Salt Marsh Restoration

through the

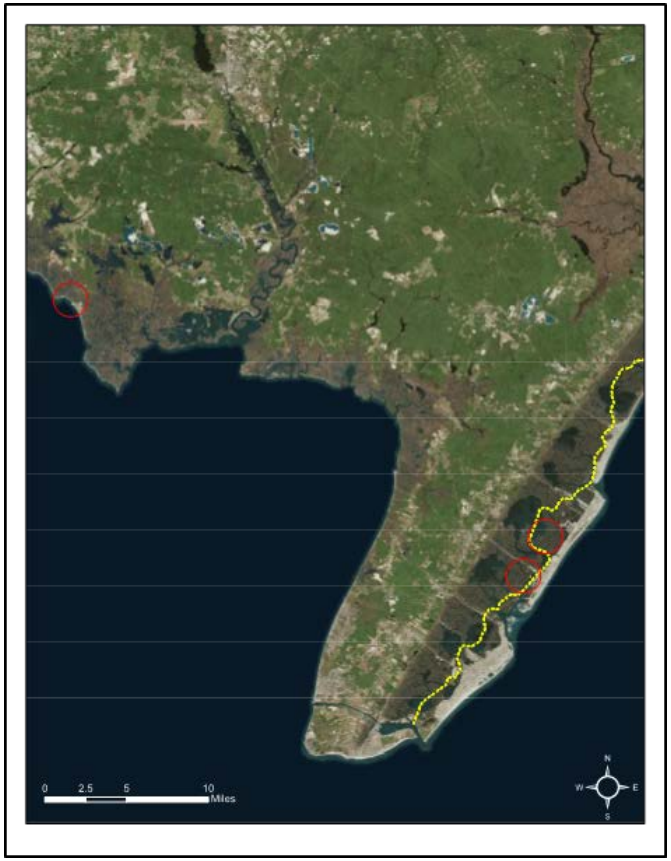
Beneficial Re-Use of Dredged Material

JACQUELINE JAHN

PROJECT ECOLOGIST, GREENVEST, LLC

Project Background

- **Objective:** Three trial projects to test the marsh restoration through beneficial re-use concept
- **Landowner:** NJ Division of Fish & Wildlife
- **Funding source:** Hurricane Sandy Coastal Resiliency grant (2-year)
- **Project Team:**
  - The Nature Conservancy
  - GreenVest
  - Princeton Hydro
  - The Wetlands Institute
  - NJDEP and more.



Project Background

Our Goals

- **Trial the beneficial reuse of dredged material to restore salt marshes to prove the concept in NJ (can achieve ecological goals while inflicting no harm)**
- **Collaborate with other resource agencies to best use limited resources**

Our Objectives

- **Implement multiple trial projects on multiple different sites**
- **Monitor projects to document success and challenges**
- **Disseminate lessons learned to facilitate future projects**

Monitoring

- Elevation
- Depth and duration of flooding
- Vegetation
- Wildlife communities
  - Fish
  - Birds
  - Macroinvertebrates
  - Benthic infauna
- Sediments
- Wave energy & flooding modelling
- Adaptive Monitoring (post-con)
- Lessons learned and Cost analysis

Trial Projects

- Ring Island Thin Layer Placement Demonstration Project
  - Aug – Sept 2014
- Ring Island Shorebird Nesting Habitat Creation
  - Aug – Sept 2014
- Avalon Thin Layer Placement Demonstration Project – Phase 1
  - Dec 2014 – Jan 2015
- Avalon Thin Layer Placement Demonstration Project – Phase 2
  - Nov 2015 – Feb 2016
- Fortescue Marsh, Dune and Beach Restoration
  - ongoing

Trial Projects

- Ring Island Thin Layer Placement Demo Project
  - Aug – Sept 2014

  - **Goal**: Raise elevation of marsh to enhance plant communities by adding a thin layer of dredged material
  - 2 trial areas (1 acre total)
  - 500-1,000 cy
  - Spraying a sand/water slurry across the salt marsh from edge
  - Placement ranged from 0.5 – 9”
  - Patchy recovery of plant communities are beginning to recover
  - **USACE & Barnegat Bay**
  - **NJDEP & The Nature Conservancy**

Trial Projects

- Ring Island Shorebird Nesting Habitat Creation
  - Aug – Sept 2014

  - **Goal**: Elevate marsh above mean high tide to create shorebird nesting habitat by adding a thick layer of dredged sand
  - 2 acre open sandy area
  - ~6,000 cy
  - Pumping sand/water slurry, dewatering and grading
  - The site has become a haven for coastal wildlife:
    - American Oyster Catchers, Least Terns, and Black-backed Gulls
    - Horseshoe crabs and Terrapin turtles
  - **USACE & Barnegat Bay**
  - **NJDEP, TNC & The Wetlands Institute**

Trial Projects

- Avalon Thin Layer Placement Demonstration Project – Phase 1
  - Dec 2014 – Jan 2015

- **Goal**: Fill unhealthy, expanding pools to restore/create contiguous marsh plain and raise the elevation of the surrounding marsh
- 2 trial areas (~5 ac total)
- ~5,000 cy
- Spraying a sand/water slurry across the salt marsh
- Limited containment
- Placement ranged from 0.5 – 18”
- **USACE & Barnegat Bay**
- **NJDEP & The Nature Conservancy**

Trial Projects

- Avalon Thin Layer Placement Demonstration Project – Phase 2
  - Nov 2015 – Feb 2016
    - **Goal**: Fill unhealthy, expanding pools to create contiguous marsh plain and raise the elevation of the surrounding marsh
    - 5 placement areas (~35 ac total)
    - ~45,000 cy
    - Staging pipe in marsh and pumping a sand/water slurry into pools
    - Fully contained
    - Placement ranged from 0.5 – 24”
    - **USACE & Barnegat Bay**
    - **NJDEP, TNC, GreenVest & Princeton Hydro**

ERDC
US Army Engineer Research and Development Center

AVALON PROJECT SITE

The problem: Expanding pool/degraded marsh complexes threaten the integrity of the salt marsh island

The solution: Fill the pools to create contiguous marsh plain and raise the elevation of the surrounding marsh

GreenVest
VISION · PERFORMANCE · RESULTS

The Nature Conservancy

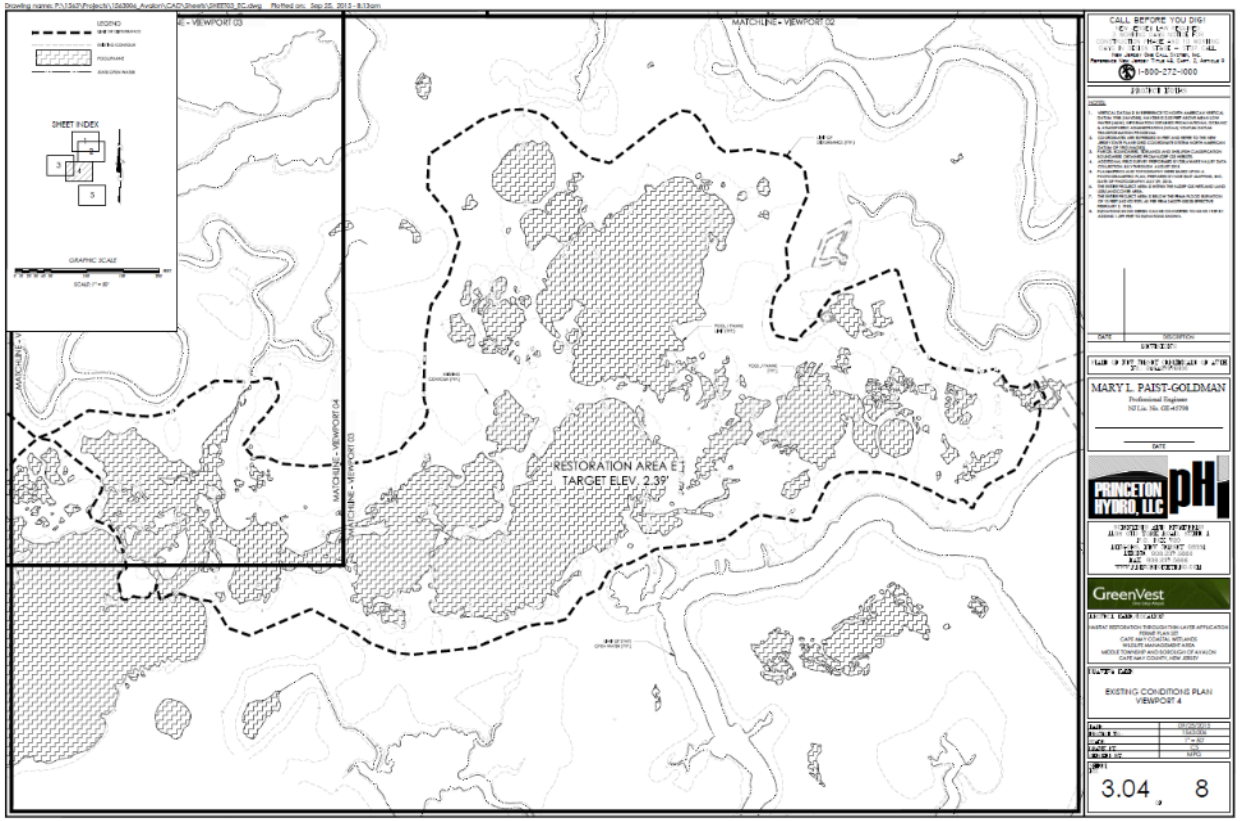
AVALON PROJECT SITE

Project Implementation

1. Sediment testing
   - 60:20:20 **SILT**:clay:sand
   - Dioxin/furans
   - Bulking
   - **Channel Sediment: USACE & ERDC**
   - **Marsh Sediment: NJDEP & Princeton Hydro**

AVALON PROJECT SITE

2. Project Design
   - Target elevations
   - Containment needs
   - Construction constraints
   - **GreenVest & Princeton Hydro**



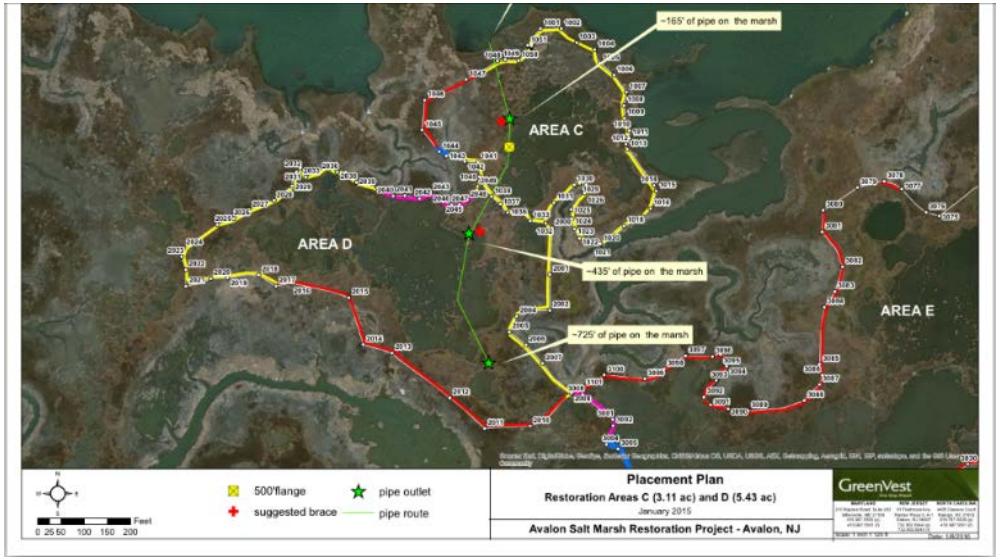
AVALON PROJECT SITE

Project Implementation

3. Containment Installation
   - Semi-permeable coconut fiber logs
   - Small, shallow “confined disposal facilities”
   - **GreenVest**

AVALON PROJECT SITE

4. Sediment placement
   - Transport & dispersal
   - 45,000cy over 40 acres
   - **USACE & Barnegat Bay**
   - **NJDFW & GreenVest**



AVALON PROJECT SITE

5. Planting
   - Natural recruitment has already begun
   - Planting will occur Spring 2017
   - **GreenVest**


So how did we get it done?

Agency Collaboration!

- Early conversations between USACE – Philadelphia District and NJ Division of Fish & Wildlife right after Hurricane Sandy
  - Interest
  - Feasibility
  - Project sites
  - Funding
- Gathering a large multi-disciplinary project team and maintaining regular communication

NJDEP's perspective at the outset

- Willingness and impetus came from viewing these as PILOT projects that will be carefully monitored
- NJDFW gathered trusted partners and set regular communication
- NJDFW invited reps from other NJDEP departments early on, who would participate in the project planning process

NJDEP's Project Team

NJDEP - Division of Fish & Wildlife
Office of Sediment & Dredging Technology
Office of Science

GREEN TRUST ALLIANCE

MANAGEMENT OF PROJECT IMPLEMENTATION

- GreenVest – project management, restoration design, construction oversight and implementation, monitoring
- Princeton Hydro – engineering, construction oversight, monitoring

THE NATURE CONSERVANCY

MANAGEMENT OF PROJECT MONITORING

- Stockton University – monitoring, modelling
- Rutgers University – monitoring
- The Wetlands Institute – monitoring, education

Project Planning Process

1. SITE ASSESSMENT
   - DEP attended site visits
   - Stated that the marsh must be degraded and BU must be the appropriate solution
   - “This is a restoration project not a disposal project.”
2. CHANNEL SEDIMENT ASSESSMENT
   - DEP performed independent assessment
   - Contaminants: “like-on-like” policy; matching marsh areas and channel segments
   - Texture: some consideration
   - Bulking and consolidation: used to set max cy of dredged material

Project Planning Process

3. RESTORATION PROJECT DESIGN
   - DEP reviewed several draft plans and participated in all design discussions
   - Required the use of bio-benchmarks to set target elevations
   - Required containment measures to protect tidal creeks and efficiently achieve target elevations
   - Required detailed topographic survey to determine target volume of dredged material and to determine containment needs
   - Target elevation was the only real success criteria but loose at that because of uncertainties in bulking and consolidation

Project Planning Process

4. PROJECT IMPLEMENTION PLANNING
   - DEP attended all planning discussions and meetings
   - DEP attended pre-construction meetings with USACE and their dredging contractor, Barnegat Bat Dredging
   - Required containment to be biodegradable
   - Required a DEP representative out on the marsh during construction
   - Required weekly communication on construction
   - Set timing restrictions for sensitive wildlife
   - Set guidelines on working during specific tidal conditions and night time
   - Required grade stakes as a visual guide on when to stop pumping, but no fixed requirement to revisit an area to meet grade
   - Set max. volume per marsh area, but allowed for easy permit modification due to uncertainties in bulking and consolidation
   - Set guidelines on how to adaptively manage construction, especially any breaches in containment

Finally Permits!

- Permits required:
  - Coastal General Permit #24 for Habitat creation, restoration, enhancement
  - Clean Water Act Section 401 Water Quality Certificate
  - Coastal Zone Management Program Consistency Determination
- Project-specific conditions:
  - No dredging between April 1 and Aug 31
  - Max volume of dredged material
  - Permitted target elevations and volumes per area
  - Sediments w elevated levels of dioxins could only be placed within designated areas on the marsh (like-on-like)
  - Minimize/document dispersal of sediments beyond area boundaries
  - Minimize impact to marsh by equipment
  - Plant
  - Monitor
- The key to permitting this project was intense participation by DEP throughout

DEP during construction

Weekly communication and troubleshooting!

Allowances made for certain circumstances.

DEP after construction

Weekly communications on monitoring and adaptive management

- **Interpreting results of monitoring**
- **Tracking unexpected results**
  - **Containment management**
  - **Vegetation die-off areas**

NJDEP's thoughts going forward

- A bit cautious to move forward until these pilot projects are complete and lessons are derived.
  - Bulking and consolidation for better planning
  - Reaction of marsh to the dredged material (chemical and physical) to establish thresholds (marsh compaction, smothering depth)
  - Issues with containment
  - Success or failure of original, recruited and planted material at various depths (recovery trajectories)
  - Costs
- Working on developing a permit application checklist
- Working on site assessment policies and how to ID if a marsh is a candidate (established the Coastal Ecological Projects Committee

Looking forward…

- Spring 2017 planting
- Continued monitoring within grant
- Acquiring funding to monitor long-term
- Publication of a team-authored white paper
- Distilling lessons learned for future projects

Thank you.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Fish and Wildlife


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Conservancy


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STOCKTON UNIVERSITY
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