# *Restoration of the Hammock River Wildlife Management Area*


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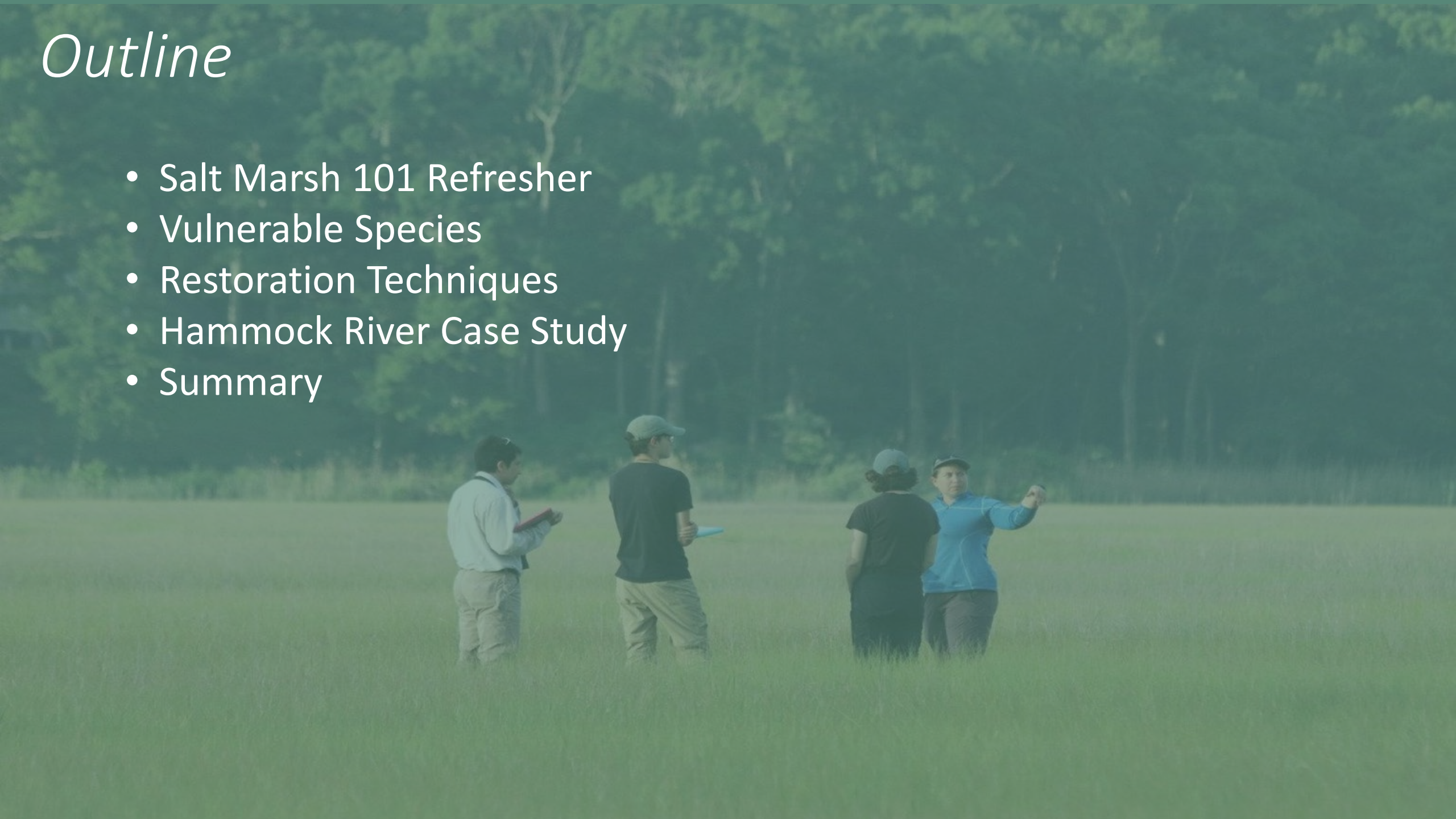
# *Outline*

- Salt Marsh 101 Refresher
- Vulnerable Species
- Restoration Techniques
- Hammock River Case Study
- Summary



# *Tidal Salt Marshes = Globally Rare*

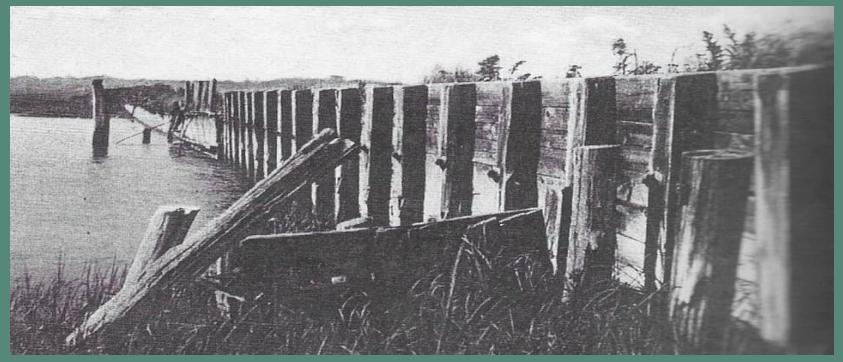
< 17,000 sq. miles

# *1/3 of Salt Marsh along Atlantic Coast*

1,411 sq. miles
Coastal Marsh

29%
U.S. Population

# 1600-1800s

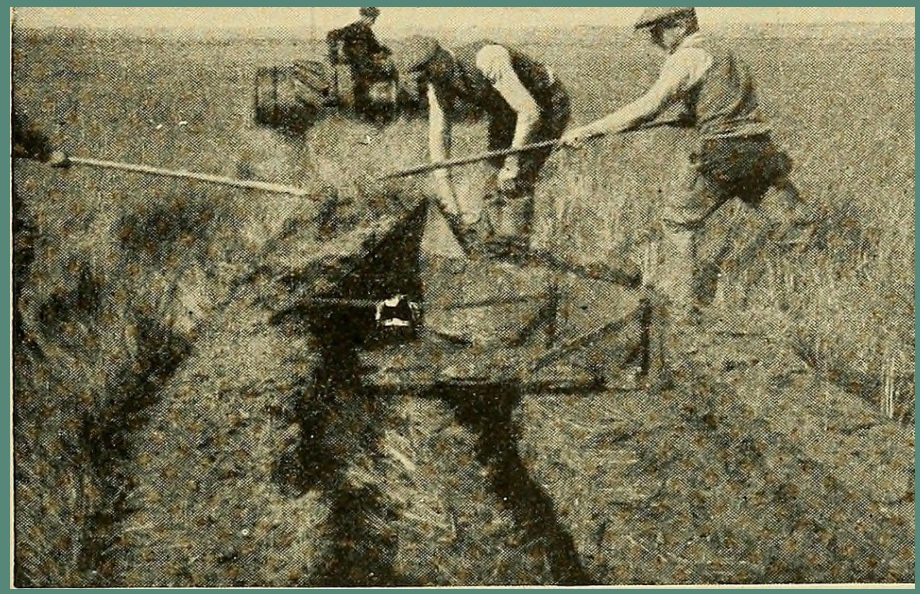
# Present Day

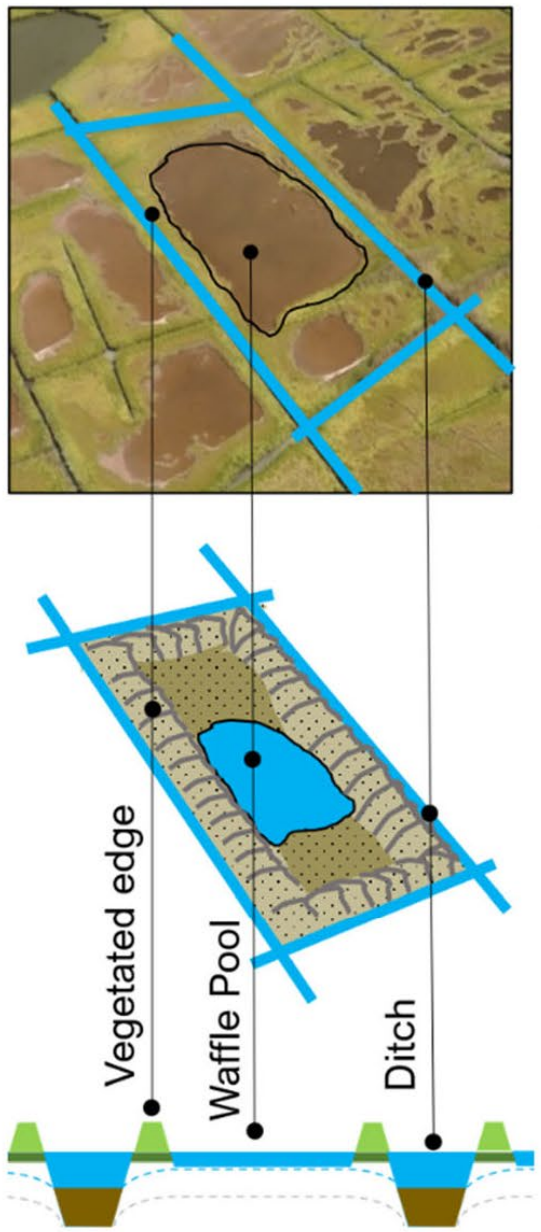
# 1900s

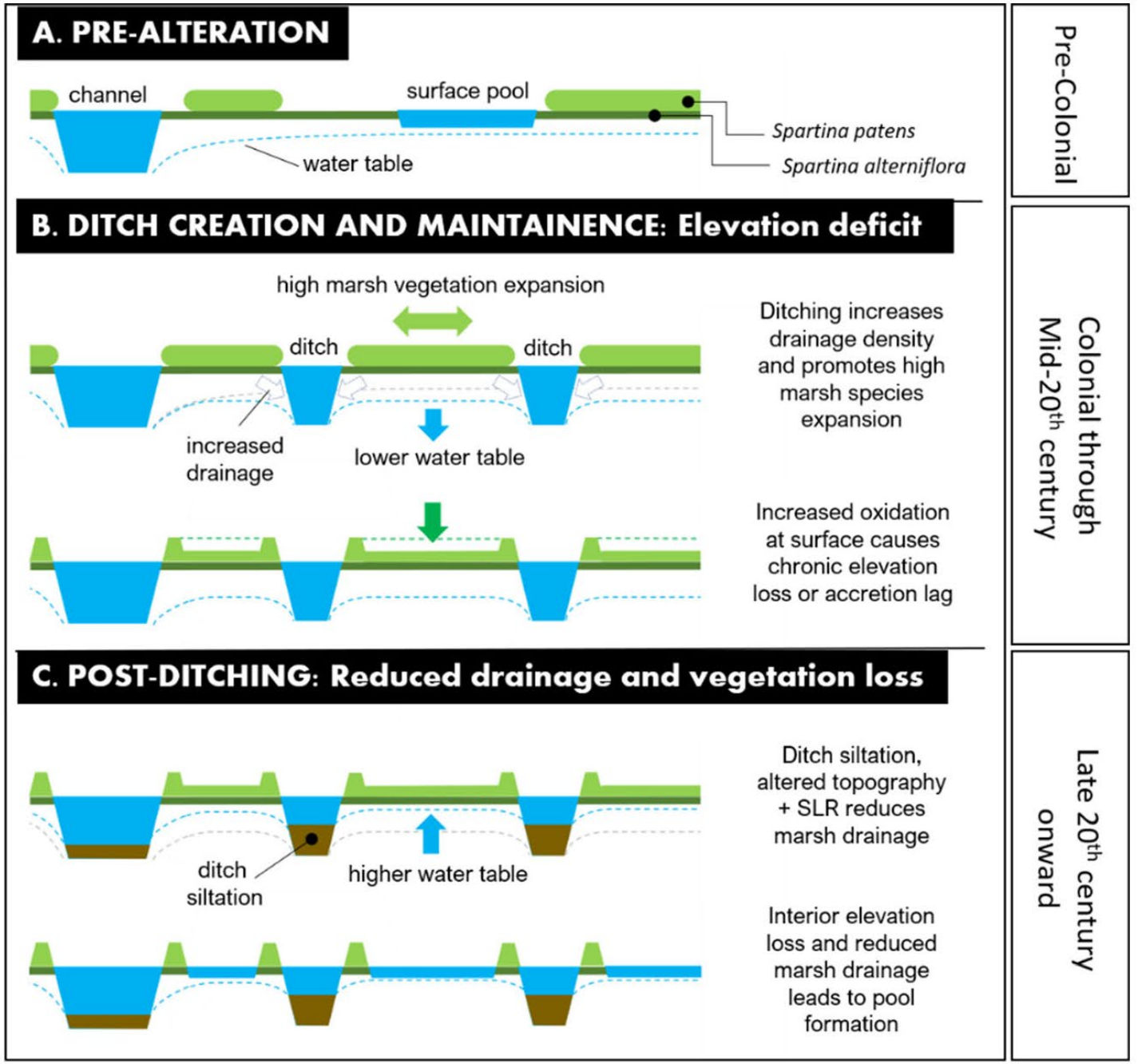
1934

2014

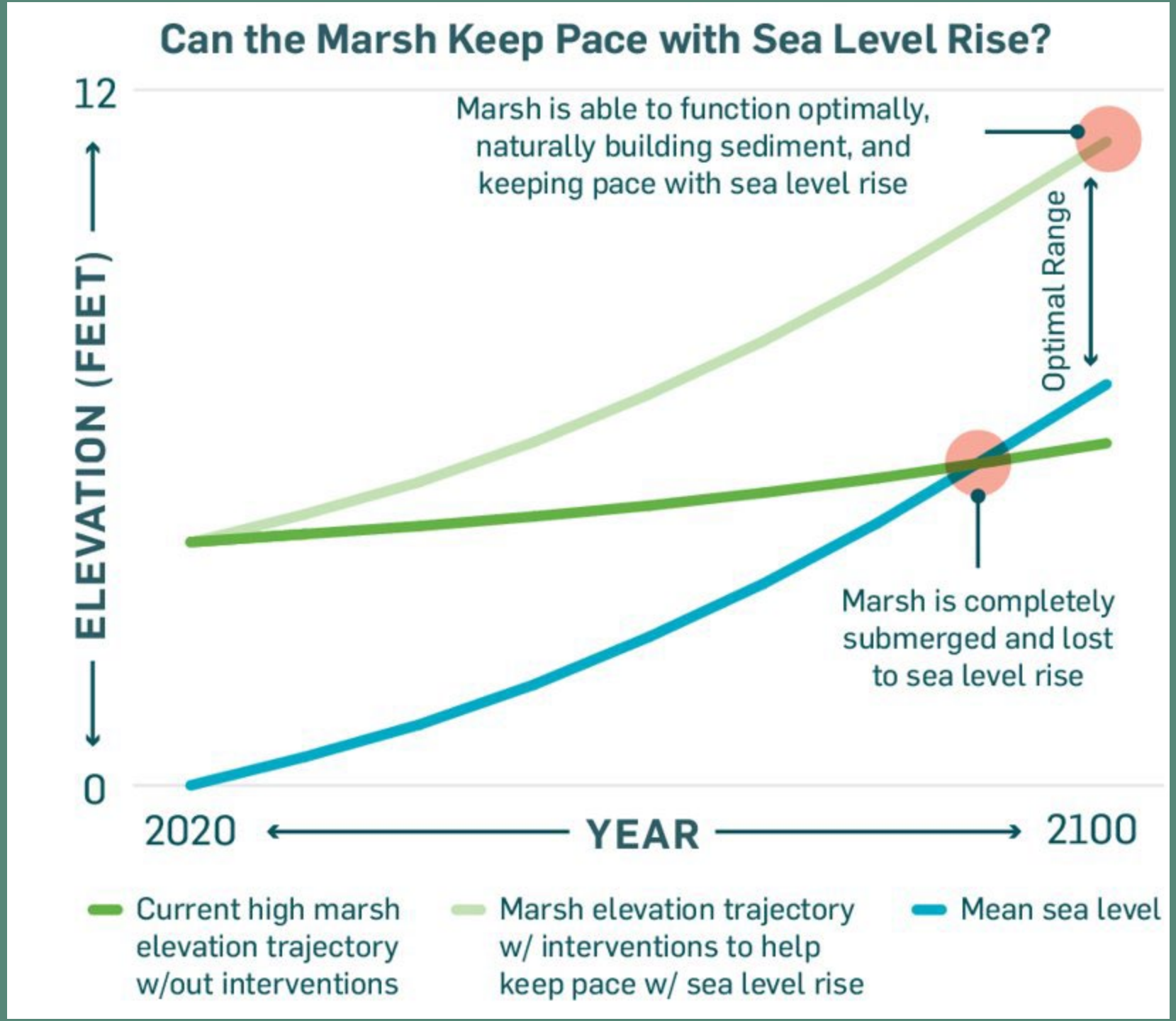
WESTBROOK, CT





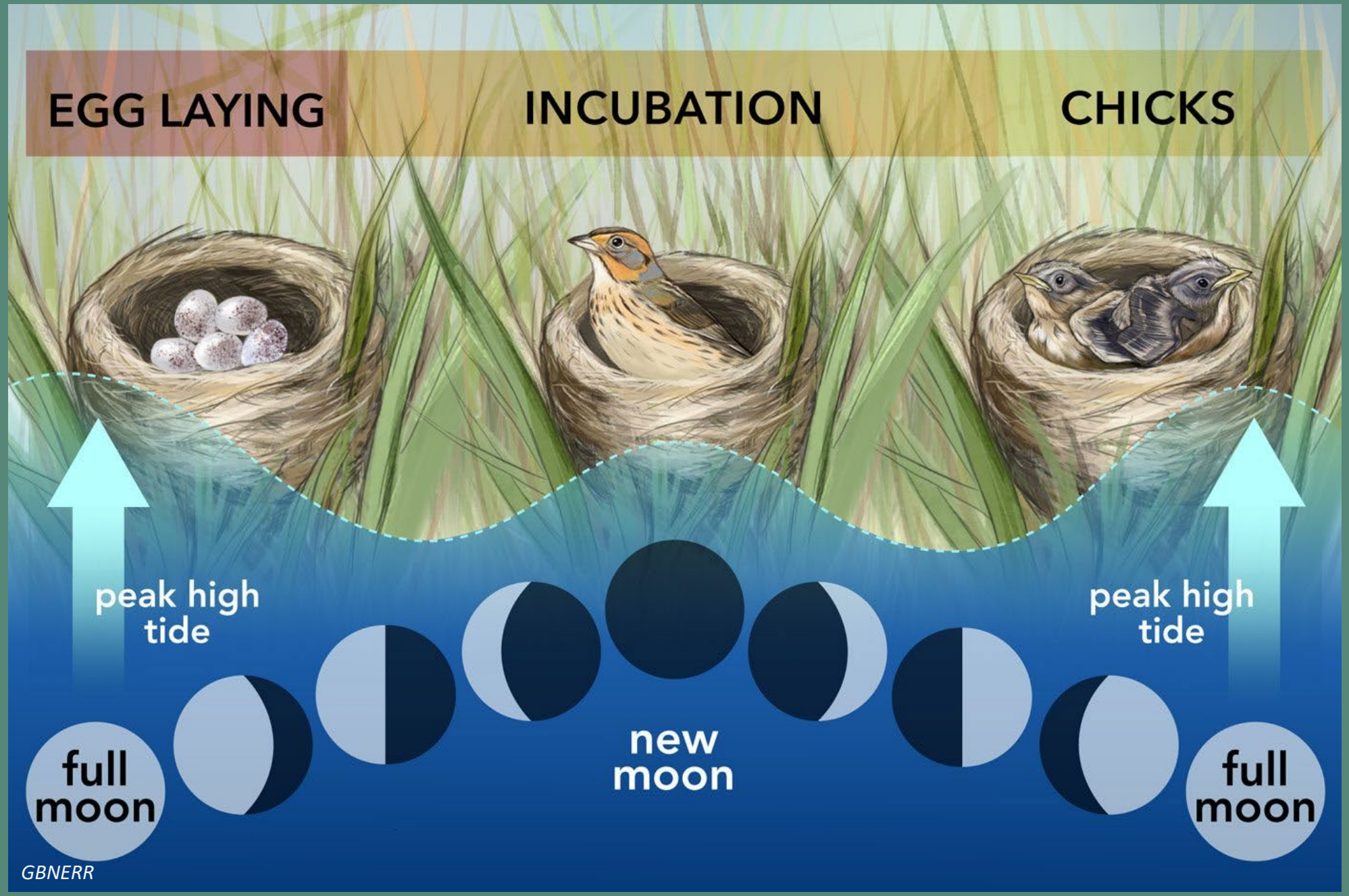




Smith et al. 2021


Can the Marsh Keep Pace with Sea Level Rise?
12
0
ELEVATION (FEET)
Marsh is able to function optimally, naturally building sediment, and keeping pace with sea level rise
Optimal Range
Marsh is completely submerged and lost to sea level rise
2020
YEAR
2100
Current high marsh elevation trajectory w/out interventions
Marsh elevation trajectory w/ interventions to help keep pace w/ sea level rise
Mean sea level

# *Canary of the Coastline - Saltmarsh Sparrow*

-84% population 1998-2018
SGCN in CT
Endangered IUCN




Need ~26 flood free days to successful raise young, just fitting in the ~28 day tidal cycle

Reproductive Failure / Local Extinction

Salt Marsh Tipping Point?

*Marsh Conversion / Loss Accelerates with SLR*

2020 2030 2040 2050 2060 2070 2080 2090 2100+

*"High Marsh" conversion*

*"Low Marsh" / Mud flat dominated*

Metonic Cycle 'up phase' begins

Estimated Extinction

*Field et al. 2017 Ecography; Roberts et al. 2017 J. Field Ornithology*

# *Science Driven, Nature Based Solutions*

**Runnels & Ditch Remediation**

- Mimics natural process of marsh succession & addresses past alterations
- Reduces peat saturation to restore marsh platform & vegetation
- Heals ditches and promotes a more natural hydrological network

**Tidal Flow Restriction Removal**

- Restore tidal flows to increase flushing and promote drainage
- Road crossings, impoundments

**Sediment Supplementation**

- Beneficial use of sediment to raise marsh elevation

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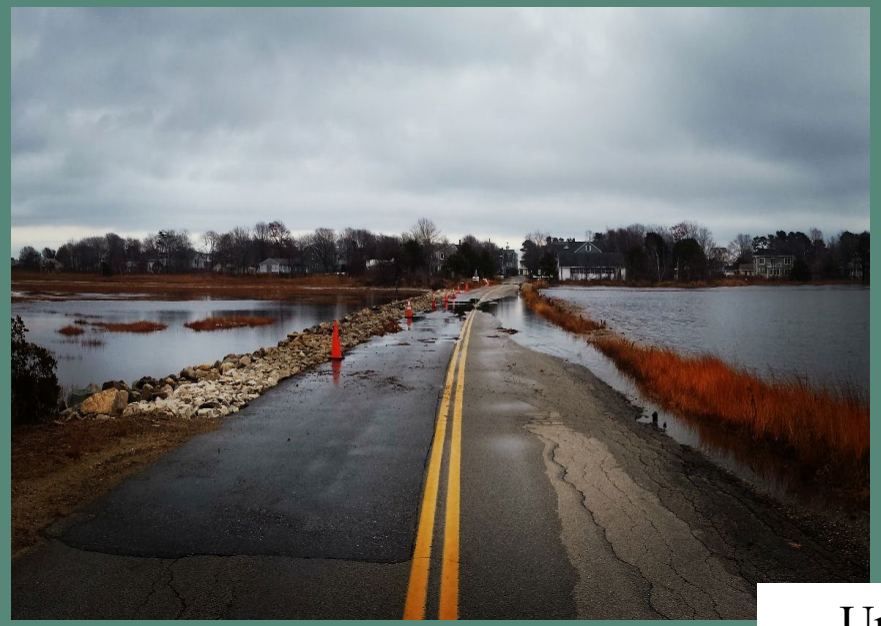
# *What do they look like*

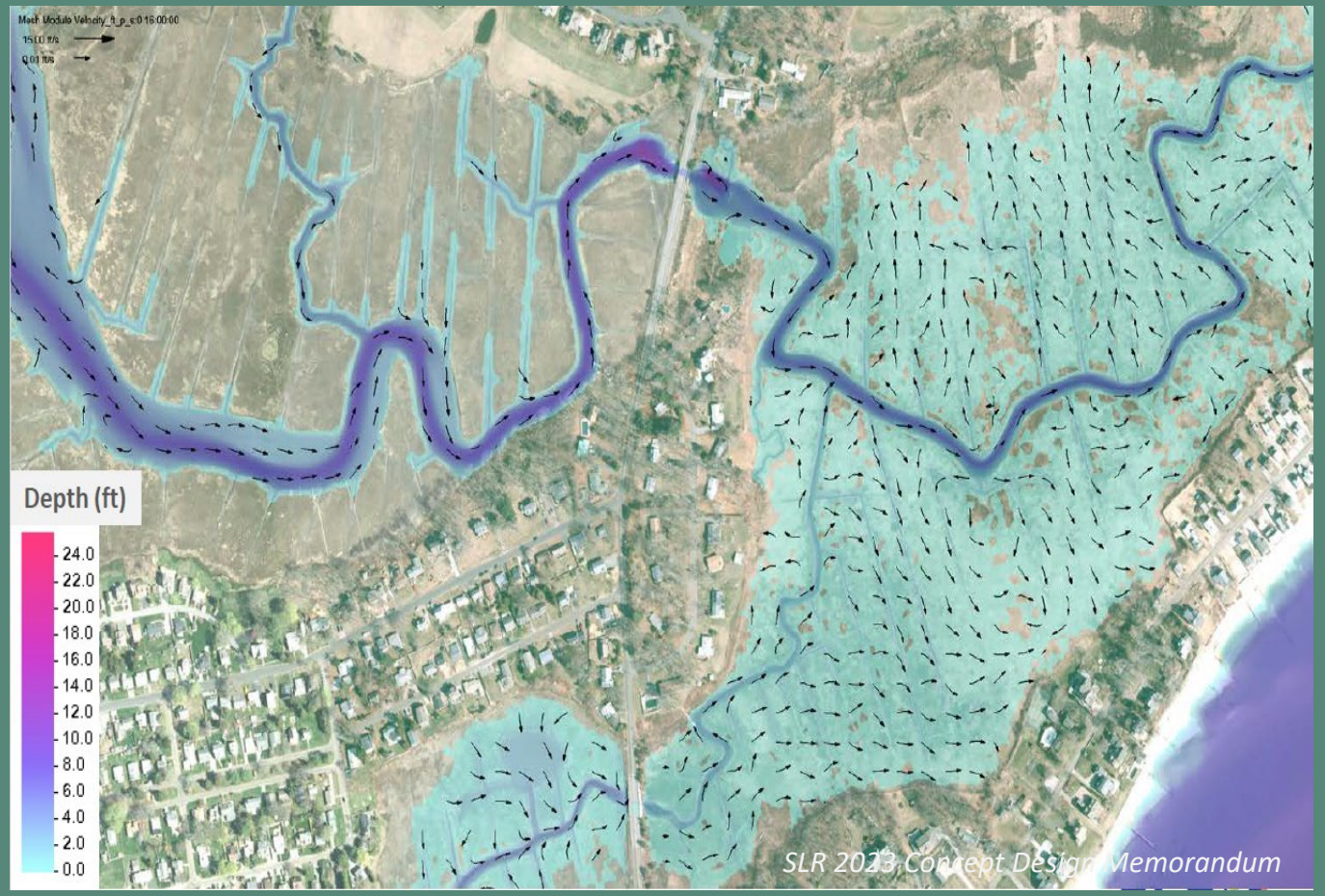


Up to 39% of marshes in the breeding range of saltmarsh sparrows have tidal restrictions

(USFWS 2019)

# *Tidal Restrictions – what's the problem*

- Restrict or block tidal flow, including sheet flow
- Reduce sediment transport upstream
- Impede drainage / impound upstream water
- Changes in salinity
- Anerobic to aerobic conditions
- Lead to elevation loss



# *Tidal Restrictions & Saltmarsh Sparrows*

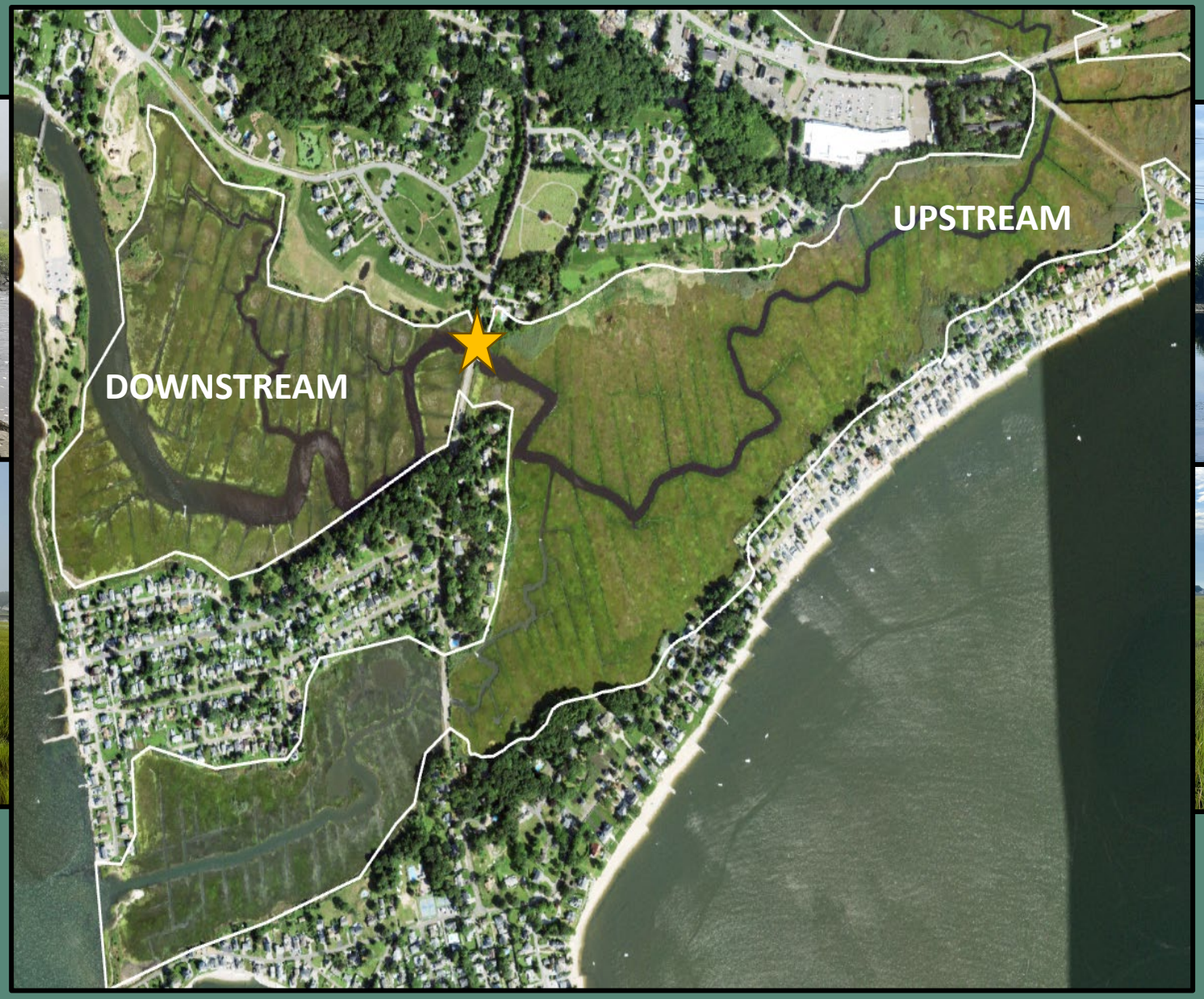
- Some evidence for higher productivity in restricted marshes (though not directly tested) Ruskin et al. 2017
- Provide a short-term ‘refugia’ from tidal flooding
- Precipitation impounded upstream
- Upstream populations vulnerable to restriction modifications

Saltmarsh Sparrow population declines greater in restricted marshes
(Correll et al. 2017)

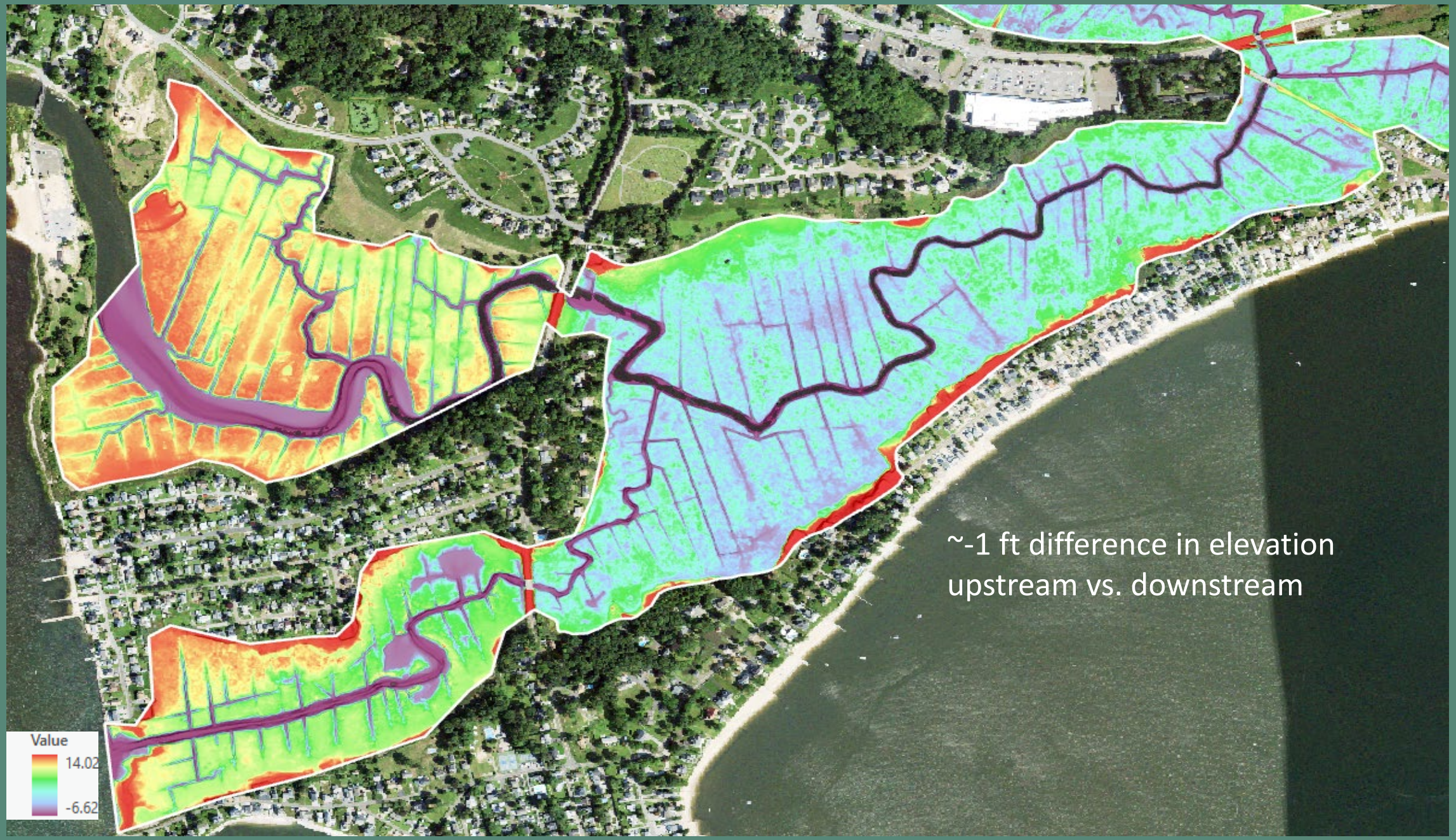
# *Project Goals*

- Remove the tidal restriction on the Hammock River
- Restore salt marsh platform through improved flow patterns and drainage
- Aid in local hazard mitigation & protect of surrounding infrastructure
- Promote Saltmarsh Sparrow breeding through water level management

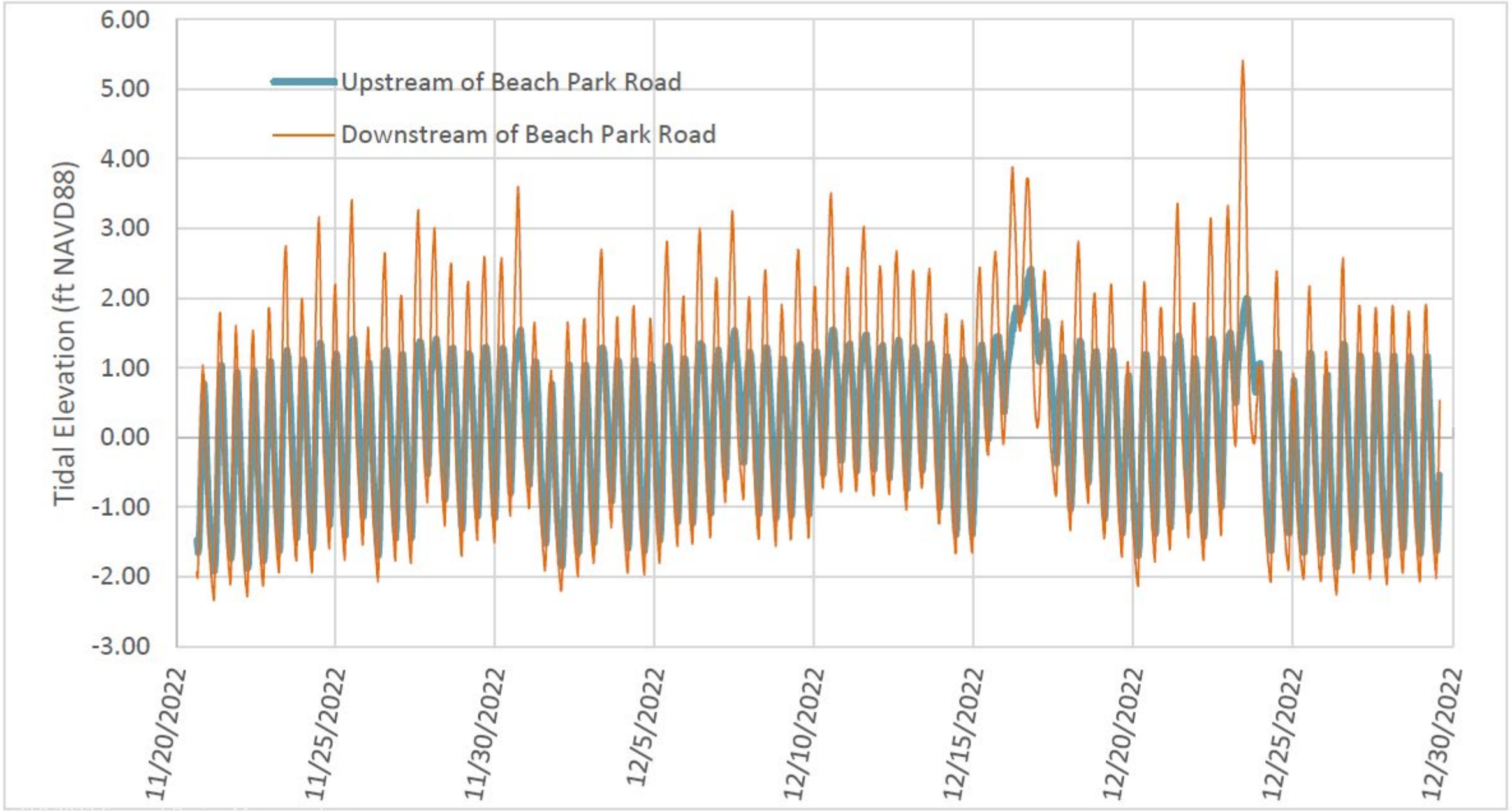
# *Hammock River – Clinton - Connecticut*




# *Elevation*


Value
14.02
-6.62
~-1 ft difference in elevation
upstream vs. downstream

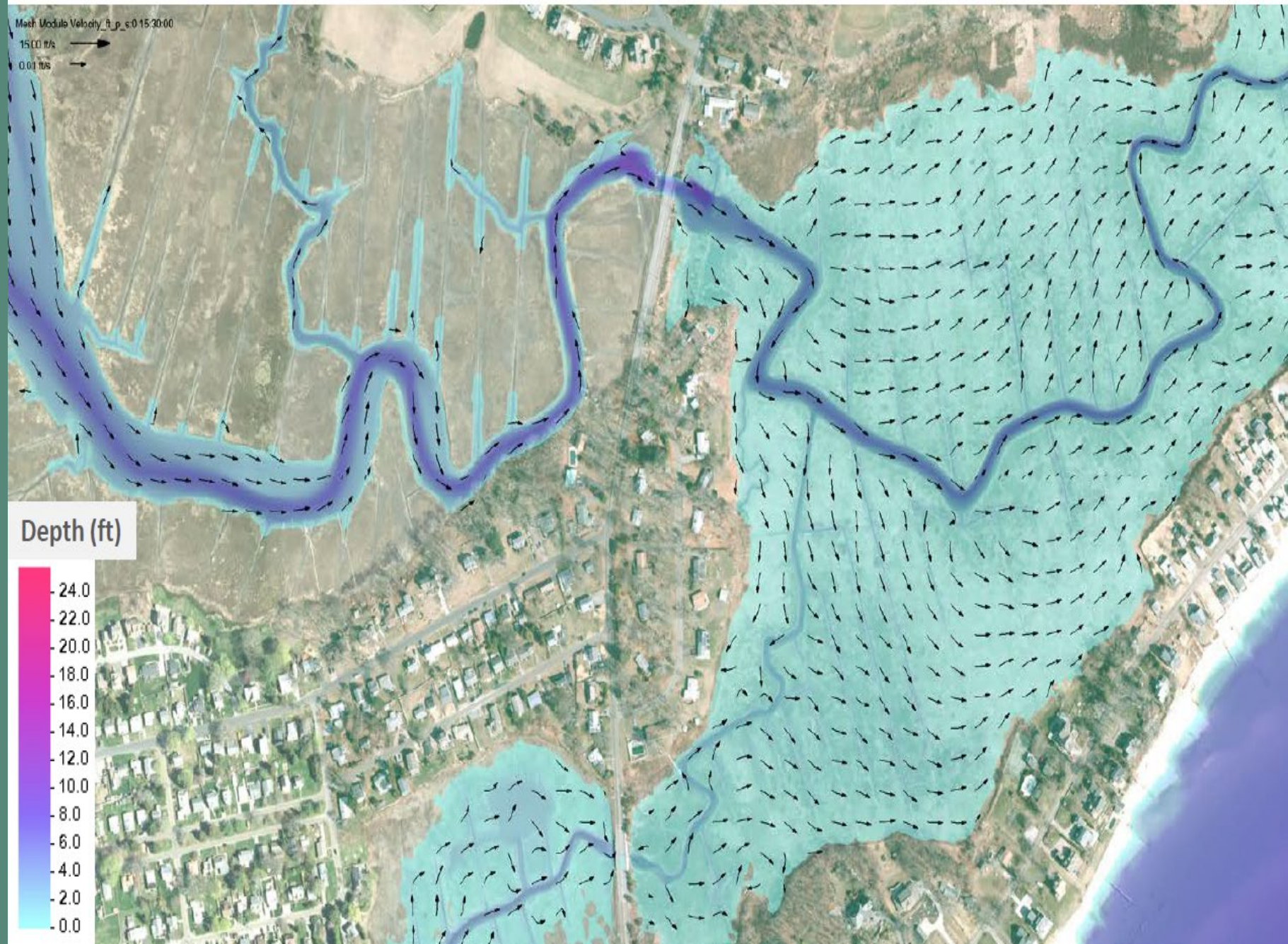
# Water Levels



# HYDRAULIC MODELING PROPOSED NORMAL HIGH TIDE

- No significant changes in WSEL during surge
- Inundation expected to decrease due to increased outflow

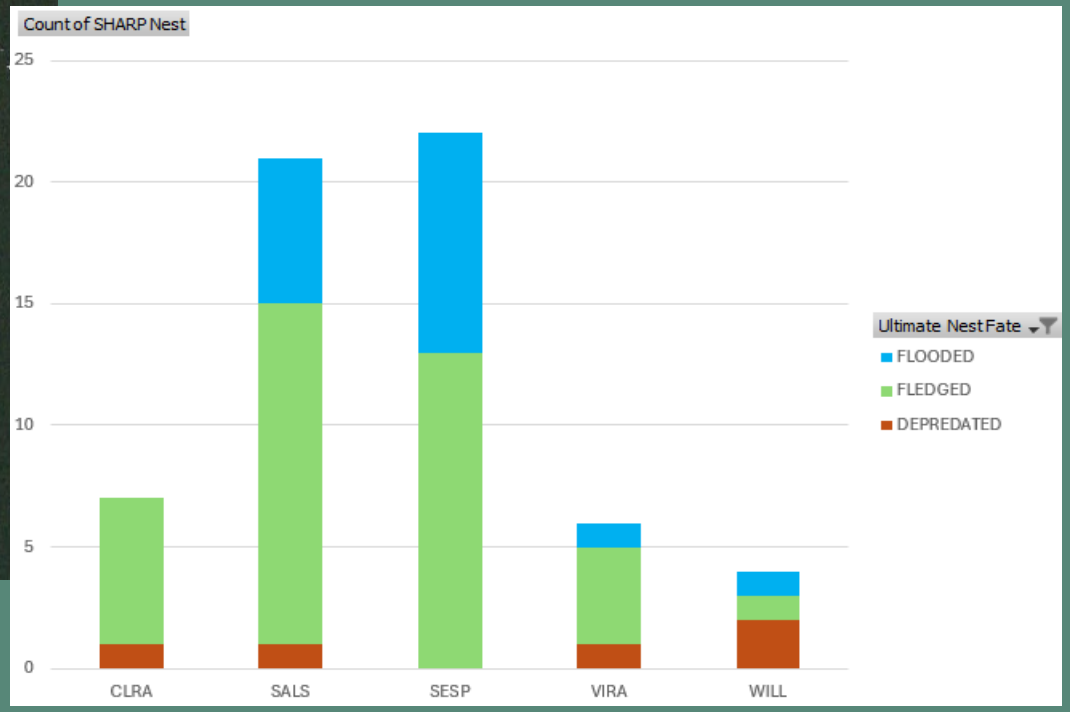
**Tide gates are necessary to achieve the projected risk reduction and ecological outcomes**




*SLR 2023 Concept Design Memorandum*

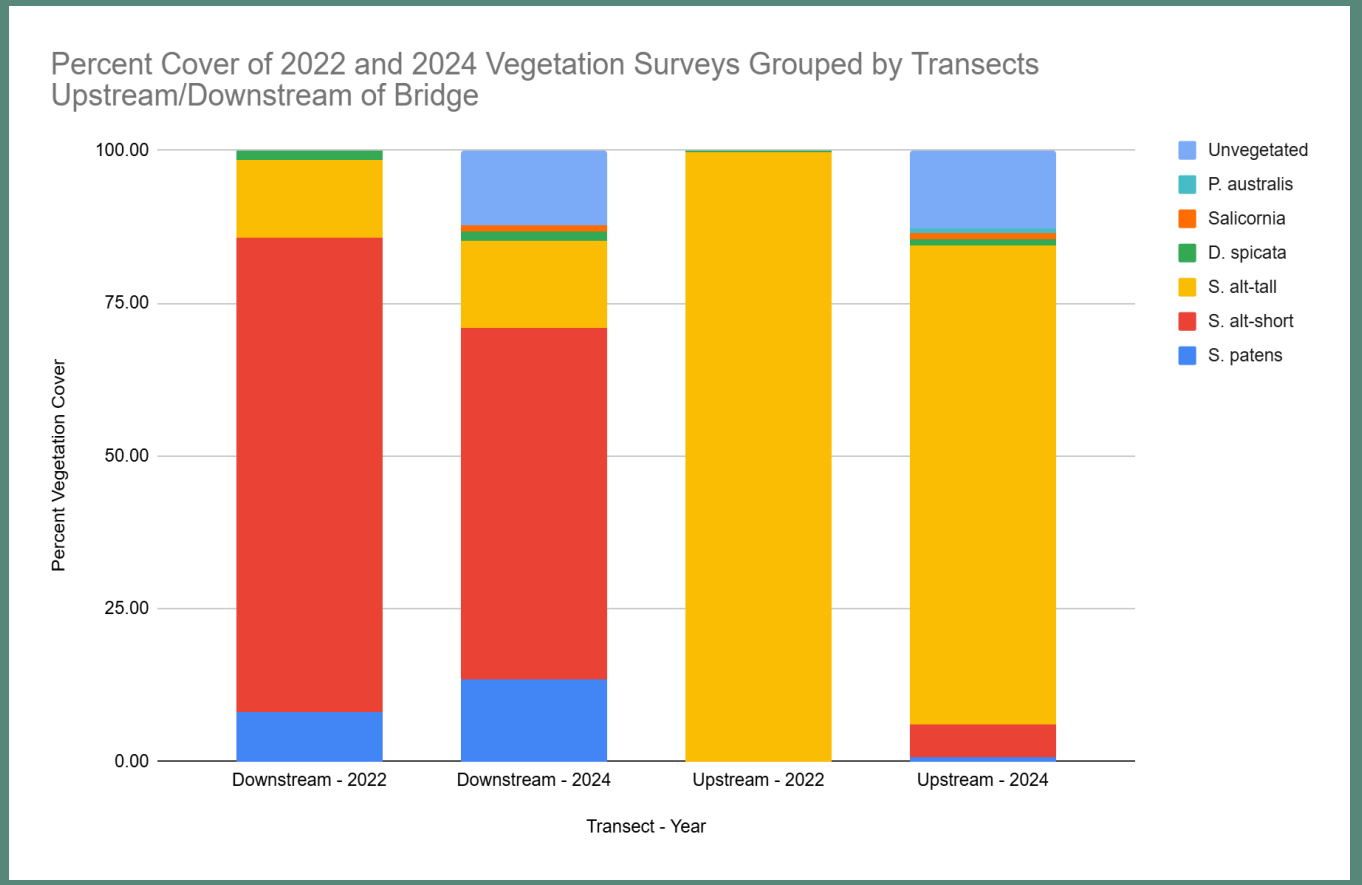
# *Tidal Marsh Bird Monitoring*


- Found & monitored nests in 2022 & 2024
- No Saltmarsh Sparrows nesting downstream in 2024 (vs. 8 in 2022)
- Overall nest success = 49%



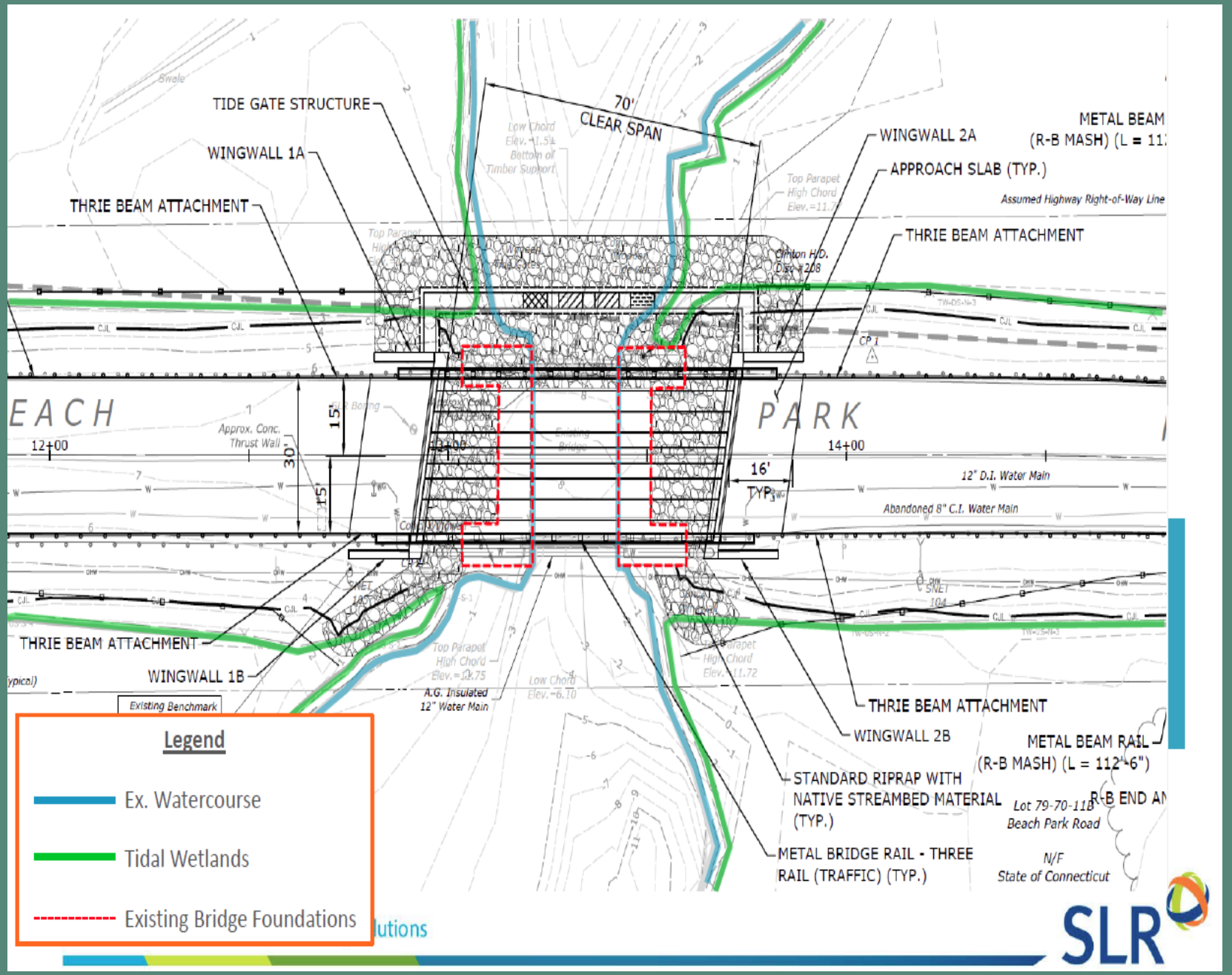
# *Vegetation Monitoring*


- 1m quadrats (200 points; 76 nest, 124 random location)
- Transects (10)



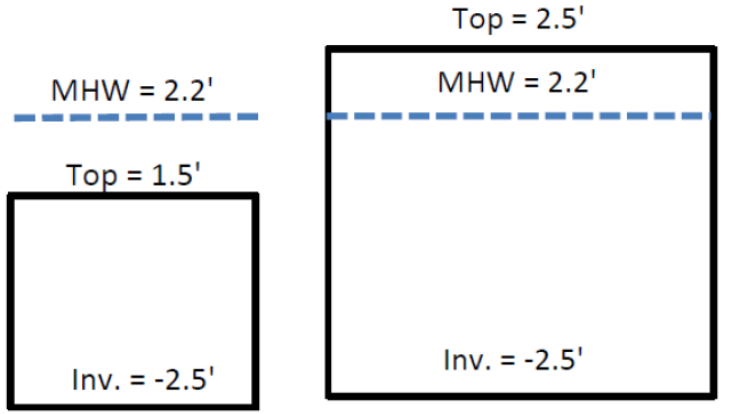
## PROPOSED BRIDGE

- Increase span from 22 ft. to ~70 ft.
- Prestressed concrete box beams
  - Low maintenance
  - Shallow structure depth
  - Allow flexibility for raising the road
  - Pedestrian walkway



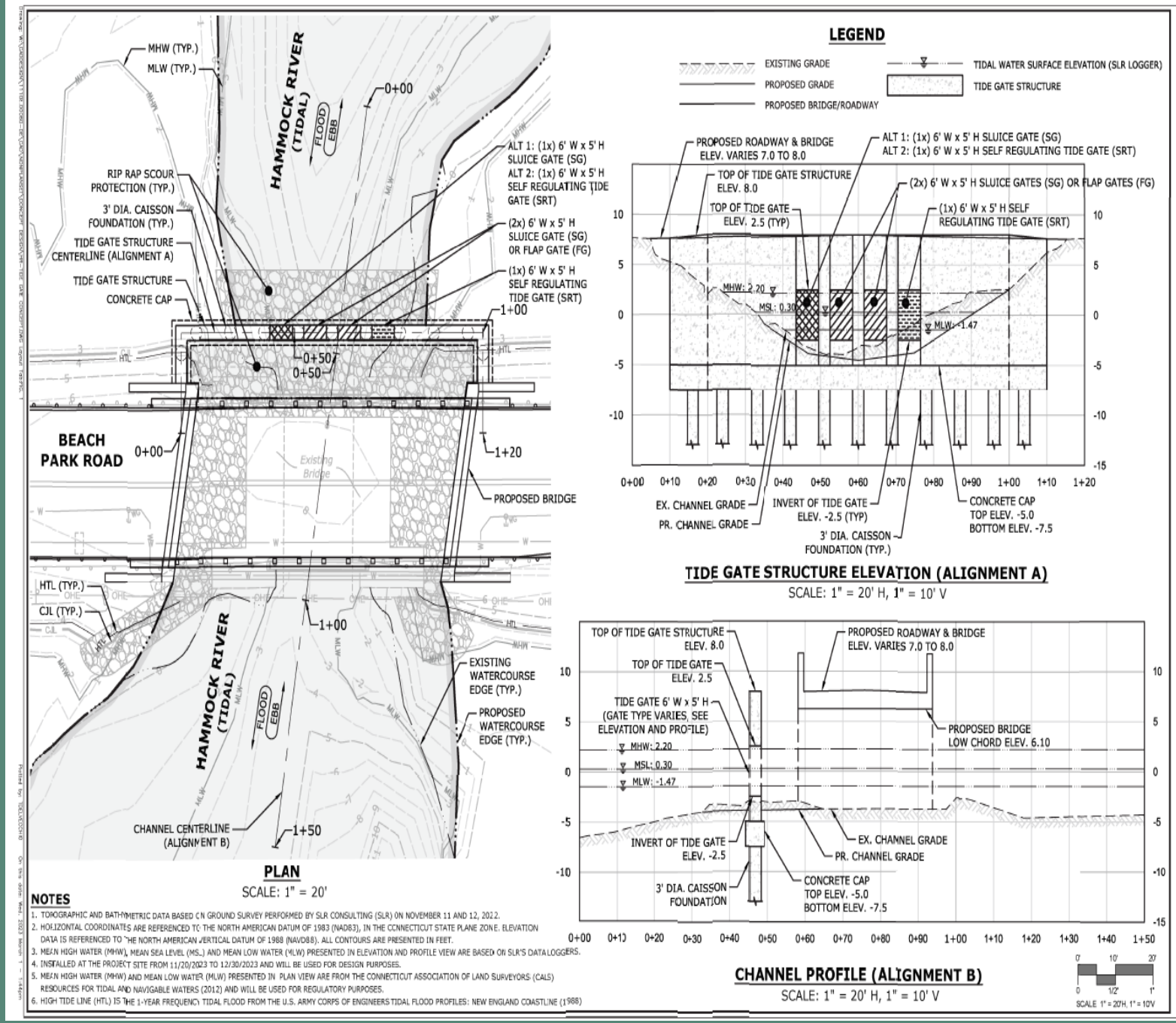
# PROPOSED TIDE GATES

- Increase opening from 64 ft. to ~144 ft.
- 2 self-regulating tide gates & 2 flap gates
  - Increased versatility
  - Lower maintenance
  - Prioritizes drainage




**Existing: 48-inch wide x 48-inch high (FG)**

**Proposed: 72-inch wide x 60-inch high (SRT or SG or FG)**



# What’s Next?

- Construction
- Finalizing the O&M Plan
- Developing a habitat management plan
- Continued monitoring

# Considerations for Restoration

## Habitat Considerations

- Low marsh vs. high marsh vs. mudflat
- Current vs. future conditions?
- Phragmites, marsh migration

## Wildlife Considerations

- Upstream nesting wildlife
- Threatened / endangered species & plants
- Impact will be greater than just the bridge/structure

## Community Considerations

- Road life – is it essential (evacuation route, etc.), can it be abandoned?
- Changes in flooding to surrounding infrastructure (homes, etc.)
- Long-term monitoring & adaptive management

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