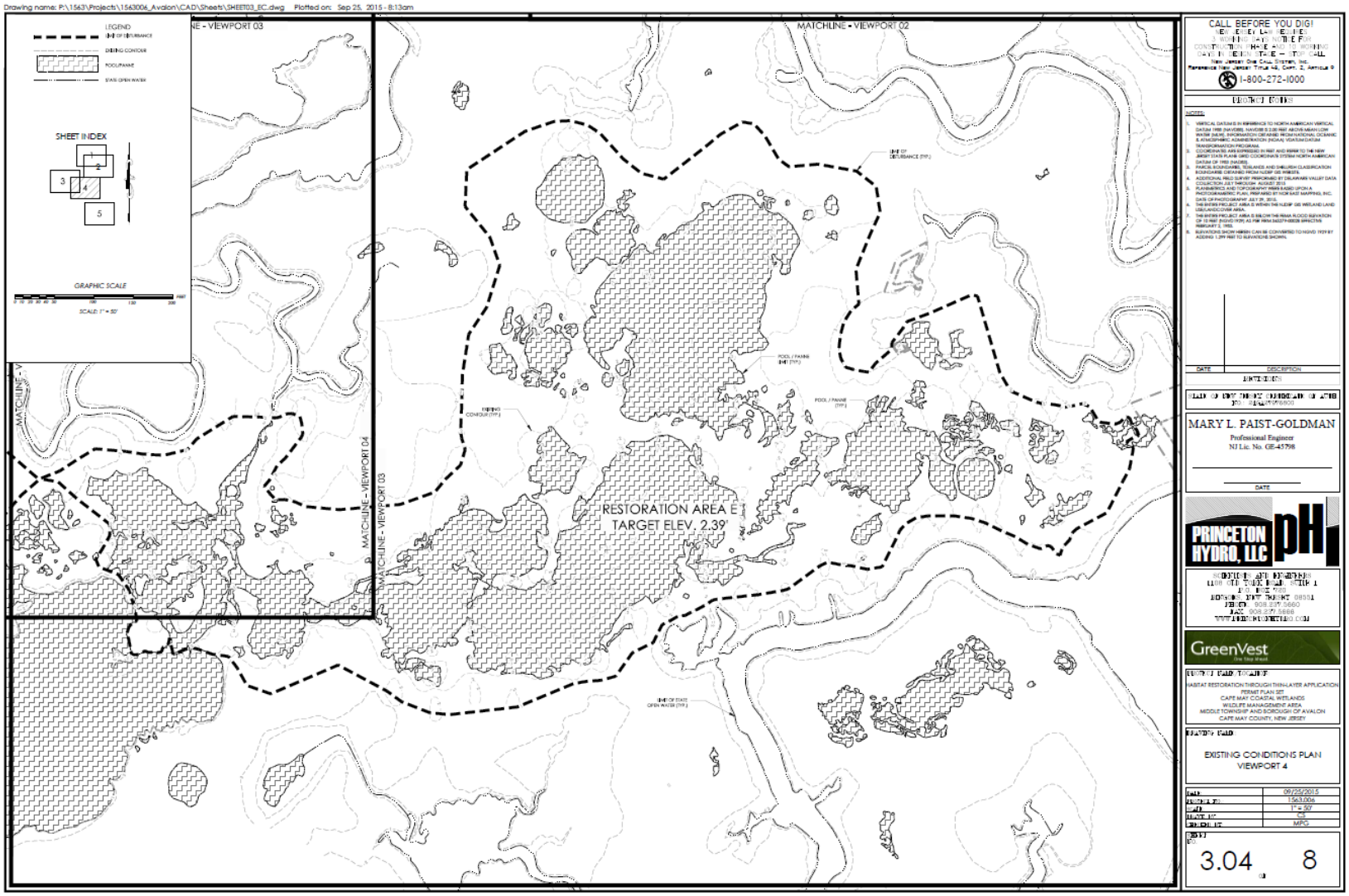
- Vegetation
- Avian use
- Elevation and depth of placement
- SETs and marker horizons
- Nekton
- Benthic infauna
- Epifaunal macro invertebrates
- Soil properties
- Wave energy
- Changes in habitat type (pool, pannes, low marsh, high marsh, dune)
- Damage cost avoided (HAZUS/ CHAMP)
- Water chemistry
- Site visits

Photo credit: GreenVest

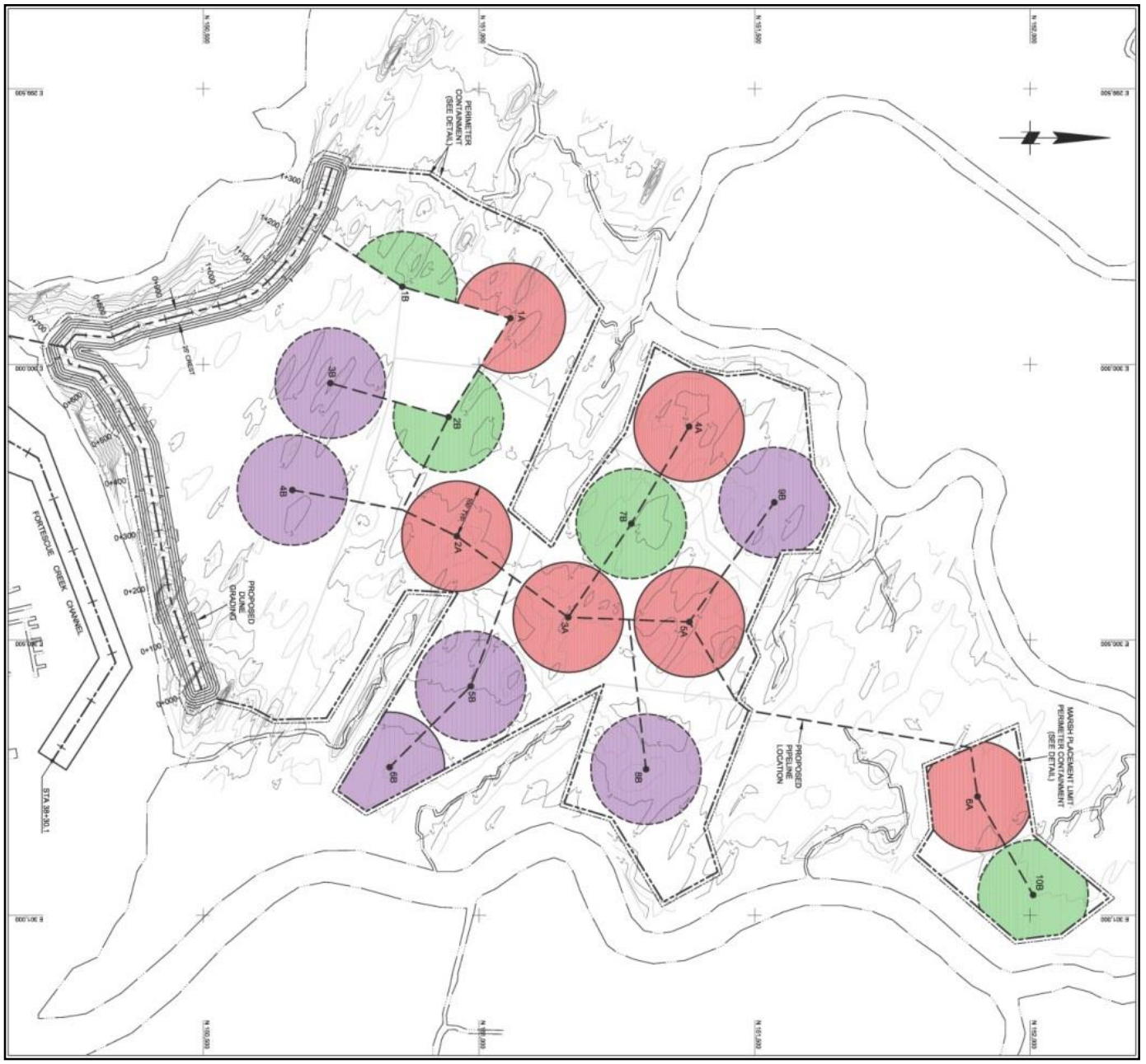
Ring Island design

- **Marsh Enhancement**
  - Place even 3 of sand on one half-acre plot and 6” in another half-acre plot
  - End of the pipeline containing nozzle placed on a pontoon that can be moved along the marsh edge
  - Due to sandy material, no containment was planned
- **Elevated Nesting Habitat**

Avalon engineered design



Fortescue conceptual design



Stakeholder and community engagement

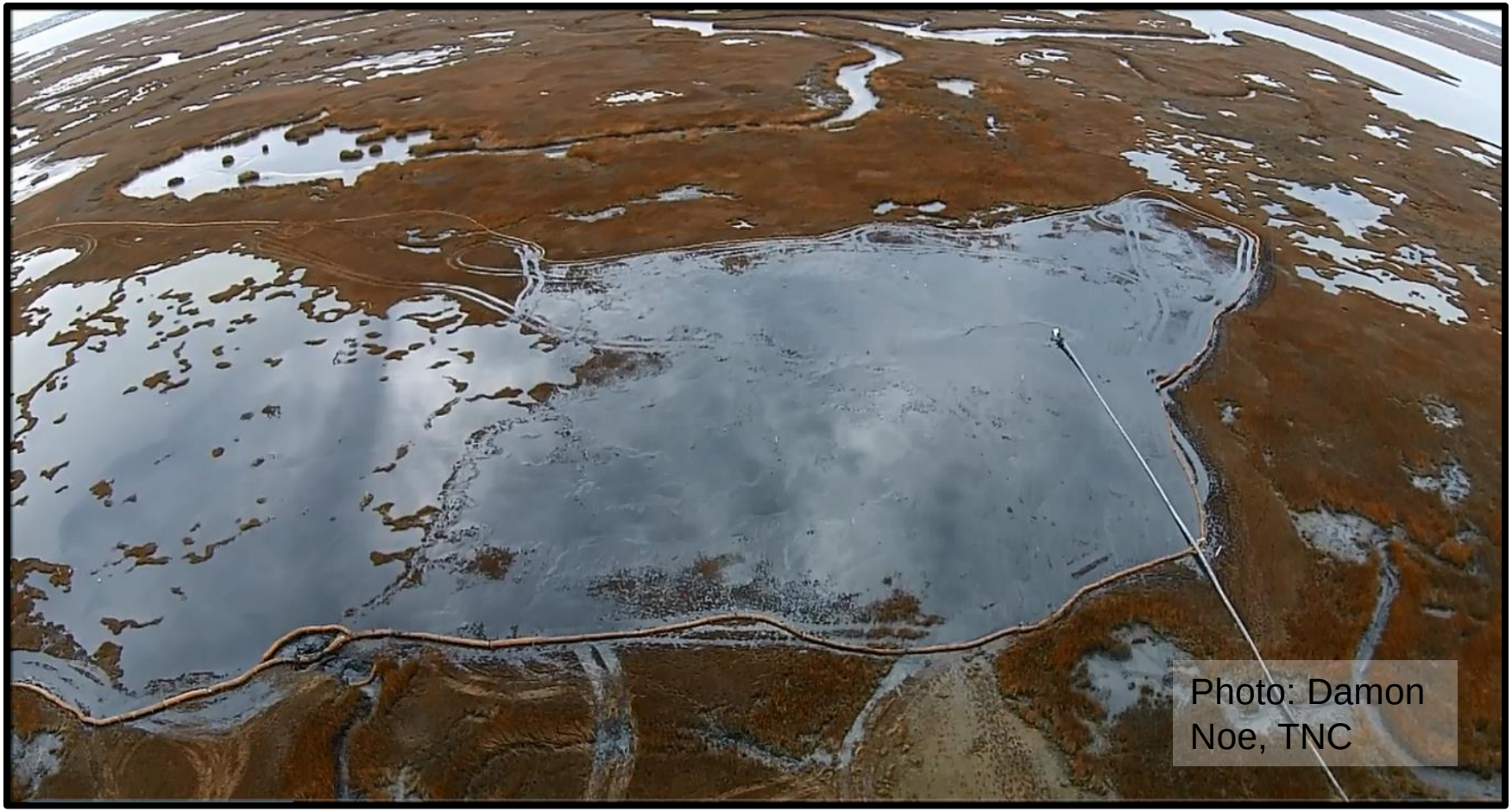
Stakeholders included on project team or frequent meetings	❖Landowner ❖State and federal regulators ❖Wetland scientists ❖Engineers ❖Dredgers and dredging experts ❖Navigation managers
Community engagement	❖ Town council meetings ❖ Pre-construction meetings ❖ News paper articles ❖ Presentation to community at Wetlands Institute

Federal and state policy and permitting

Project	NJDEP Permit	USACE Permit
Ring Island Demo Marsh and Elevated Nesting Habitat	Combined GP29 and AUD; CZM Consistency and WQC.	Not required
Avalon Marsh	2014 Demo Project – GP29 and AUD; CZM Consistency and WQC. 2015 Pilot Project – GP24 and AUD; CZM Consistency and WQC.	Not required
Fortescue Marsh **Fortescue Beach** **Fortescue Dune**	Combined GP29 and AUD, CZM Consistency and WQC issued to NJDEP-DFW for habitat enhancement. Combined Waterfront Development Permit. AUD, CZM Consistency, and WQC issued to NJDOT-OMR for the dredging and dredged material placement work.	Combined Individual permit for dredging and habitat restoration issued to NJDEP-DFW.

Implementation: Ring Island

Implementation: Avalon



Implementation: Fortescue

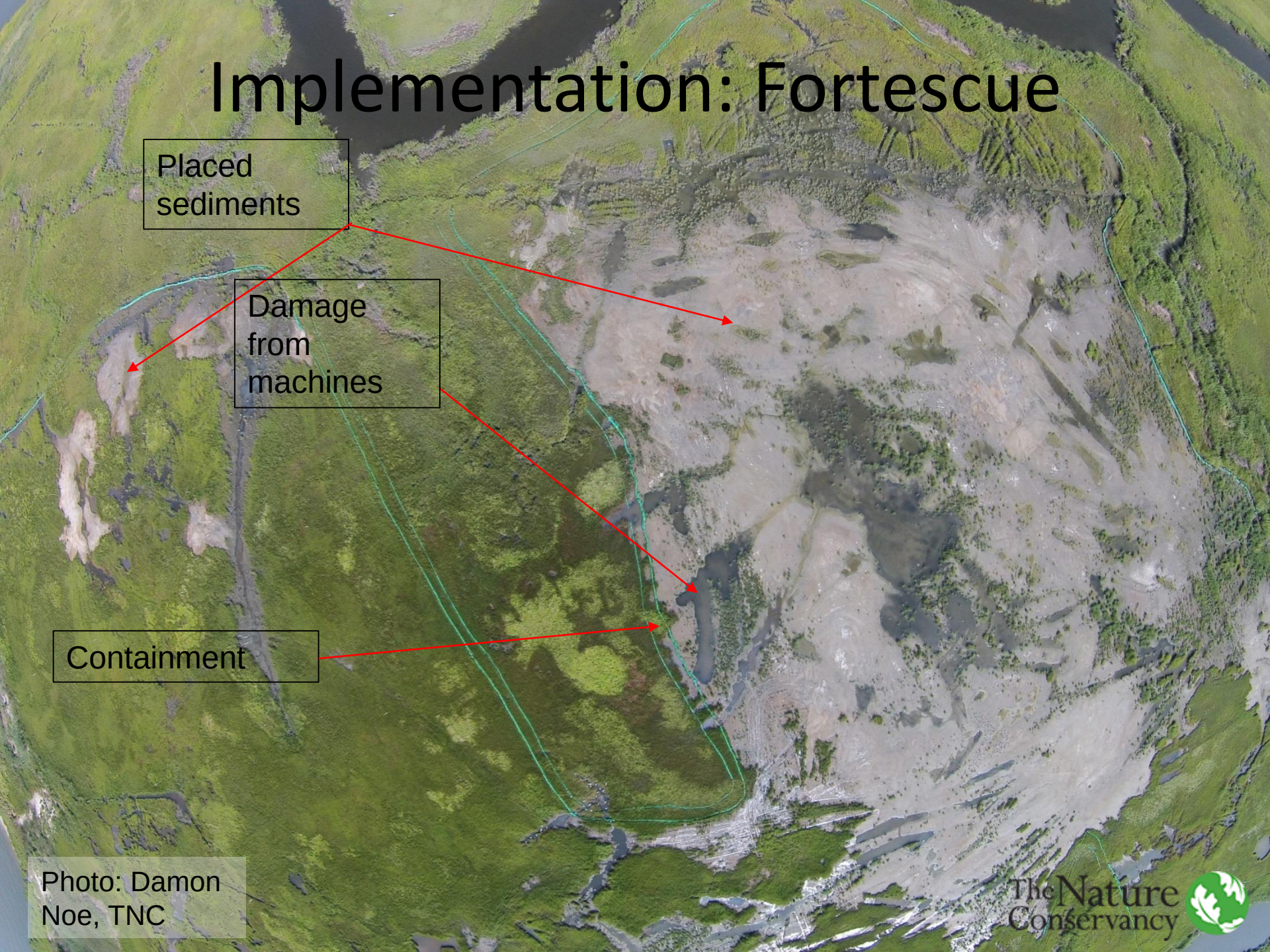


Photo: Damon Noe, TNC

The Nature Conservancy

Avalon after one growing season

June 24 2016

Photo: Jessie Buckner, TNC

Sept. 20th 2016

Photo: Jaci Wollard, NJDEP

Depth of placement

Ring Island

- 96% sand
- average depth of placement was 5.9”

Avalon

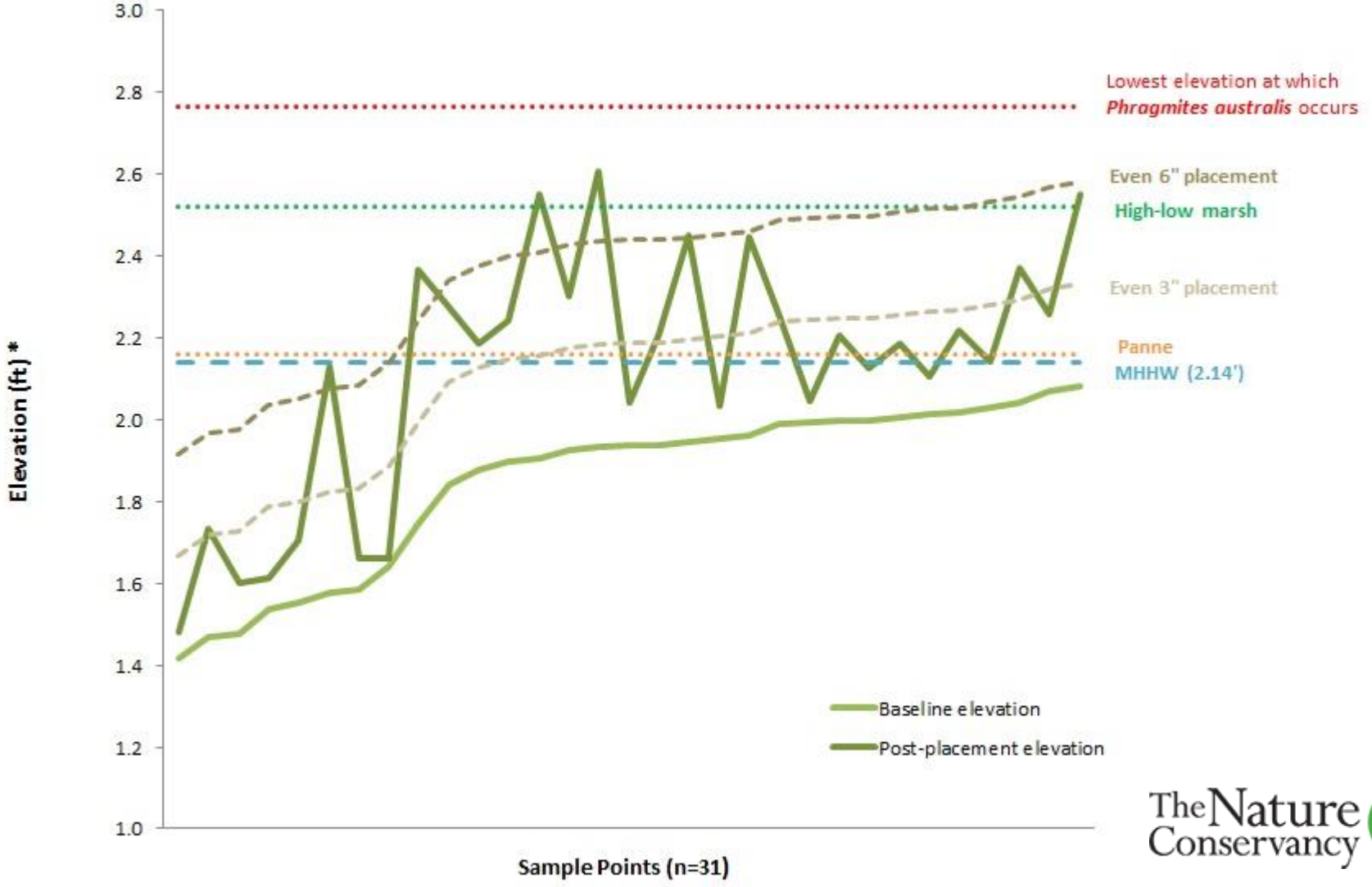
- fine-grained silt
- average depth of placement of 9.5” (excluding plots that started as pools)

Fortescue

- silt and sand mixture
- average depth of 6.3”

The Nature Conservancy

Ring Island: depth of placement/ elevation



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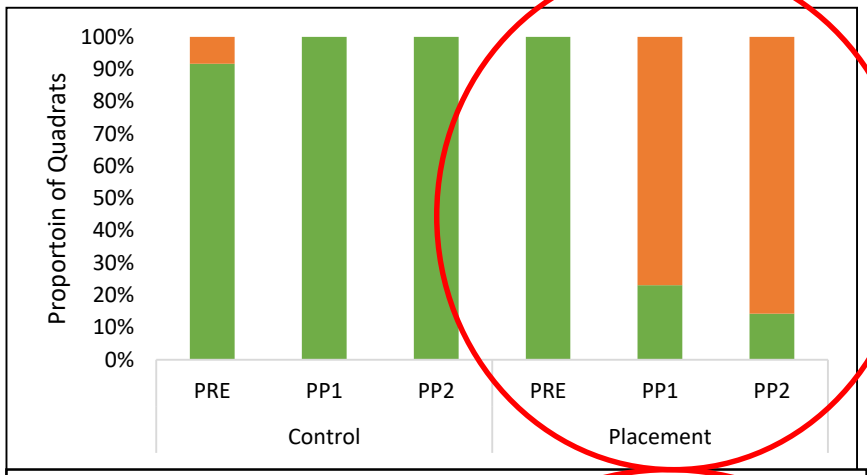
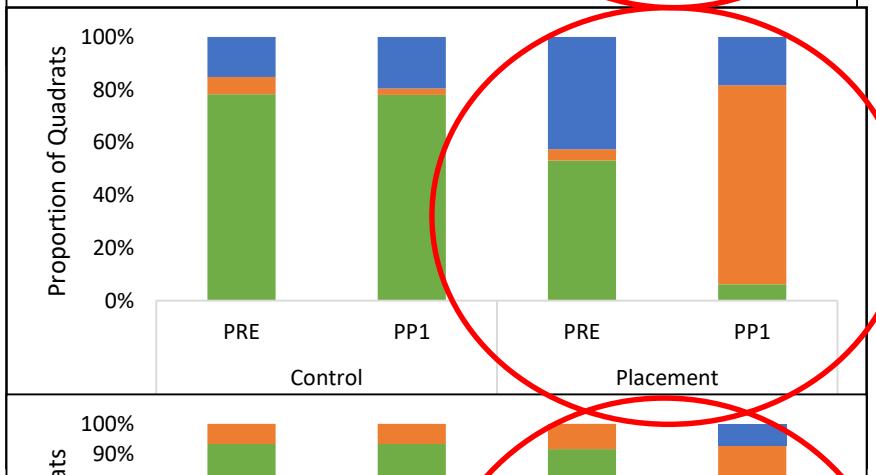
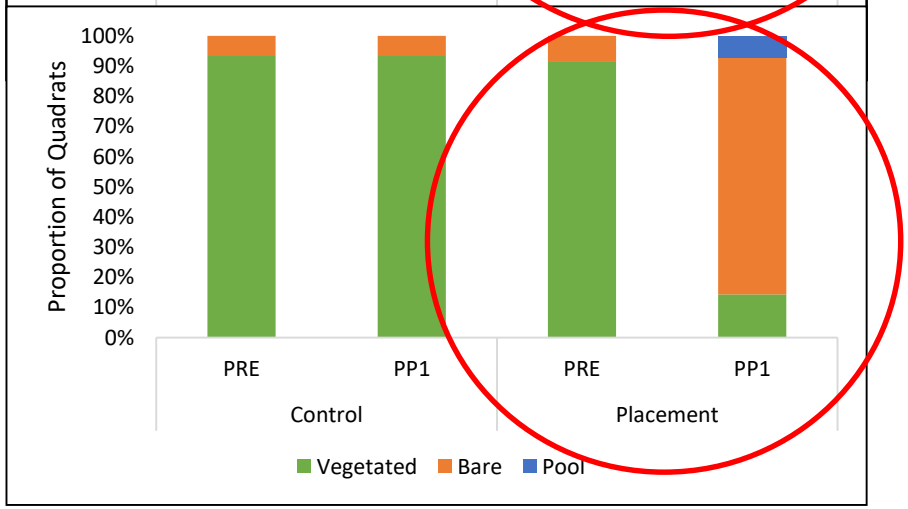
Vegetation



Ring Island



Avalon



Fortescue

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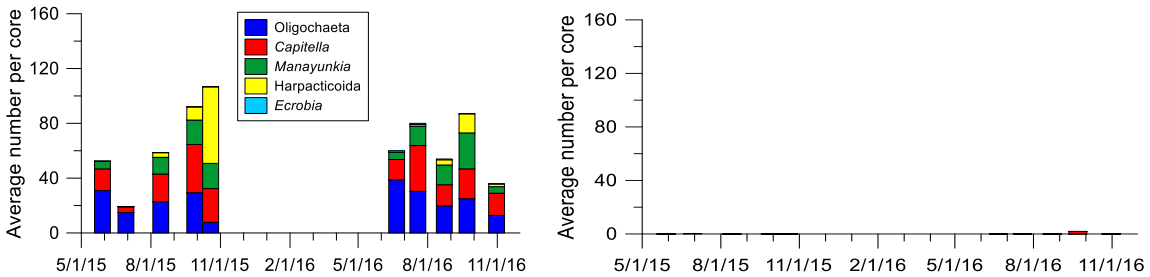
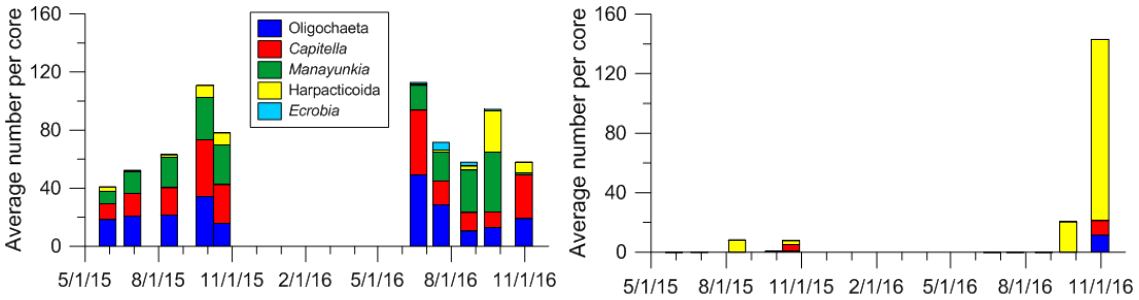
Benthic Infauna

Control | Placement

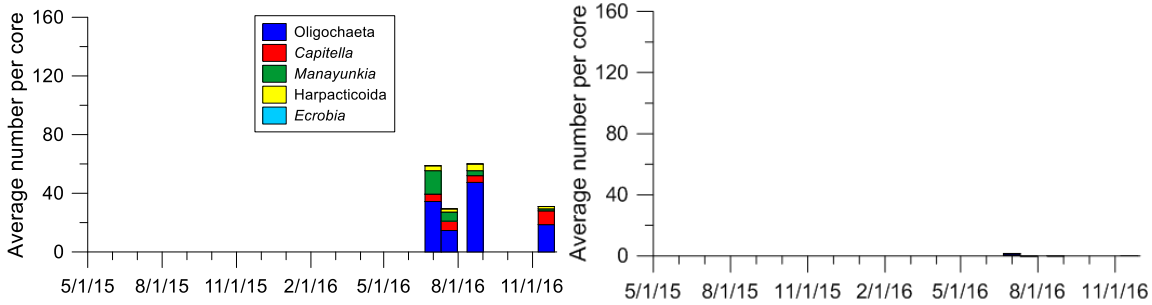
Ring Island
2 years post placement



Avalon
1 year post placement



Fortescue
1 years post placement



Taghon, Rutgers University, ongoing research

Sediments

- Very low organic matter in placed sediments
- Sediments hydraulically sorted as they were placed = low pore space and plating in fine grained sediments
- Too high = too dry = acid sulphate conditions
  - pH <3.8 in upper 17 cm

Tunstead, NRCS

Design: major lessons learned

- Sandy sediments are not well suited to being hydraulically spread in a thin and even layer on existing marsh
- Selecting proper target elevations is key:
  - bio-benchmarks
  - thinner is better
  - aim lower rather than higher to maintain tidal flushing and reduce need for containment
  - study how channel sediments will dewater and consolidate
- Work with dredging company to design constructible projects
  - distance that sediments can be pumped from channel
  - distance from marsh edge that sediments can be pumped into marsh
- Clearly document as-built goals AND post construction goals

Permitting: major lessons learned

- Involve regulators and landowner as soon and as often as possible in your project to address concerns as they arise
- Get permits in at least 3 months prior to planned construction

Construction: major lessons learned

- It takes longer to construct a marsh enhancement project than either a traditional dredging project or a dune/beach project
- Avoid using machinery (even if low pressure) on the marsh as much as possible
- Plan to remove containment

Monitoring: major lessons learned

- Find funding to monitor for more than 3 years post-construction (5-10 years more likely)
- Include regular site visits with structured qualitative observations (e.g., fixed photo points, condition of containment, etc.)

Is using dredged material for marsh enhancement a "win-win" situation? The jury is still out.

"Big" project-specific questions to answer include:

- How long does it take for the marsh to be enhanced?
- Are there long-term negative impacts of such projects?
- Are there really cost savings by combining projects?
- Is this a once and done solution or will we need to place sediment on the marsh repeatedly over time?

Stay tuned for answers …

Photo: Damon Noe, TNC

Thank you.

US Army Corps of Engineers®

Welcome to the NJ Coast

Photo credit: Jim Wright/TNC/LightHawk

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NEW JERSEY
PHOTOGRAPHY

Threats to salt marshes

Photo: TNC

Photo: Jeanna M
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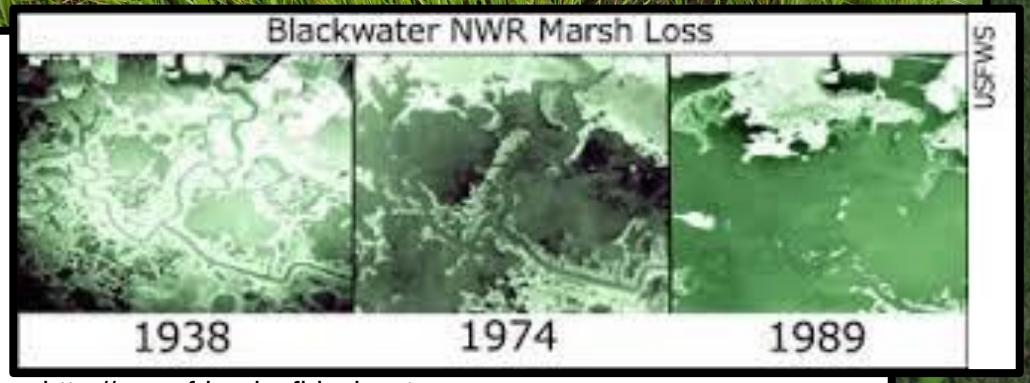

http://www.friendsofblackwater.org