Strategies for Assessment and Restoration of Resilient Urban Tidal Wetlands

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February 3rd, 2016
Delaware Wetlands Conference

Parks

RPA Historic Tidal Wetlands & NWI Tidal Wetlands

NWI Tidal Wetlands

RPA Historic Tidal Wetlands

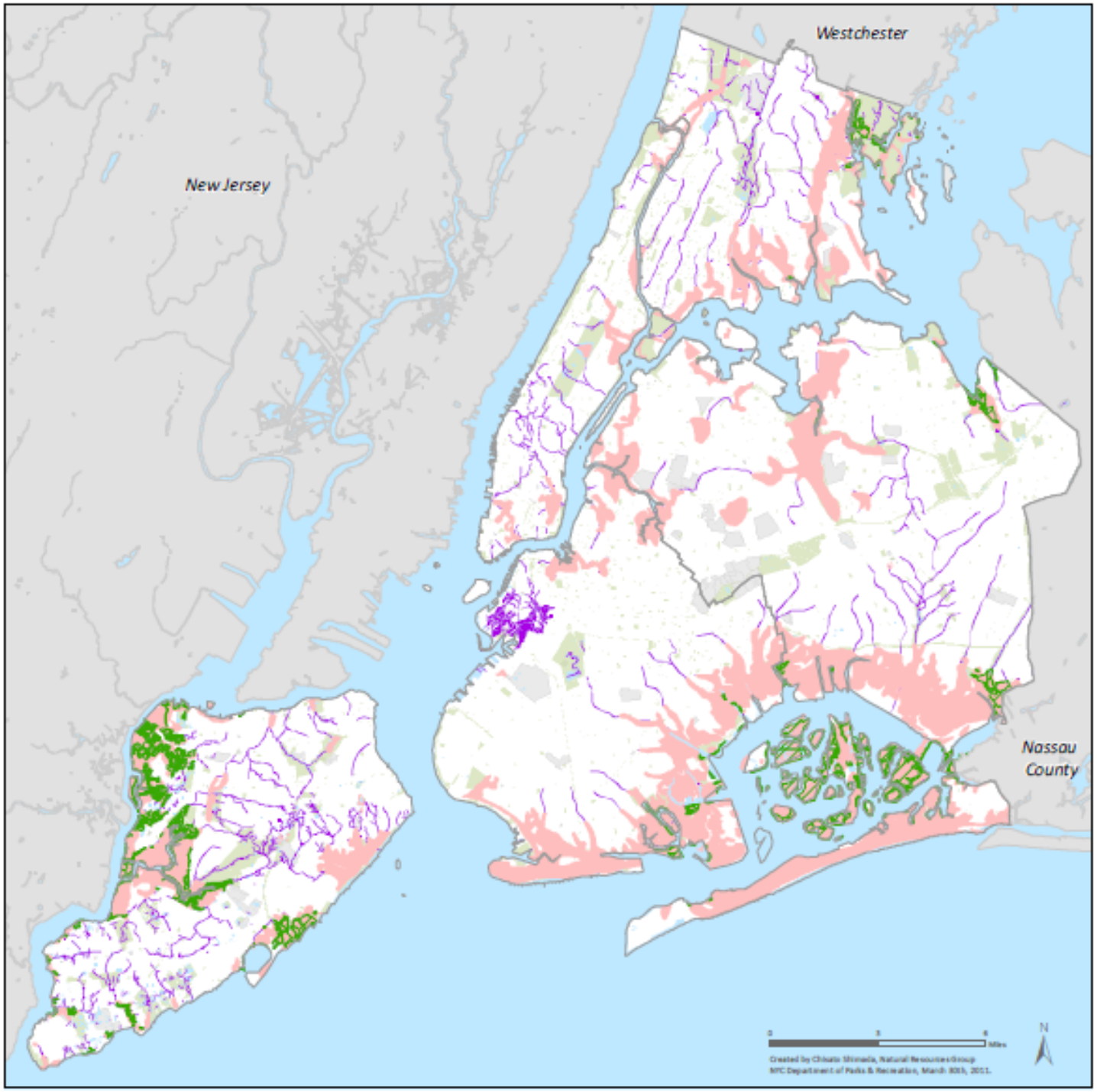
Hstoric Wetlands Tidal or Fresh

Historic Tidal Wetlands

Borough

Water Bodies

Parks



City of New York
Parks & Recreation

Project Background

- 2012-2014 EPA-funded salt marsh conditions and vulnerability assessment – did not include restored sites
- 2014 EPA WPD grant - add restored sites to city-wide assessment, inform future restoration design, update protocols

EPA WPD Grant: Strategies for Assessment and Restoration of Resilient Urban Tidal Wetlands

Objectives: Quantify the ecological conditions and functions of restored marshes in order to:

1) Compare restored marshes to one another and to naturally occurring salt marshes

2) Develop salt marsh restoration design guidelines that take into account sea level rise and climate change

3) Review and refine monitoring guidelines for restoration projects

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Objective 1: Compare restored marshes to one another and to naturally occurring salt marshes

Research Question: How does habitat and structural stability compare across restored sites and to naturally occurring marshes in NYC?

Habitat (22 restored sites, 6 reference sites)

- Characterize vegetation community
- Count fauna

Structural Stability (8 restored sites, 6 reference sites)

- Determine belowground biomass
- Characterize soil structure
- Examine change in vegetated extent of marsh since restoration

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Natural Salt Marshes

Restored Salt Marshes

N

0 5 10 Miles

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Prepared By Forestry, Horticulture and Natural Resources
January, 2016
Data Source: NYC Parks, January 2016
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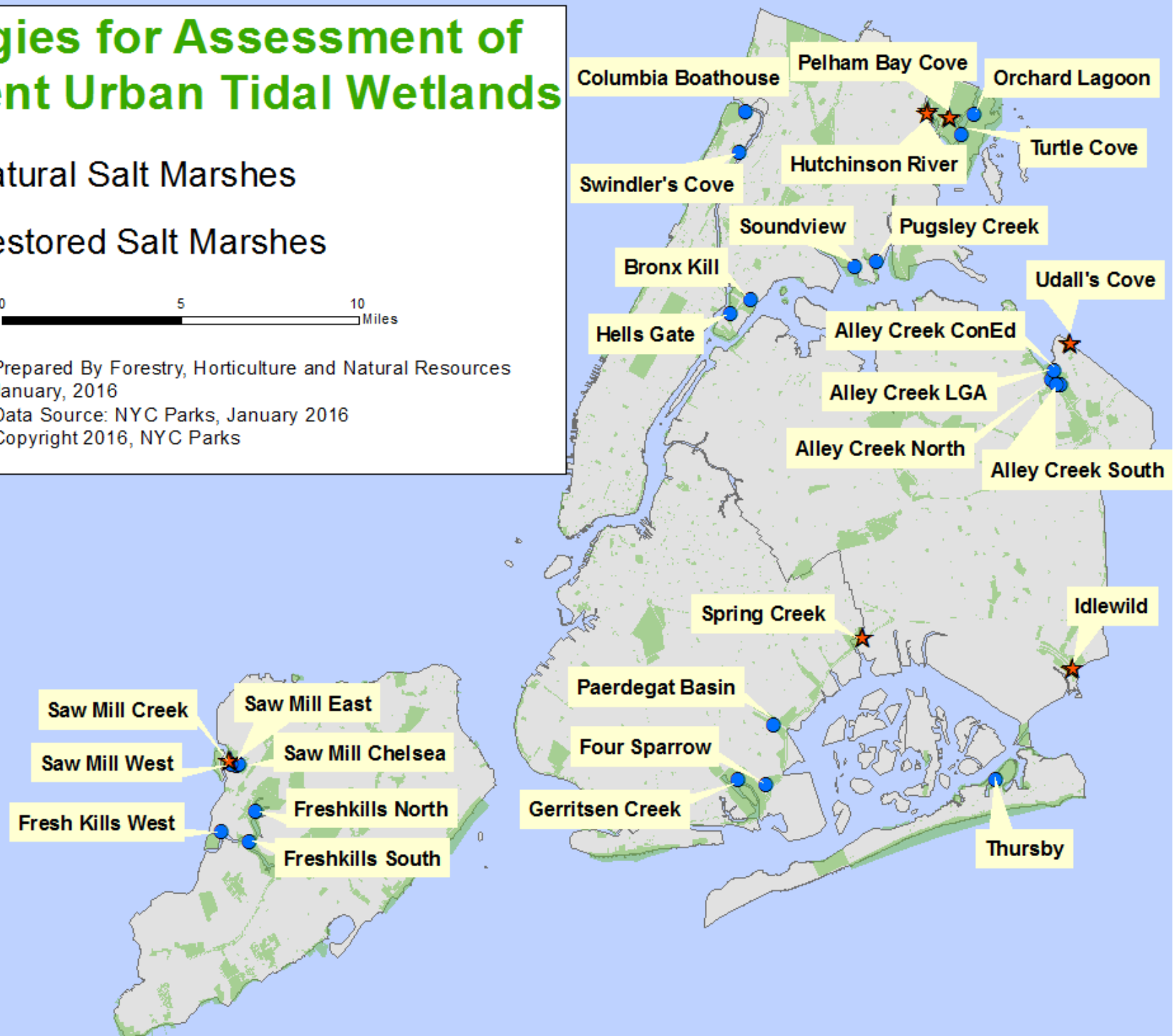

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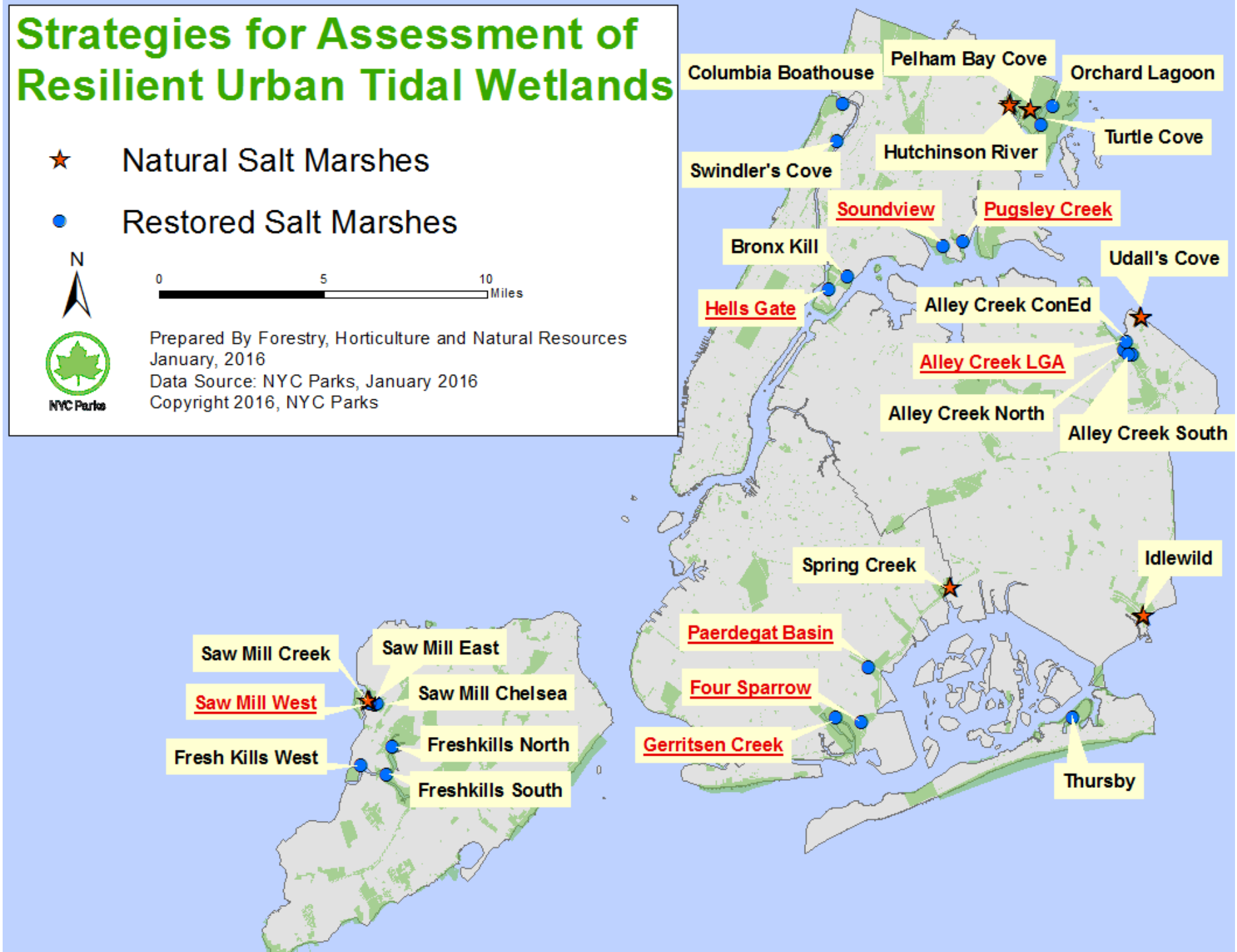
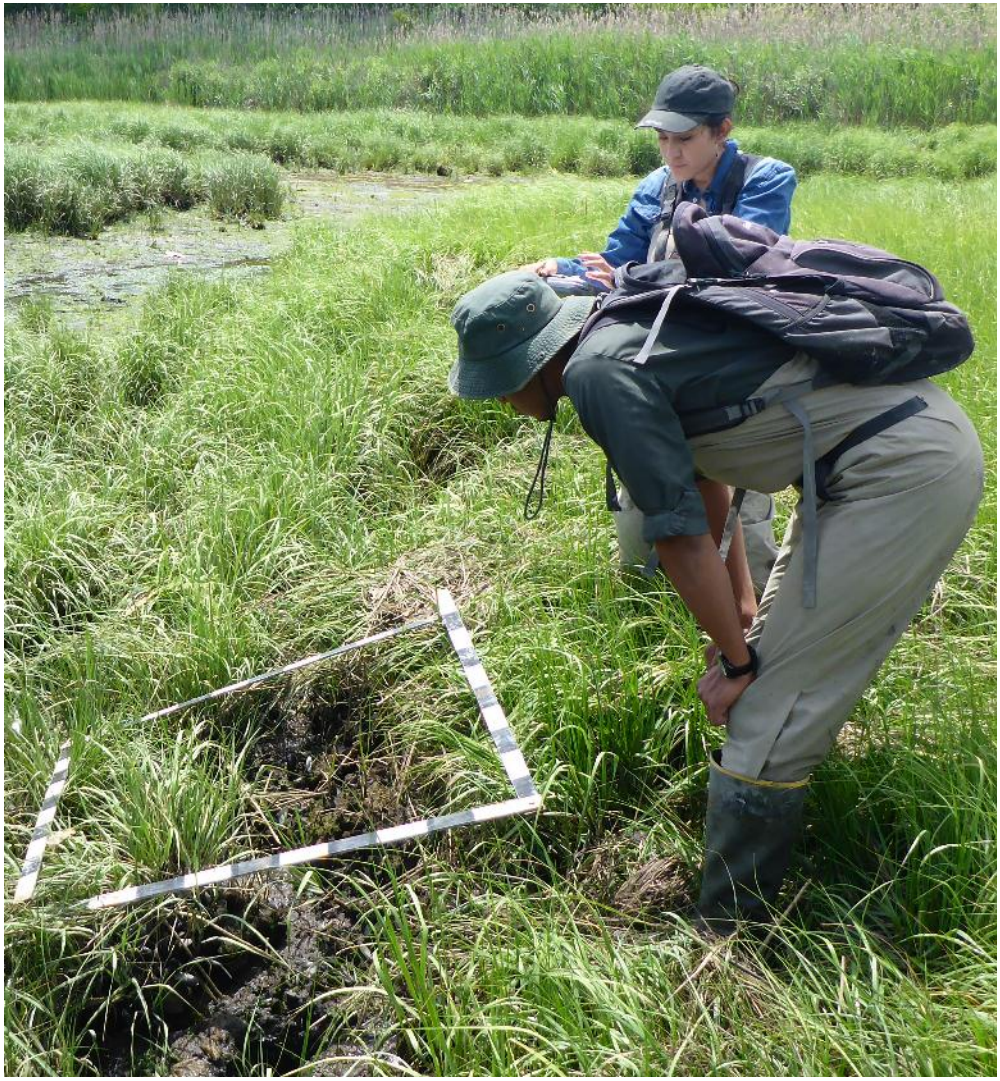


Habitat

<u>Protocol</u>
30 random 1m2 quadrats

Vegetation:
- Percent cover of vegetation and non-vegetation
- Stem heights (*Spartina alterniflora*)
- Aboveground biomass collection

Fauna Counts:
- Mussels *(Geukensia demissa)*
- Crab burrows *(Uca* spp.*)*
- Snails (*Melampus bidentatus, Illyanassa obsoleta)*



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Structural Stability

<u>Protocol</u>

- Collect and process root cores for live and dead dry weight
- Soil samples to analyze bulk density, organic content, and texture
- Desktop analysis comparing construction drawing of restoration to current vegetated extent
  - Creek widths
  - Vegetated footprint

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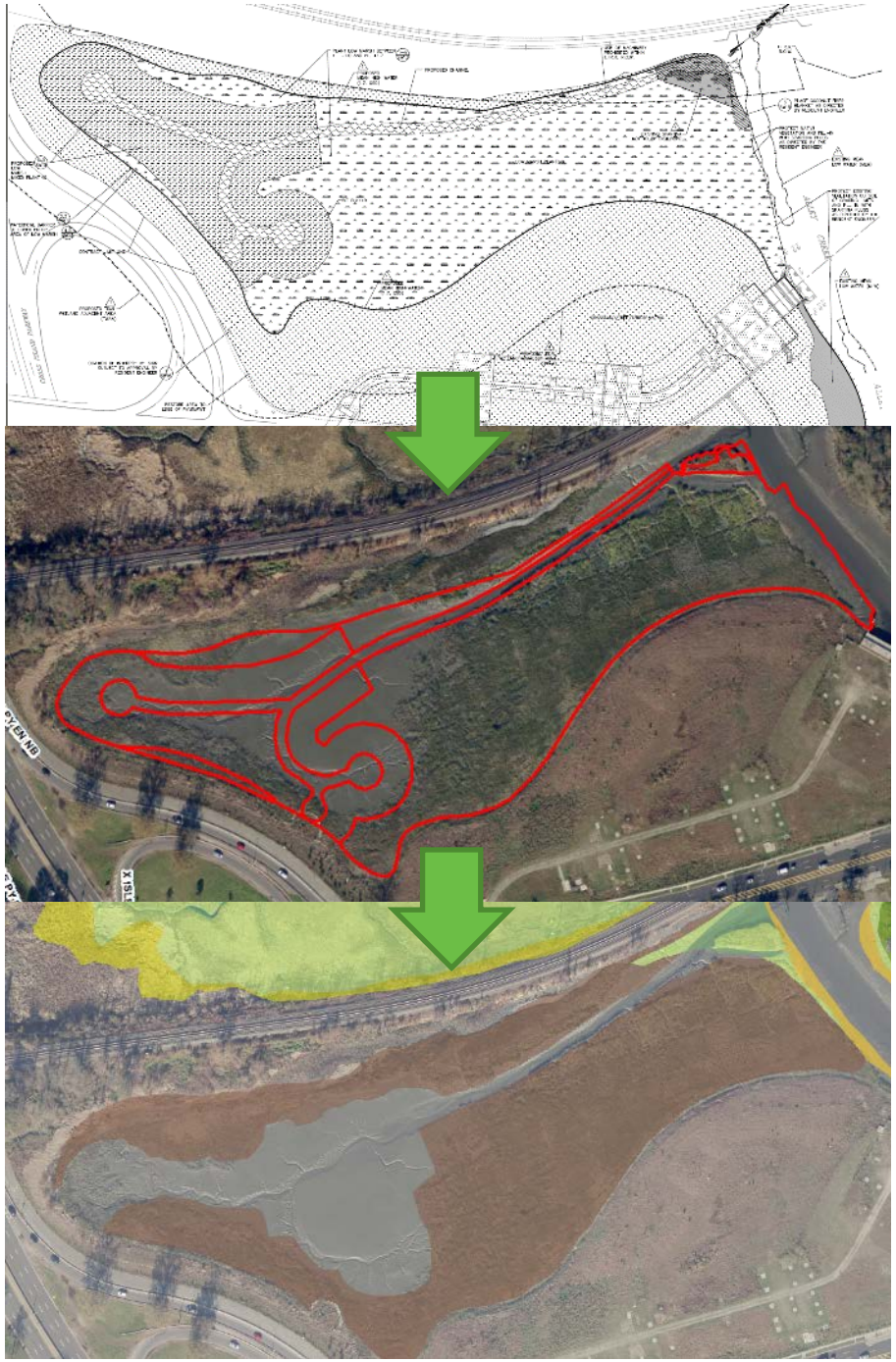
Desktop analysis: change in marsh footprint

Overlay:

- Restoration plan
- Current marsh extent

Create map showing change

Calculate change (loss or gain) in the footprint since restoration



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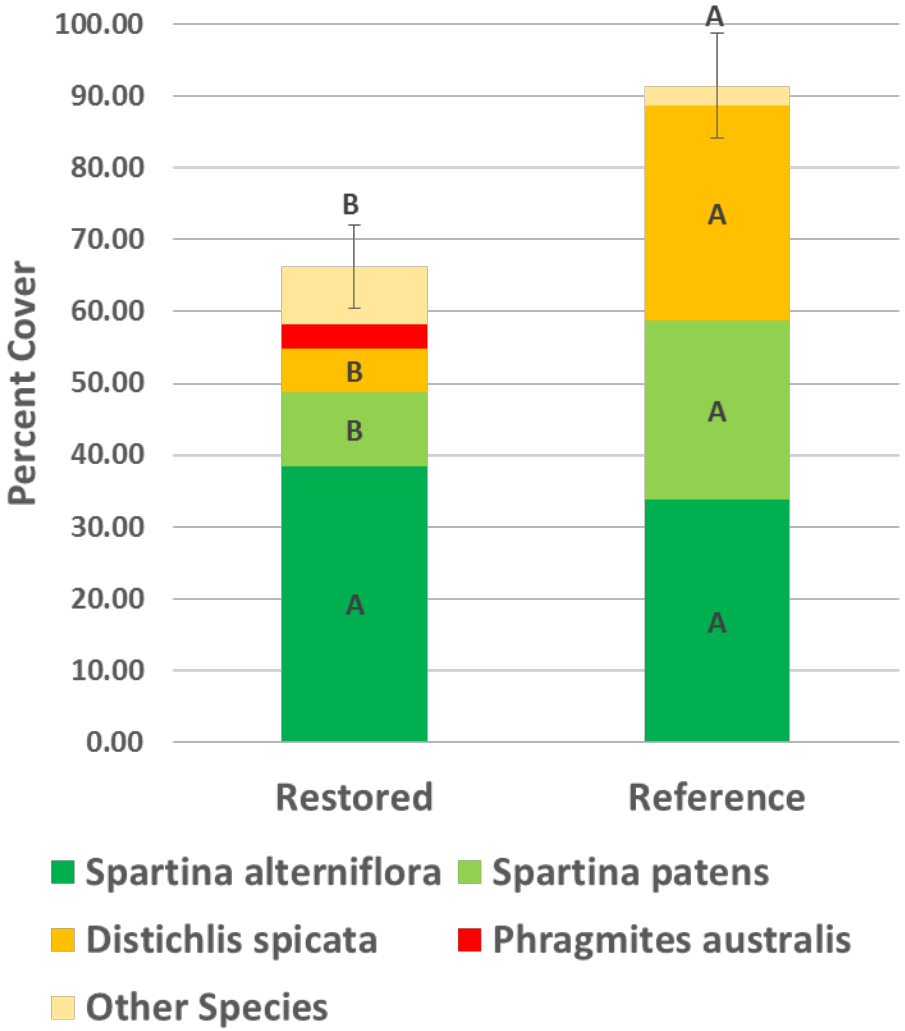
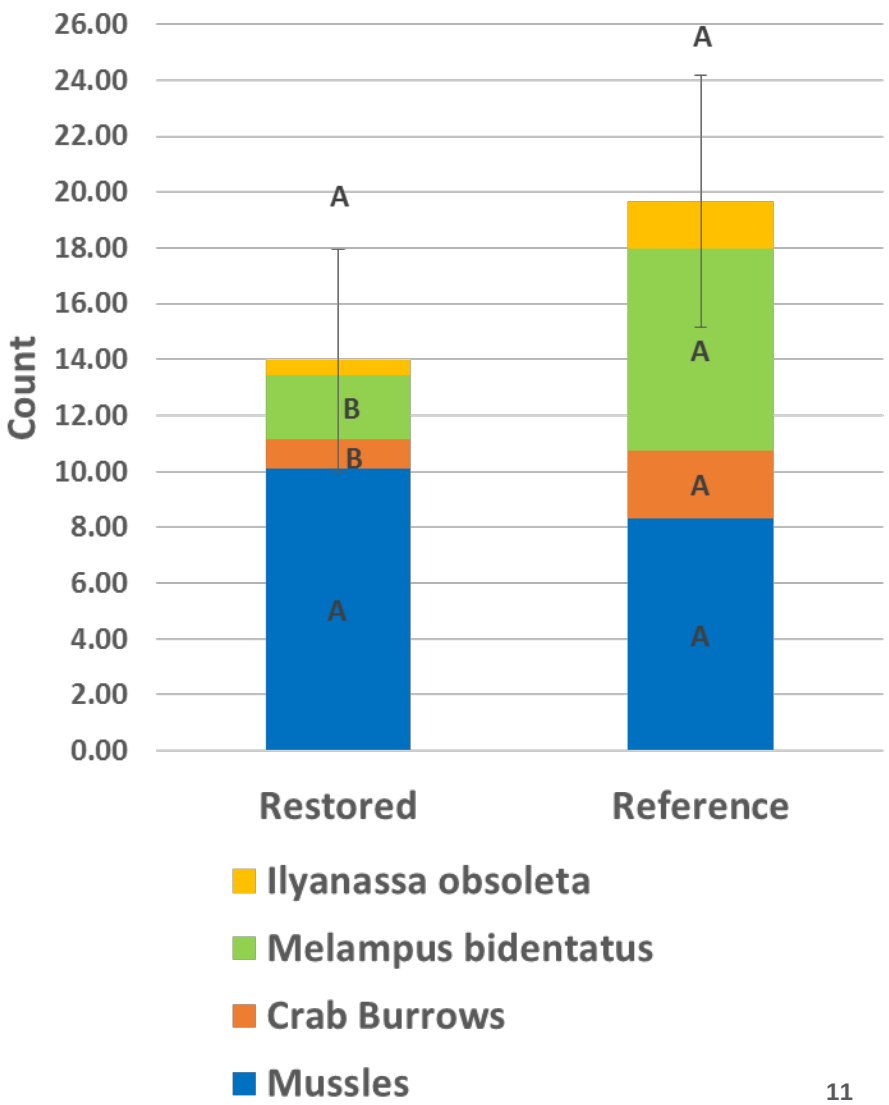
Preliminary Findings - Habitat





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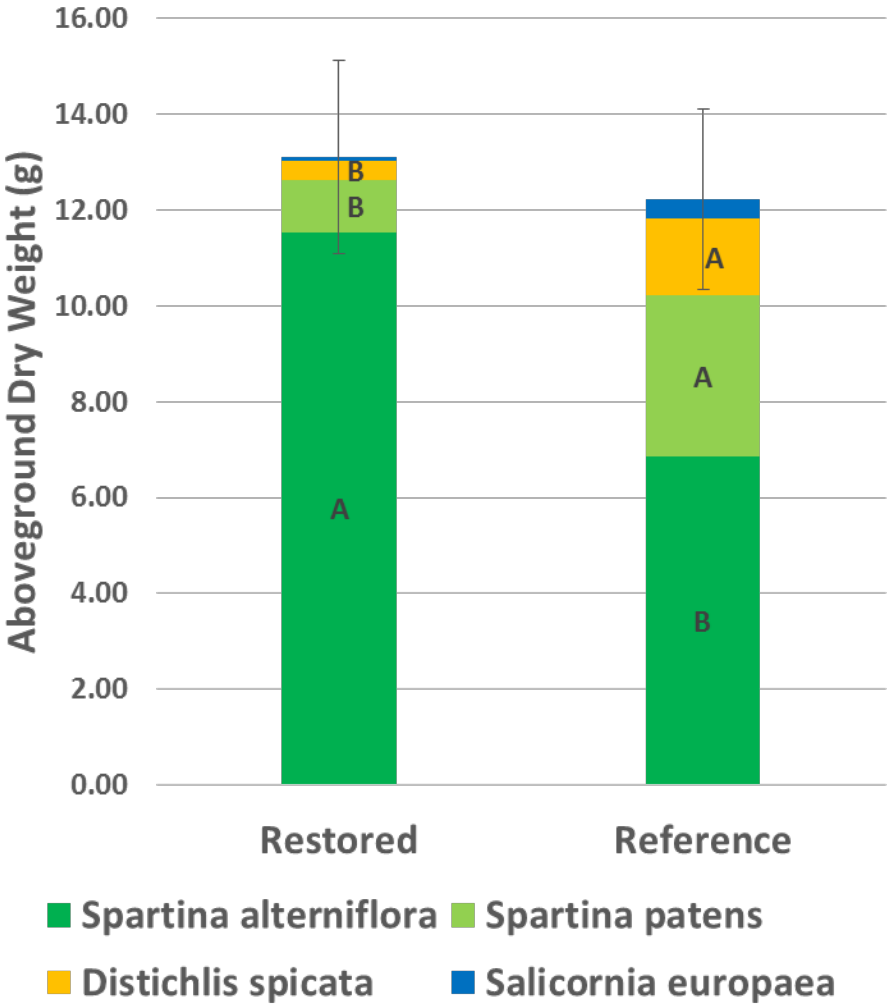
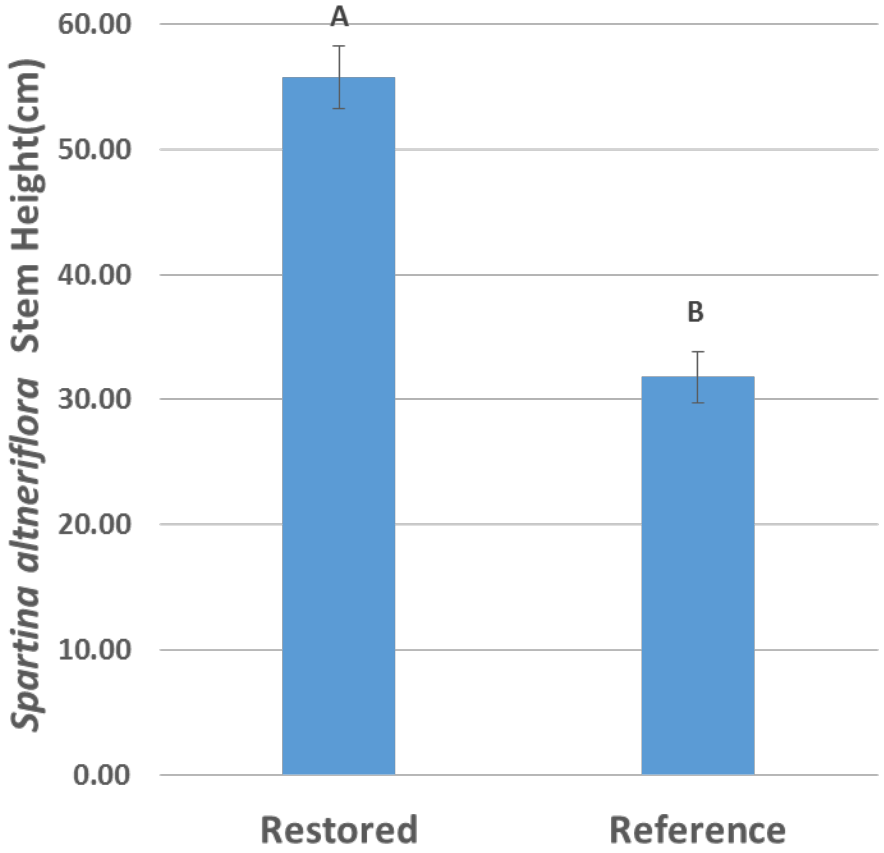
Preliminary Findings - Habitat





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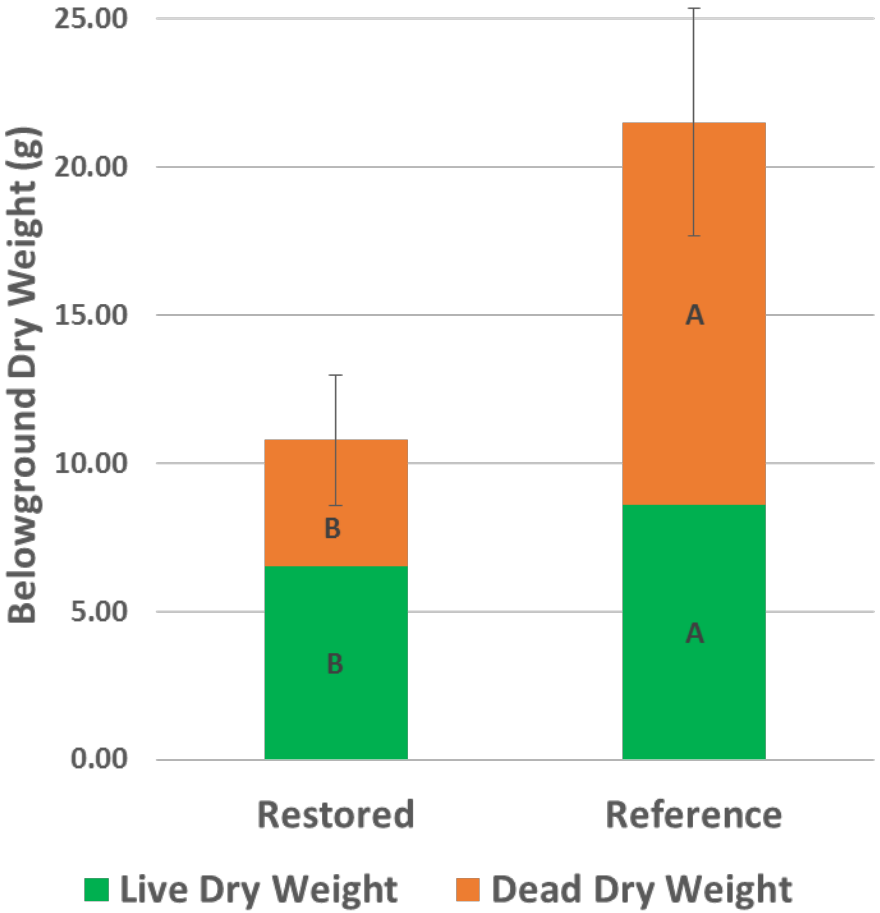
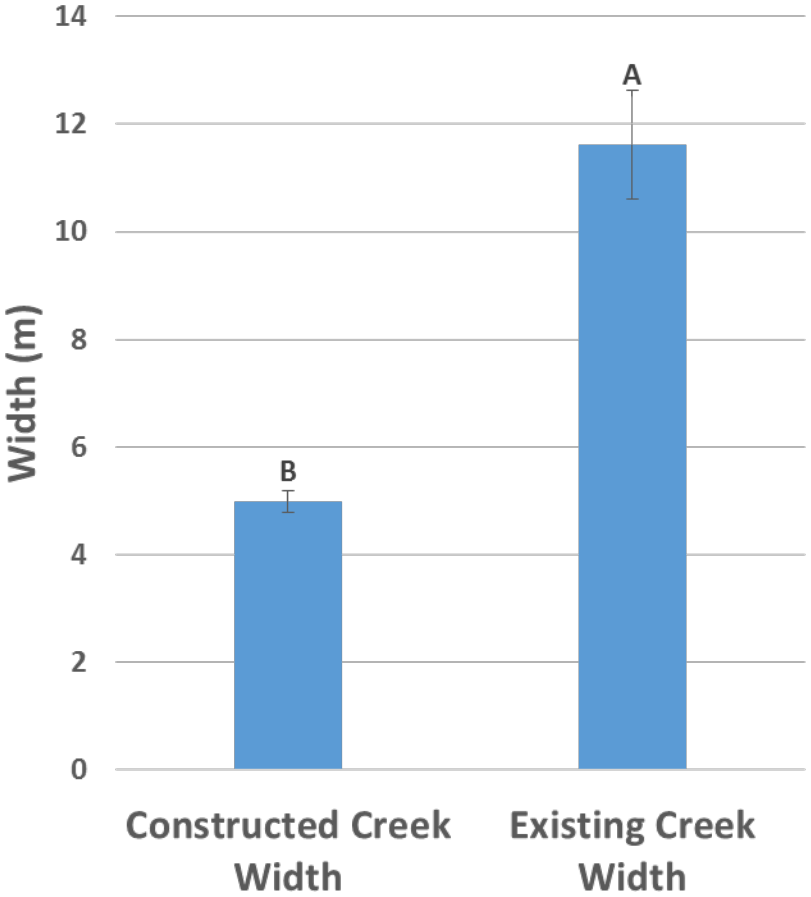
Preliminary Findings – Structural Stability





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Objective 2: Develop salt marsh restoration design guidelines that take into account sea level rise and climate change

Determine how restoration design and construction parameters influence the current condition of these restored sites

Mixed model approach
- Determine predictors of the field data/ current condition

Variables:
- Substrate type (sand or peat)
- Elevations (low and high marsh)
- Time since restoration (years)
- Size (acres)
- Pre-existing shoreline (yes or no)
- Constructed channels (yes or no)
- Change in constructed creek width (meters)
- Project manager survey questions (yes or no)

Develop guidelines based on findings

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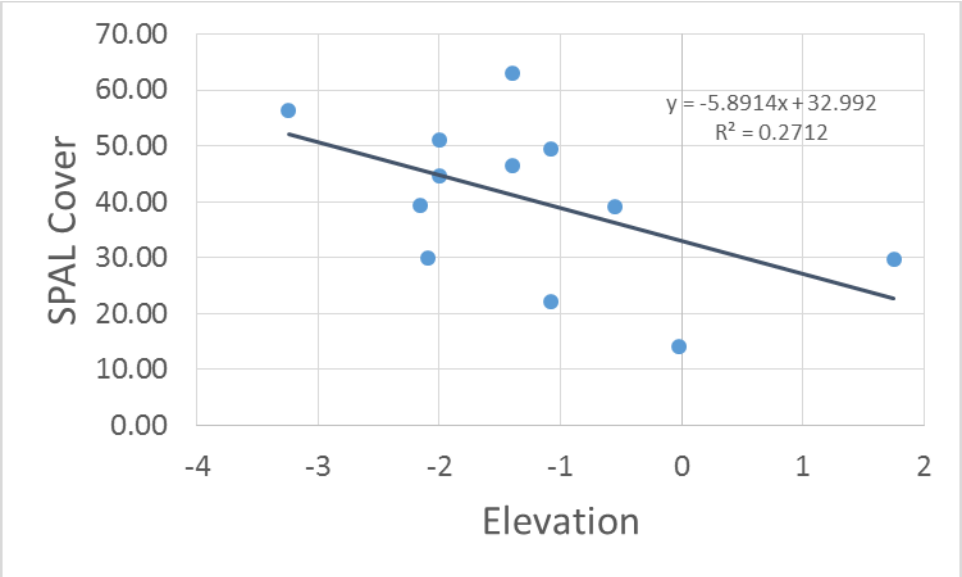
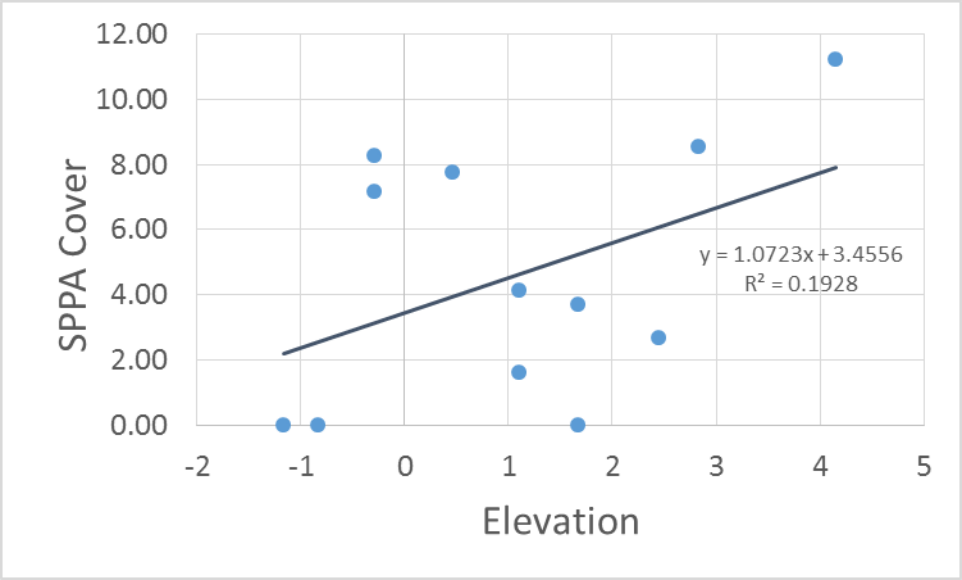
Elevation





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Objective 3: Review and refine monitoring guidelines for restoration projects

- Review and update existing NYS protocol

What questions & functions captured? → Additional questions & functions? → Update & add methods

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New York State Protocol (2000)*

Design:

- Permanent transects
- Permanent quadrats/plots
- Permanent photo stations

Vegetation

- Percent cover
- Stem density
- Flower density
- Plant height
- Basal area
- Rhizome spread

Soil properties

- Soil organic matter
- Soil salinity

Benthic Invertebrates

- Ribbed mussels
- Fiddler crab burrows
- Others (i.e. snails)

Macrofauna

- Birds

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*Niedowski NL (2000) New York State Salt Marsh Restoration and Monitoring Guidelines

Example additions:
New York State Protocol (2000)*

Design:

- Permanent transects
- Permanent quadrats/plots
- Permanent photo stations
- Stratify sampling by sub-habitat (HM, LM)
- Increase sample size

Vegetation

- Percent cover
- Stem density
- Stem diameter
- Flower density
- Plant height

Soil properties

- Soil organic matter
- Soil salinity
- Accretion/sedimentation rate

Benthic Invertebrates

- Ribbed mussels
- Fiddler crab burrows
- Others (i.e. snails)

Macrofauna

- Birds
- Target sensitive species

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*Niedowski NL (2000) New York State Salt Marsh Restoration and Monitoring Guidelines

Next Steps

- Complete data analysis and monitoring protocol review
- Create monitoring and design guidelines
- Workshop guidelines with local and regional practitioners
- Incorporate into future restoration projects

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Thanks!

Acknowledgements:
US EPA Region 2
Natural Areas Conservancy
Marit Larson
Rebecca Swadek
Ryan Morrison
Kim Thompson
Karolina Vera

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