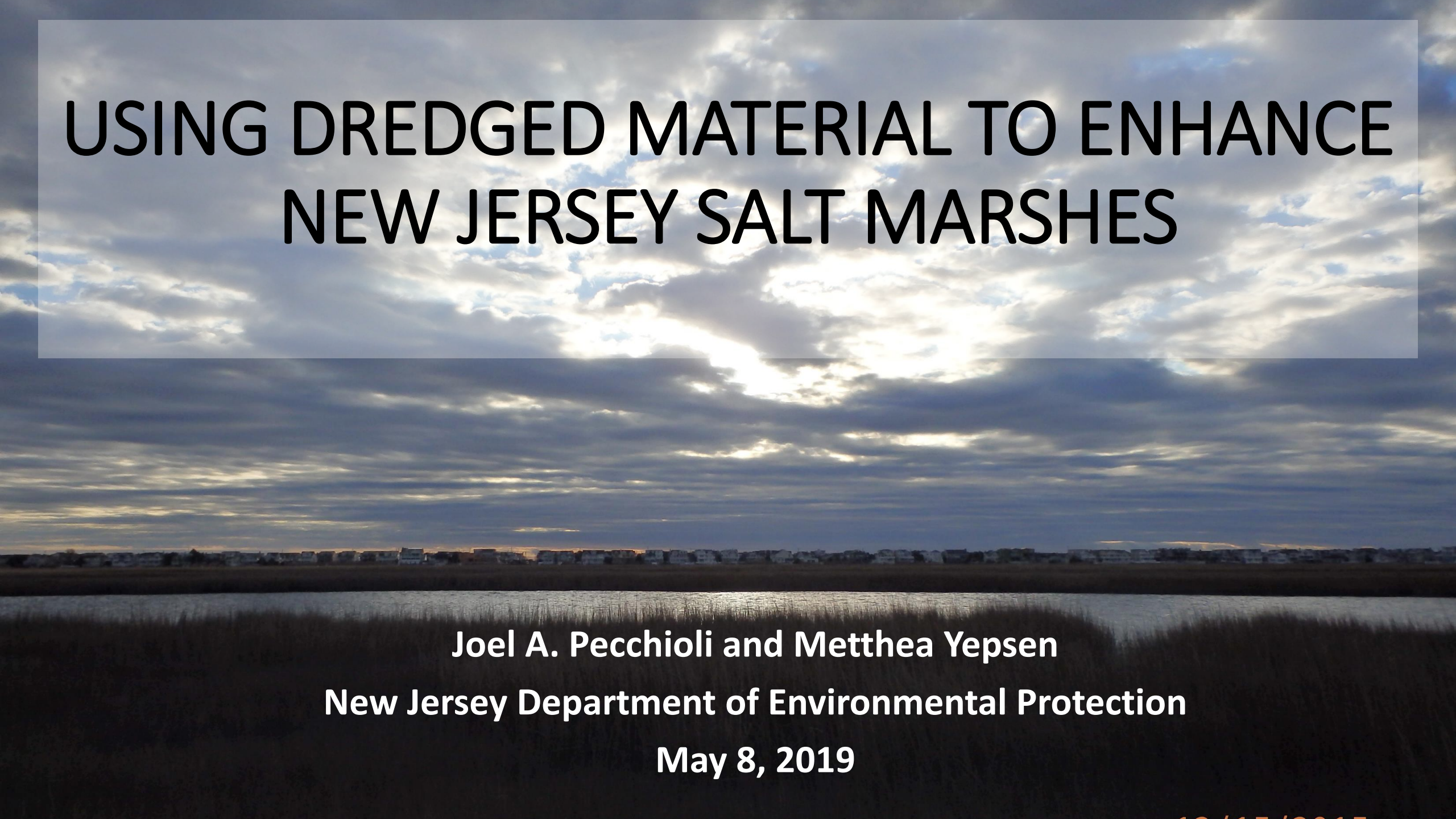
USING DREDGED MATERIAL TO ENHANCE NEW JERSEY SALT MARSHES



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New Jersey Department of Environmental Protection

May 8, 2019

Project Team

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

NEW JERSEY DIVISION OF Fish and Wildlife

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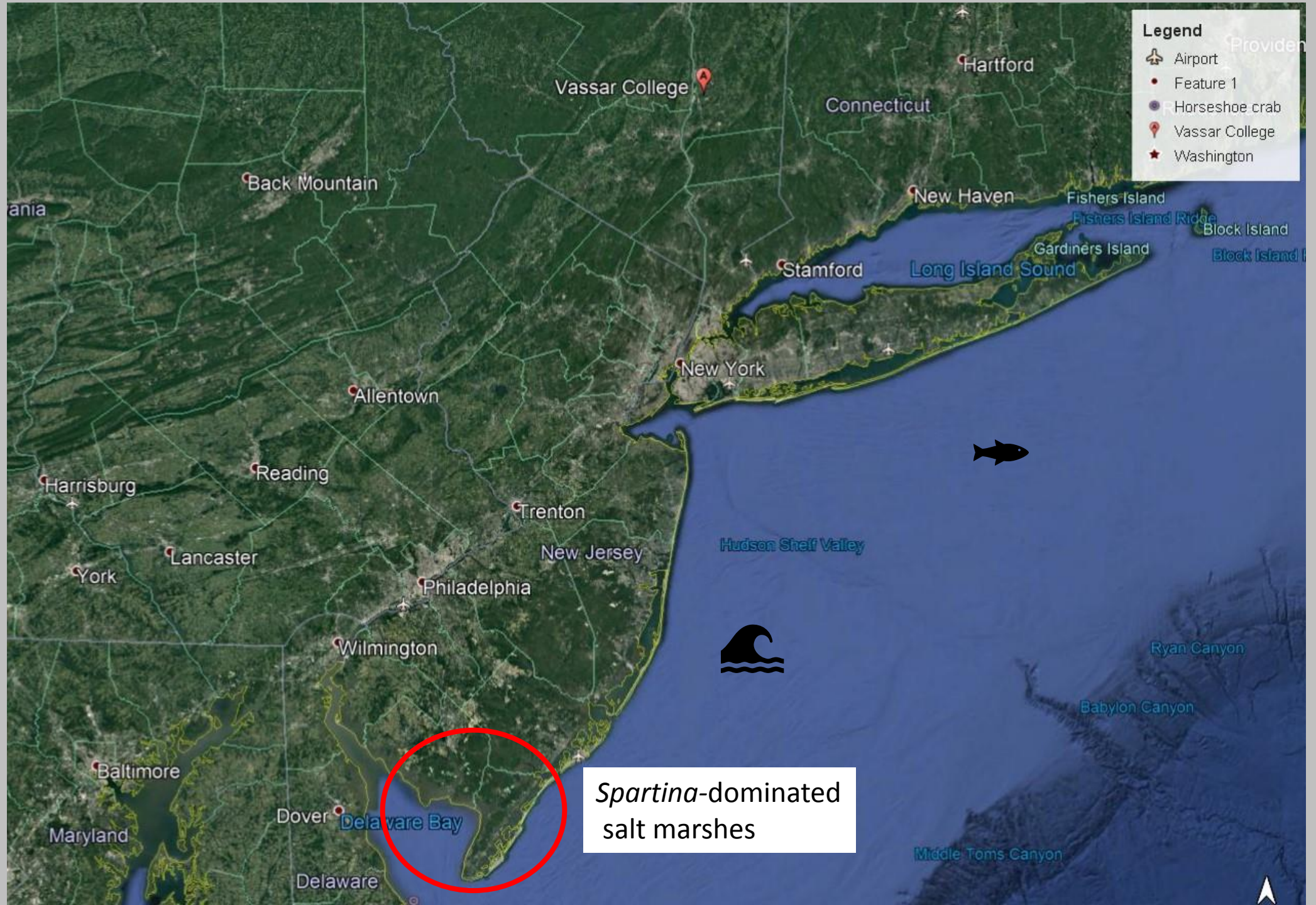
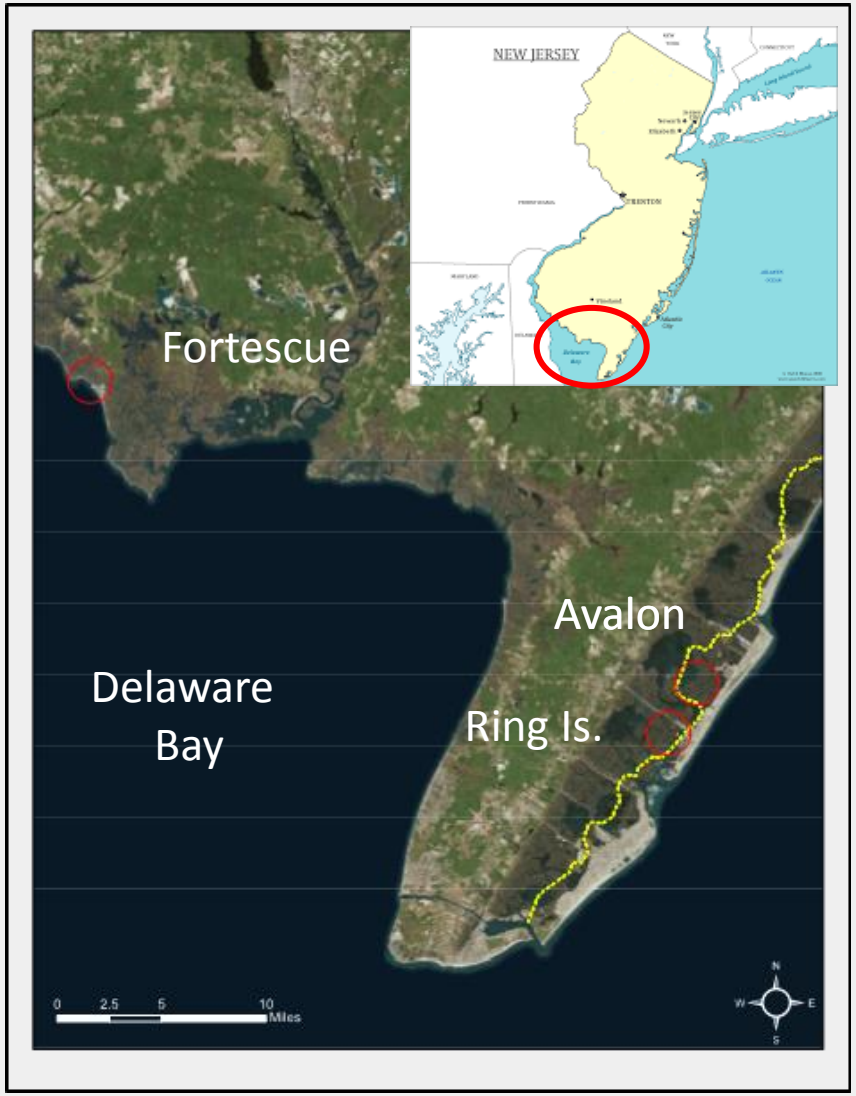

Legend
Airport
Feature 1
Horseshoe crab
Vassar College
Washington
Vassar College
Hartford
Connecticut
Back Mountain
New Haven
Fishers Island
Block Island
Gardiners Island
Long Island Sound
Stamford
New York
Allentown
Reading
Harrisburg
Trenton
New Jersey
Lancaster
York
Philadelphia
Wilmington
Hudson Shelf Valley
Ryan Canyon
Babylon Canyon
Middle Toms Canyon
Baltimore
Dover
Delaware Bay
Maryland
Delaware
Spartina-dominated salt marshes

NFWF Grant Overview and Objectives

- NFWF Hurricane Sandy Coastal Resiliency Competitive Grants Program (2014)
- Regional need for marsh enhancement and dredging
- Test dredged material beneficial use concept (ecological & economic benefits)
- Three “experimental” pilot projects in New Jersey – Ring Island, Avalon, & Fortescue



NJ Pilot Project Components & Conceptual Design Objectives

Project Site	Marsh Enhancement	Other Components
Ring Island (Sep 2014)	2 ~ 0.5-acre areas Thin Layer Placement (sand - 3 or 6 inches)	Shorebird Elevated Nesting Habitat (ENH)
Avalon (Dec 2014 – Jan 2015) (Nov 2015 – Feb 2016)	5 areas – 45 acres Fill degraded/expanding pools Overflow – TLP	Edge erosion/restoration considered - rejected
Fortescue (March 2016)	2 areas - 6.6 acres Increase elevation	Dune Restoration Beach Nourishment

Did not consider future sea-level rise

ADAPTIVE MANAGEMENT!!!

ITERATIVE DESIGN PROCESS

Site Assessment & Selection

Question #1: Is the marsh stressed?

Question #2: Can dredged material placement address the cause(s) of this stress?

- site hydrology
- sediment accretion/erosion

- High-level desktop analyses
- Rapid on-the-ground assessment
- Detailed site characterization

? - Nearby dredging project

Degraded and <u>Expanding</u> Pools

- anoxic
- no biota
- undercut edges

“Stressed Marsh”

+

Elevation Deficit

Reduced Vegetation Cover and Vigor

Marsh Edge Erosion

Placement Area Selection - Avalon Phase 2

Marsh Plain & Pool Characteristics

- Vegetation: % cover, height, vigor
- Elevation
- Biota use
- Pools: anoxic, no biota, undercut edges (vs. “healthy” pools)

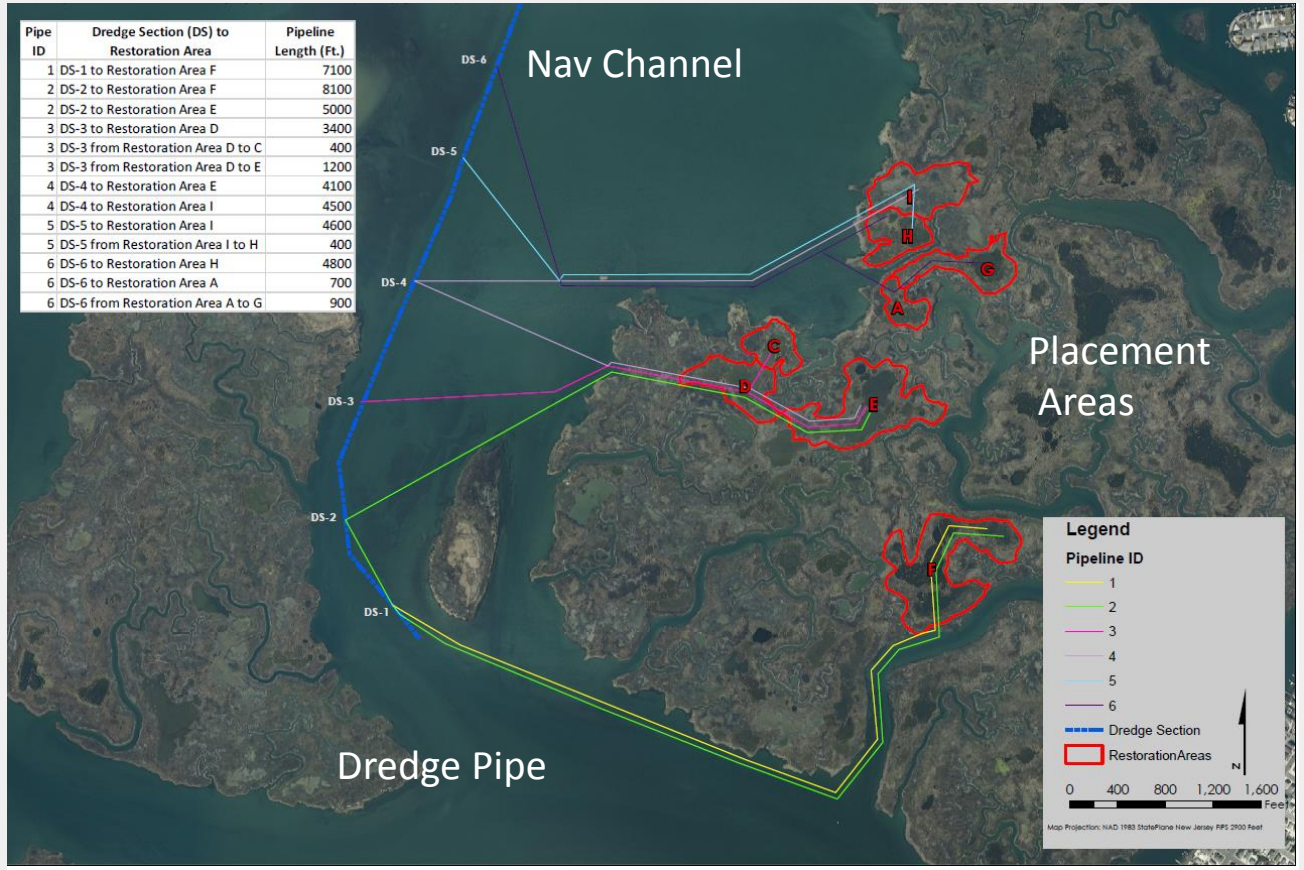
Sediment Characteristics

- Channel data compared to
  - NJDEP Ecological Screening Criteria (sediment, water quality)
  - marsh surface data

Dredging Project Design - Avalon

- Specific channel sections matched with marsh enhancement areas
  - Contaminant concentrations
  - Grain size distribution
- Volume of dredged material needed in each area calculated
- Pipe layouts designed
  - Distance from marsh edge
  - Marsh topography

Lesson Learned: It is critical that the design and construction of the marsh enhancement project is closely coordinated with the dredging project.



Pipe ID	Dredge Section (DS) to Restoration Area	Pipeline Length (Ft.)
1	DS-1 to Restoration Area F	7100
2	DS-2 to Restoration Area F	8100
2	DS-2 to Restoration Area E	5000
3	DS-3 to Restoration Area D	3400
3	DS-3 from Restoration Area D to C	400
3	DS-3 from Restoration Area D to E	1200
4	DS-4 to Restoration Area E	4100
4	DS-4 to Restoration Area I	4500
5	DS-5 to Restoration Area I	4600
5	DS-5 from Restoration Area I to H	400
6	DS-6 to Restoration Area H	4800
6	DS-6 to Restoration Area A	700
6	DS-6 from Restoration Area A to G	900

Sediment Testing

Project Site	Navigation Channel Grain Size Distribution TOC Bulk Sediment Chemistry Elutriate	Marsh Surface Grain Size Distribution TOC Bulk Sediment Chemistry
Ring Island (~1 acre)	1 core (96% sand) 6,000 CY	Not Conducted
Avalon (~60 acres)	19 cores/11 analytical 51,000 CY	71 samples/29 analytical Contaminant Issue
Fortescue (~20.5 acres)	8 cores/3 analytical 83,000 CY	33 samples/14 analytical Grain Size Issue

Marsh Enhancement Project Design

Target Ecological Elevations

- Biological benchmarks
- Max 4-6 inches dredged material

? – Consider future sea level rise?

Target Dredged Material Placement Elevations

- Bulking factor (assumed 2x)
- Consolidation

Placement Area boundaries revised

- Natural topographic contours
- High flow drainage paths
- Dredged material volume

Containment needs determined

- Target Placement Elevation vs. existing elevation
- Available containment sizes/diameters

Project Construction

Pre-Placement

- Planning and pre-construction meetings
- Site prep: grade stakes, containment

Placement

- Hydraulic dredging & placement
- Hands-on, real-time **ADAPTIVE MANAGEMENT**
- Constant communication with dredger

Post-Placement

- Inspection, clean-up, surveys

Post-Construction Monitoring Program

Formal Monitoring

- Vegetation
- Elevation/Topography
- Surface Water Levels
- Wildlife communities
  - Fish
  - Birds
  - Macroinvertebrates
  - Benthic infauna
- Sediment
- Wave Energy & Flood Modeling

Monthly Site Inspections

- Started in April 2016
- Real-time observations to identify significant issues and guide adaptive management
- Observations of:
  - Vegetation recovery/die-off
  - Containment
  - Dredged material
  - Planted material
  - Wildlife
- Fixed photo points

Lesson Learned: Qualitative monthly post-construction monitoring is very useful to adaptively manage the marsh enhancement project.

Post-Construction Adaptive Management

Vegetation Die-off Areas

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Containment Removal

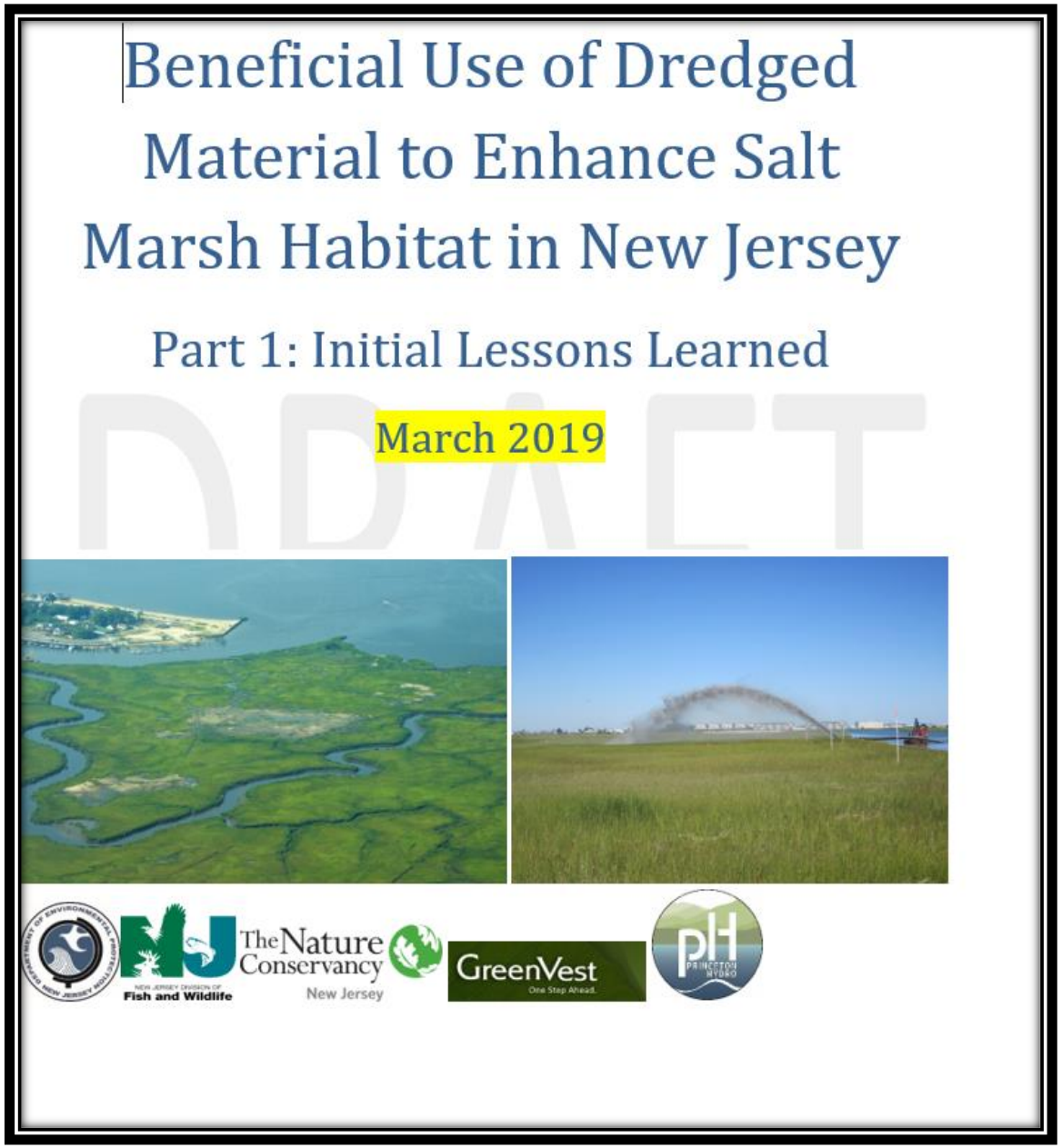
Invasive Species

Dredged Material Consolidation

Planting

Other Issues

- Regulatory – State and federal (USACE)
- Dredged material management alts?
- Schedule - Dredging “windows”
- Dredging contractors
- Cost: $45 - $140 per cubic yard
  $56,000 - $405,000 per acre
- Consider sea level rise?
  - Risk of action vs. no action
  - Temporal considerations
  - Adaptive capacity



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Thank You!