Advancing Science and Practice at the Seven Mile Island Innovation Laboratory

Lenore P. Tedesco, PhD
Executive Director, The Wetlands Institute
ltedesco@wetlandsinstitute.org
A Proving Ground Using Natural and Nature-Based Features to Provide Ecological Uplift and Enhanced Resilience for Ecosystems and Coastal Communities

Test Bed to Advance and Improve Dredging Techniques and Marsh Restoration and Coastal Feature Creation Techniques in Coastal New Jersey

Using an Adaptive Management and Systems Approach and Moving Forward From Pilots to Solutions

Based on an International Concept Pioneered by the Dutch

Back Bay Marsh Dominated System with Shallow Bays, Sounds and Tidal Inlets

SEVEN MILE ISLAND INNOVATION LABORATORY
Encompassing 24 mi², and 15,000 acres of Back Bay Tidal Marshes, Shallow Bays, and Inlets

- Bisected by the NJ Intracoastal Waterway
- Part of the Cape May Wetlands Wildlife Management Area
- Home of The Wetlands Institute

- Federal Beach Fill and Navigation Projects
- Confined Disposal Facility (CDF)
- Prior Placement Sites (PP)
- Elevated Nesting Habitat (ENH)
- Thin Layer Placement (TLP)
- Marsh Enhancement (ME)
SMIIL 2020/2021 Projects

- Elevation Enhancement and Nesting Habitat
- Sandy Marsh Edge Protection
- Elevation Enhancement and Nesting Habitat
- Mud Berm Creation and Tidal Flat Enhancement

Existing SMIIL Projects

- Avalon Marsh Enhancement
- Ring Island Nesting Habitat (not shown)
- Great Flats Nesting Habitat (not shown)
Average elevation change ranged between 0.9’ – 1.2’ but as much as 3’ in some areas.

On average, sites lost ½ elevation gain by 2017, 2 years post-placement.

Overall are close to ecological target elevations.

- NWFW Hurricane Sandy Coastal Resilience Grant
- Early Pilot Testing Pool Filling and Thin Layer Placement
  - Winter 2014 6,000 cy; Winter 2015 49,000 cy
  - Average elevation change ranged between 0.9’ – 1.2’ but as much as 3’ in some areas
  - On average, sites lost ½ elevation gain by 2017, 2 years post-placement
  - Overall are close to ecological target elevations

AVALON MARSH ENHANCEMENT PROJECT
NESTING HABITAT CLUSTERS: MIMICKING NATURE AND ACHIEVING A SYSTEM SOLUTION

- **Ecologic Value**
  - Creates Network of Nesting Sites at Different Stages of Succession
  - Separates Populations for Resiliency
  - Mimics Historic Distribution of Colonial Nesting Birds

- **Dredging Value**
  - Provides for Repetitive Placement
  - Creates More Volume Utilization
  - Allows for Staggered Placement

- Ring Island A (2014; 2018; 2021)
- Great Flats (2018)
- Ring Island B (Future?)
- Stone Harbor Point
Elevated Nesting Habitat Creation
- Fall 2014 – 1 acre 6000 cy

Sandy Thin Layer Placement
- 2 sites – 0.9 acre 1000 cy

Elevated Nesting Habitat Maintenance
- March 2018 1,200 cy
- 120' of Channel Cleared
- Reestablish Berm Crest at 6'
- Created Containment Berm with Onsite Sand

RING ISLAND ELEVATED NESTING HABITAT REPETITIVE PLACEMENT
How did elevation affect nesting bird use of the site?

Fig. 7. Elevation models (ft, NAVD88) and nest locations on Ring Island elevated nesting habitat over 5 years. Images labeled by 'Elevation data month year: nest data year'.

Nest displayed by species, collected by Garmin GPS or Trimble GPS. Elevations modeled from RTK data using empirical kriging model in ArcGIS, all years except 2016. *2016 elevations modeled from LiDAR data, provided by USACE, modeled by Princeton Hydro.
- Placed 6,000 yd$^3$ on 1 acre habitat
- Free Pump until Material to Create Containment
- Target Ecological Elevation 5.5'
  - Placement to 6.5' for Settling and Anticipated Wind Transport
  - 95%+ fine sand
- Had Thin Layer Placement of Mud on Surrounding Marsh Platform

Marsh platform had 0.1 - 0.4' elevation gain (mud)

Nesting Habitat had 3-4' elevation gain (sand)
NORTHERN USACE PRIOR PLACEMENT AREAS

- Prior Placement Sites Created Important Wading Bird Habitat
- Nesting Areas Account for Nesting for Nearly 1/3 of Wading Birds in State of NJ
- Habitat Degrading with Elevation Loss
Ecological Goals

- Unconfined on Marsh Sediment Placement to Create Elevated Nesting Habitat for Wading Birds
- Tidal Creek Outflow to Expand Intertidal Flats
- In Water Placement to Create Sandy Marsh Edge Protection Feature and Diamondback Terrapin /Horseshoe Crab Nesting Areas

Dredge Methods
- Direct placement to build marsh elevation
- Distribution Pipe to Separate Sand and Mud
- Marsh Edge Placement of Sandy and In water Placement of Mud

ISLAND ELEVATION ENHANCEMENT AND SANDY MARSH EDGE PROTECTION
ISLAND ELEVATION ENHANCEMENT & MUD BERM EMPLACEMENT

- Ecological Goals
  - Increase Elevation to High Marsh (> 3.5' NAVD88)
    - Target Seaside Sparrow and Wading Bird Nesting Elevation
    - Replace Lost High Marsh Habitat
    - Increase Marsh Platform Elevation to Spartina Benchmark Elevations
  - Build Subtidal Up to Intertidal Mud Berm
    - Shallow Subtidal Area to above MLLW to Enhance Benthic Macroalgae

- Dredge Methods
  - Direct placement to build marsh elevation
  - Y-valve to direct sand vs mud
  - In water placement of mud
ADVANCING SCIENCE AND PRACTICE AT THE SEVEN MILE ISLAND INNOVATION LABORATORY

For more information:

Lenore Tedesco – ltedesco@wetlandsinstitute.org

Monica Chasten - Monica.A.Chasten@usace.army.mil

Wetlandsinstitute.org/SMIIL

ewn.el.erdc.dren.mil/
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Pursuit of Engineering With Nature®
Strategies in the New Jersey Back Bays

Lenore P. Tedesco, PhD
Executive Director, The Wetlands Institute
ltedesco@wetlandsinstitute.org

Monica Chasten
Project Manager, USACE
Monica.A.Chasten@usace.arm.mil