SEVEN MILE ISLAND INNOVATION LABORATORY

Lenore P Tedesco – The Wetlands Institute
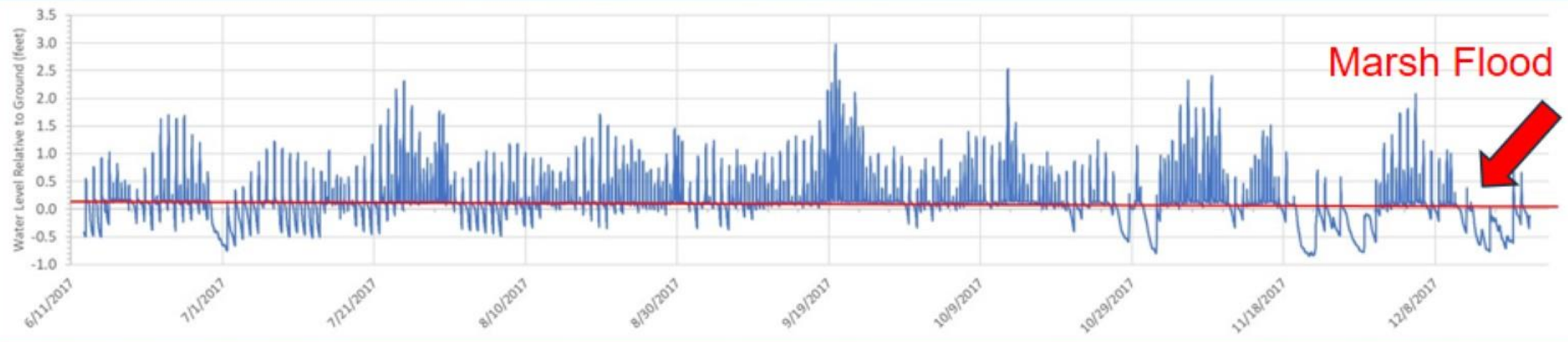
Monica A. Chasten - Philadelphia District of USACE

Ginger Kopkash - NJDEP

Lisa Ferguson - The Wetlands Institute

Dave Fanz – NJDEP (Retired)

US Army Corps of Engineers®

Wetlands INSTITUTE

- Sea level rise rates now exceed most marsh accretion rates in NJ
- Sediment is the currency of these systems and keeping sediment in the systems has become crucial to the long-term fate of shallow coastal ecosystems

- A Proving Ground Using Natural and Nature-Based Features to Provide Ecological Uplift and Enhanced Resilience for Ecosystems and Coastal Communities

- Test Bed to Advance and Improve Dredging and Marsh Restoration Techniques in Coastal New Jersey

- Advancing the Progression from Sediment Removal (25%) to 60% (post-Sandy) to a Goal of 100% Beneficial Use of Clean Channel Sediments in Coastal New Jersey

- Using an Adaptive Management and Systems Approach to Restoration and Creation Retaining Sediment in Systems and Moving Beyond Pilot Projects to Solutions

- Based on an International Concept Pioneered by the Dutch

SEVEN MILE ISLAND INNOVATION LABORATORY

- Critical shoals in NJIWW limit vessel access and are high priority nationally for the USCG
  - NJIWW ranks 3rd on national priorities for USCG
  - Both sand and mud shoals
- Back bay marsh-dominated system with shallow bays, sounds and tidal inlets that is a predominant setting throughout the Atlantic and Gulf Coast
- History of in-water creation and beneficial use sites and projects creating opportunities for longitudinal analysis and a commitment to long term monitoring
- Philadelphia District as an EWN Proving Ground partnered with with centrally located field research station with extensive historic records

WHY SMIIL AND WHY NOW?

A SEDIMENT PROGRESSION:
FROM CONFINEMENT TO IN-WATER CREATION

SEVEN MILE ISLAND INNOVATION LAB SYSTEM

- ▶ Confined Disposal Facility (CDF)
- ▶ Sandy Elevated Nesting Habitat (ENH)
- ▶ Thin Layer Placement (TLP)
- ▶ Marsh Enhancement (ME)
- ▶ Prior Placement Sites (PP)
- ▶ Habitat Enhancement (HE)

SMIIL Project Concepts

★ Sturgeon Island Elevation Enhancement
★ Gull Island Intertidal Flats Expansion
★ Shark Island Marsh Edge Protection
★ Wetland Accretion Enhancement
★ High Marsh / Transition Enhancement

Existing SMIIL Projects

★ Avalon Marsh Enhancement
★ Ring Island Nesting Habitat (not shown)
★ Great Flats Nesting Habitat (not shown)
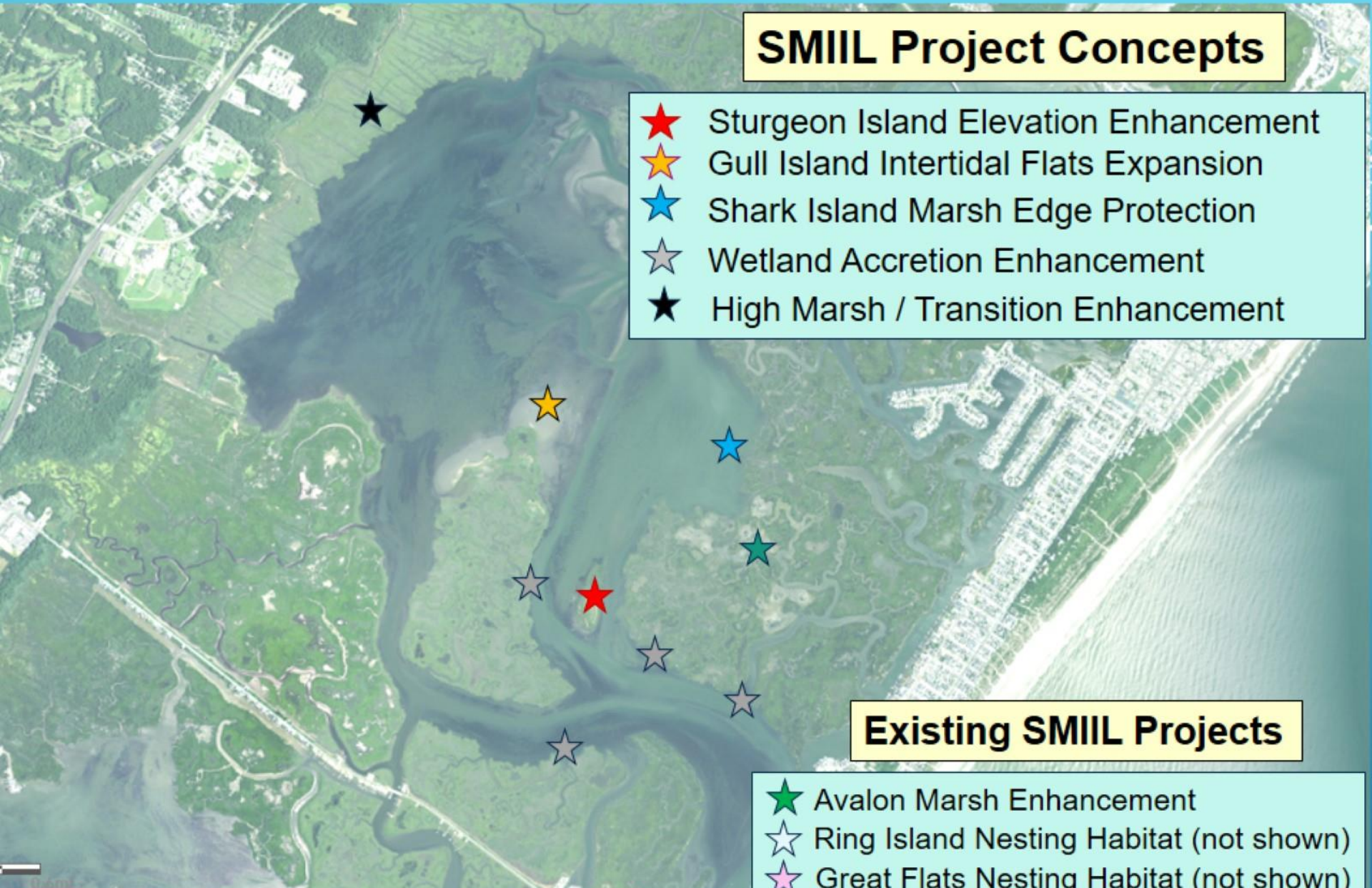
AVALON MARSH ENHANCEMENT PROJECT
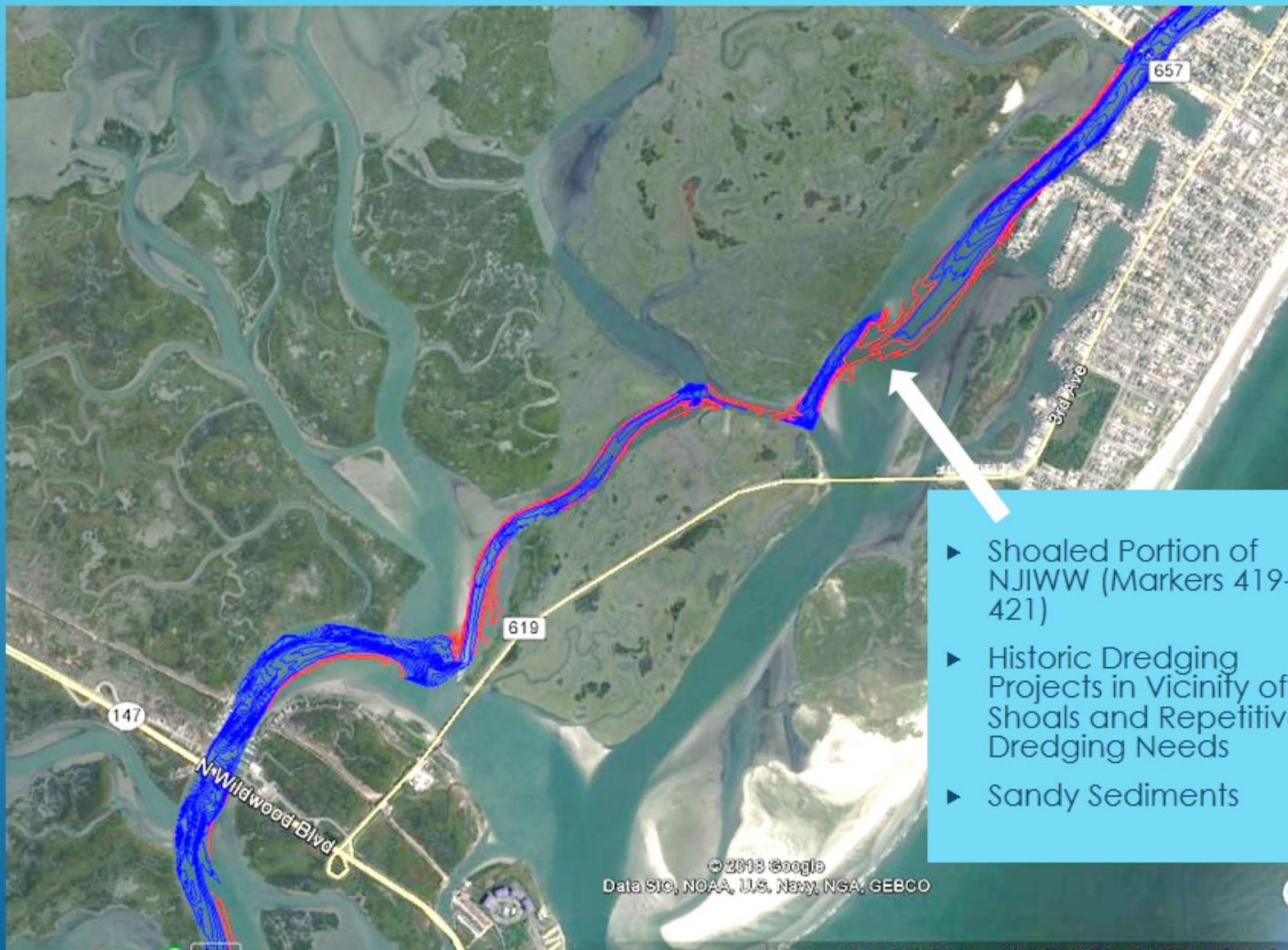
- ► Shoaled Portion of NJIWW (Markers 419-421)
- ► Historic Dredging Projects in Vicinity of Shoals and Repetitive Dredging Needs
- ► Sandy Sediments

NJIWW IN SOUTHERN SEVEN MILE ISLAND INNOVATION LAB

The Wetlands Institute

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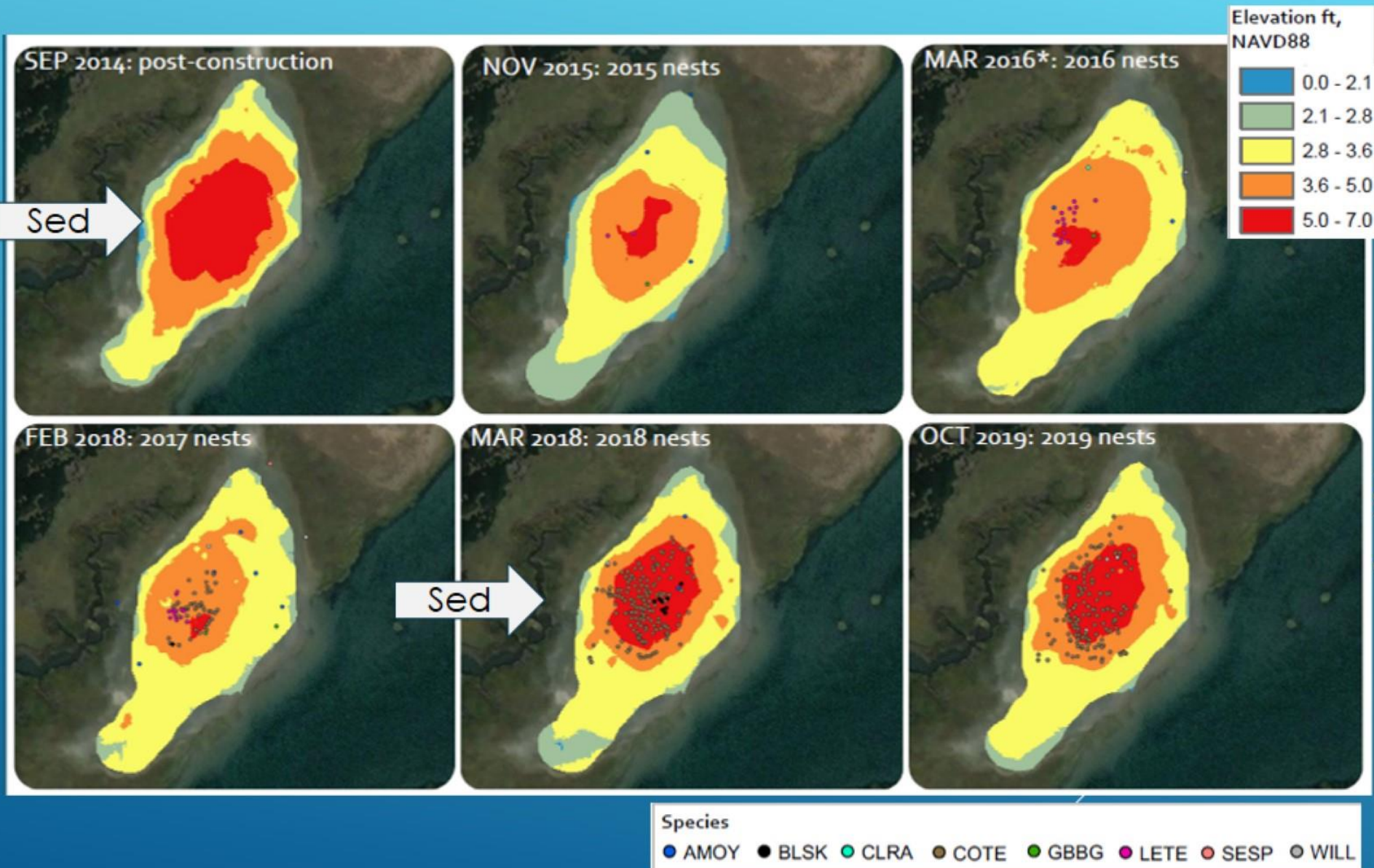 - 2 sites – 0.9 acre 1000 cy

Ring Island Beneficial Use Projects

New Jersey

3/10/2018 USACE

2/26/2018 USACE

▶ Elevated Nesting Habitat Maintenance

  ▶ March 2018 1,200 cy

  ▶ 120' of Channel

  ▶ Reestablish Berm Crest at 6'

RING ISLAND ELEVATED NESTING HABITAT REPETITIVE PLACEMENT

NESTING RESPONSE TO HABITAT CREATION

Ferguson, et al, 2019

HABITAT CLUSTERS: FROM PILOTS TO SYSTEM SOLUTIONS

► Ecologic Value

  ► Creates Network of Sites at Different Stages of Succession

  ► Separates Populations for Resiliency

  ► Mimics Historic Distribution of Colonial Nesting Birds

► Dredging Value

  ► Provides Opportunities for Repetitive Placement

  ► Creates More Volume Utilization

  ► Allows for Staggered Placement

★ Ring Island A (2014; 2018)
★ Great Flats (2018)
★ Ring Island B (Future)
★ Stone Harbor Point

CDF 103

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

GREAT FLATS NESTING HABITAT

Boundary is edge of previous sand placement
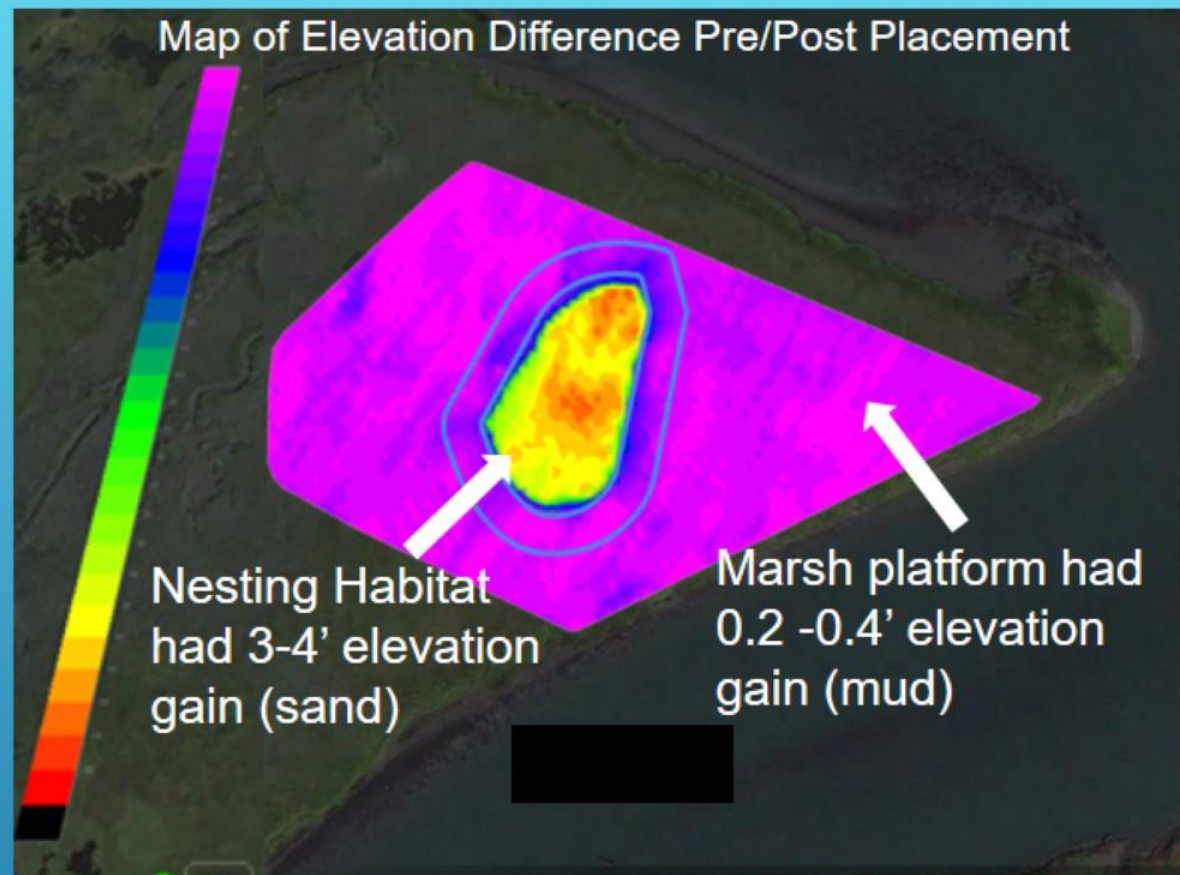
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GREAT FLATS HISTORICAL IMAGERY

- Placed 6,000 yd³ on 1 acre habitat
- 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 platform

Existing High Marsh

GREAT FLATS NESTING HABITAT

Map of Elevation Difference Pre/Post Placement

Nesting Habitat had 3-4' elevation gain (sand)

Marsh platform had 0.2 -0.4' elevation gain (mud)

- ▶ Created 1-2 acre area of upland and high marsh habitat on former material placement site
- ▶ Managed muddy runoff to be thin layer placement through unconfined placement followed by berm building to achieve elevation targets
- ▶ Wind transport of fine sand to surrounding areas augments marsh build up rates providing added benefit
- ▶ Future refurbishment allows for ongoing channel maintenance

SMIIL Project Concepts

⭐ (red) Sturgeon Island Elevation Enhancement (2020)
⭐ (yellow) Gull Intertidal Flats Expansion (2020)
⭐ (blue) Shark Island Marsh Edge Protection
⭐ (gray) Wetland Accretion Enhancement

- **Prior placement sites created important wading bird habitat**
  - Nesting areas account for nesting for nearly 1/3 of wading birds in State of NJ
- **Habitat degrading with elevation loss**
- **Declining nesting success rates and decrease in species diversity**

2007 IR Gull/Sturgeon Island Placement Complex
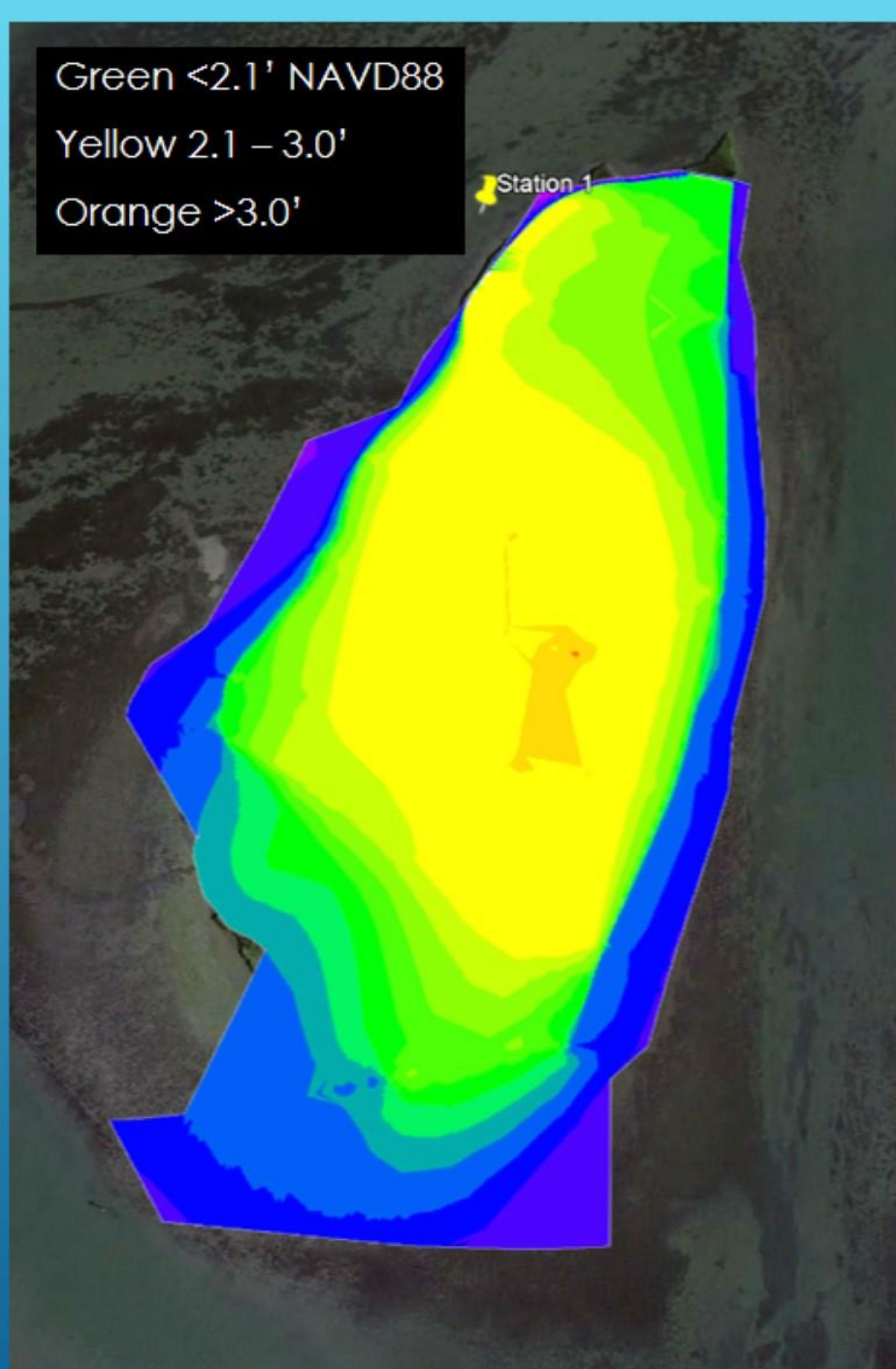
Sturgeon Island

ISLAND ELEVATION ENHANCEMENT

STURGEON ISLAND

Flooding Frequency for Stone Harbor
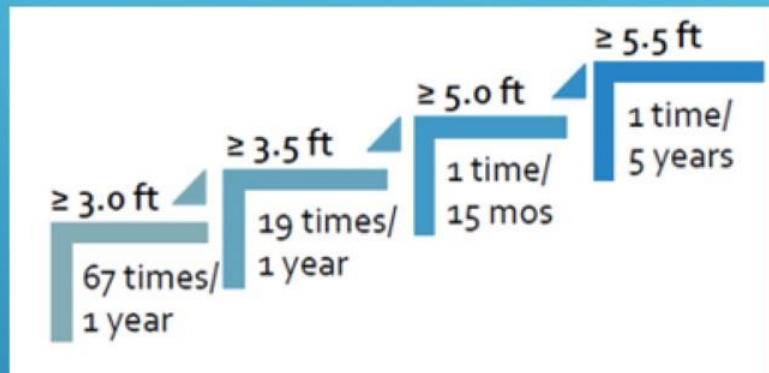
- Ground elevation at nesting sites ranged from 2.2'-2.5' NAVD88

- Nesting height ranged from 2.7' to 3.5'

- Favored Iva, Phrag and mixed Phrag areas (yellow)

  - Iva fructescens – 2.18' +/- 0.67

  - Mix – 2.26' +/- 0.61

  - Phragmites – 2.38' +/- 0.57

Flooding frequency for Stone Harbor based on 2003 – 2018. Calculated by Remington & Vernick Engineers.

Green <2.1' NAVD88

Yellow 2.1 – 3.0'

Orange >3.0'

Station 1

Sturgeon Island

High Vigor (N)

Wrack

Distichlis Flat

Wading Bird
Nesting Area

2017 Imagery

STURGEON ISLAND CONCEPT: ISLAND ELEVATION ENHANCEMENT AND DYNAMIC BERM CREATION (2020)

- **Navigation Goal**
  - Maintain safe navigation by clearing NJIWW shoals between markers 386 AND 397
- **Ecosystem Goals**
  - Enhance habitat for important wading bird colony
    - Build nesting platform to expand suitable nesting habitat
    - Create erosion barrier to decrease wave energy and supply sediment to island
    - Create sandy terrapin nesting habitat
- **Placement Approach Goals**
  - Test methods of unconfined sediment placement and material transfer
 - Develop tools to allow sand and mud placement separation

Sturgeon Island

- Phase IA Dynamic berm creation with sandier sediments for edge erosion protection, terrapin nesting habitat, wrack barrier and elevation maintenance

- Phase IB Unconfined sediment placement to elevate marsh platform to 1' above MHHW (3.5' NAVD88)

- Phase II Elevated nesting habitat enhancement and creation to supratidal elevations suitable for Iva

Phase IA

Phase IB

Phase II

- (A) In water placement created important intertidal foraging flats for shorebirds and wading birds

- (B) Unconfined on marsh sediment placement created elevated nesting habitat for wading birds
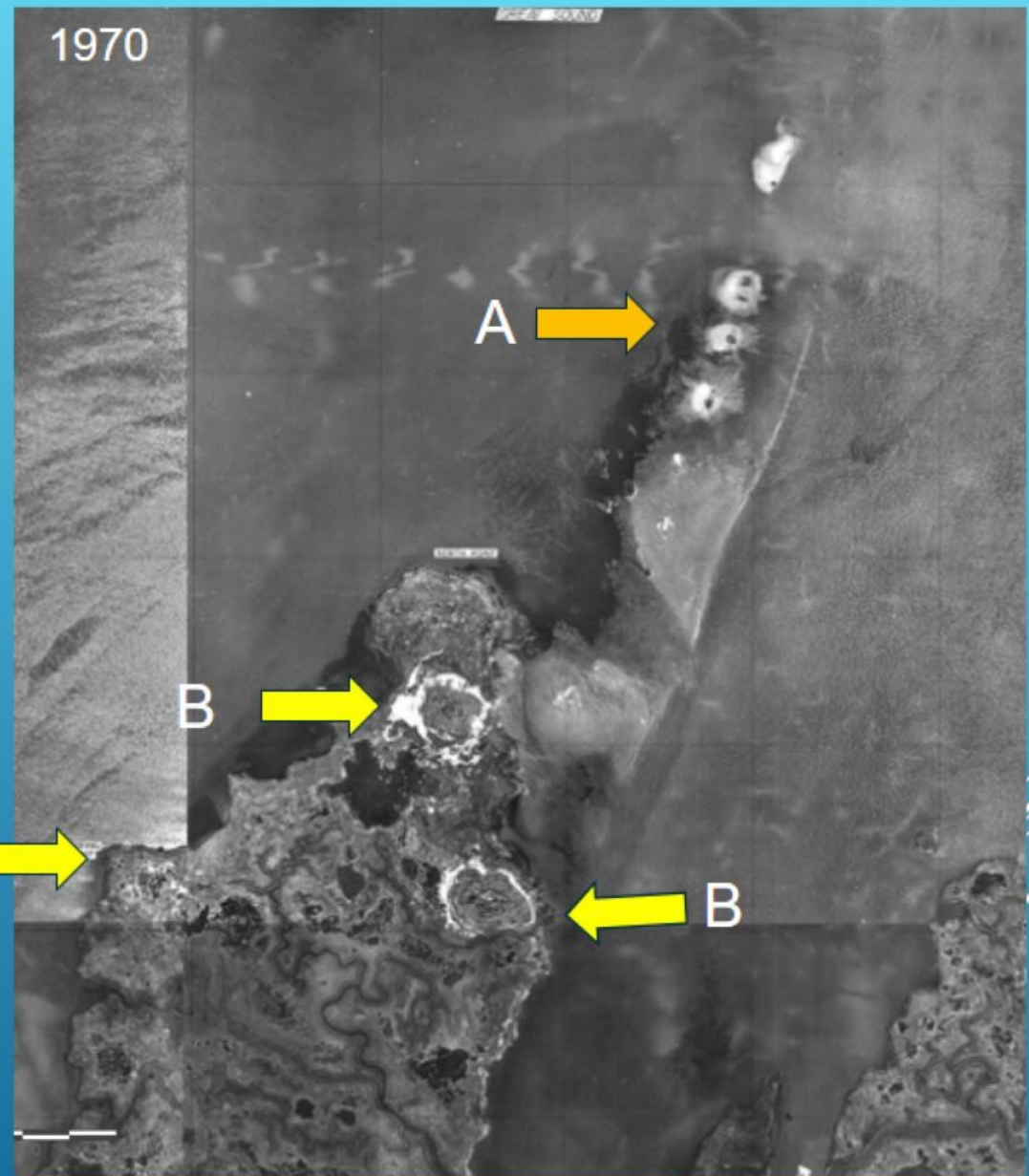
GULL ISLAND FLATS EXPANSION
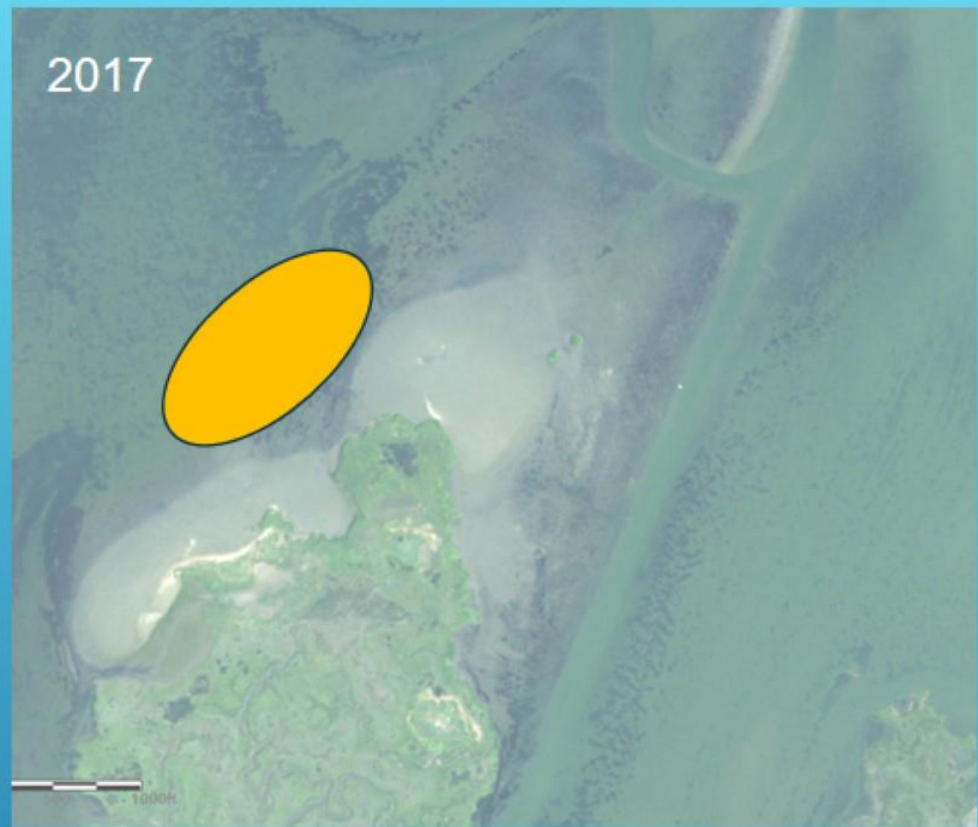
- Unconfined in water placement to enhance intertidal flats
- Reintroduction of SAV missing from SMIIL since 1930's
- Large volume for channel clearing dredging
- Reoccupy prior placement areas

GULL ISLAND FLATS EXPANSION

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