



# Scotch Bonnet Marsh Restoration Project at Cape May Coastal Wetlands Wildlife Management Area

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# The Wetlands Institute



Promoting appreciation, understanding and stewardship of wetlands and coastal ecosystems through programs in research, conservation and education for more than 50 years

- 501c3 with 18 member Board of Trustees
- 19 Full-time, 3 part-time, 35+ seasonal staff
- Nearly 19,000 visitors and 14,000 school children annually
- More than 1,300 members





# Education Programs

- Formal School Group Engagement Opportunities
  - Field Trips
  - Traveling Env. Ed Programs
  - Science Education at Sea
- Non-formal Group Engagement Opportunities
  - Scouts
  - Homeschool
- General Public Engagement Opportunities
- Environmental Education Intern Program
- Week-Long Themed Summer Nature Programs for Children



# Research and Conservation at The Wetlands Institute



- Marsh Health and Sustainability Restoration and Monitoring
- Habitat Restoration Projects for Coastal Birds
- Diamondback Terrapin Research and Conservation Program
- reTURN the Favor Horseshoe Crab Habitat Enhancements and Rescue Program
- Coastal Conservation Research Intern Program





# Value of Coastal Wetlands



- Recreation and aesthetic beauty
- Among most biodiverse ecosystems on earth
- Support fisheries and wildlife
  - Provide shelter, food and nursery grounds for more than 75% of commercial fish and shellfish
  - Provide important habitat for a variety of birds, waterfowl and imperiled species
- Filter runoff and excess nutrients to help maintain water quality in coastal bays
- Store carbon at a rate 10x higher than mature tropical forests helping to moderate effects of climate change



## Coastal Wetlands Protect Our Communities

- ▶ 1 acre of salt marsh can absorb 1.5 million gallons of water
- ▶ During storms, they absorb flood waters and wave energy
  - ▶ Decrease property damage in adjacent communities by up to 20% (NOAA)
  - ▶ On average provide \$695,000 of value per square mile during storms by reducing impacts of storm surge and flooding
  - ▶ Were shown to reduce storm damage to coastal communities backed by wetlands during Hurricane Sandy by 20-30%

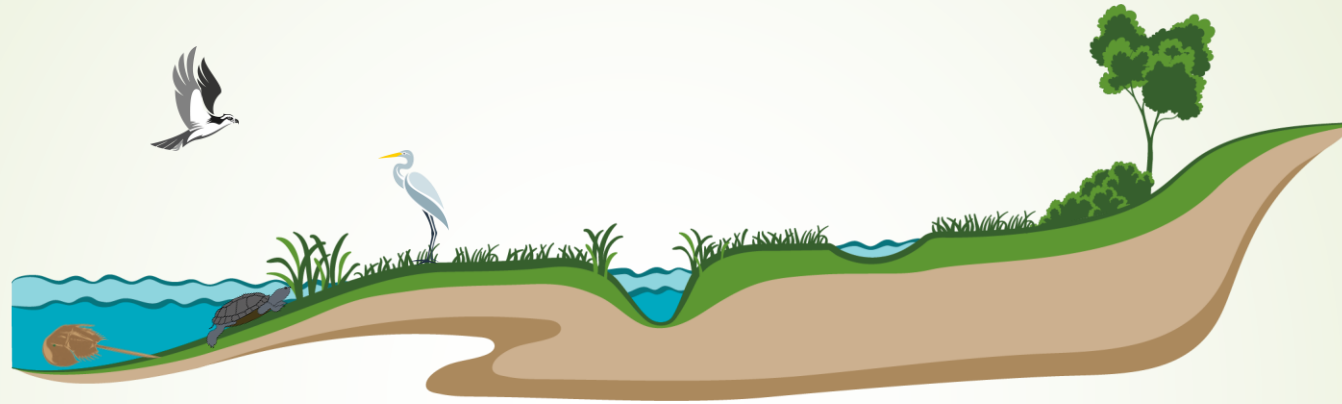


Seaside Heights NJ; Image: Tim Lawson, NJ Governor's Office

**We are losing 80,000 acres of coastal wetlands each year mainly due to sea-level rise and development (NOAA)**



# Marshes Flourish in a Delicate Balance with Tidal Waters



- ▶ Marshes are “at” sea level
  - ▶ Daily tides nourish marshes
  - ▶ Moon tides and storm tides bring waters onto the marsh
- ▶ Wetlands occur over very narrow elevations relative to sea level and can “keep up” with sea level under certain sea level rise scenarios

*Too much flooding slows marsh growth  
and leads to drowning*

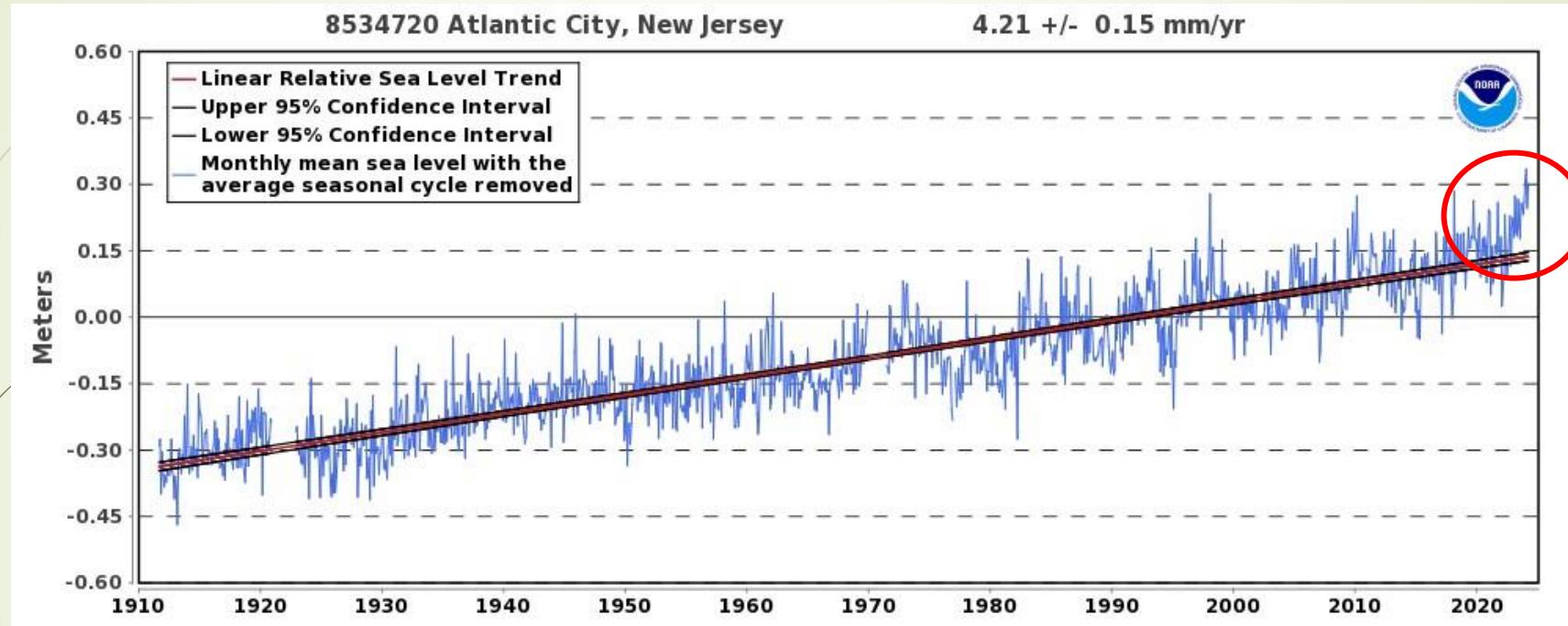




- Wetlands migrate to higher elevations (landward) as sea level rises
- Natural and healthy response but development pressures have blocked wetland migration in many places

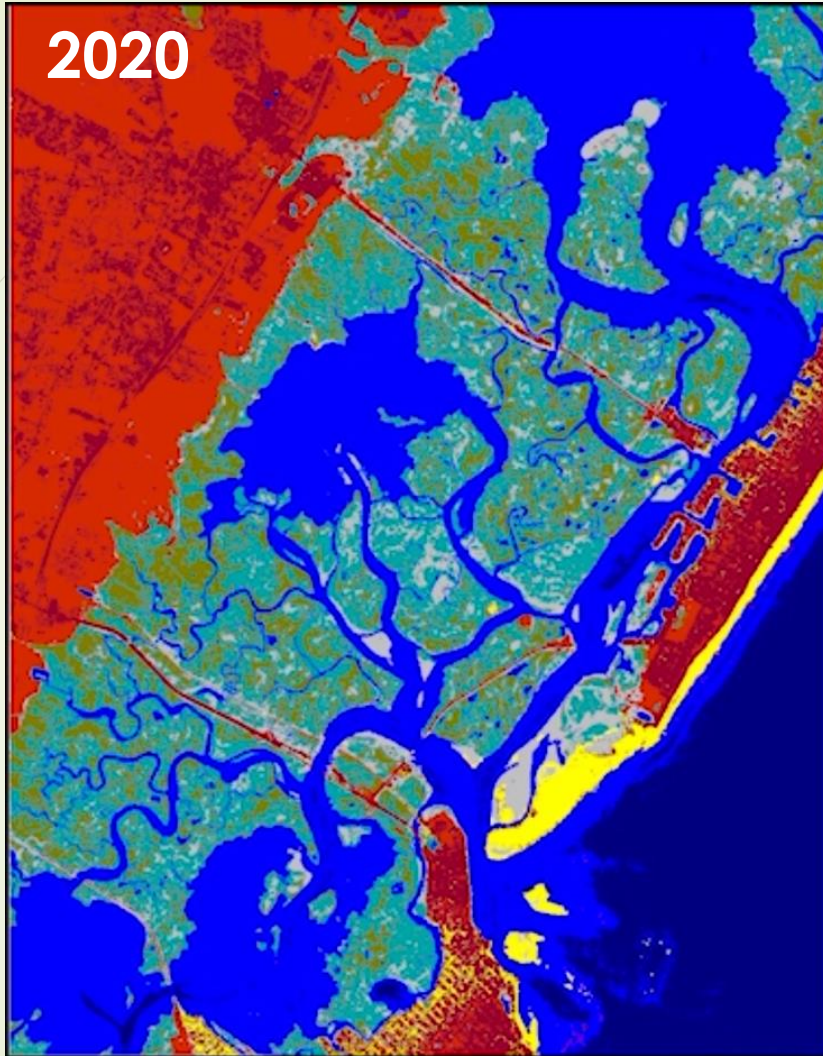


# Sea Level Rise Trends

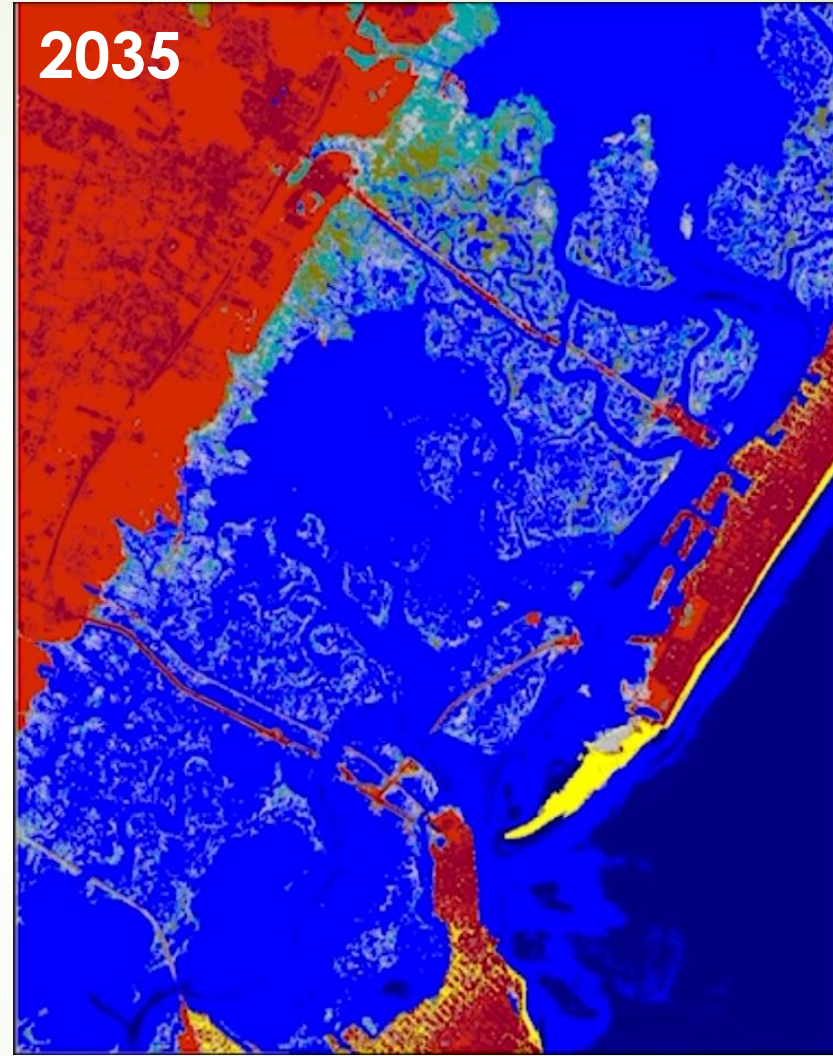


- NJ Sea level rise rate is 2x Global Average
- 1911 – 2023 rose 1.4 feet in 100 years
- Long-term Average Rate has increased to **4.2 mm/year** (0.17"/yr) after several increases in the past decade
- Shorter-term Sea level rise rates (past 15 years) are **6 mm/year** (0.25"/yr)
- Sea level rise rates of 4 mm/year (0.15"/yr) are too fast for many marshes to keep up

2020



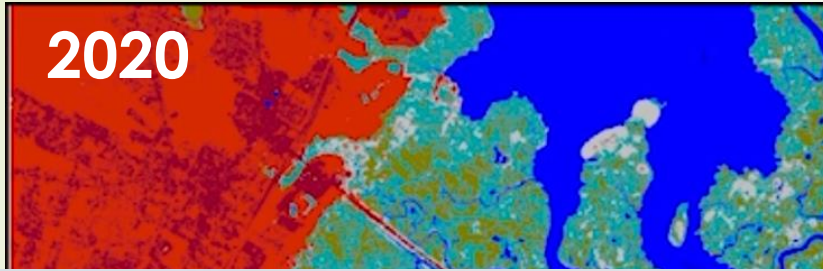
2035



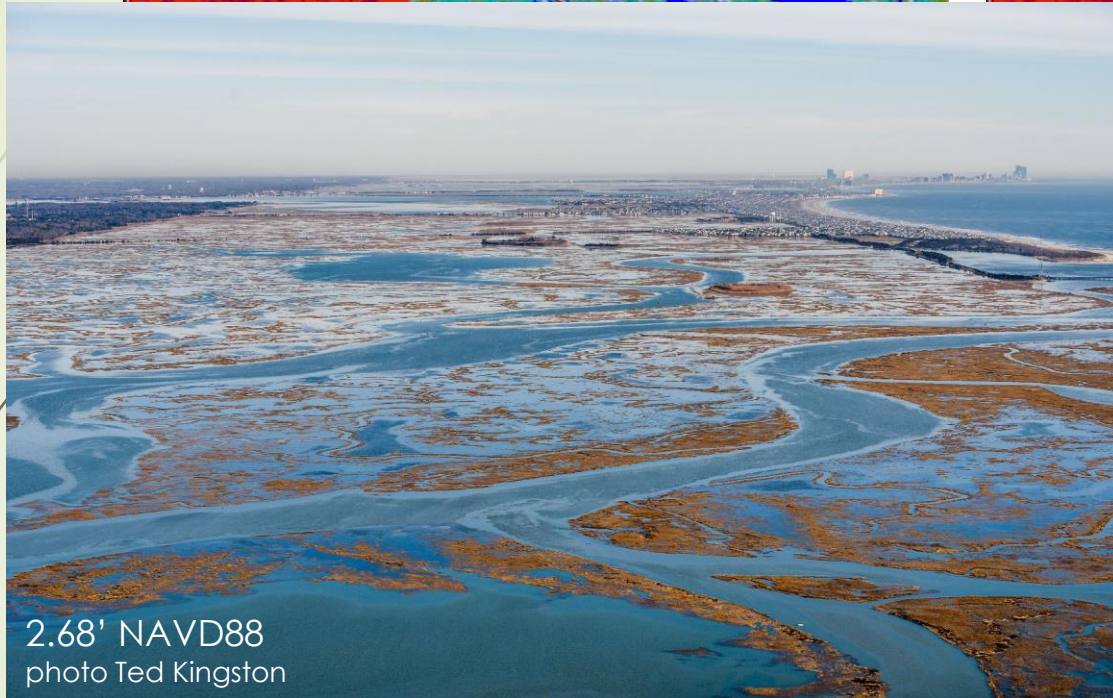
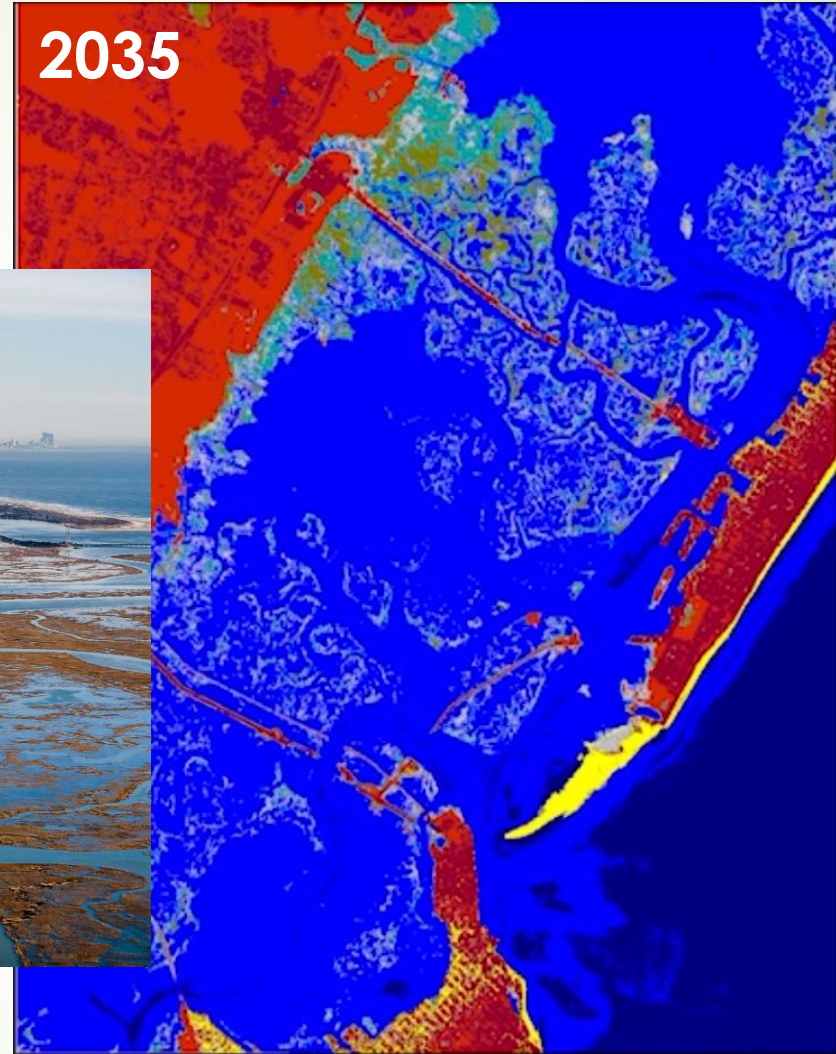
High Tide Flooding (MHW SLAMM) and Coastal Resilience



2020



2035



2.68' NAVD88  
photo Ted Kingston

## High Tide Flooding (MHW SLAMM) and Coastal Resilience



# Sunny Day Flooding



10/30/2023 3.89' NAVD88  
Photo: Devin Griffiths

6/2/2023 2.86' NAVD88  
Image Courtesy Ted Kingston



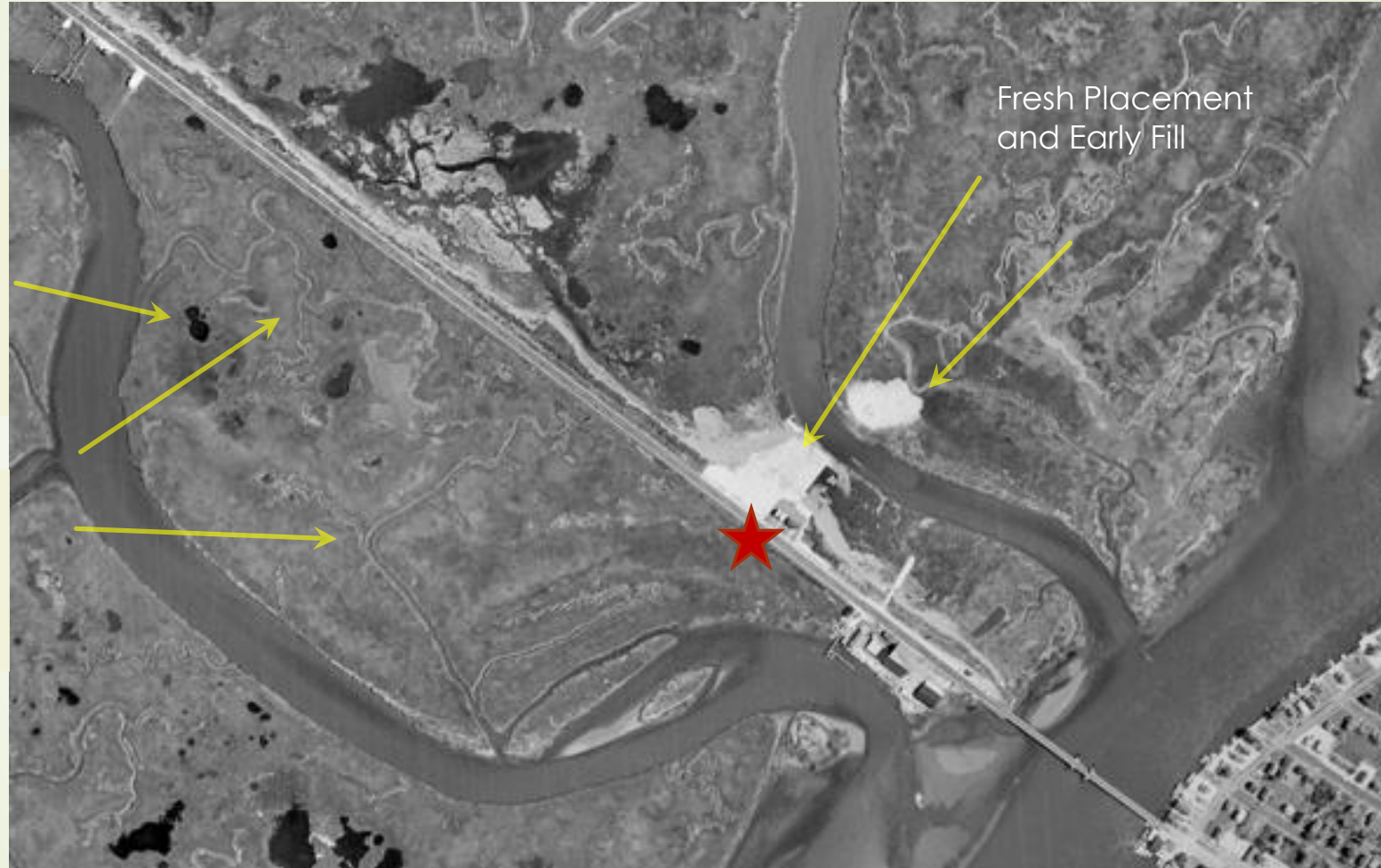


# History of Marsh Evolution

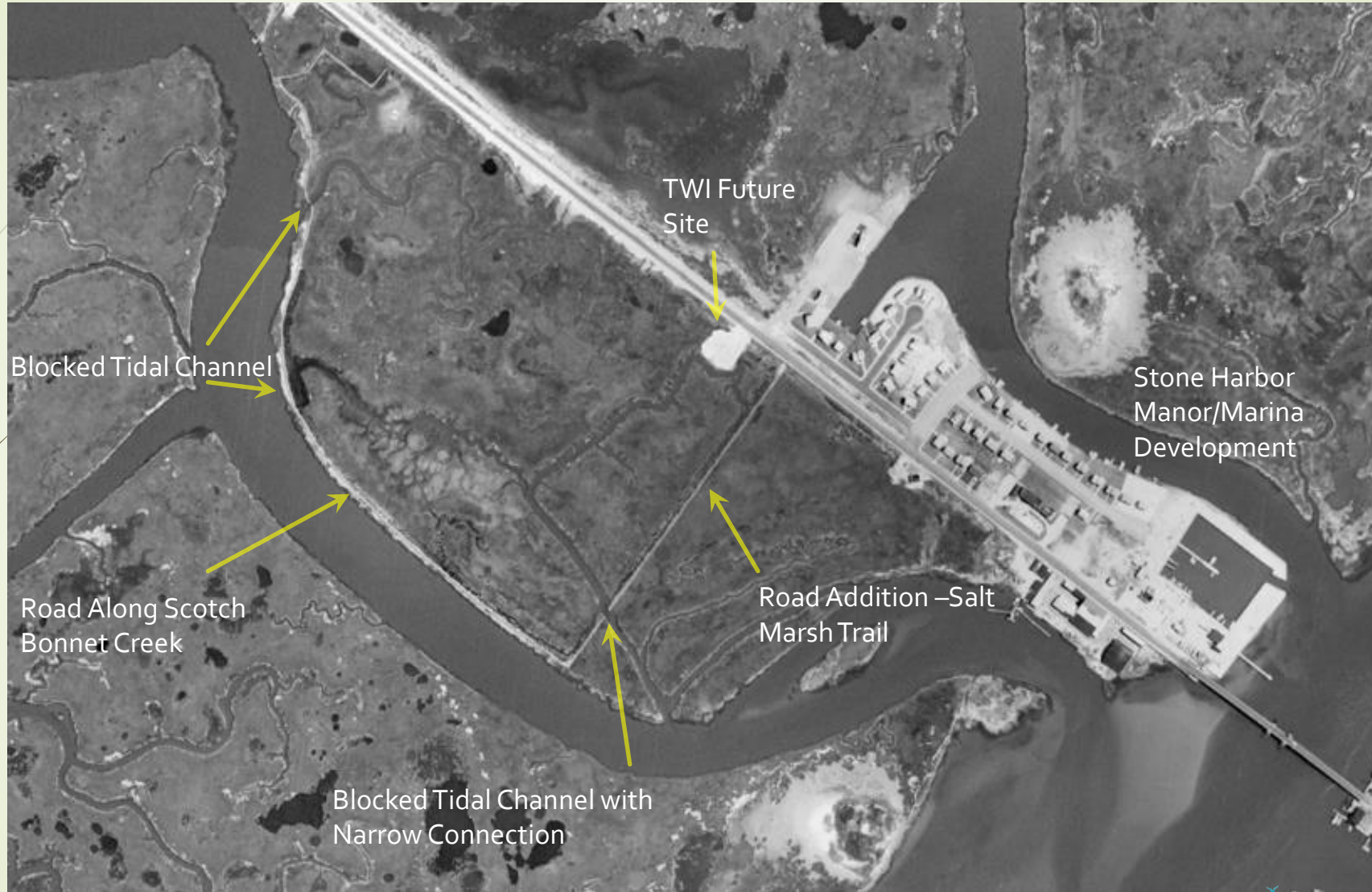
## Cape May Coastal Wetlands Wildlife Management Area

Broad marsh plain with a few isolated pools

Relatively narrow tidal channels

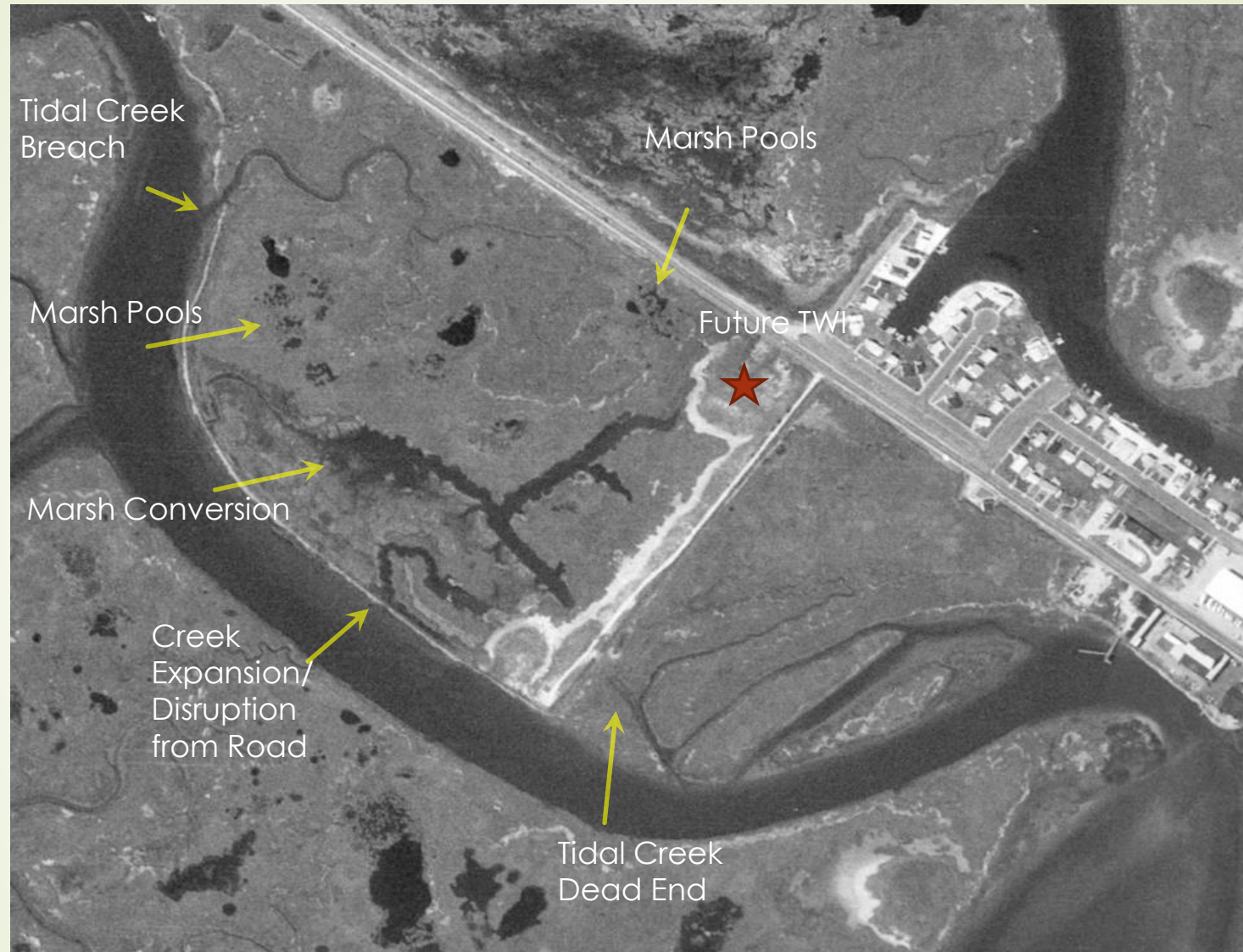


1956



1963





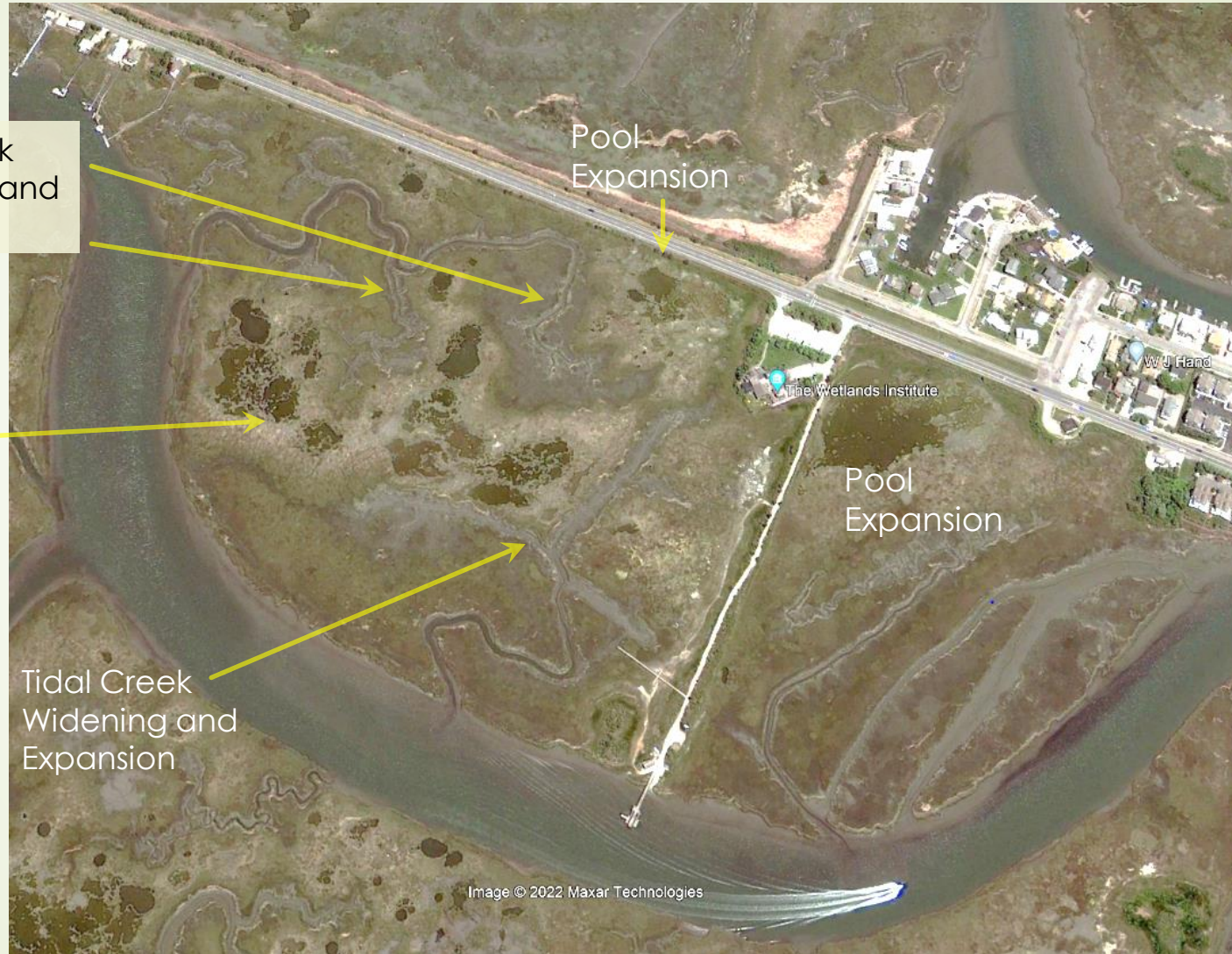
1970



Low Tide Image So Waterways Show as Mudflats

Tidal Creek  
Widening and  
Expansion

Significant Pool  
Expansion/New  
Pool  
Development  
and Marsh Loss



2009



# Current Marsh Conditions



2021

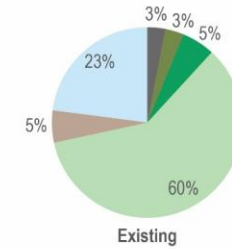


# 2020 Existing Conditions



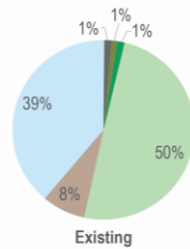
- Legend (SLAMM)
- Open Ocean
  - Estuarine Water
  - Developed Dry Land
  - Undeveloped Dry Land
  - Shrub/ Scrub
  - Regular Flooded Marsh (Low Marsh)
  - Irregular Flooded Marsh (High Marsh)
  - Tidal Flat
  - Ocean Beach

Elevation-derived habitat distributions via SLAMM\*:



Existing  
Scotch Bonnet Island

Southern SMIL



Existing



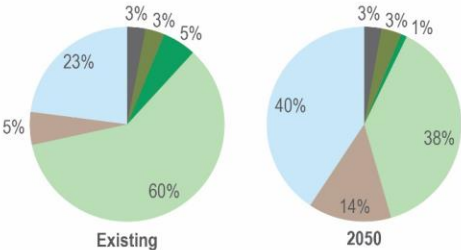
# 2050 Projected Conditions



2050, 2.1ft SLR (<17%) SLAMM Simulation- 2018DEM (1m)

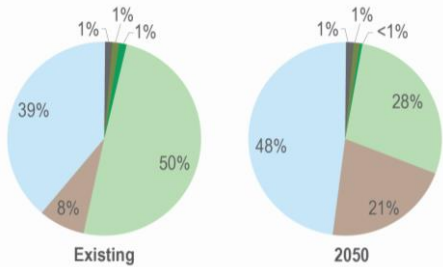
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Elevation-derived habitat distributions via SLAMM:



Scotch Bonnet Island

Southern SMIL





# Seven Mile Island Innovation Laboratory

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



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# Seven Mile Island Innovation Laboratory

- A **Test Bed** and **Think Tank** to Advance and Improve **Dredging Techniques** and **Marsh Restoration Techniques** in Coastal New Jersey
- Based on an **International Concept** Pioneered by the Dutch
- 24 sq mi **Back Bay Marsh** Dominated System with **Shallow Bays**, Sounds and Tidal Inlets Bisected by the **NJ Intracoastal Waterway Behind 7 Mile Island**
- **50+ Member Working Group** for Knowledge Sharing
- More than **30 Scientists** Working in SMIL



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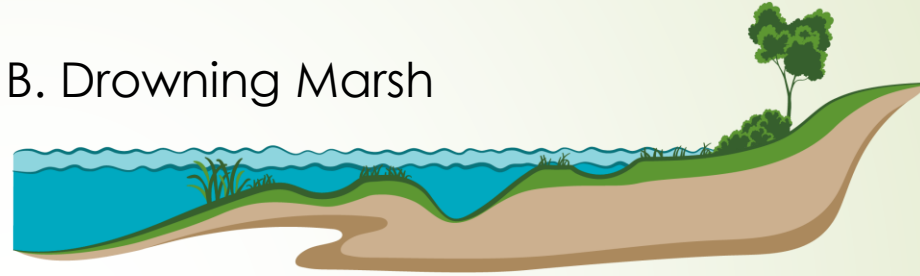
# Saving Drowning Marshes

- **A. Marsh under ideal conditions.** Blue lines are tide flooding levels - dark blue is daily tidal flooding, light blue is intermittent flooding (spring and storm tides).
- **B. Current marsh flooding scenario.** Repetitive flooding is too frequent and too high, stifling healthy marsh growth and leading to **marsh drowning**.
- **C. Elevated marsh surface** using clean **dredged sediment** to **raise marsh elevation** to ideal tidal flooding levels. Initially this creates a **short-term impact** to the marsh grasses, resulting in a **temporary muddy surface**.
- **D. Rehabilitated marsh 2-3 years post placement.** Marsh level is at suitable elevation for tidal flooding, promoting marsh grass recovery and **healthy marsh function**.

A. Healthy Marsh



B. Drowning Marsh



C. Newly Elevated Marsh



D. Rehabilitated Marsh

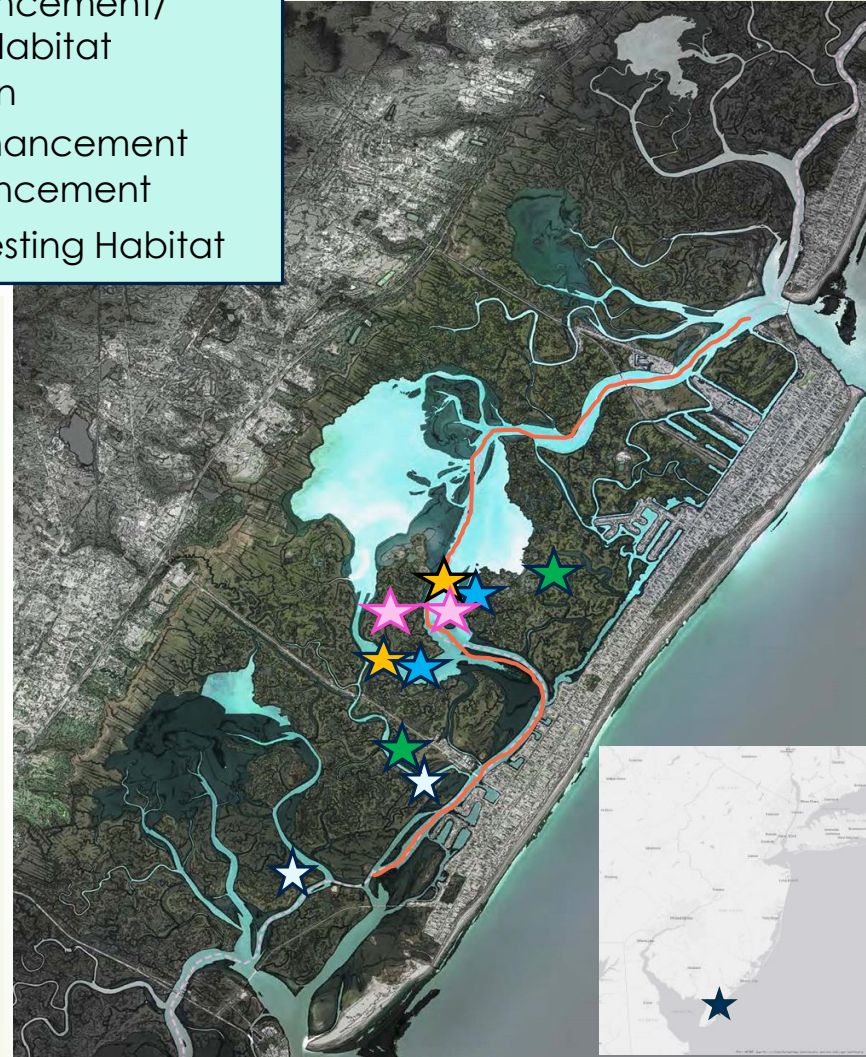




# Saving Drowning Marshes Through Innovation

- ★ Marsh Elevation Enhancement/  
Wading Bird Nesting Habitat
- ★ Marsh Edge Protection
- ★ Intertidal Shallows Enhancement
- ★ Marsh Elevation Enhancement
- ★ Beach Nesting Bird Nesting Habitat

- Completed 9 Projects since 2014
- Restored more than 85 acres of marsh and created 2 nesting areas
- New Projects in 2024 will increase the restored marsh acreage to more than 100 acres
- Millions in investment for marshes, wildlife and community resilience
- NJ is a national leader in nature-based solutions thanks to this work



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# Saving Drowning Marshes: Sturgeon Island

- Used clean dredged sediment to elevate marsh by more than 2 feet
- During 2<sup>nd</sup> growing season marsh grasses started to recolonize the new resilient marsh surface
- Offset sea level rise by decades



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11/2020



# Saving Drowning Marshes: Gull Island

8/2022



8/2024



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# Saving Drowning Marshes: Gull Island



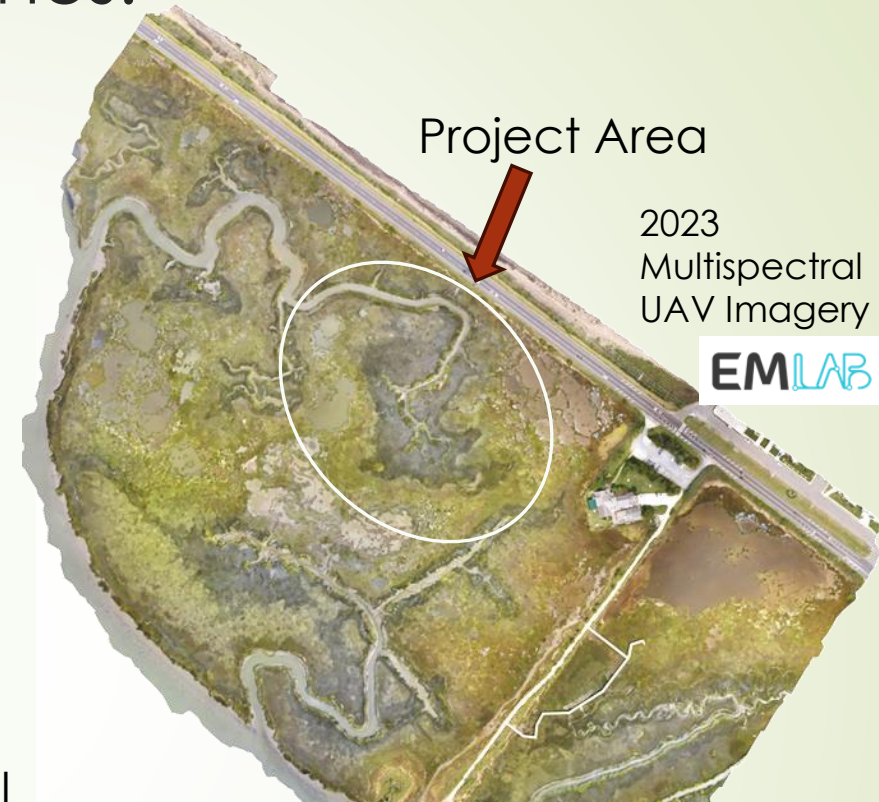
- Used clean dredged sediment to elevate marsh by more than 2 feet
- Restored open water pool to marsh to increase marsh acreage and stabilize the marsh
- Offset sea level rise by decades





# Saving Drowning Marshes: Scotch Bonnet Island

- Reestablish Healthy Marsh
  - Increase marsh elevation by up to 2 feet to reestablish tidal flooding levels
- Increase Marsh Acreage
  - Increase marsh acreage by 6 -10 acres to offset marsh acreage loss since 1941
  - Protect marsh from additional marsh acreage loss
- Marsh Recovery Timeline
  - Expect natural marsh grass revegetation by seedbank to begin in 2 years
  - Can take up to 5 years for dense grass cover





# Scotch Bonnet Island Marsh Elevation Enhancement Project: Where Will We Do This?



- Properties Owned By NJDEP and TWI
- In Lowest Marsh Area



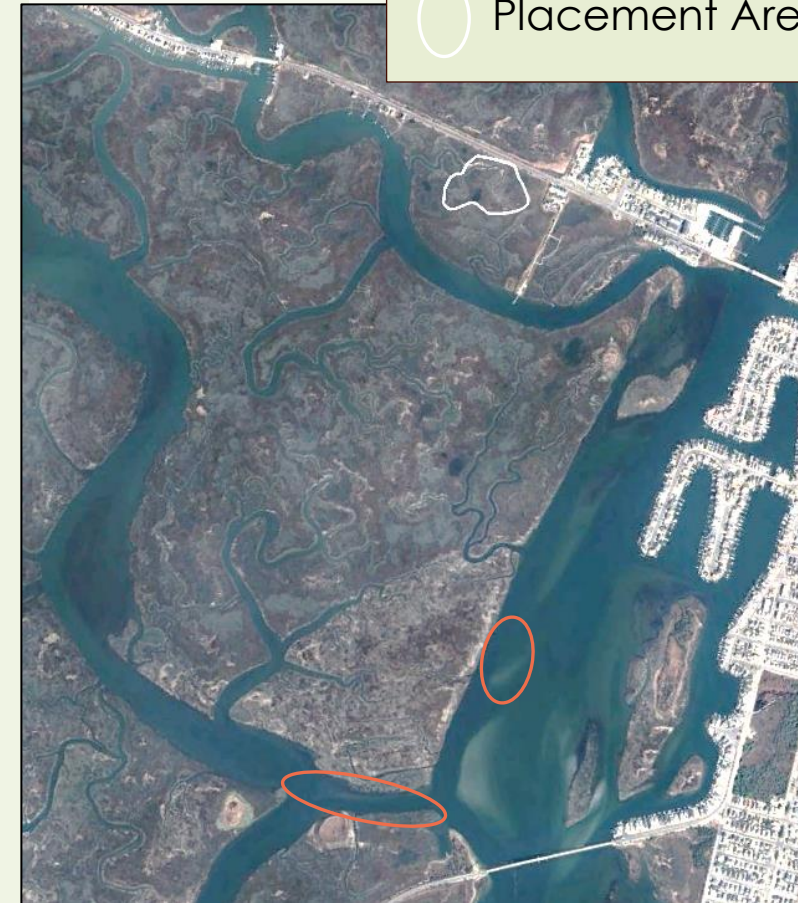
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# Scotch Bonnet Island Marsh Elevation Enhancement Project

- USACE Philadelphia District Maintenance Dredging
  - NJ Intracoastal Waterway Shoals
  - Pipeline from dredge site to placement site
- Barnegat Bay Dredging Company
  - Dredge Fullerton
- Timing and Timeline
  - Late September - October 2024
  - 6 – 8 weeks in duration for construction



○ Dredging Area  
○ Placement Area

# Scotch Bonnet Island Marsh Elevation Enhancement Project

- Dredging and Placement Method
  - Hydraulic pipeline dredge pumping 25,000 cy of mixed fine sand and mud to site
  - Nozzle outlet pumping onto marsh surface
  - Fully biodegradable coconut-fiber containment logs to direct flows



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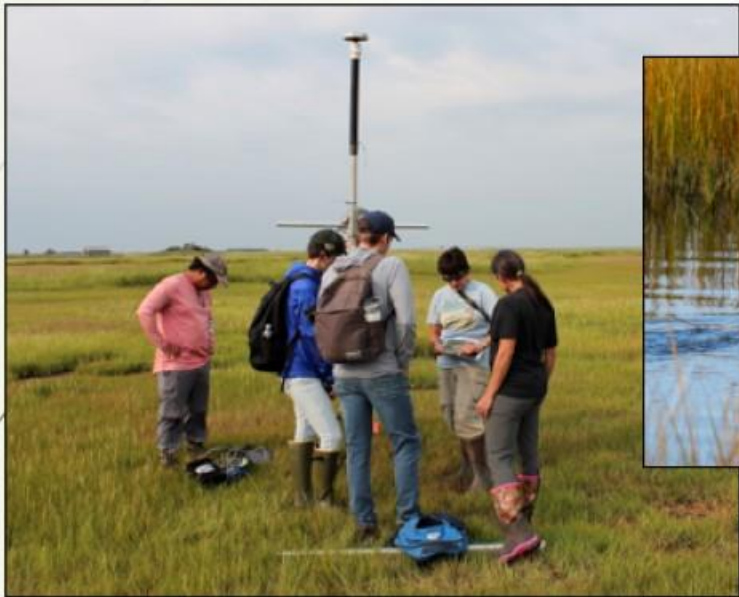
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# Scotch Bonnet Island Marsh Elevation Enhancement Project: Research/Tech Transfer and Education Hub



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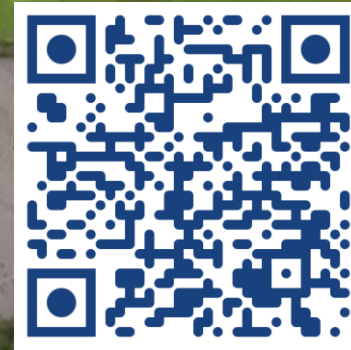
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An aerial photograph of a coastal wetland area. A wide, winding river flows through the landscape, which is characterized by lush green marshes and smaller, interconnected water channels. In the distance, a small cluster of buildings is visible on a peninsula. The overall scene is a mix of natural greenery and water, with some developed areas.

For more information:

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[wetlandsinstitute.org/scotchbonnet](http://wetlandsinstitute.org/scotchbonnet)

Working to Ensure These Marshes  
are Here For Generations to Come