Use of Dredge Material for Wetland Restoration: 2 Case Studies

CIB STAC

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Delaware Department of Natural Resources and Environmental Control
Wetland Monitoring and Assessment Program

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Background

- Many tidal marshes along the east coast of the U.S. are sinking due to land subsidence and/or have drowned due to rising sea levels
- Mid-Atlantic region of the U.S., including Delaware, is a sea-level rise hotspot
- DNREC regularly dredges Indian River to stay navigable; disposing of materials in upland containment units
- Beneficial use of dredge material is a wetland restoration strategy used to address this issue
- Spread dredged sediments onto a degraded existing salt marsh to raise elevation, or sediments are used to recreate submerged former marsh

Examples

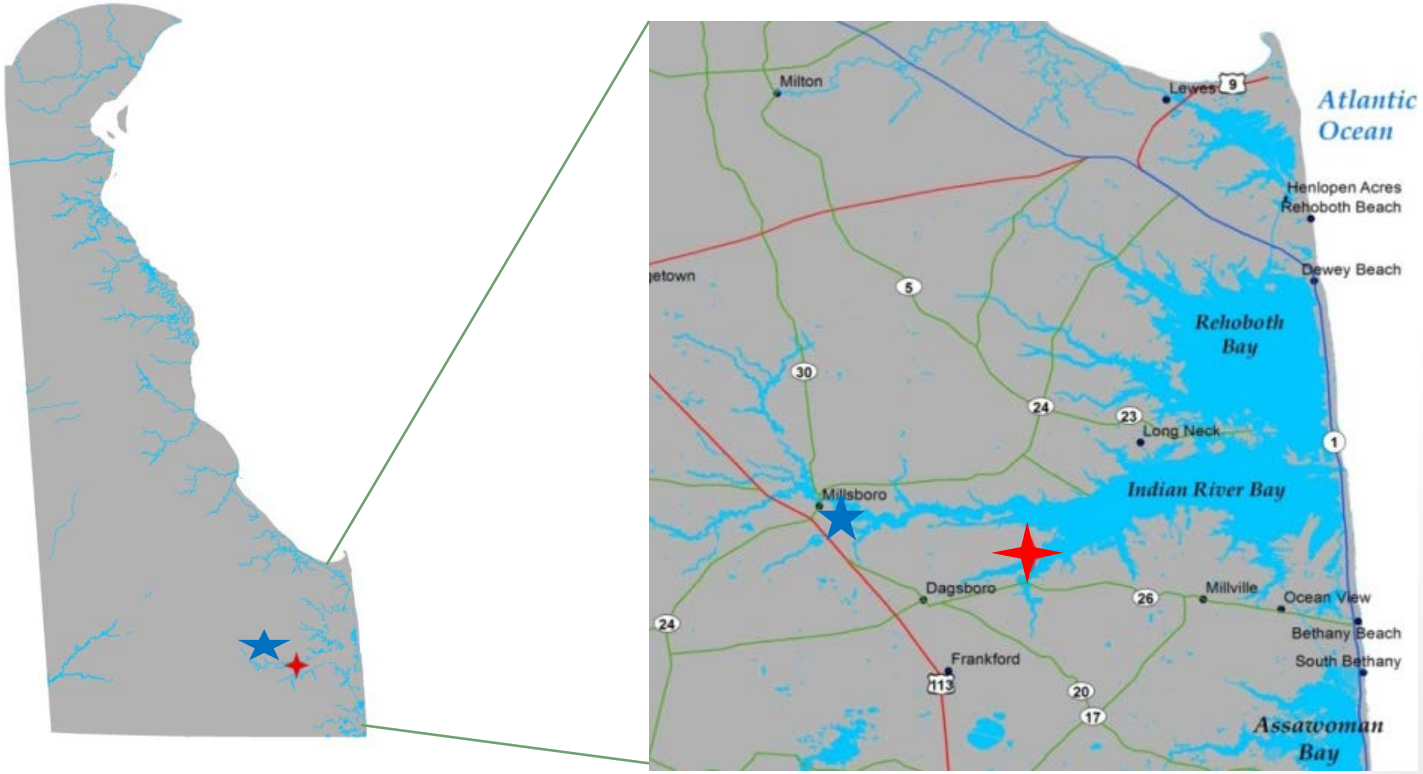

Blackwater National Wildlife Refuge (MD)
USFWS


The Wetlands Institute
Ring Island (NJ)


Prime Hook National Wildlife Refuge (DE)
USFWS

Two DNREC Case Studies

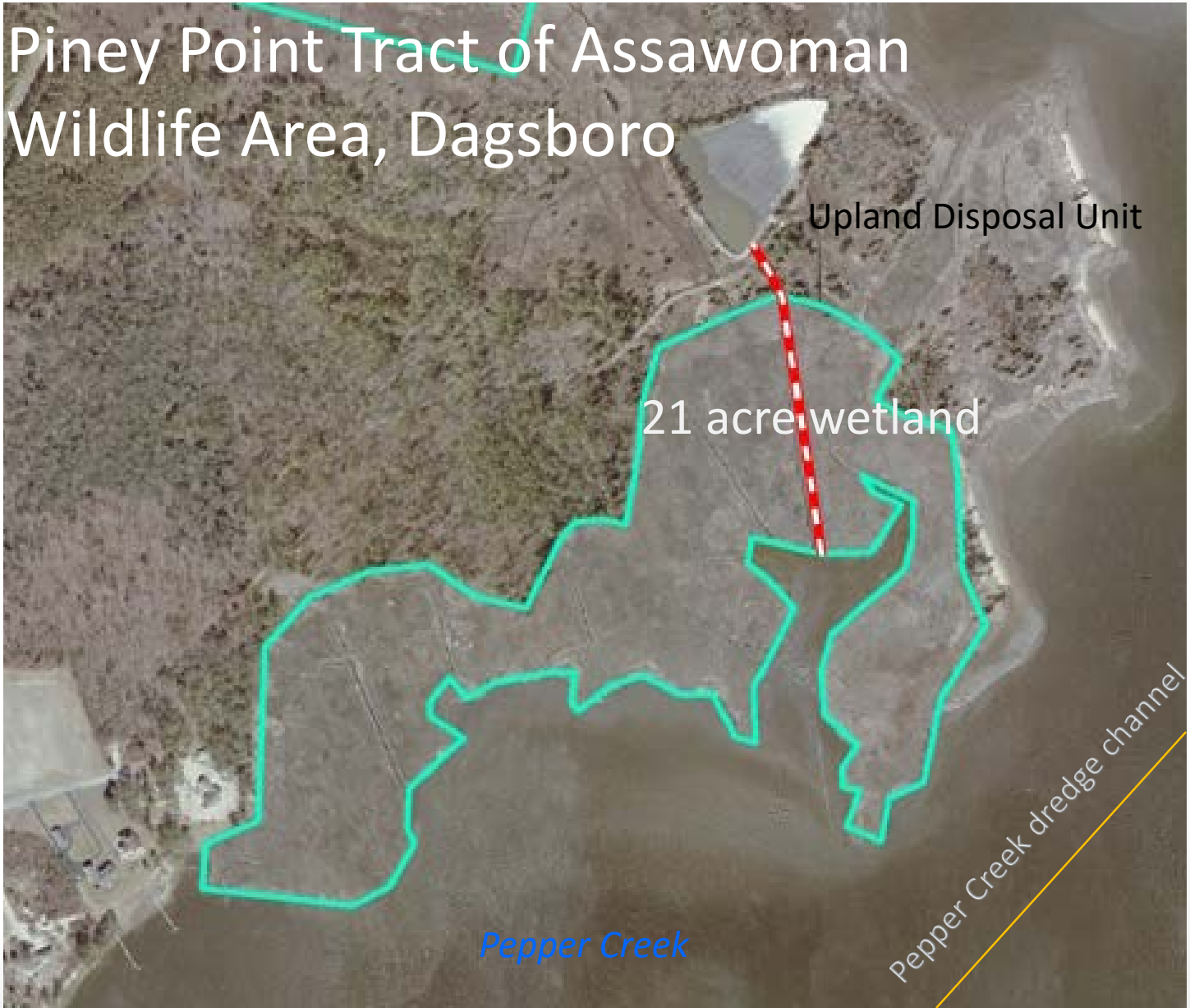
- Completed: Piney Point (thin layer)
- In Progress: Millsboro (platform recreation)



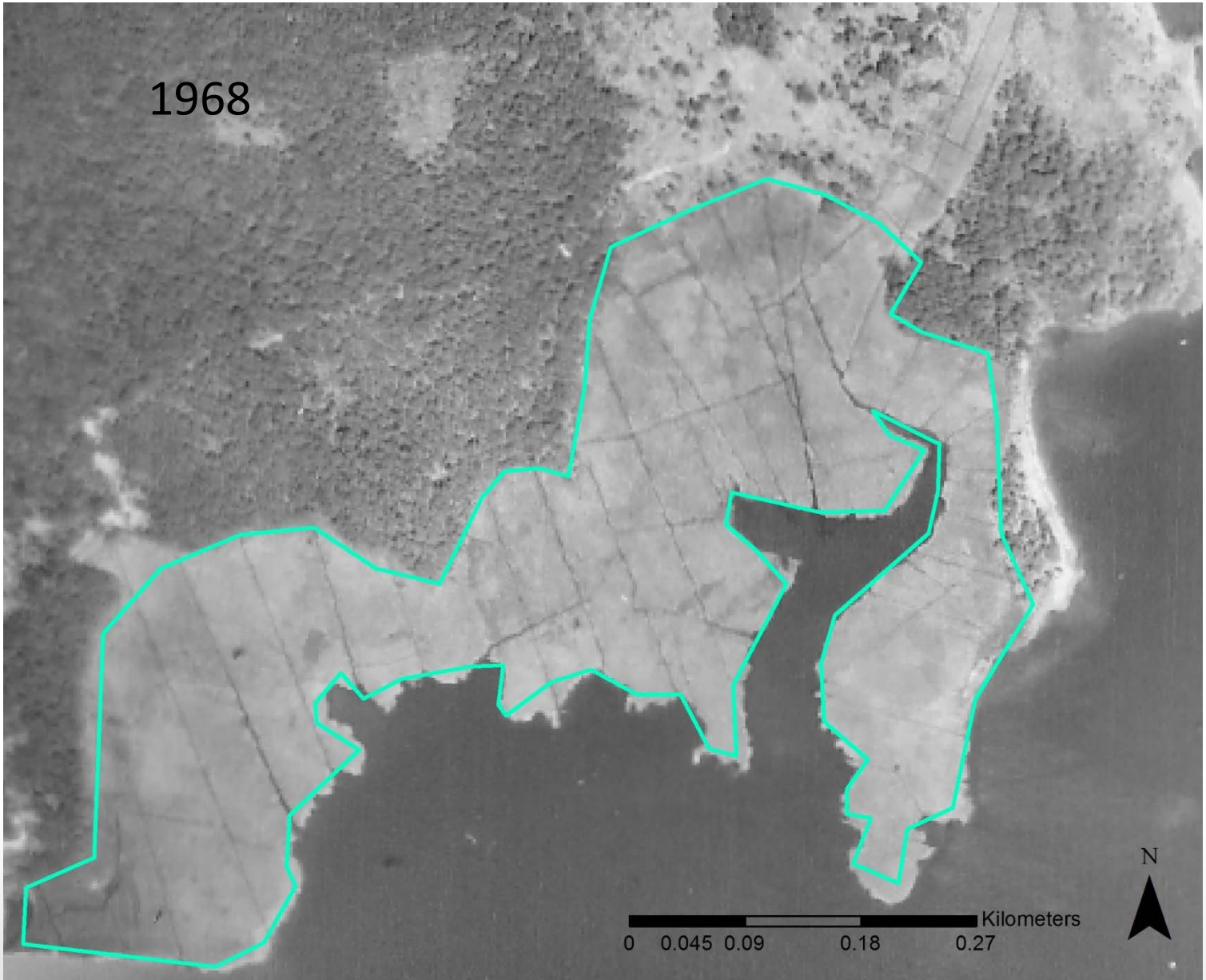
Project Goals

- 2015 Delaware Wetland Management Plan action item
- DNREC seeking alternate uses of dredge material
- Reduce reliance on disposal areas
- Goal:
  - Build DNREC capacity for beneficial use
  - Test the efficacy of treating tidal wetland with dredge materials
  - Investigate techniques, equipment, logistics, biological results
  - Focus on information transfer
  - Serve as a baseline examples for permit requests

Project 1: Piney Point 2013



Site Selection



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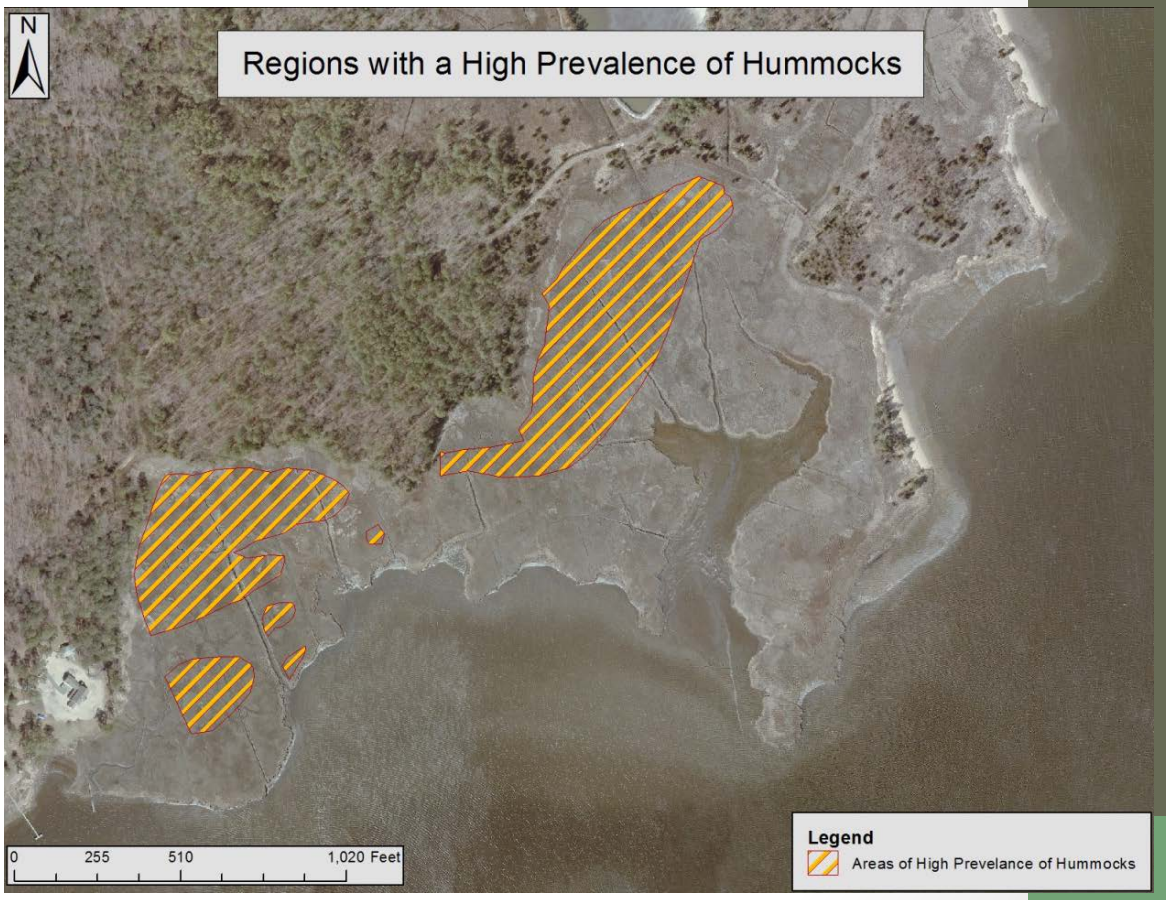
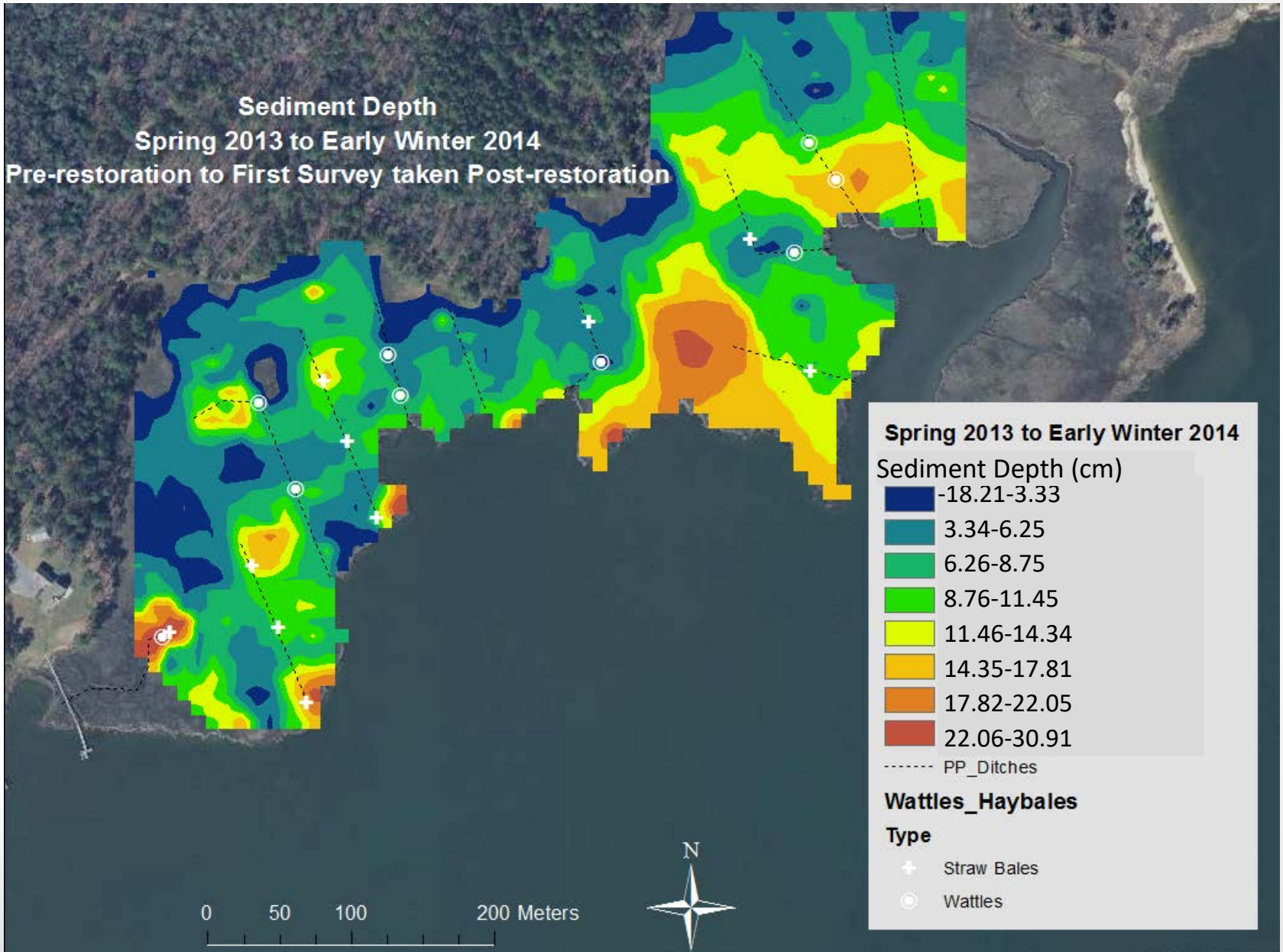


Project Plan

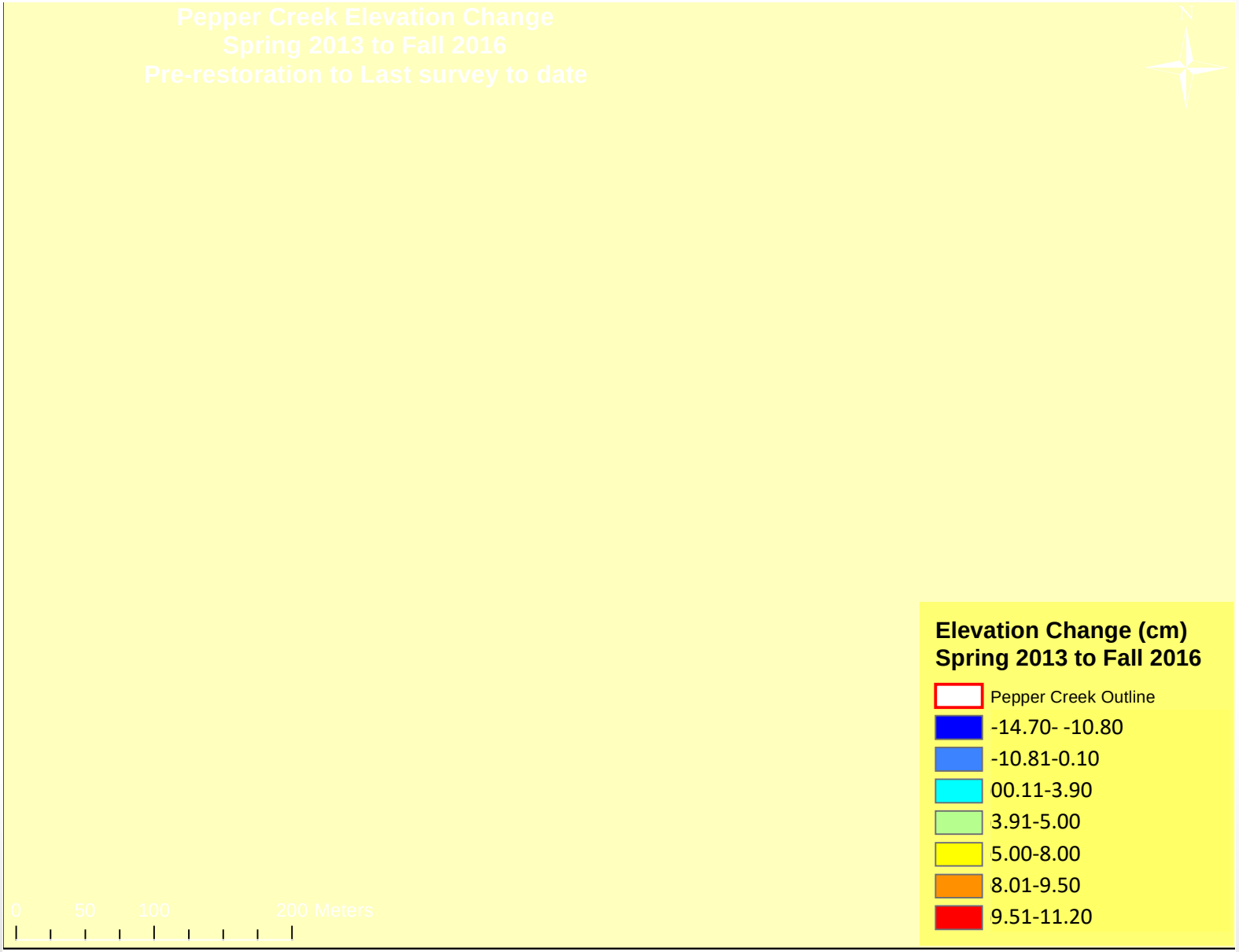
- Raise elevation to 1.05’ NAVD88
- Stay below Phragmites elevation, plan for SLR
- Supply sediment and boost surface elevation
- Apply up to 10,000yd^3 of sediment in thin layer
- Target only silty sediments for application, pass over sand
- Allow sediments to flow and spread out naturally
- Prevent sediment loss and plumes with temporary sills
- Plant as necessary, allow for colonization

Equipment

Monitoring Sediment Depth

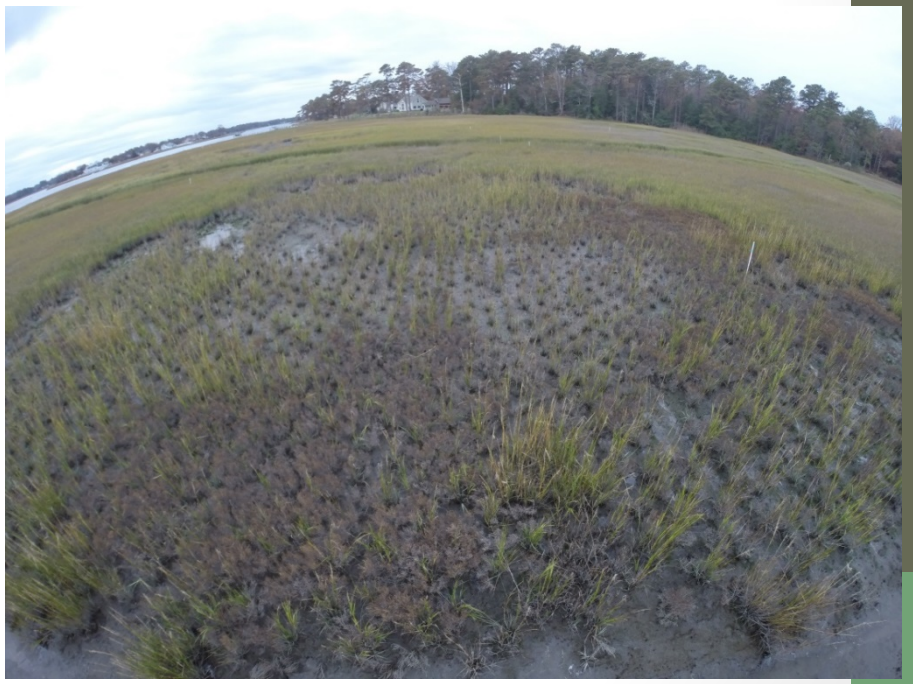


Sediment Settling



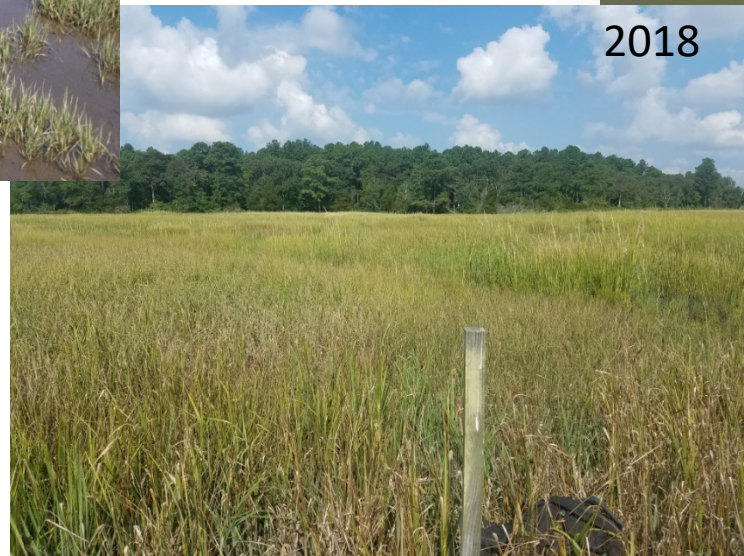
Plantings

- April 2015 planting in demonstration area
- Planted 2,600 *Spartina alterniflora* plugs



2015

Plant Regrowth



Lessons Learned:

- Site specific conditions will vary greatly!
- Vegetation prevents major sediment runoff
- Spray distance is limited by debris and wind
- Difficult to measure precisely how much is being applied
- Limit sediment to 10-12 cm
- Do not apply before heavy freeze
- Limit days of application in one spot (2)
- More feldspar plots
- Monitor mussels
- Quantify sediment volume with pre & post channel surveys
- Pair biomass and feldspar plots

Lessons Learned:

- Big Picture
  - Aerially broadcasting material is possible
  - Pre and Post monitoring is crucial
  - Biological need should be carefully considered
  - Responsive dredging and spraying teams
  - Grain size and depth & re-vegetation plan
- Future Needs
  - Longer revegetation monitoring
  - Threshold thickness for mussels and oysters
  - Project cost estimates

Project 2: Millsboro Public Works

Restore 15 acres of tidal wetlands on Town of Millsboro property through wetland recreation and invasive Phragmites treatment.

Current Site Conditions

- Extremely shallow water; exposed mudflat at low tide (old marsh platform)
- Many old tree stumps where forest used to be
- Several small drainage areas running through marsh
- Marsh dominated by invasive European reed (*Phragmites australis*)

1937


0 0.0425 0.085 0.17 Kilometers
N
W
E
S
Millsboro Wetlands
USDA Agricultural Stabilization and Conservation Service

Shoreline change over decades

Proposed Project Area: 2 Parts

Proposed Project Goals

a) Test efficacy of recreating a former, submerged tidal wetland with the reuse of dredge materials in Delaware
b) Restore Phragmites invaded area to native marsh
c) Investigate techniques, equipment, logistics, and results
d) Share lessons learned with other states and organizations
e) Educate public about project goals and benefits of tidal wetlands

Part 1: Restoring native high marsh

- Treat invasive *Phragmites* (8 acres) to eradicate it and keep it from invading new created marsh platform
  - Aerial spray via helicopter with herbicide for 2-3 years (state contractor); already sprayed once in fall 2019
  - Burning after the 2-3 years of spraying to remove dead material and allow new seeds to sprout (DE Forest Service)
  - Seed with native high marsh species after burning

Part 2: Recreating former low marsh

- Build new marsh platform (7 acres) using dredged sediments from the upper reaches of the Indian River (fall/winter 2020)
  - Pump dredged sediment to site up to target elevation
  - Hold sediment with containment materials (sediment berms, straw waddles)
  - Allow area to slowly drain out water and settle
  - Work with, not against, natural drainage areas

Part 2: Recreating submerged low marsh (continued)

- After several months dewatering and settling, seed area with native plants (spring 2021)
  - Aerial seeding combined with hand seeding

The Climate Trust

Monitoring Plan

- **Monitor** a set of parameters **for at least 3-5 years** after construction

Goal is to create a marsh that….	Metrics
Has robust native low marsh vegetation	Vegetation percent cover Vegetation species composition Vegetation thickness Biomass
Has proper elevation and stability to sustain native low marsh vegetation	Marsh elevation Marsh accretion Bearing capacity
Is used by wildlife	Bird surveys
Can be adaptively managed in a timely manner and be used as a demonstration site	Photo points

Monitoring Plan

Metric	Method	Frequency
Vegetation percent cover	1x1m quadrats along transects	Once per year (summer)
Vegetation species composition	1x1m quadrats along transects	Once per year (summer)
Vegetation thickness	Horizontal veg obstruction board along transects	Once per year (summer)
Biomass	Cores at specific points	Once every 2 years (summer)
Bird surveys	Area search or point count surveys	Once per year (summer)
Bearing capacity	Slide hammer along transects	Once per year (summer)
Marsh elevation	RTK along transects	Once per year (summer or winter)
Marsh accretion	Feldspar marker horizons	Once per year (summer or winter)
Photo points	Photos from fixed markers	4 times per year

Proposed Timeline 2019-2022

Fall 2019	• Spray Phragmites
2020	• Baseline Monitoring
Fall 2020	• Spray Phragmites • Wetland platform restoration part 1
Spring 2021	• Monitor sediment elevations
Fall 2021	• Spray Phragmites • Wetland platform restoration part 2
Early Spring 2022	• Burn dead Phragmites off • Seed restored high marsh

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