

# Using Dredged Sediments to Uplift Marshes, Build Subtidal Shallows and Provide Marsh Edge Protection in the Seven Mile Island Innovation New Jersey



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- ▶ Encompassing 24 mi<sup>2</sup>, and 15,000 Acres of Back Bay Tidal Marshes, Shallow Bays, and Inlets
- ▶ Bisected by the NJ Intracoastal Waterway and Part of the Cape May Wetlands Wildlife Management Area (NJDEP)
- ▶ Collaborative Partnership to Advance Marsh Restoration Techniques Using Dredged Sediments

#### PROJECTS AND FEATURES OVERVIEW

- Federal Beach Fill and Navigation Projects
- Confined Disposal Facilities (CDF)
- Prior Placement Sites (PP)
- Elevated Nesting Habitat (ENH)
- Thin Layer Placement (TLP)
- Marsh Enhancement (ME)
- Intertidal Shallows (IS)
- Marsh Edge Protection (MEP)
- Tidal Flat Enhancement (TFE)

- ▶ Navigation Channel Creation and Maintenance Historically Placed Materials on Marshes and Built Islands
- ▶ Unconfined on Marsh and In Water Sediment Placement Created Important Habitats
- ▶ Most of the Remaining High Marsh Habitat in the Area Occurs on Historic Fill
  - ▶ Created important wading bird nesting habitats (98A,B,C)
  - ▶ Accounts for 27% of all colonial nesting wading birds in New Jersey
  - ▶ Experiencing Habitat Degradation with Elevation Loss Impacting Nesting Success
- ▶ Unintentional Beneficial Use with Engineering with Nature Principles that Provides Lessons Learned



 Historic Placement



## LEGACY SEDIMENT PLACEMENT

▶ Gull Island

- ▶ Large portion of tidal marsh on southern Gull Island is projected to convert to mud flats and open water
- ▶ Southern margin experiencing marsh edge erosion and risks of breaching

▶ Sturgeon Island

- ▶ Northern portions of island at low elevation and at risk of conversion to flats
- ▶ Northwestern island experiencing marsh edge erosion

▶ Both Islands

- ▶ Low-vigor *Spartina* flats border directly to open water or are functioning as low marsh and transitioning to high-vigor *Spartina*



## ► Ecological Goals

- Raise Elevations of Southeastern Marsh Platform Across a Gradient of Elevations
  - Target Wading Bird Nesting Elevations - Transitional Upland Shrub Habitat (>3.5' NAVD88)
  - Target High Marsh Elevations for Salt Marsh Sparrow (2.8' – 3.3' NAVD88)
  - Target Low Marsh Elevation for Fish Habitat (2.1 – 2.7' NAVD88) and Shorebird and Wader Foraging
- Create Marsh Edge Protection Zone
  - More Natural Marsh Edge Slope
  - Create Wave Energy Buffer
  - Intertidal Shoal to Marsh Edge Elevation (2.0' NAVD88)
- Enhance Intertidal and Subtidal Shallows
  - Target Elevations to MLLW Where Macroalgal Flats Transition from Sparse to Densely Vegetated (-1.0 MLLW – 0' MLLW)



## GULL ISLAND PROJECT GOALS

## GULL ISLAND

Unvegetated Flats

Marsh Pools

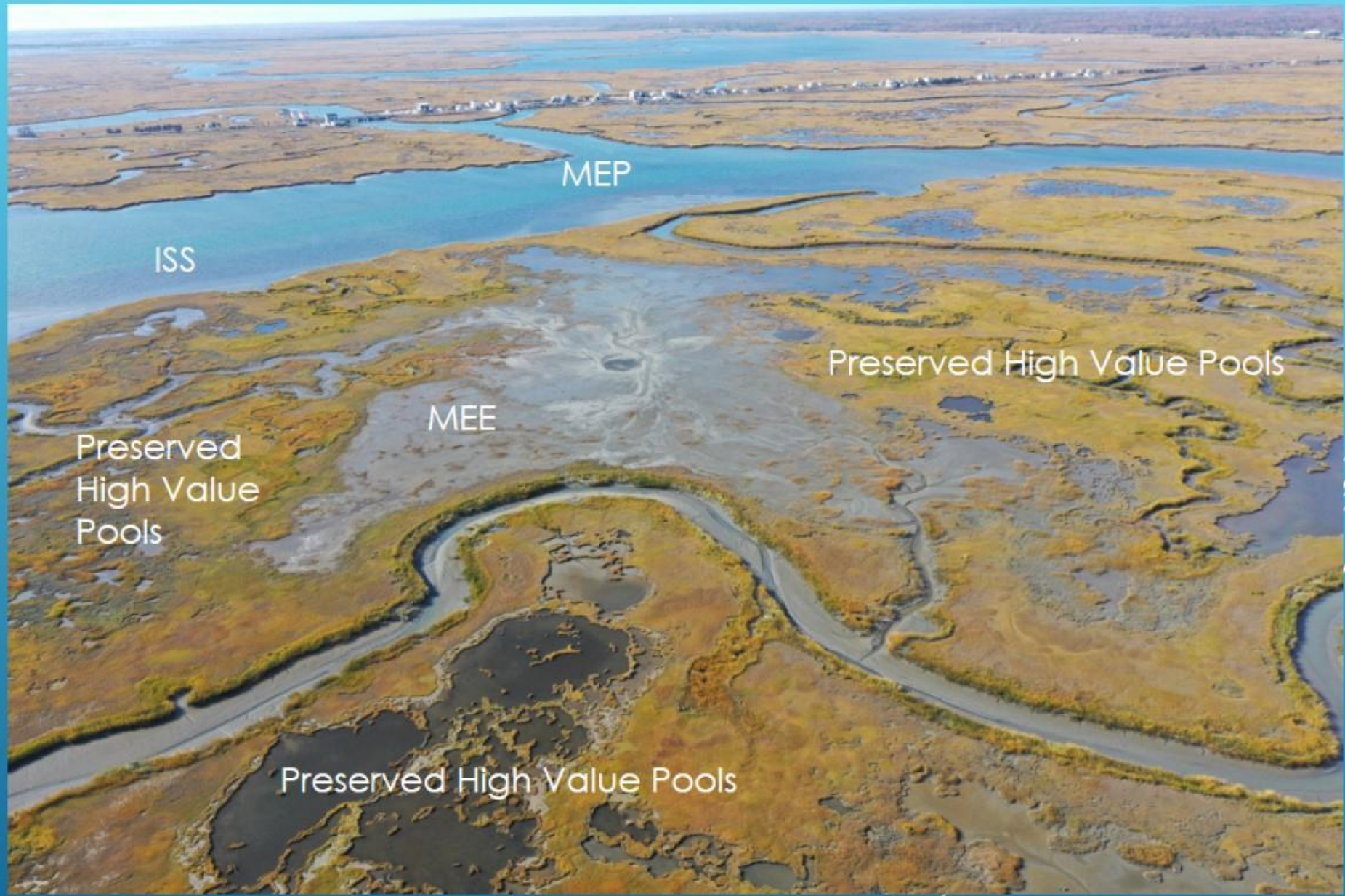
Subtidal Shallows

Intertidal Mud Flats

- ▶ Preserved marsh pools noted to be high quality habitat via avian use surveys and SAV occurrence
- ▶ Targeted marsh enhancement to areas of unvegetated flats at elevations below benchmark elevations for *Spartina alterniflora*
- ▶ Used benthic surveys and macroalgae assessments to set goals for intertidal shallows and mudflat target depths
- ▶ Used marsh erosion assessments and offshore slopes to locate marsh edge features



- ▶ September 2020
  - ▶ Placed 40,000 cubic yards of mixed fine sand and mud
- ▶ Marsh Elevation Enhancement (MEE)
  - ▶ 21 acres of elevation lift
  - ▶ 3.9' NAVD88 grading down to 1.8' NAVD88
- ▶ Marsh Edge Protection (MEP)
  - ▶ Built to marsh edge (2.0' NAVD88) grading down to MLLW
- ▶ Enhanced Intertidal Shallows (ISS)
  - ▶ Shallowed up to MLLW along southern island flank



# INITIAL ASSESSMENT GULL ISLAND

## Ecological Goals

- ▶ Marsh Elevation Enhancement to Create Nesting Habitat for Wading Birds
  - ▶ Target Elevation 3.5' NAVD88
  - ▶ Shrub Habitat Elevation Benchmark
  - ▶ Above 2.41' NAVD88 MHHW (old epoch) and 3.5' NAVD88 Frequent Storm Flood Elevation
- ▶ Create Sandy Marsh Edge Protection Feature
  - ▶ Protect Erosional Marsh Edge
  - ▶ Create Diamondback Terrapin /Horseshoe Crab Nesting Areas
- ▶ Enhance Intertidal and Subtidal Shallows
  - ▶ Target Elevations to MLLW Where Macroalgal Flats Transition from Sparse to Densely Vegetated (-1.0 MLLW – 0' MLLW)



# STURGEON ISLAND PROJECT GOALS

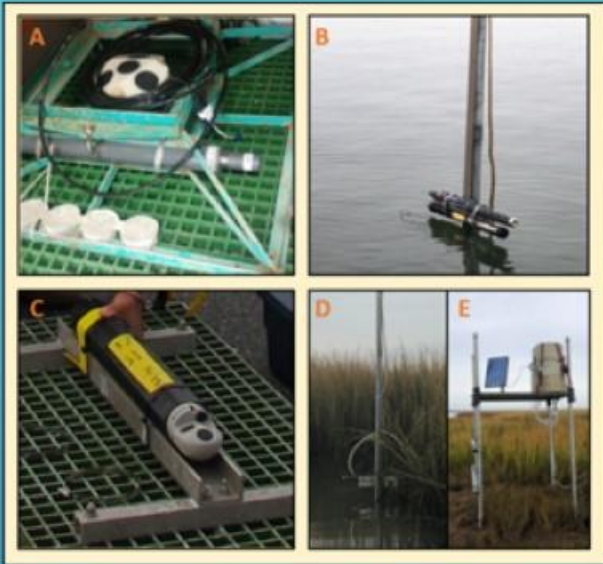


- ▶ Placed in Two Phases
  - ▶ March 2020
    - ▶ 4,200 cubic yards
  - ▶ September 2020
    - ▶ 15,000 cubic yards
  - ▶ Mixed fine sand and mud
- ▶ Marsh Elevation Enhancement (MEE)
  - ▶ 3.5 acres of enhancement
  - ▶ 3.0' NAVD88 grading down to 1.9'
- ▶ Marsh Edge Protection (MEP)
  - ▶ Placed small sand ridge along toe of erosional slope
- ▶ Enhanced Intertidal Shallows (ISS)
  - ▶ Shallowed above MLLW along eastern island to extend flats northward
- ▶ Plan to return to add additional material to reach ecological goals

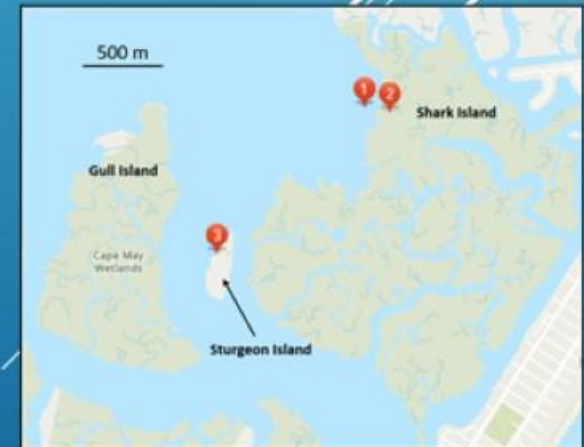
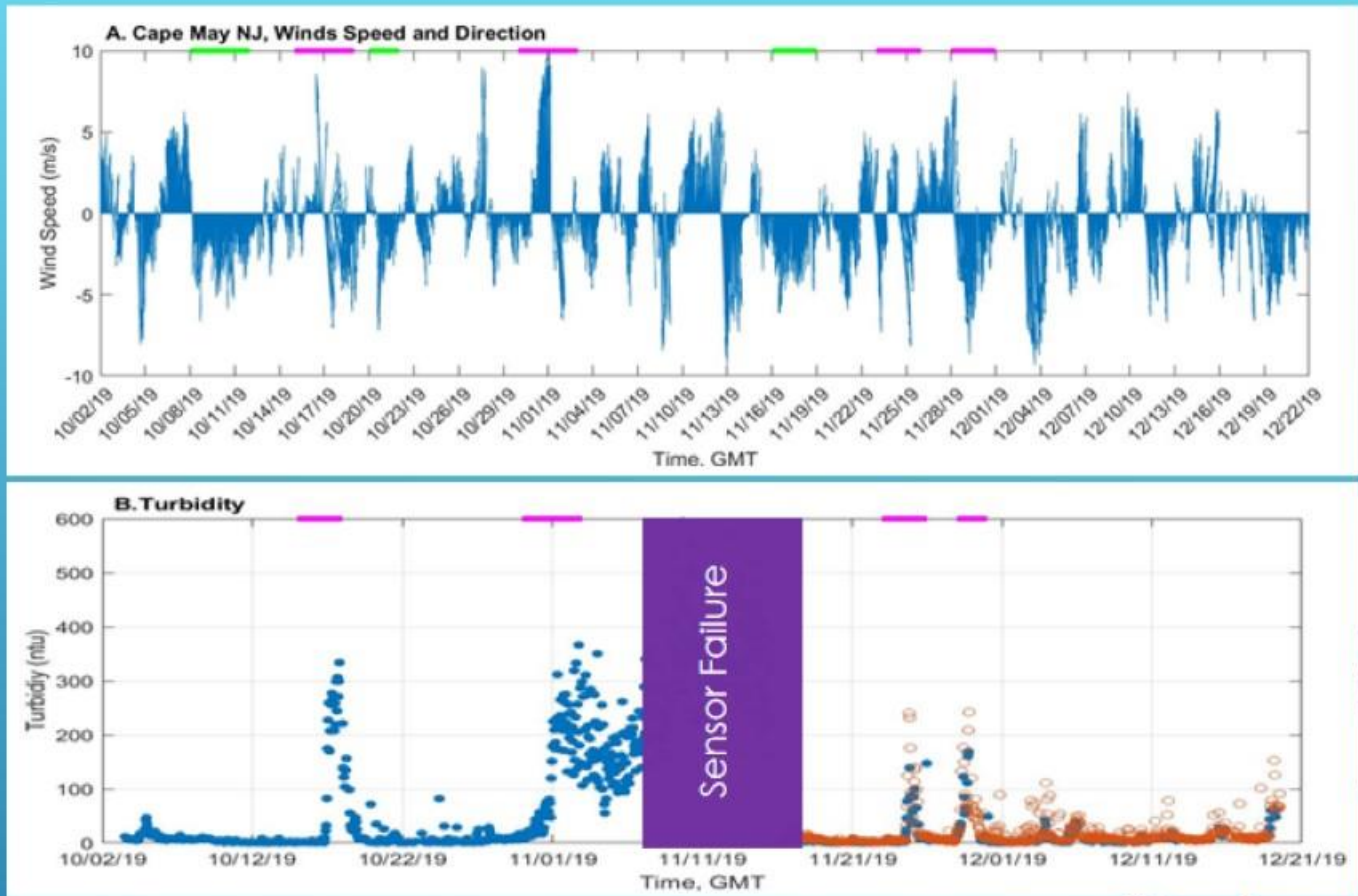


# INITIAL ASSESSMENT STURGEON ISLAND





- ▶ Background Turbidity Assessment
- ▶ October – December 2019:
  - ▶ Very low turbidity system overall
  - ▶ Spikes in turbidity of 250 – 380 ntu during periods of winds  $>5$  m/s (11 mph) corresponding to the passage of a Nor'easter and with a southerly wind event.



# TURBIDITY MONITORING DURING STORMS

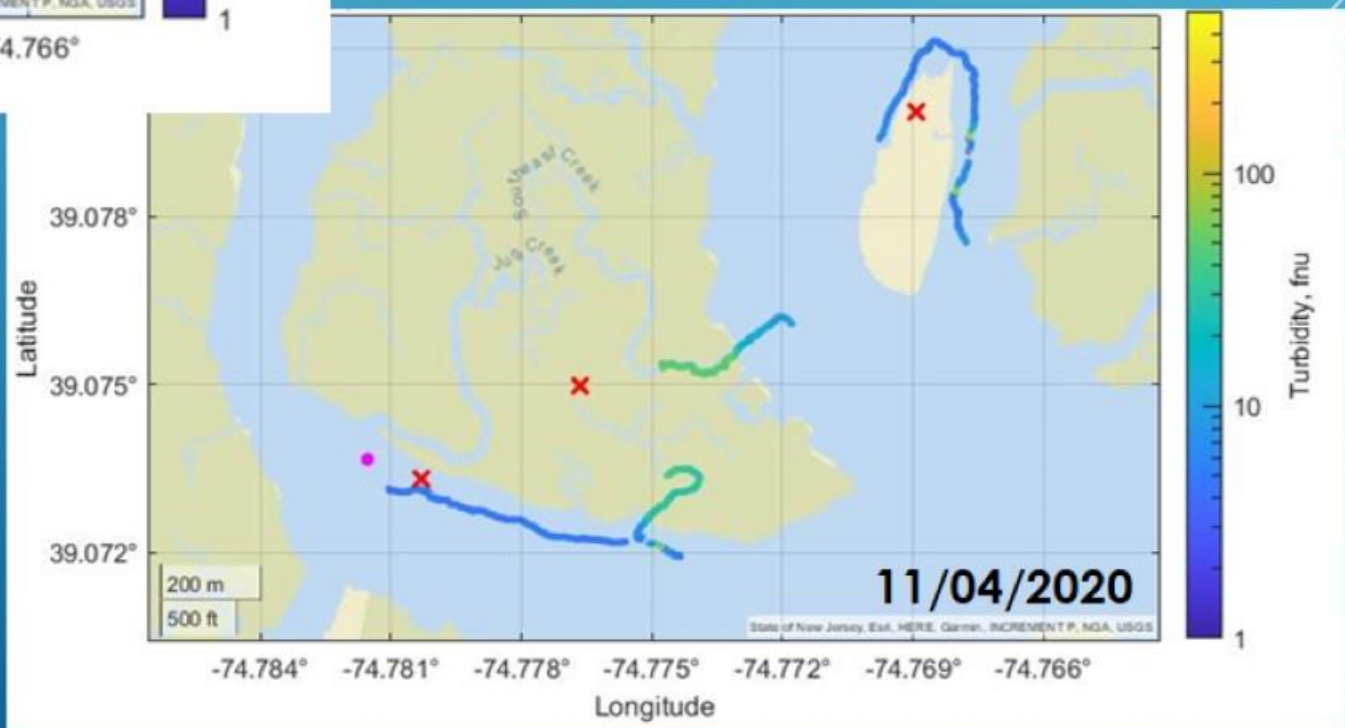


During Placement

X = Location of Discharge Pipe

1 Month Post-Placement

TURBIDITY MONITORING DURING AND POST-PLACEMENT

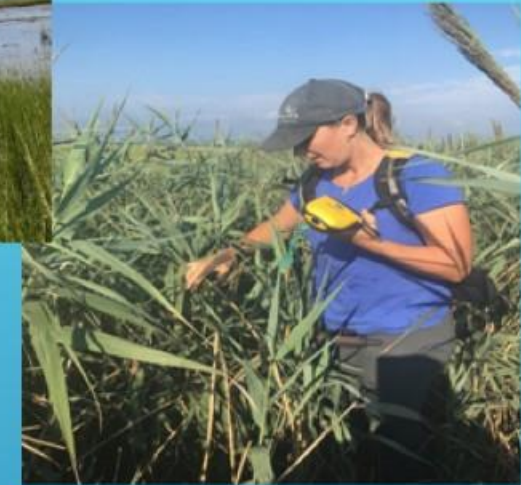


▶ Pre-Placement

- ▶ Topographic and Bathymetric Surveys
- ▶ Winds, Waves, Currents, and Turbidity Monitoring
- ▶ Water Levels and Flooding Elevations
- ▶ Vegetation Benchmark Elevation Surveys
- ▶ Benthic Community Assessment
- ▶ Macroalgae Assessment
- ▶ Avian Site Usage and Nesting Success Assessment
- ▶ Panne and Pool Survey

▶ Post-Placement

- ▶ Topographic and Bathymetric Surveys
- ▶ Sediment Dynamics and Evolution
- ▶ Water Levels and Flooding Elevations
- ▶ Benthic Community Assessment
- ▶ Macroalgae Assessment
- ▶ Avian Site Usage Assessment
- ▶ Vegetation Response



# MONITORING AND ASSESSMENT



# ADVANCING SCIENCE AND PRACTICE AT THE SEVEN MILE ISLAND INNOVATION LABORATORY

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