Beneficial Use Projects: Seven Mile Island Innovation Lab, New Jersey

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

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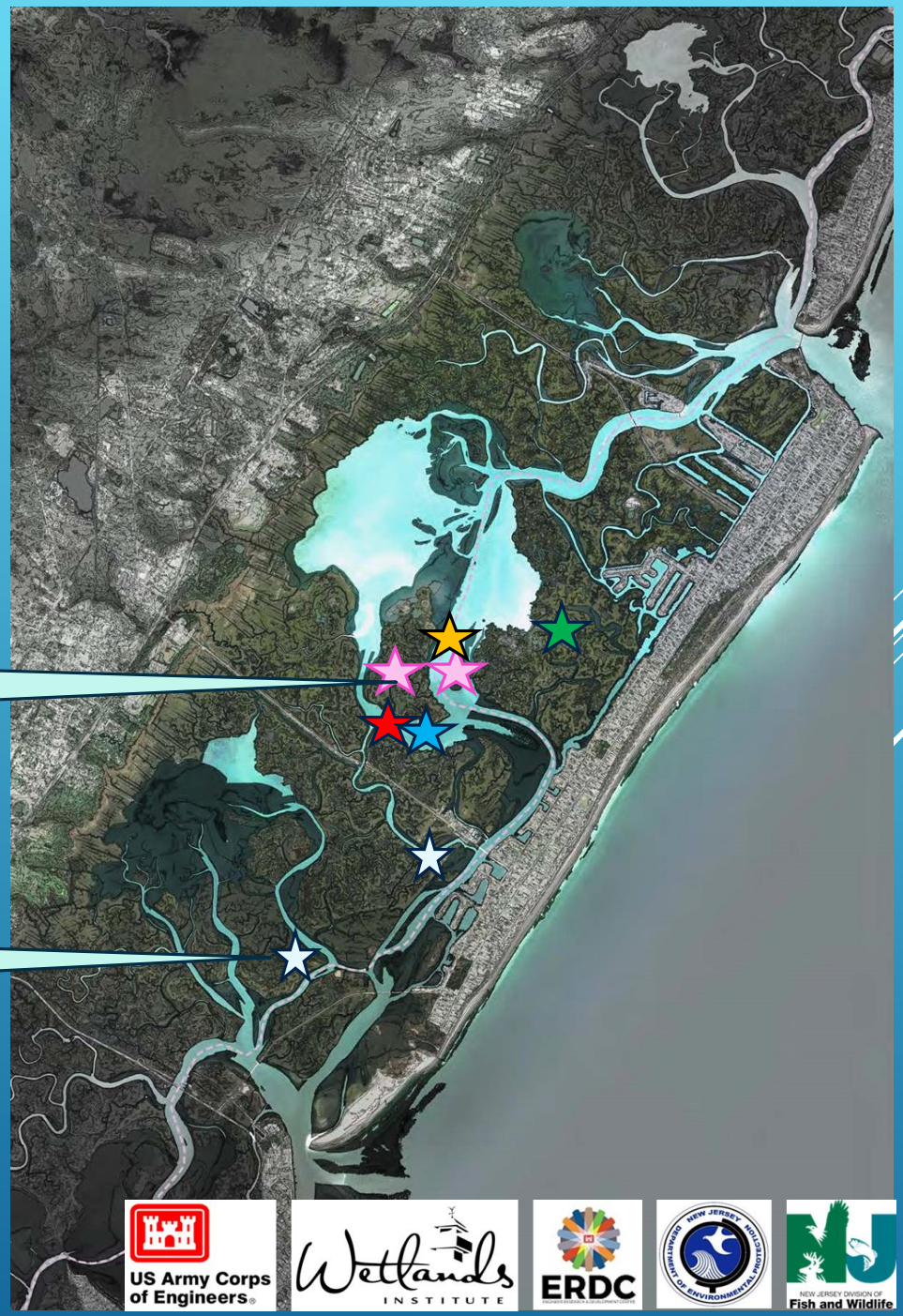
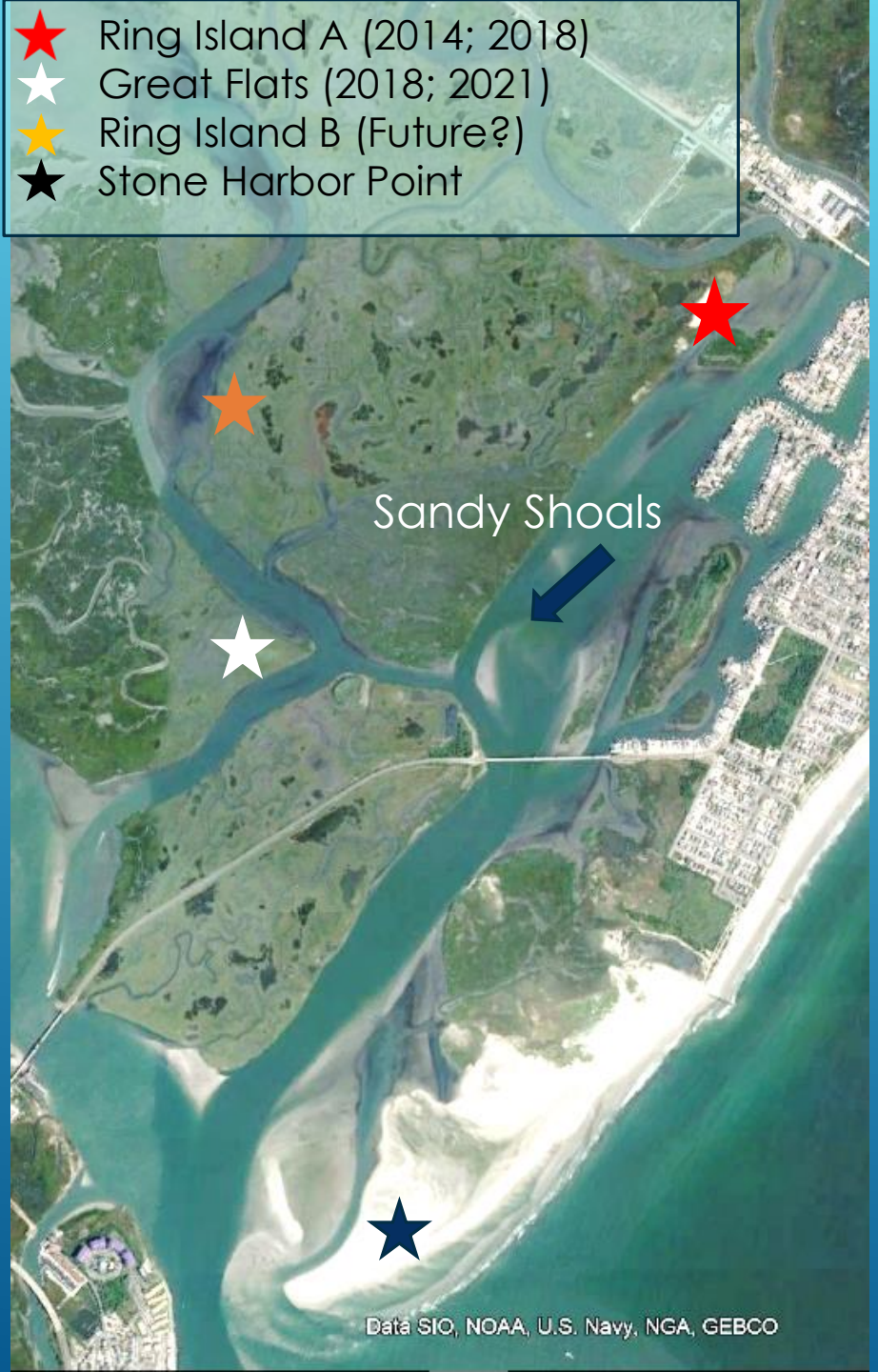
SMIIL BENEFICIAL USE PROJECTS

- Marsh Elevation Enhancement/Wading Bird Nesting Habitat
- Sandy Marsh Edge Protection
- Intertidal Shallows and Tidal Deltas
- Edge Protection and Tidal Flat Enhancement
- Marsh Enhancement
- Elevated Nesting Habitat

Sediment Type Mixed Fine Sand and Mud
Hydraulic Dredging and Transport
Nearby Placement Sites for Constructability/Cost

Sediment Type: Fine to Medium Sand
Hydraulic Dredging and Transport





NESTING HABITAT CLUSTERS: MIMICKING NATURE AND MANAGING NAVIGATIONAL NEEDS

- Dredging Need
  - Shoaled Portion of NJIWW
  - Sandy Sediments (95%+)
- Ecologic Value
  - Creates Network of Nesting Sites for Several Beach-Nesting Species at Different Stages of Succession
    - Black Skimmer
    - Common and Least Terns
    - American Oystercatcher
  - Separates Populations for Resilience
  - Reduces Footprint of Marsh Disturbance
- Dredging Value
  - Provides for Repetitive Placement Cycles
  - Matches Ecological Goals with Dredging Goals
  - Minimizes Permitting and Reduces Costs

- Elevated Nesting Habitat Creation
  - Fall 2014 – 1 acre 6000 cy
- Sandy Thin Layer Placement
  - 2 sites – 0.9 acre 1000 cy

RING ISLAND ELEVATED NESTING HABITAT REPETITIVE PLACEMENT

- Elevated Nesting Habitat Maintenance
  - March 2018 1,200 cy
  - 120’ of Channel Cleared
  - Reestablish Berm Crest at 6’ for 5.5’ Ecological Goal
  - Disturbed Vegetation Stabilization
  - Created Containment Berm with Onsite Sand
  - Have Diamondback Terrapin and Horseshoe Crab Nesting Usage

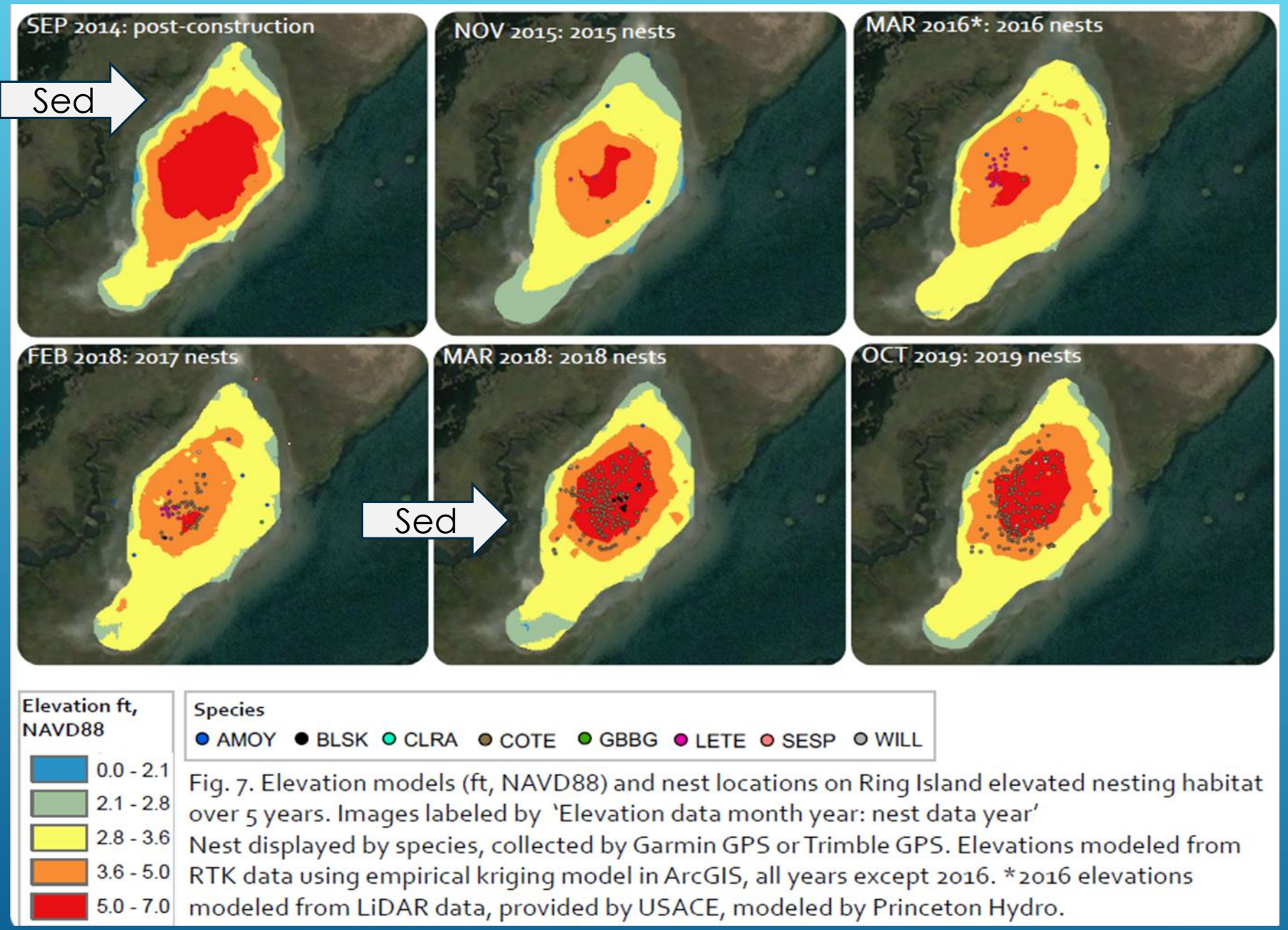
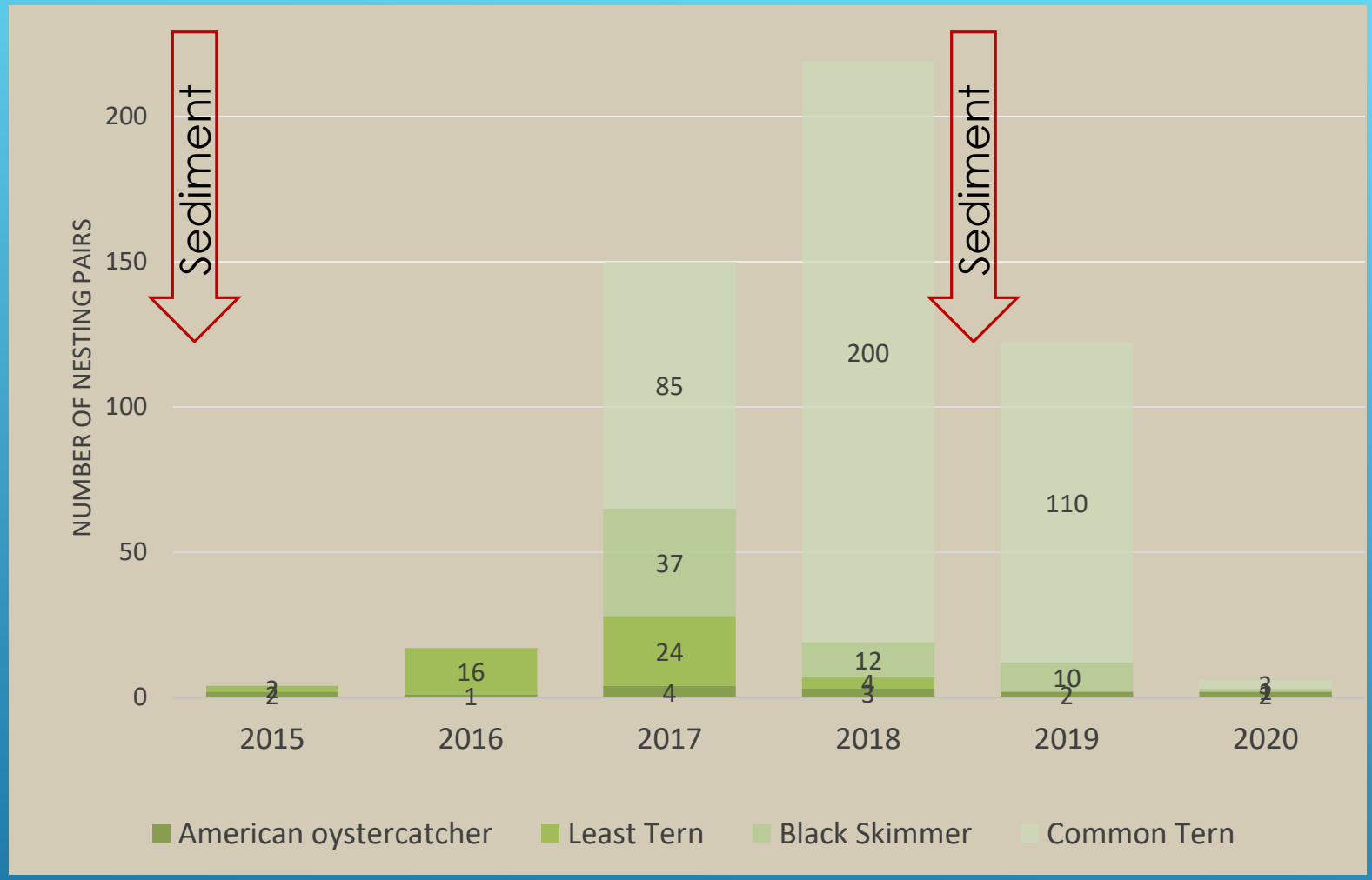


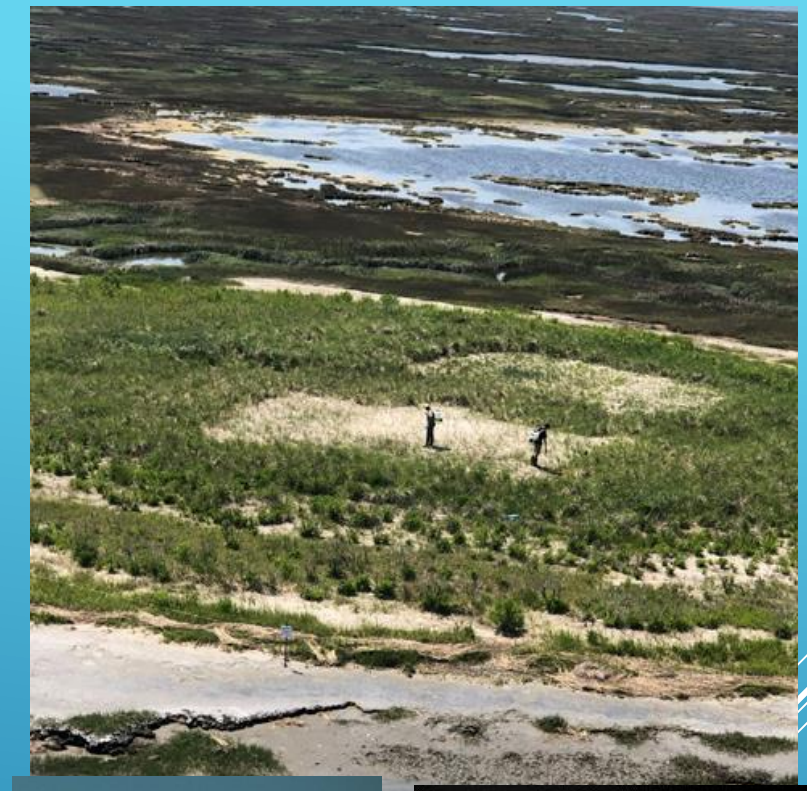
Fig. 7. Elevation models (ft, NAVD88) and nest locations on Ring Island elevated nesting habitat over 5 years. Images labeled by 'Elevation data month year: nest data year'
Nest displayed by species, collected by Garmin GPS or Trimble GPS. Elevations modeled from RTK data using empirical kriging model in ArcGIS, all years except 2016. *2016 elevations modeled from LiDAR data, provided by USACE, modeled by Princeton Hydro.

- Documented habitat use and nesting success
- Strong species response to available nesting habitat
- Observed vegetation establishment and reduction in elevated platform

Ferguson, et al, 2019



Ferguson et al, 2021

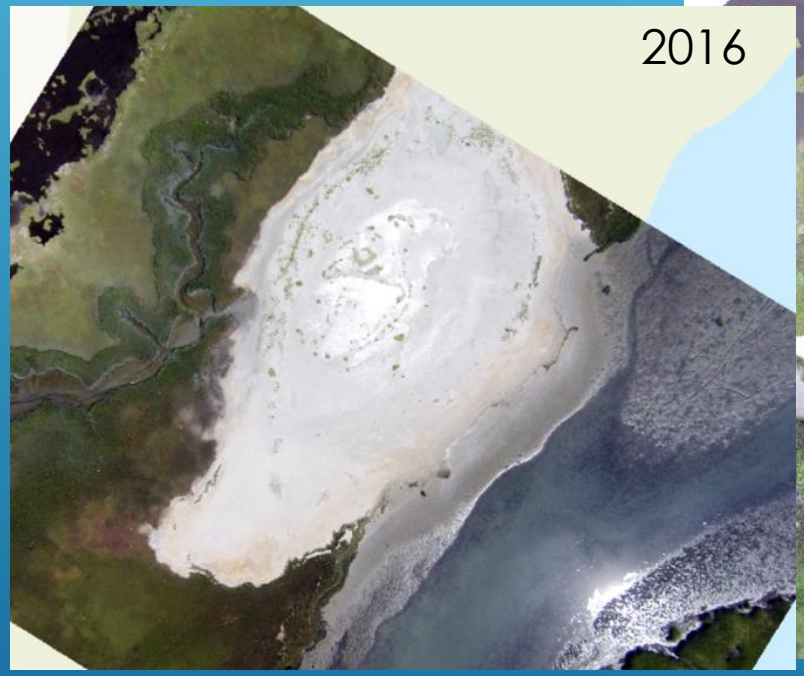


ADAPTIVE MANAGEMENT

- More habitat management challenges as ENH matured
- Number and success of nesting declined

Image Courtesy NJDEP

- Vegetation Management via Burning and Concentrated Salt Solution Had Limited Temporal Success
- After Three Years, Vegetation Cover Limited Site Utilization by Colonial Nesting Birds
- Refurbish Site with Additional Sand and Remove Vegetation or Manage for Colonial Wading Bird Colonies?



ADAPTIVE MANAGEMENT AND SITE SUCCESSION

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- Sited Project on Historic Fill Area
- Placed 6,000 yd^3 on 1 Acre Habitat
- Free Pump until Enough 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

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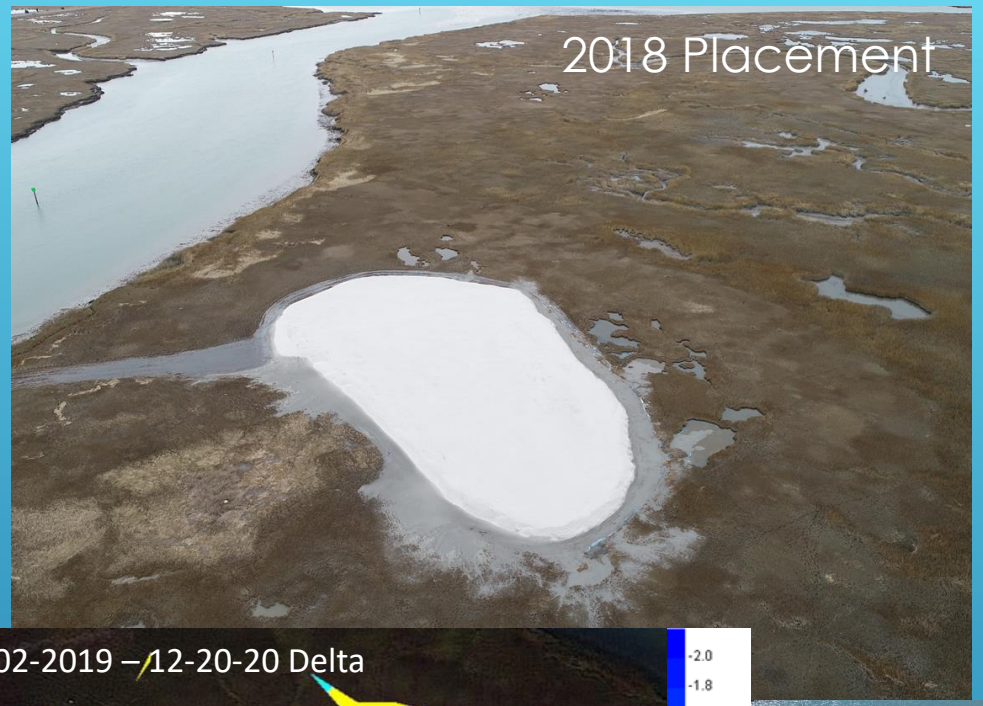
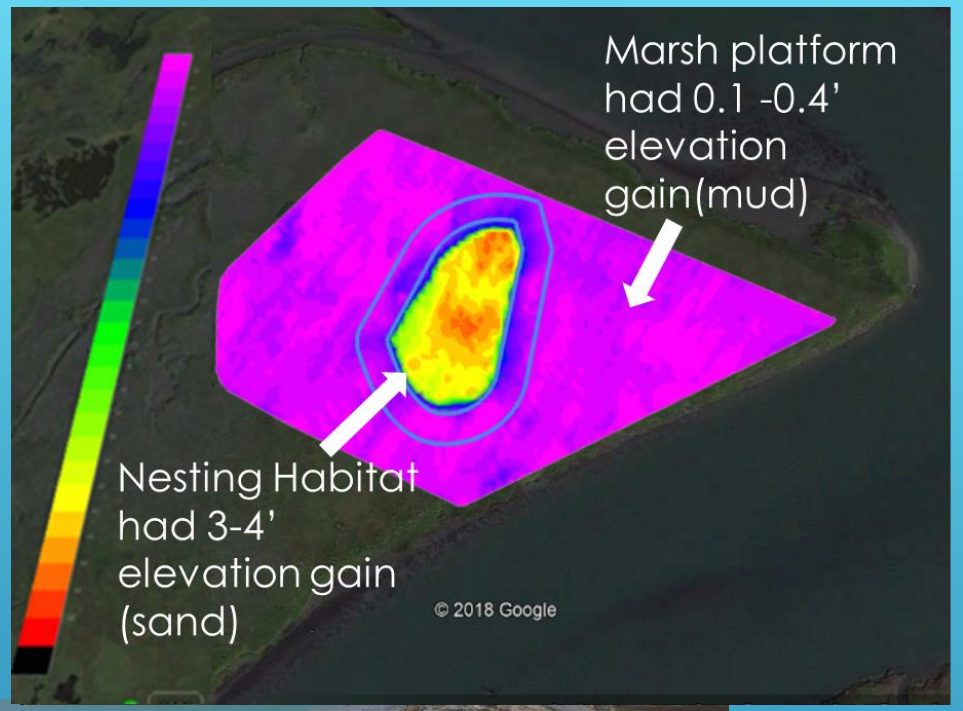
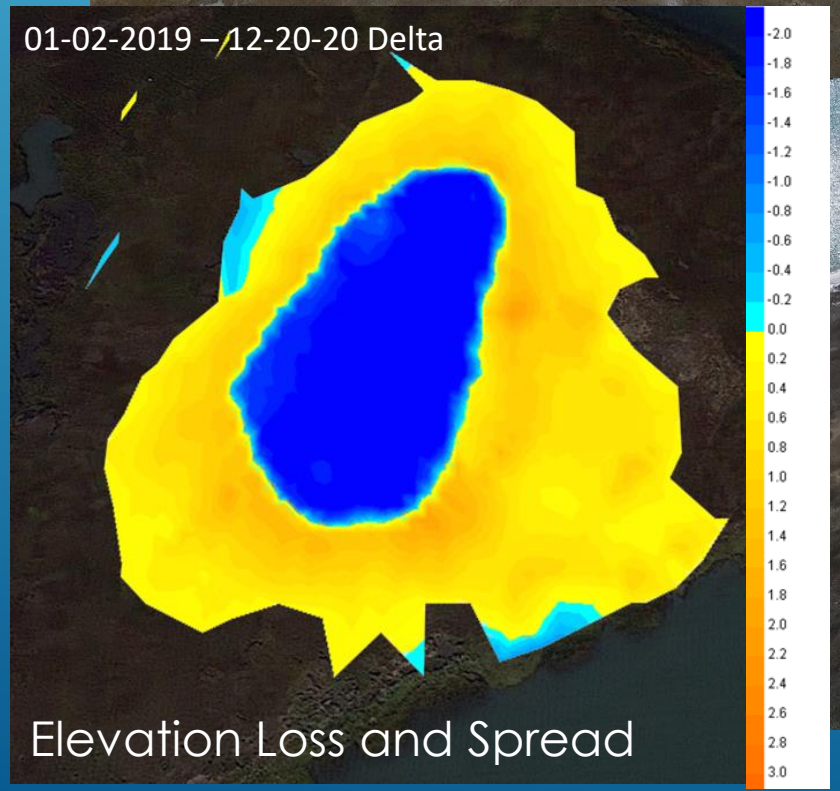




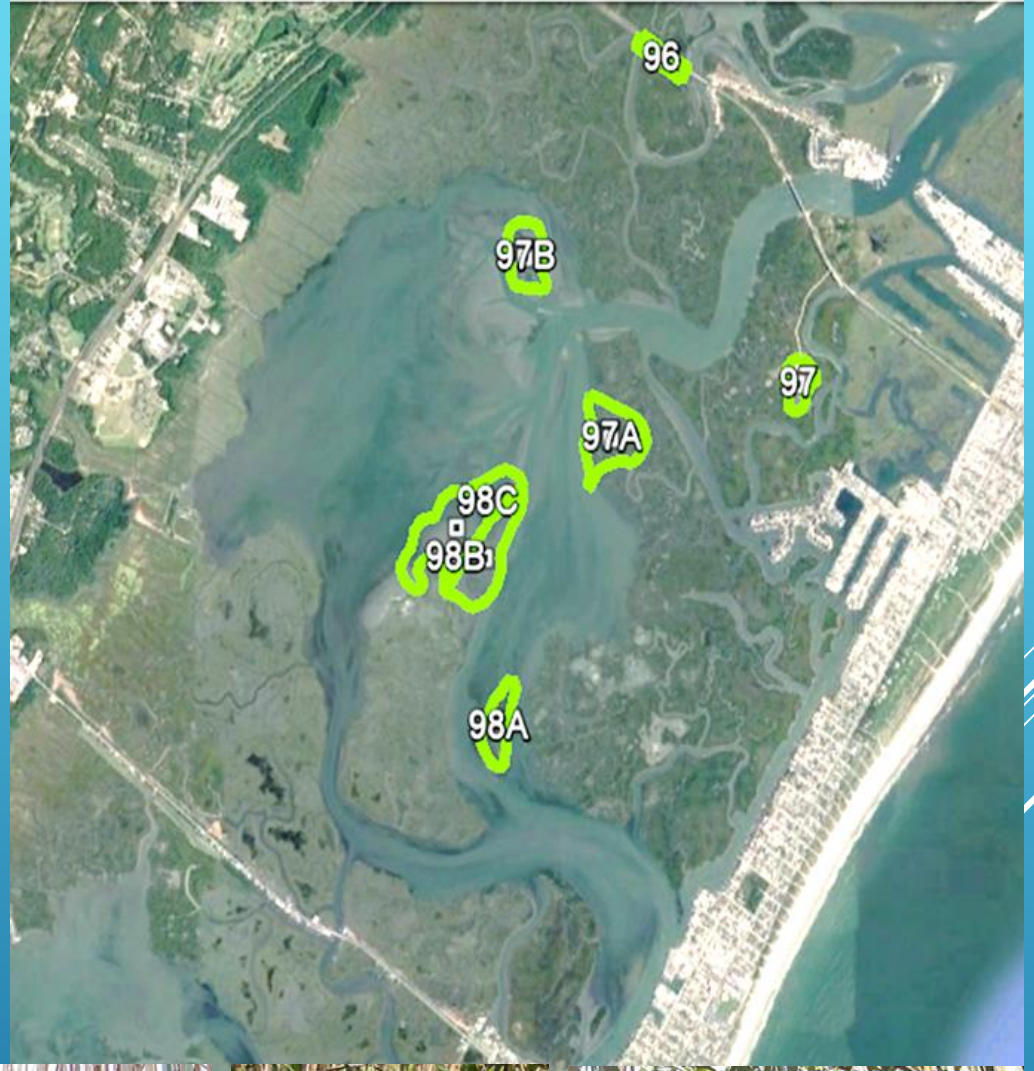


January 2021

- Refurbished with 3,900 CY
- Berm with existing material
- Ecological Elevation 5.5'
  - Construction Elevation 6.5' for Settling and Anticipated Wind Transport
  - 95%+ Fine Sand

GULL AND STURGEON ISLANDS

- Legacy placement sites created important wading bird nesting habitats (98A,B,C)
  - Nesting habitat includes Phragmites, woody shrub, and trees
- Gull and Sturgeon Island colonies support ~27% of colonial nesting wading birds in New Jersey (NJDFW, 2018)
  - Habitat on both islands is degrading: flooding, habitat loss, density-dependent impacts, competition

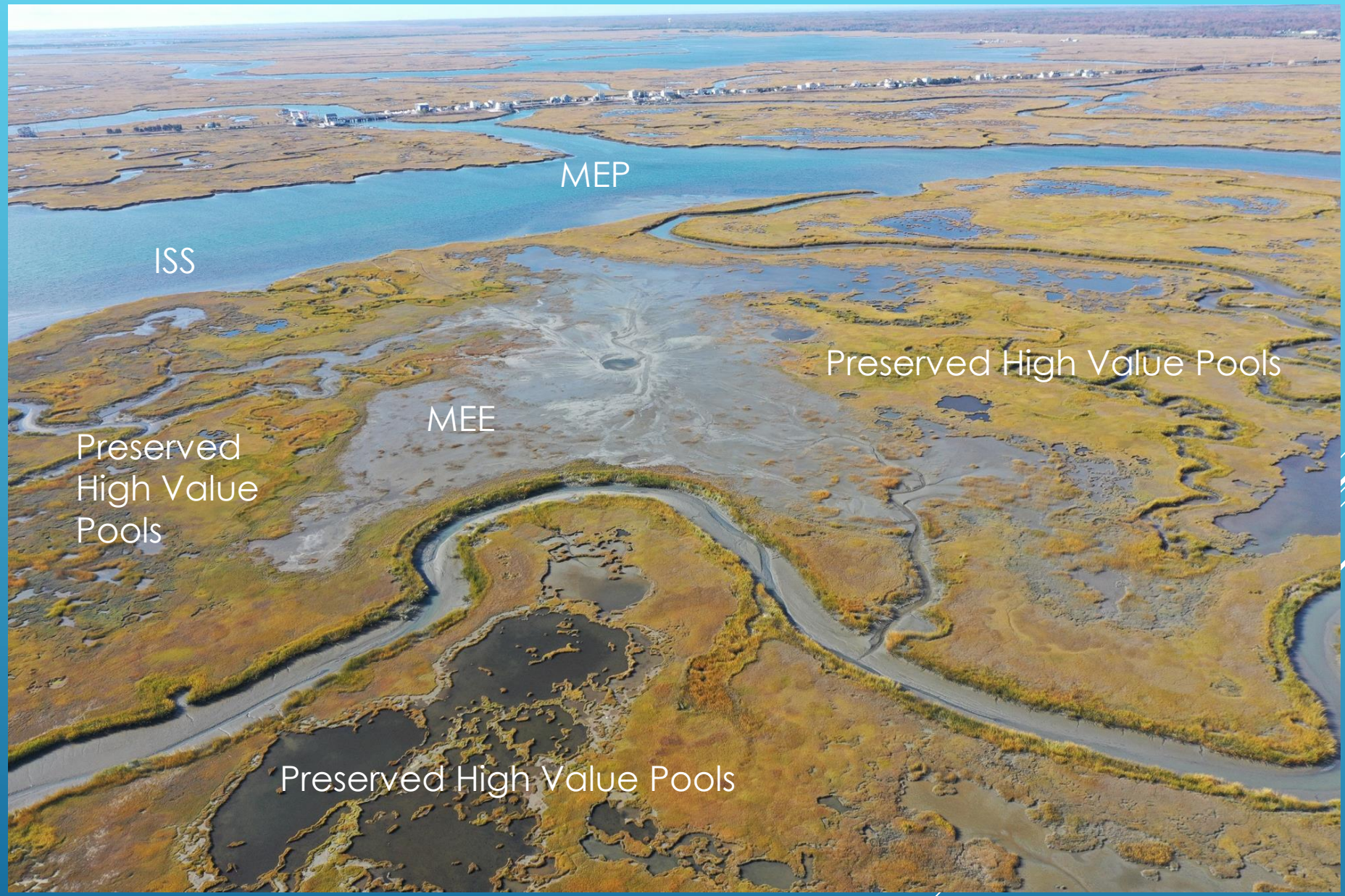


- Gull Island
  - Large portion of tidal marsh on southern Gull Island is projected to convert to mud flats and open water
  - Southern margin experiencing marsh edge erosion and risks of breaching
- Sturgeon Island
  - Northern portions of island at low elevation and at risk of conversion to flats
  - 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*
  - Only stable portions of islands are historic dredge material placements

GULL ISLAND PROJECT GOALS

- 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)

- 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 PROJECTS

Year 1

- *Spartina* colonization has initiated across several areas
- Intertidal and subtidal flats are stable and lack evidence of turbidity generation
- Avian site usage monitoring is documenting wading bird foraging, shorebird and gull loafing, and migratory shorebird occurrence
- Benthic and SAV monitoring is ongoing
- Several research projects evaluating sediment transport and fate, elevation evolution, and compaction

GULL ISLAND RESTORATION

ADVANCING SCIENCE AND PRACTICE AT THE SEVEN MILE ISLAND INNOVATION LABORATORY

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