USING DREDGED MATERIAL TO ENHANCE NEW JERSEY SALT MARSHES

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New Jersey Department of Environmental Protection
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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

<table>
<thead>
<tr>
<th>Project Site</th>
<th>Marsh Enhancement</th>
<th>Other Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring Island</td>
<td>2 ~ 0.5-acre areas&lt;br&gt;Thin Layer Placement (sand - 3 or 6 inches)</td>
<td>Shorebird Elevated Nesting Habitat (ENH)</td>
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<tr>
<td>(Sep 2014)</td>
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<tr>
<td>Avalon</td>
<td>5 areas – 45 acres&lt;br&gt;Fill degraded/expanding pools&lt;br&gt;Overflow – TLP</td>
<td>Edge erosion/restoration considered - rejected</td>
</tr>
<tr>
<td>Fortescue</td>
<td>2 areas - 6.6 acres&lt;br&gt;Increase elevation</td>
<td>Dune Restoration Beach Nourishment</td>
</tr>
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<td>(March 2016)</td>
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</table>

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

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
Beneficial Use of Dredged Material to Enhance Salt Marsh Habitat in New Jersey

Part 1: Initial Lessons Learned

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Thank You!