

# Using Nature-based Solutions that Build Resilience that Benefits People and Wildlife



*Wetlands*<sup>®</sup>  
INSTITUTE ~ SINCE 1969



EMILAB

akrf



# THE WETLANDS INSTITUTE

STONE HARBOR, NJ

RESEARCH, CONSERVATION, AND EDUCATION NON-PROFIT  
ESTABLISHED IN 1969 AND BUILT AT THE COASTAL INTERFACE

SEEKING NATURE-BASED SOLUTIONS TO  
RESTORE TIDAL MARSHES FOR STORM  
RISK REDUCTION

REPLACING VANISHING HABITAT

SIGNIFICANT RISK AND  
LOW RESILIENCE AND  
SUSTAINABILITY

CONNECTING PEOPLE TO NATURE

REIMAGINING BUILDING AND  
GROUNDS FOR RESILIENCE AND  
HABITAT ENHANCEMENT

## CROSS-SECTOR COLLABORATION

LOCAL DATA IN THE HANDS OF MULTIPLE DISCIPLINES CAN INFORM ADAPTIVE, NATURE-BASED INFRASTRUCTURE THAT CAN SCALE

design

landscape architecture

architecture

place

engineering

ecology

education

outreach

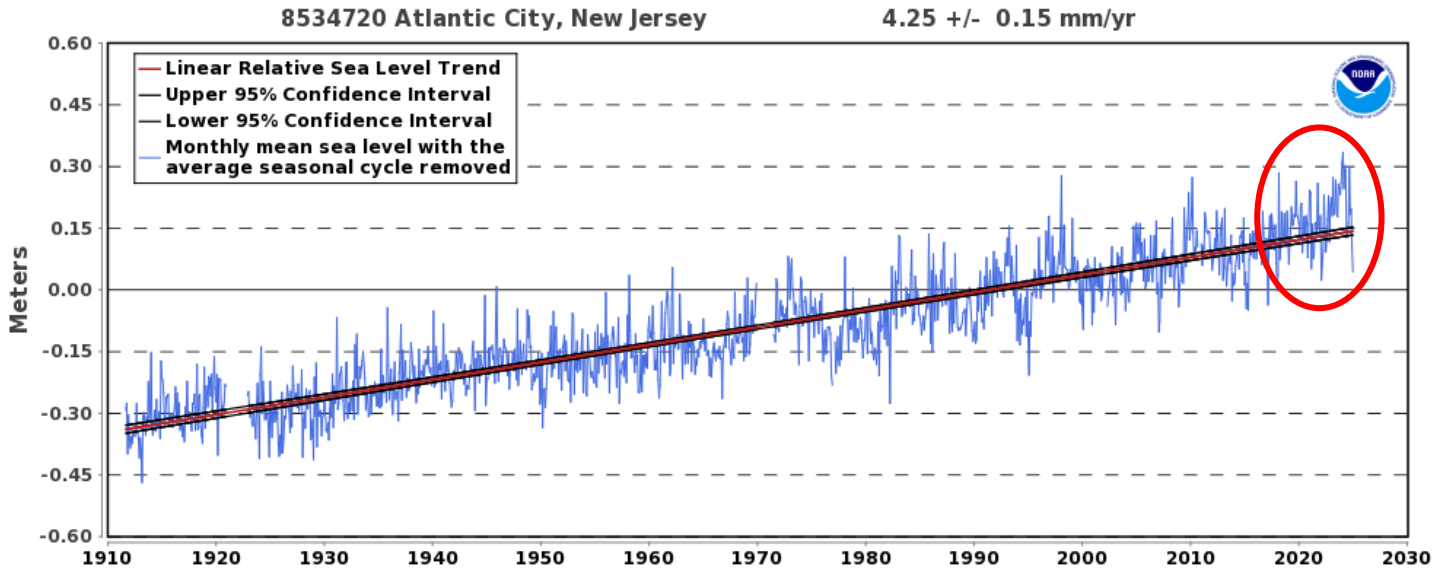
nonprofit

science communication

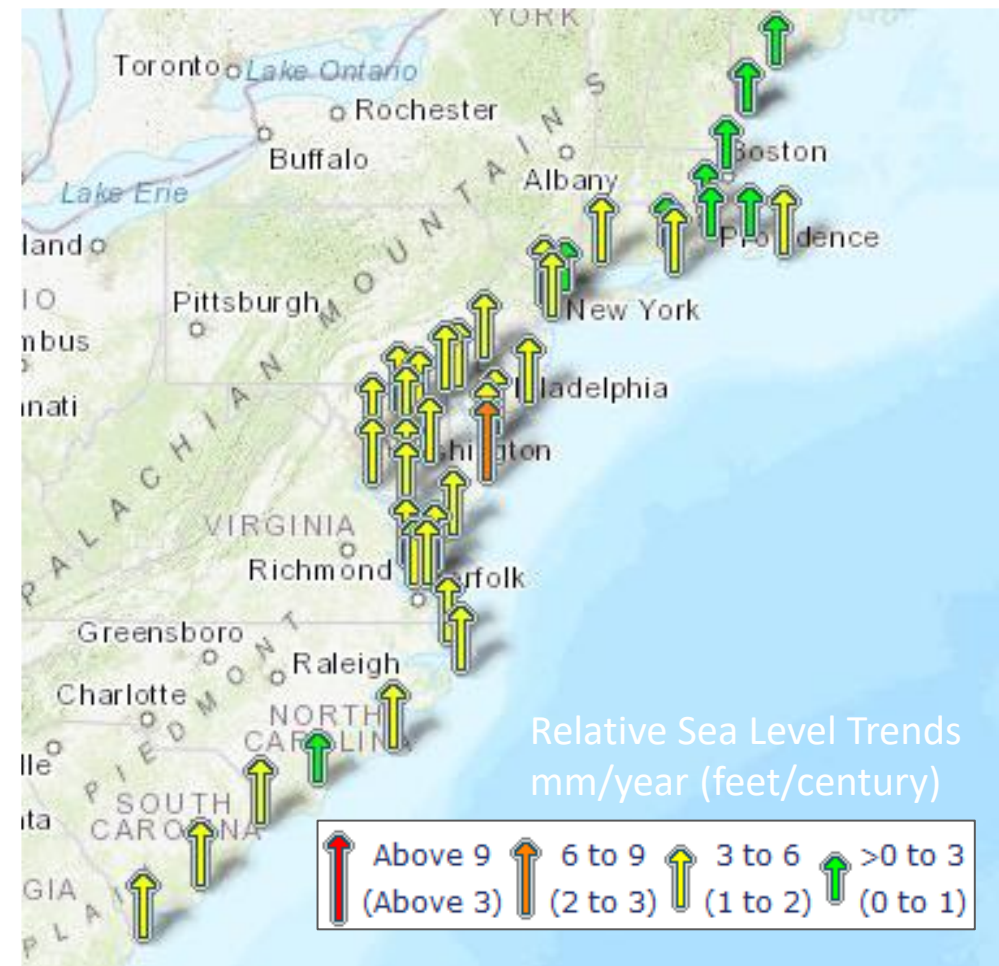
research



# Relative Sea Level Trend

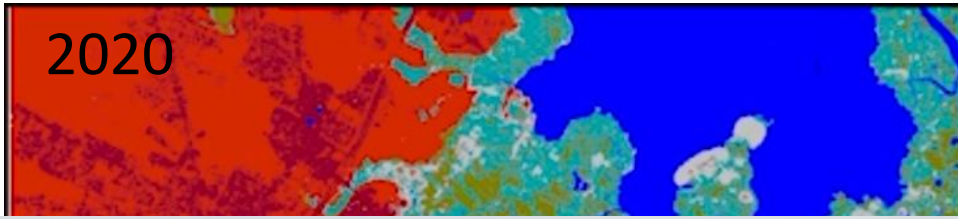


- New Jersey SLR is 3x Global Average
- 1911 – 2024 rose 1.4 feet in 100 years
- Long-term average rate has increased to **4.25 mm/year** (0.18"/yr) after several rate increases in past decade
- Shorter-term sea level rise rates (past 15 years) are **6.1 mm/year** (0.25"/yr)

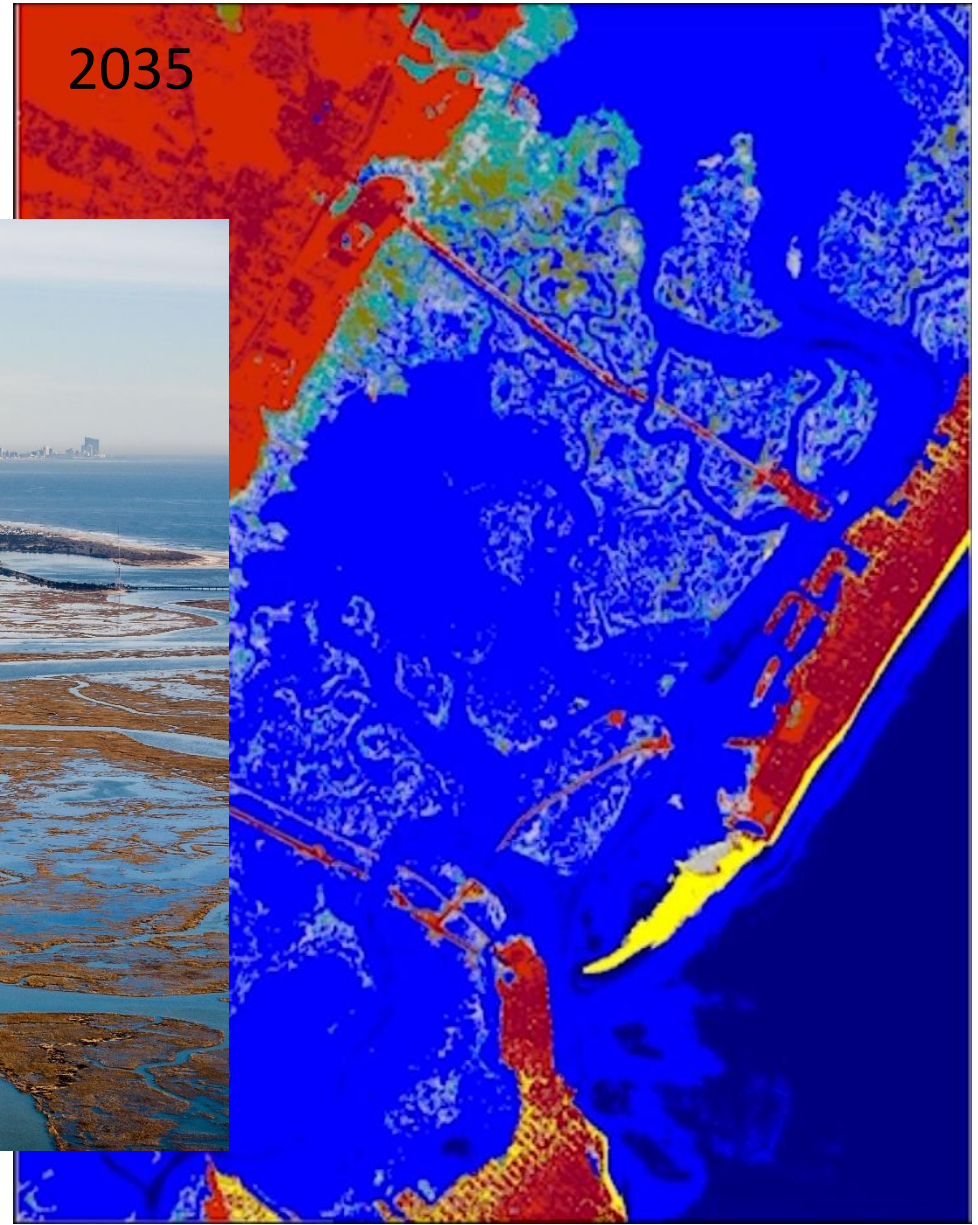


- Typical marsh accretion rates in the area are 4 mm/year; measured accretion in SMILL marshes confirm this rate
- Regional subsidence rates are ~2 mm/year

2020

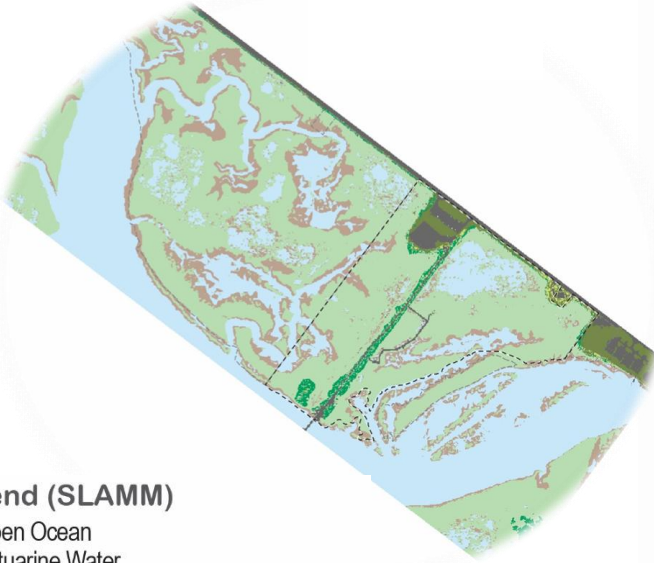
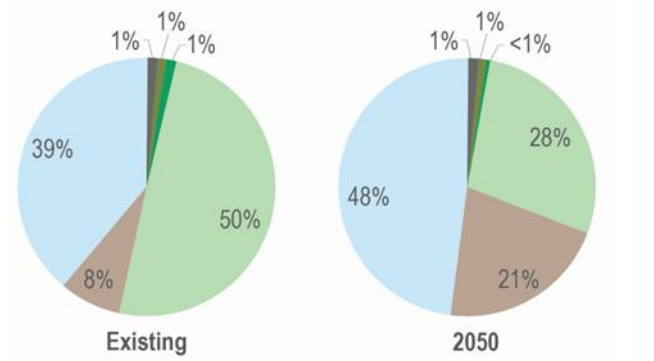
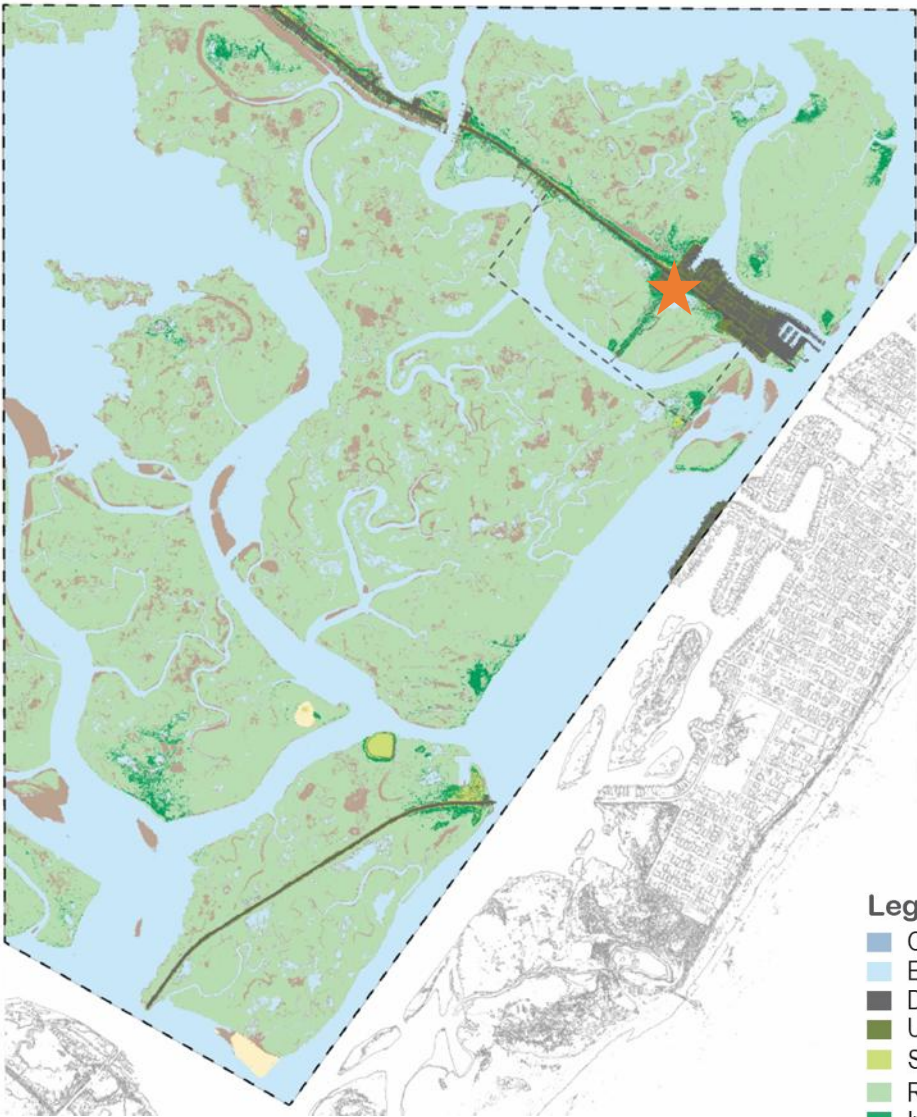


2035



2.68' NAVD88  
photo Ted Kingston

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



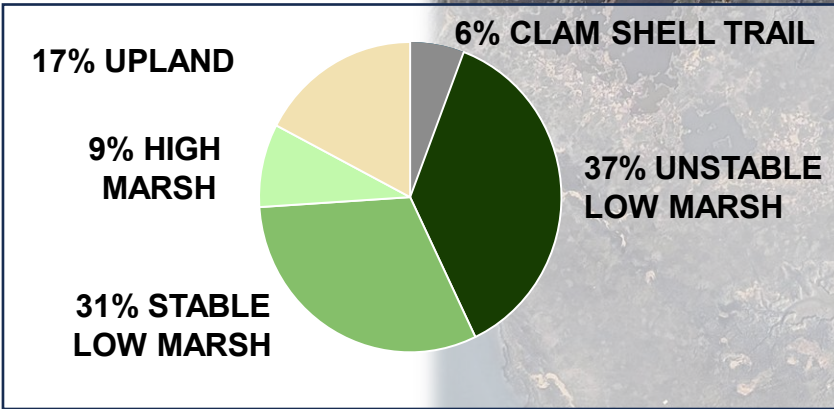
2020 Existing Conditions

2050 Predicted 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 Trail Habitats (2019)



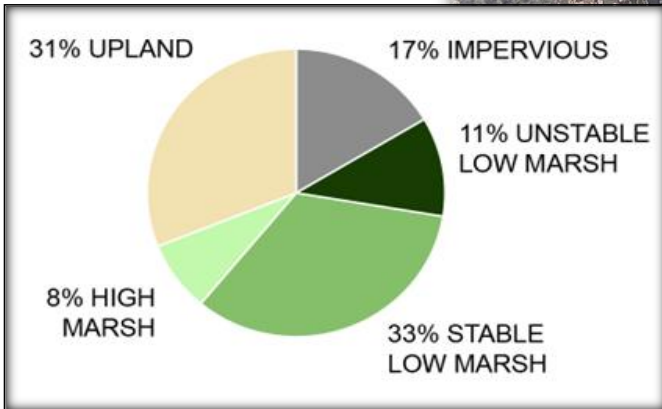
## • How We Set Ecological Elevations

- SLAAM (Sea Level Affecting Marsh Model) Modeling using 17% chance of exceedance and 2030-time horizon (1.1' over 2000 levels)
- In-situ elevation and vegetation benchmarks
- Current tidal elevation relative to tidal inundation from local tidal datum calculations
- Future marsh trajectory analysis

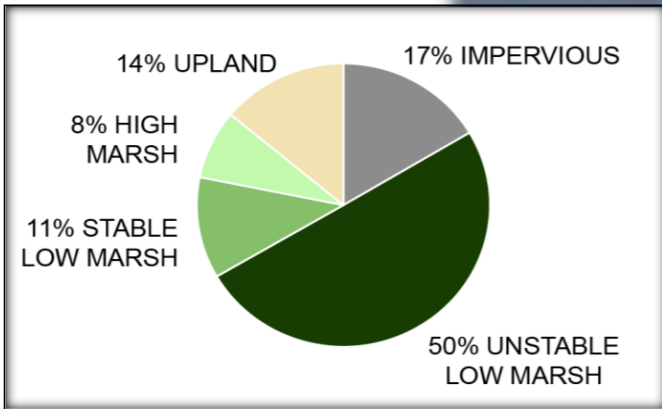


# Projected Trail Habitats (2030)

2019

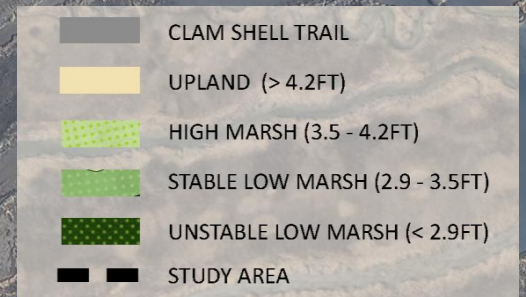


2030



Unstable marsh is drowning marsh

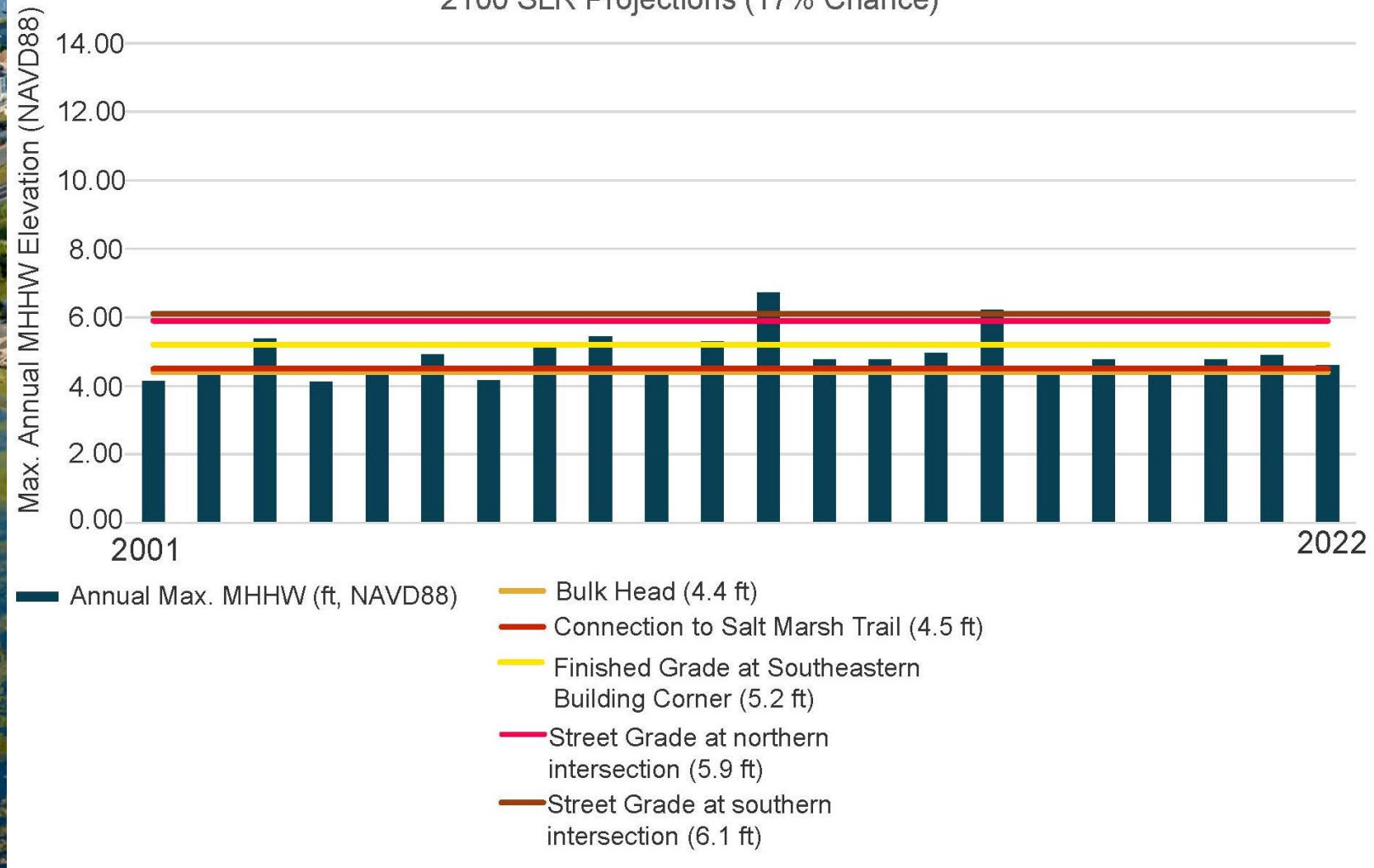
Marsh Restoration



2030 projection reflects **sea level rise** and its effects in **drowning the marsh in the No-Action Scenario**

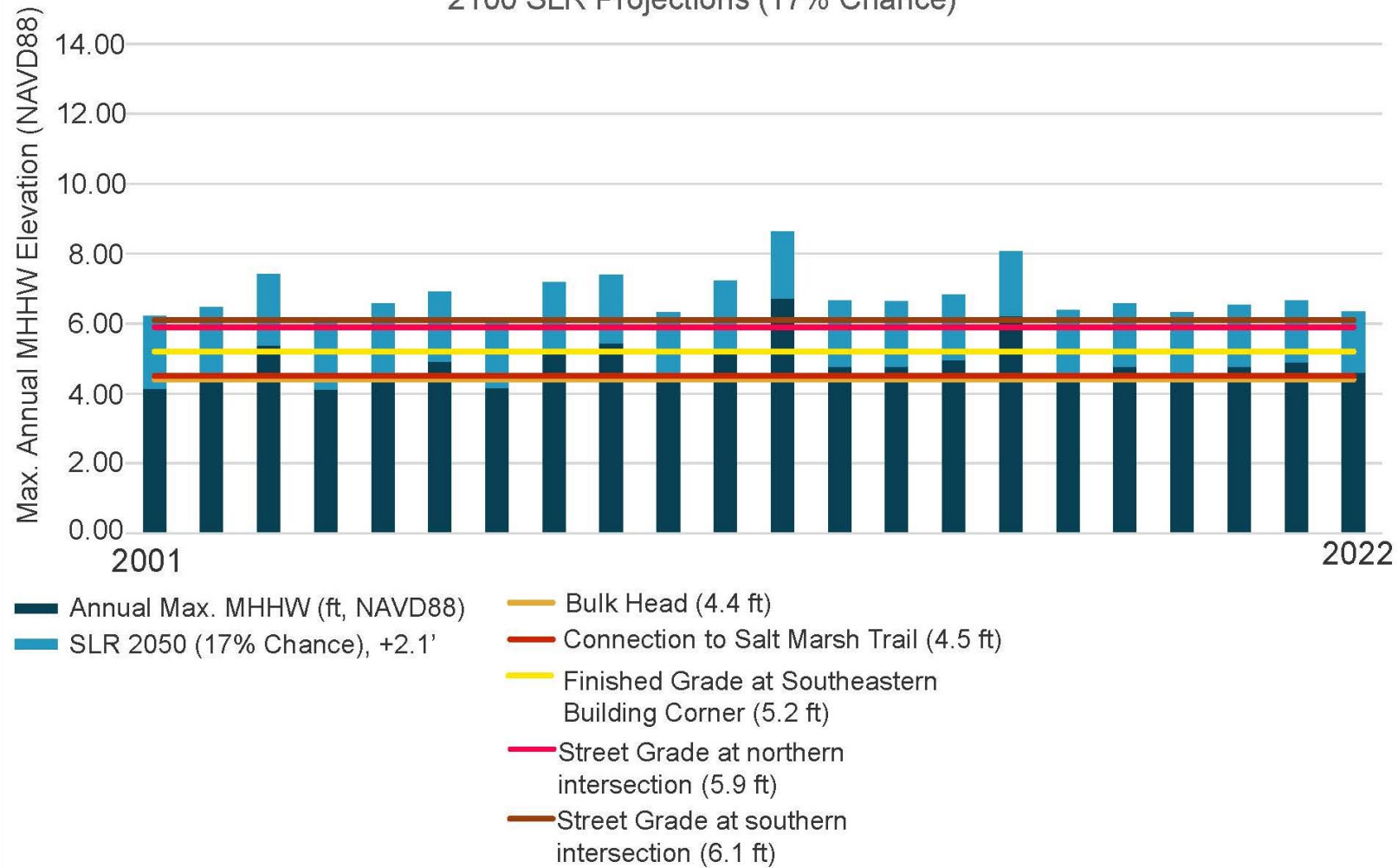
# RISK ANALYSIS

Projected Years when Key Site Elevations are Exceeded Based on 2050 and 2100 SLR Projections (17% Chance)



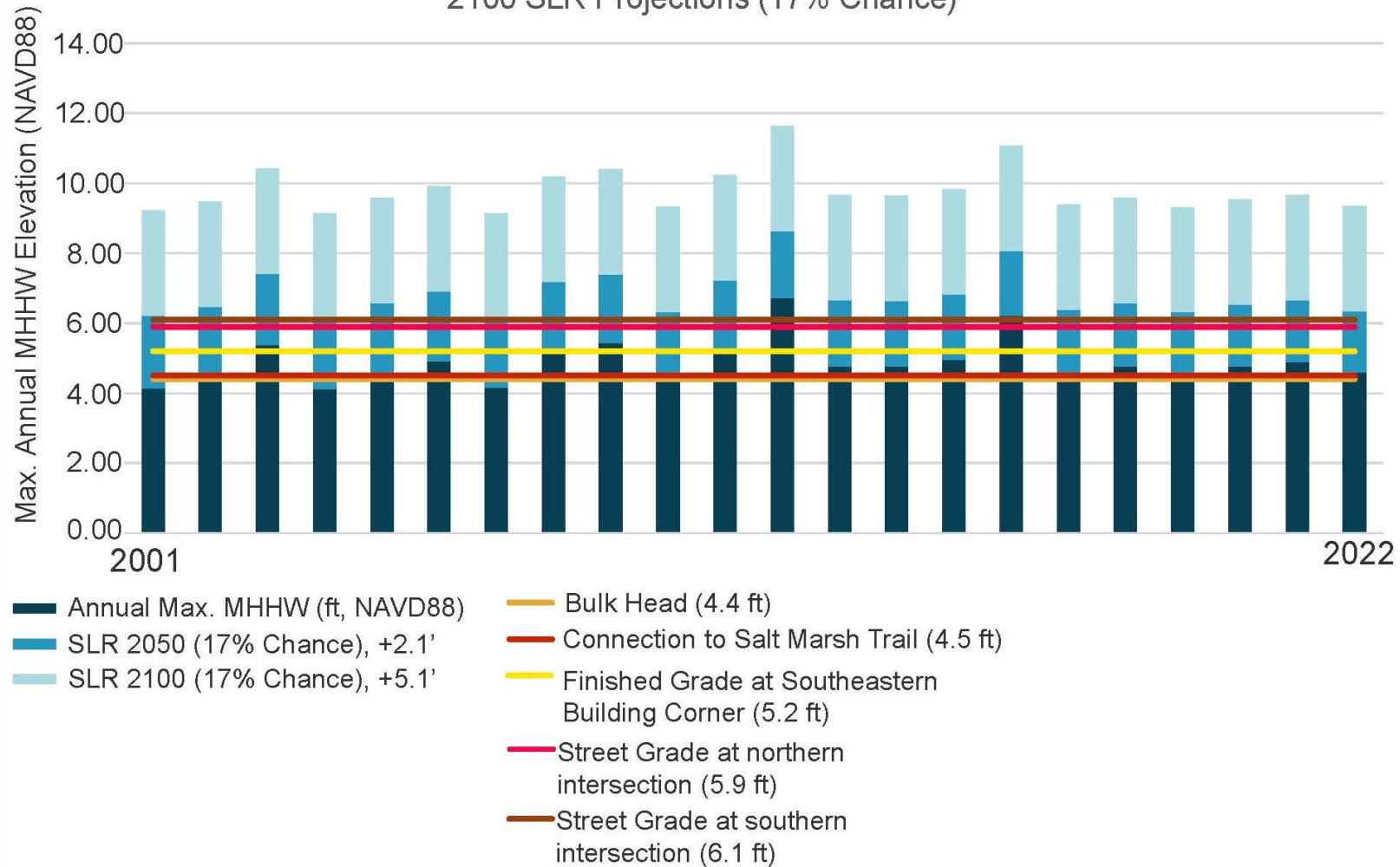
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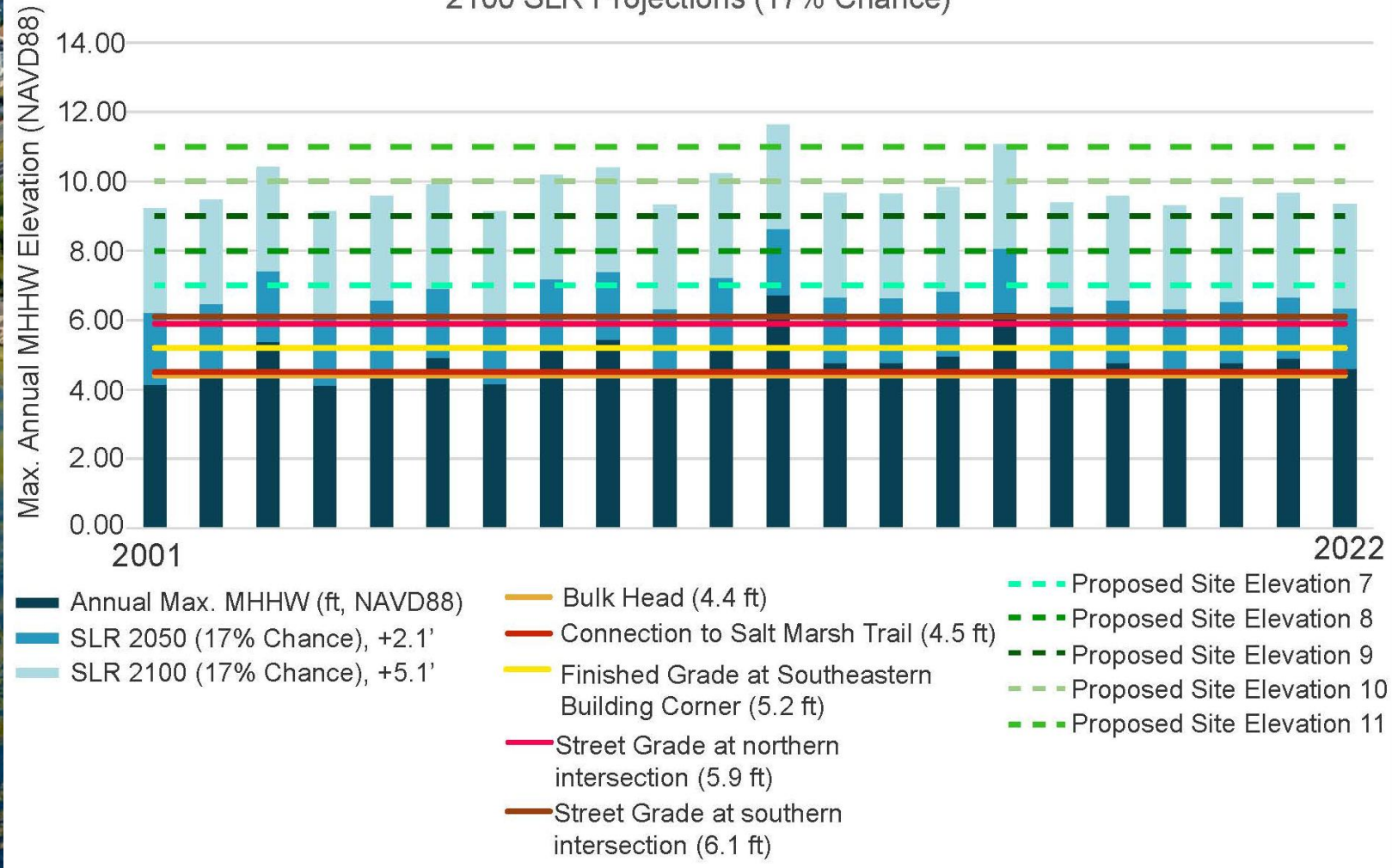
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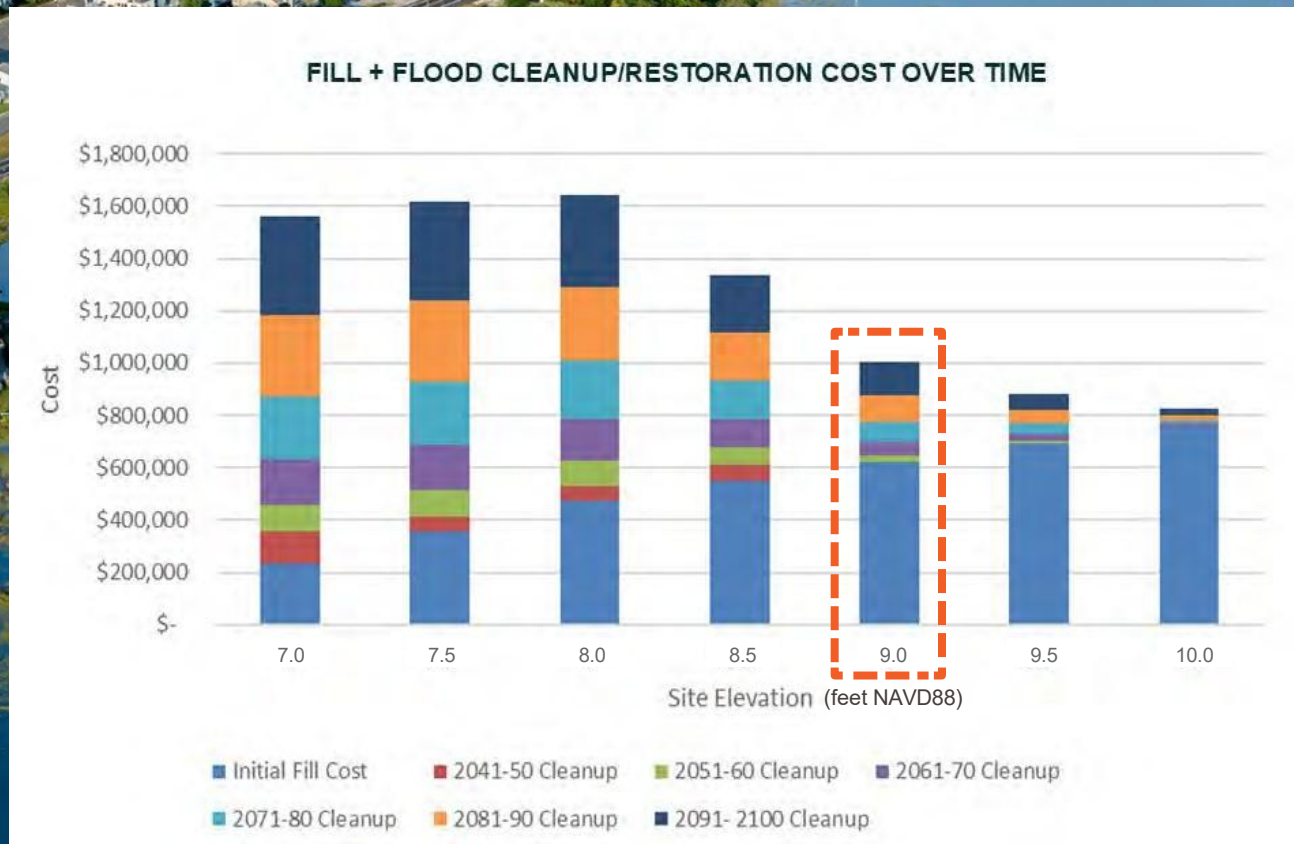



# RISK ANALYSIS

Projected Years when Key Site Elevations are Exceeded Based on 2050 and 2100 SLR Projections (17% Chance)



# COST-BENEFIT ANALYSIS





• Phase I

- Scotch Bonnet Marsh Elevation Enhancement
- Completed Fall 2024
- 5.5 acre rehabilitation of drowning marsh
- 14,000 CY placement of dredged sediment from USACE maintenance dredging of NJIWW
- Up to 3' of thickness to increase marsh elevation capital into 2040 stable low marsh elevations

Phase I  
Marsh Restoration

• Phases II/III

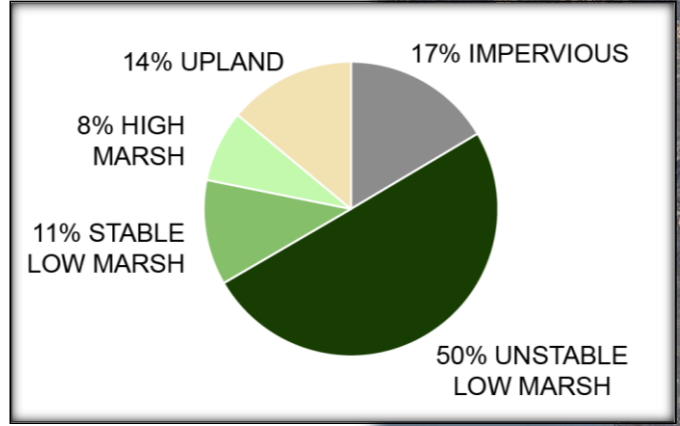
- Salt Marsh Trail Revitalization and Marsh Restoration
- Elevate Salt Marsh Trail for public access, education and resilience
- Elevate Upland habitat and building site
- Restore 5 acres of drowning marsh
- Restore and expand habitat for diamondback terrapins and marsh-dependent birds
- Create climate-resilient and beneficial ecosystem

Phases II/III

# Design Habitats in Salt Marsh Trail Ecosystem Revitalization Project

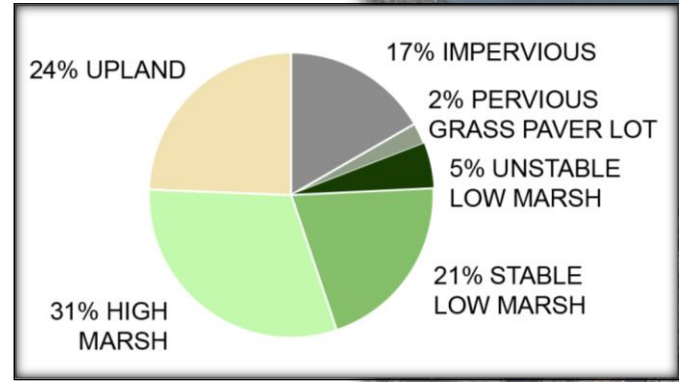
**2030**

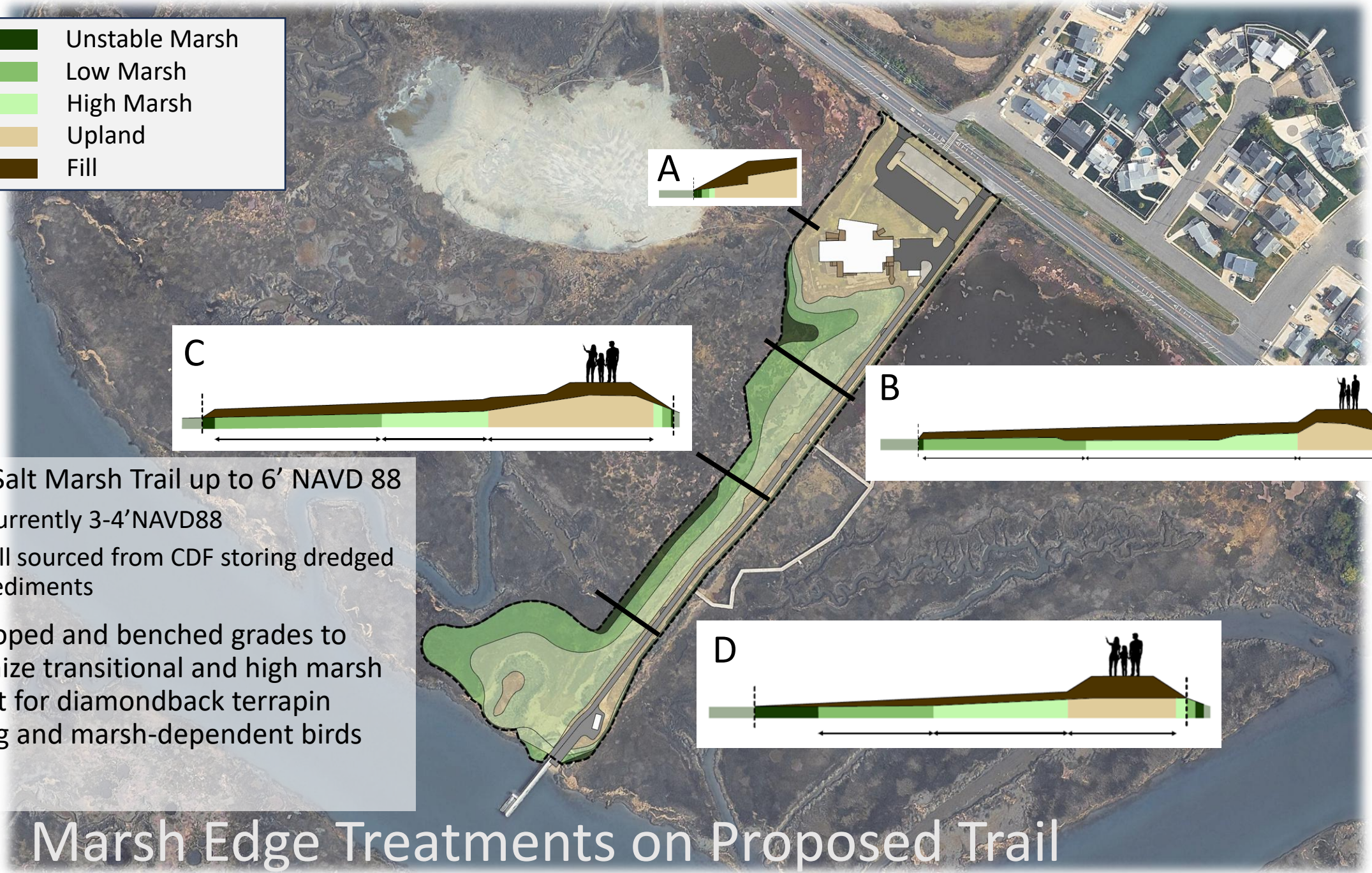
Marsh Restoration



Unstable marsh is drowning marsh

**Proposed**



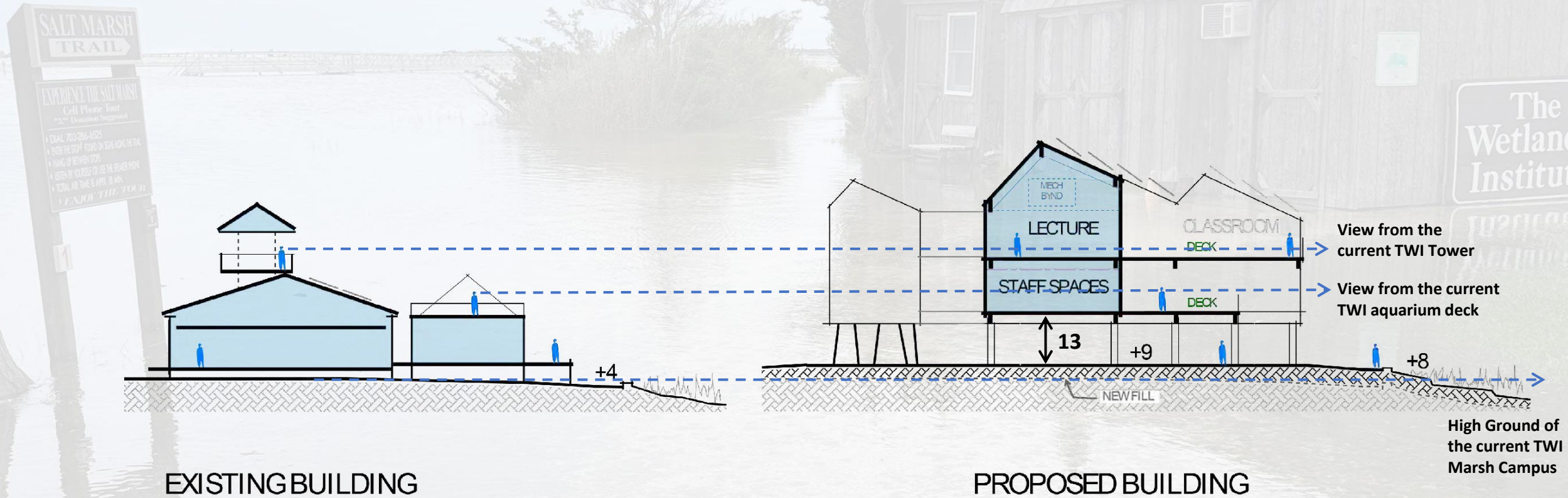


- Raise Salt Marsh Trail up to 6' NAVD 88
  - Currently 3-4' NAVD88
  - Fill sourced from CDF storing dredged sediments
- Use sloped and benched grades to maximize transitional and high marsh habitat for diamondback terrapin nesting and marsh-dependent birds

# Marsh Edge Treatments on Proposed Trail

# SITE DESIGN

Reimagining the Marsh Campus includes creating a state-of-the-art gateway facility that creates resilience and centers on nature-based solutions while supporting our robust research, conservation, and education programs.

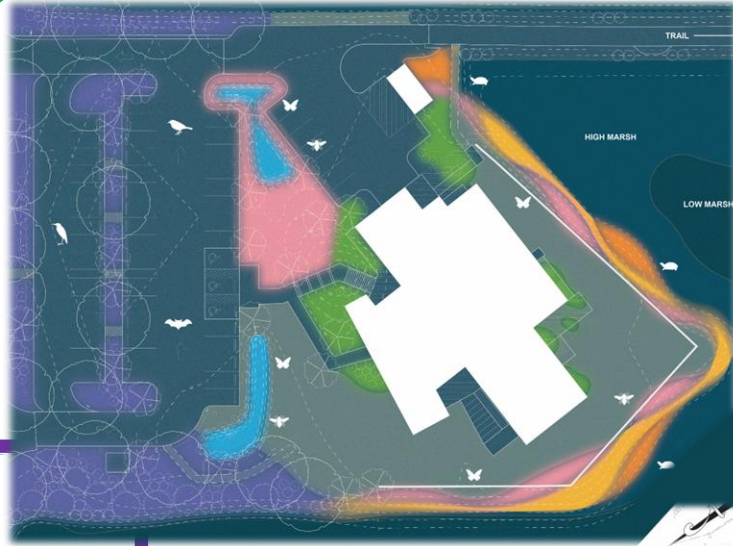


# Proposed Wetlands Institute Ecosystem Design

- HIGH MARSH PLANTING
- LOW MARSH PLANTING
- UNSTABLE LOW MARSH
- BUILDING PALETTE
- PARKING LOT PALETTE
- LAWN
- RAIN GARDEN PALETTE
- POLLINATOR PALETTE
- UPLAND PALETTE
- TERRAPIN PALETTE



# Phase III: Create a Climate-Adapted Ecosystem Housing a Resilient State-of-the-Art Gateway Facility



- RAIN GARDEN PALETTE
- POLLINATOR PALETTE
- UPLAND PALETTE
- TERRAPIN PALETTE
- BUILDING PALETTE
- PARKING LOT PALETTE
- LAWN

## Habitat Goals and Ecosystem Services

Instead of vertical barriers that separate people from nature and negatively impact wildlife, we will create ecozones that provide important habitat that will be home to stunning beauty and biodiversity.

- Lenore Tedesco (ltedesco@wetlandsinstitute.org)
- Tyler Kinney (tyler.kinney@dep.nj.gov)
- Carolyn Paone (cpaone@akrf.com)
- Keith VanDerSys (kvand@design.upenn.edu)