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Monitoring and Adaptive Management of Salt Marsh Restoration in Jamaica Bay, Gateway National Recreation Area, New York

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Doug Adamo, Kathy Mellander, Mary Foley
National Park Service
Mellissa Alvarez
US Army Corps of Engineers, New York District
Mary-Jane James-Pirri
University of Rhode Island, Graduate School of Oceanography

Overview

Gateway National Recreation Area

Marsh Loss in Jamaica Bay

Restoration

Monitoring and Adaptive Management

Lessons Learned

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Gateway National Recreation Area

Photos courtesy of Lincoln Hallowell, Gateway National Recreation Area

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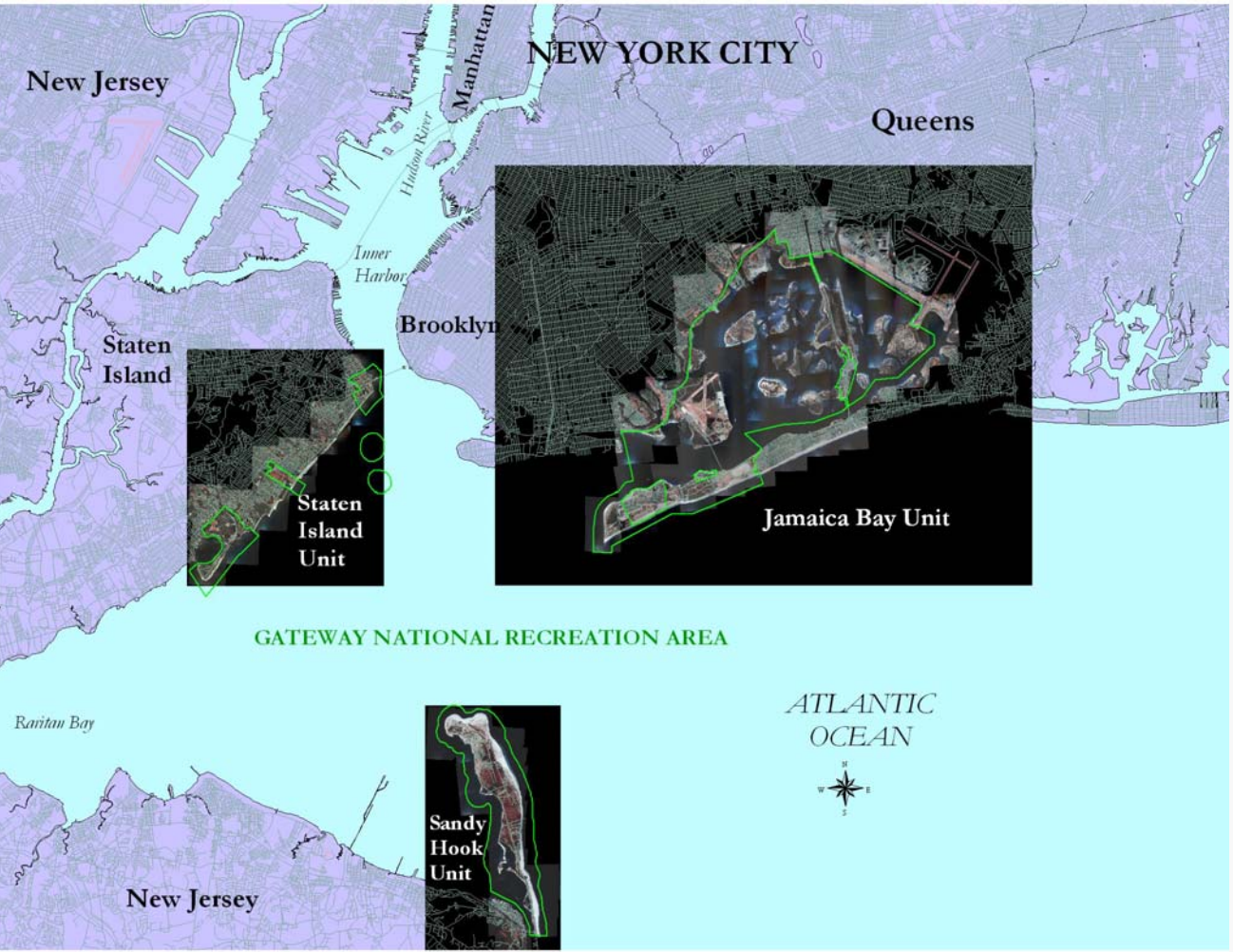
Gateway National Recreation Area



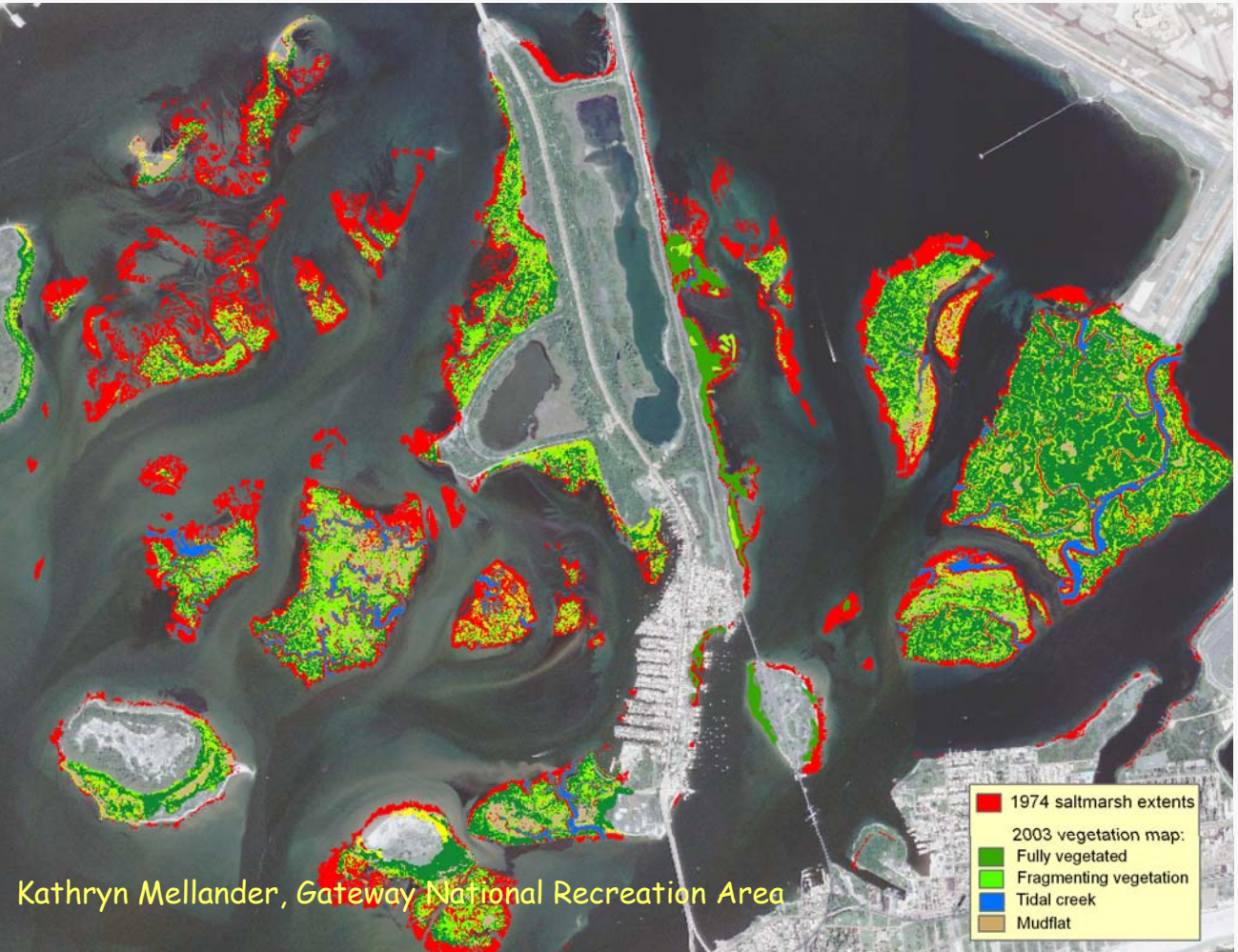
Salt marsh loss in Jamaica Bay

New York State Department of Environmental Conservation

Salt marsh loss in Jamaica Bay

New York State Department of Environmental Conservation

Salt marsh loss in Jamaica Bay



Kathryn Mellander, Gateway National Recreation Area

Restoration of the Jamaica Bay Ecosystem:

- Research
- Watershed Management
- Marsh Island Restoration

Research

- Marsh Loss and Site Characterization
- Marsh Development Processes
- Hydrodynamics and Sediment Flux
- Marsh Biogeochemistry

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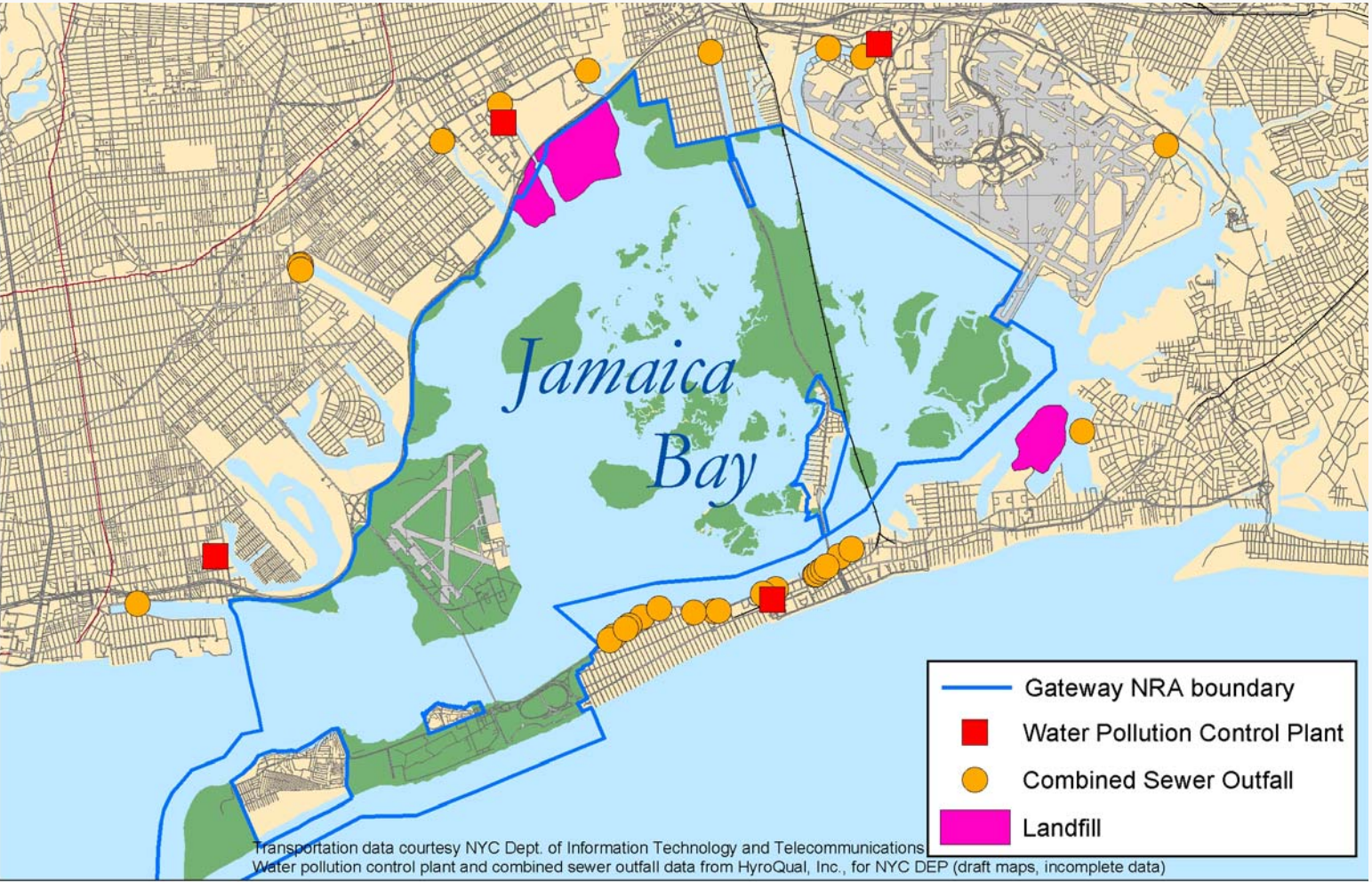
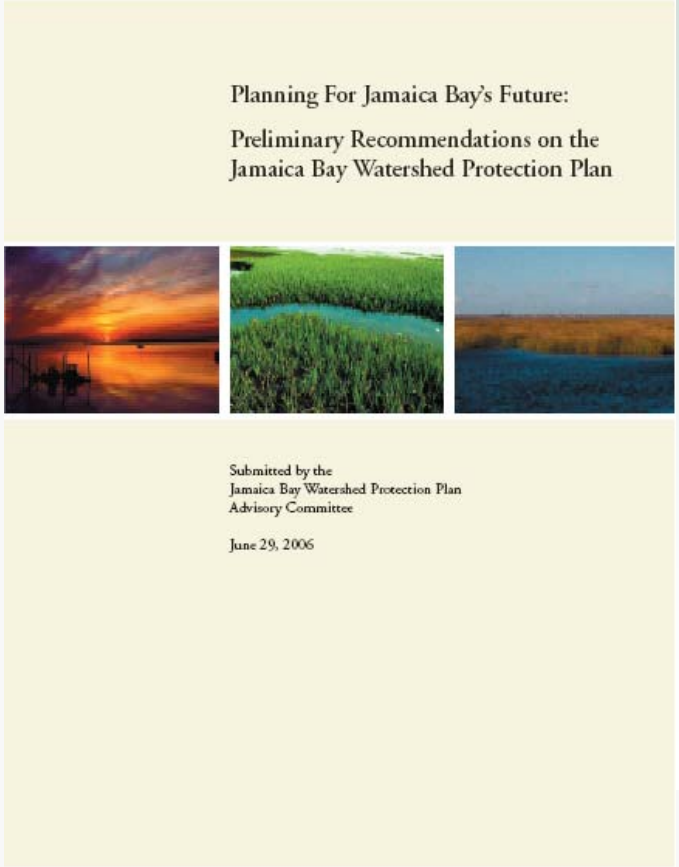
Watershed Management



Watershed Management

15 priority recommendations

- Reduce nutrient inputs
- Increase protection for watershed wetlands
- Increase water quality monitoring
- Increase public education and access



Planning For Jamaica Bay's Future:

Preliminary Recommendations on the Jamaica Bay Watershed Protection Plan

Submitted by the
Jamaica Bay Watershed Protection Plan
Advisory Committee

June 29, 2006

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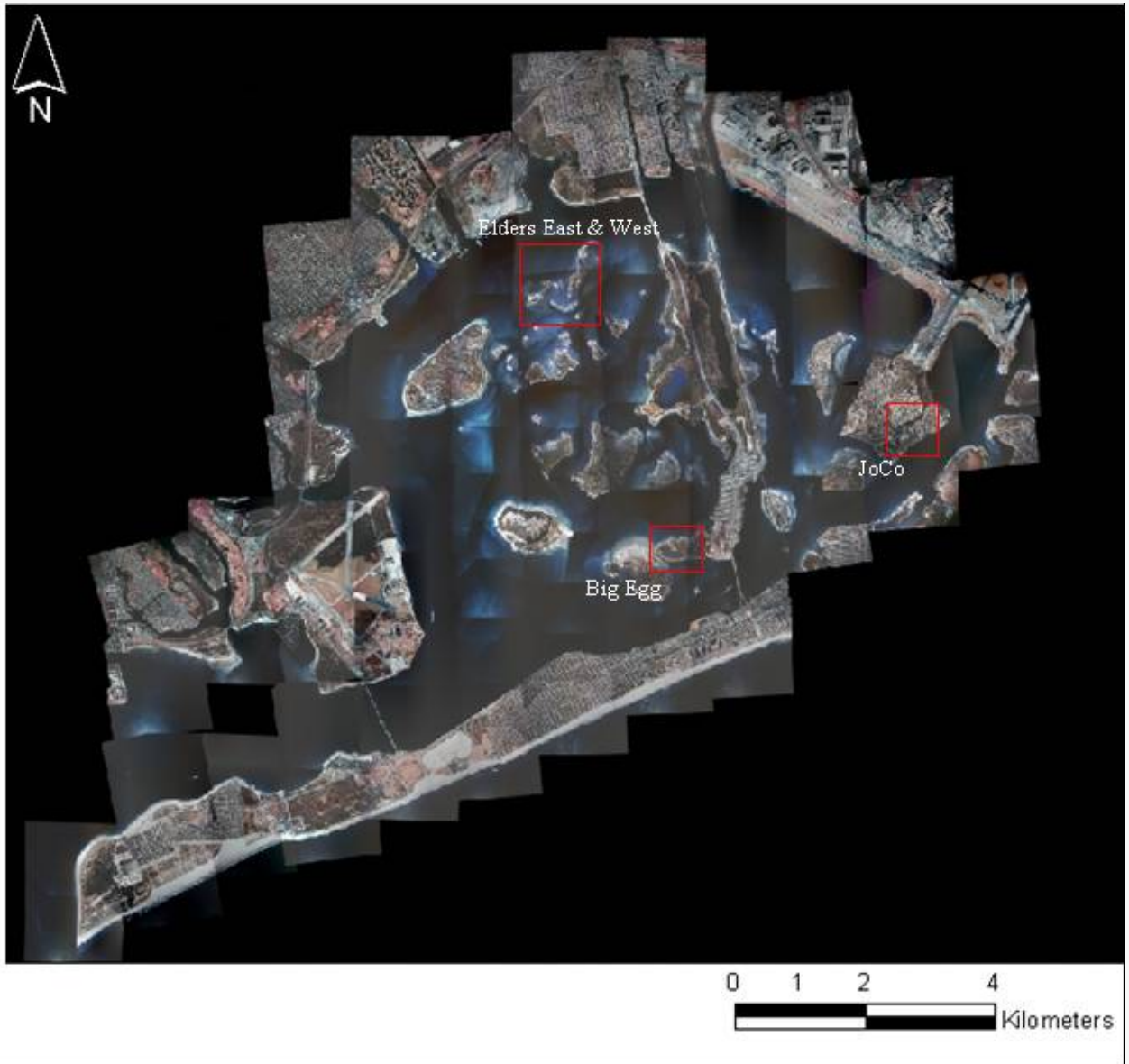

Jamaica Bay Marsh Island Restoration

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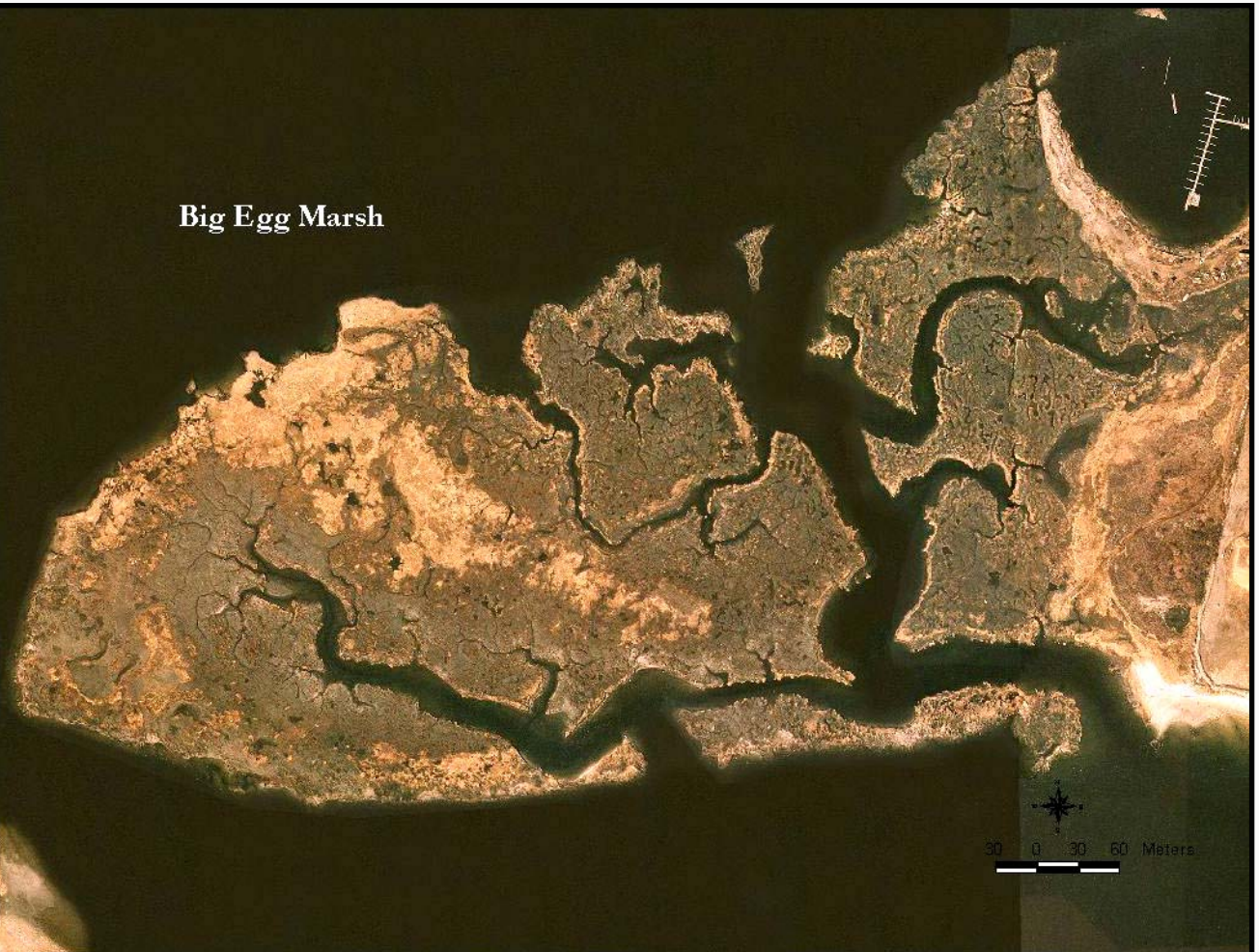
Big Egg Marsh



Big Egg Marsh

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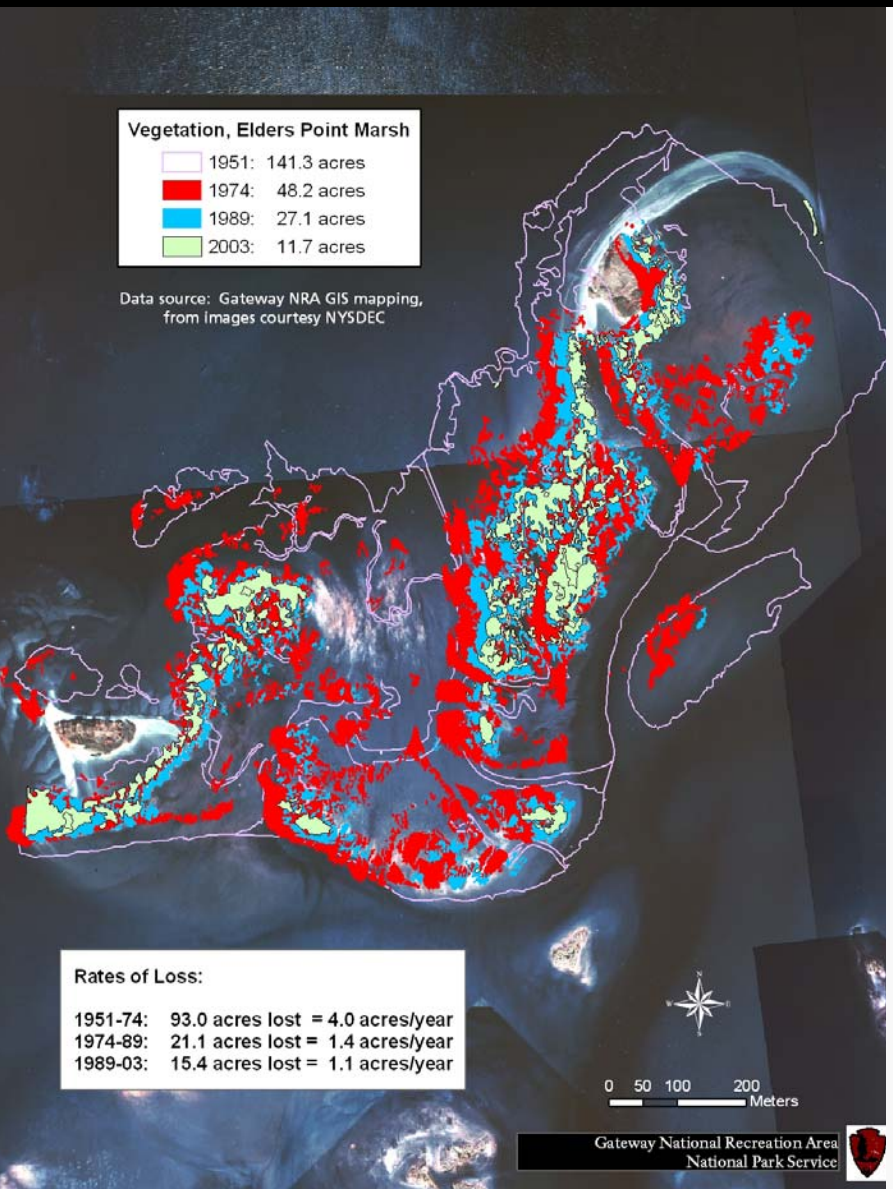
Big Egg Marsh



Elders Point Marsh

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Marsh Restoration

Photo courtesey of Kathryn Mellander, Gateway National Recreation Area

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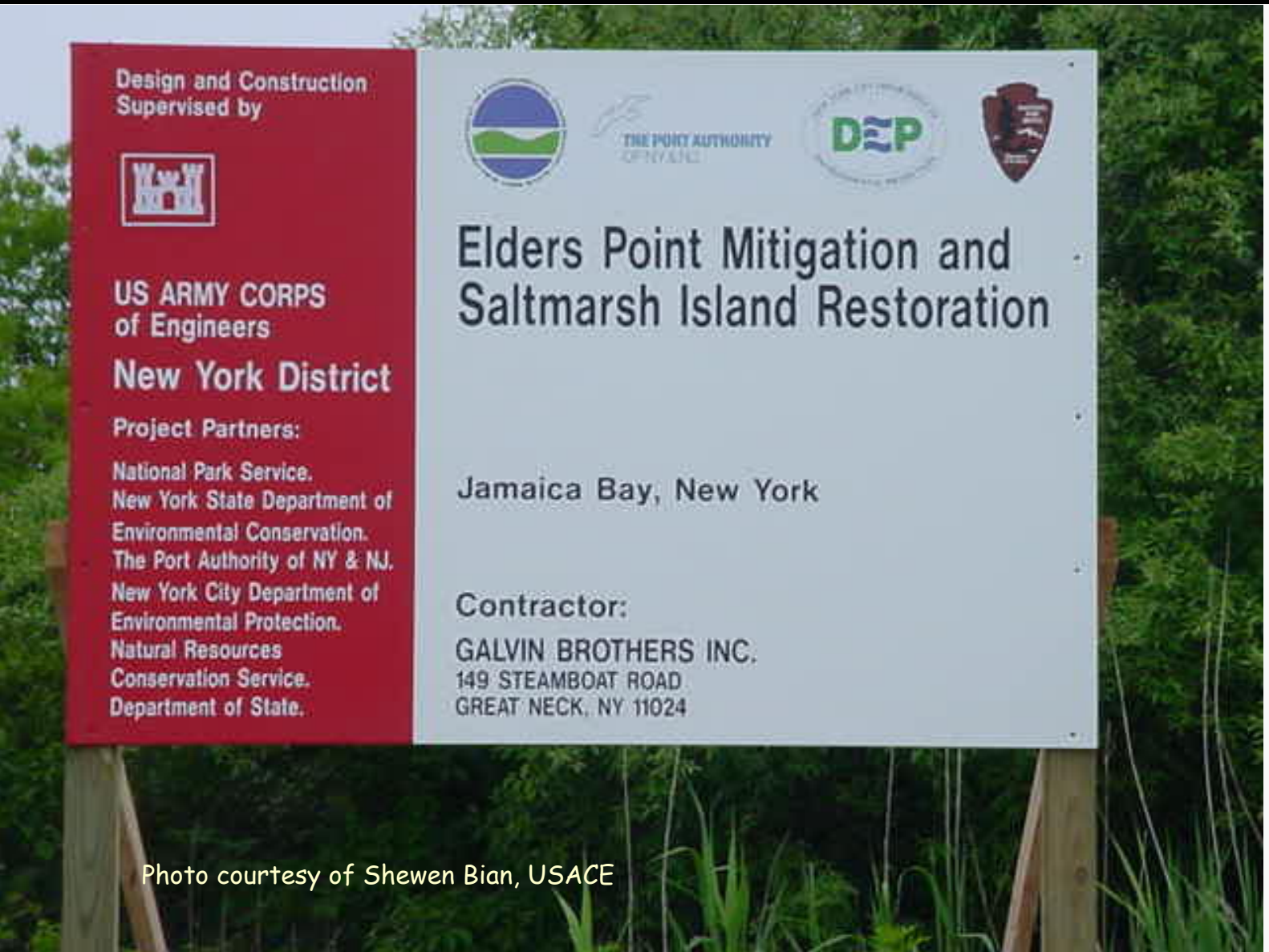

Photo courtesy of Shewen Bian, USACE

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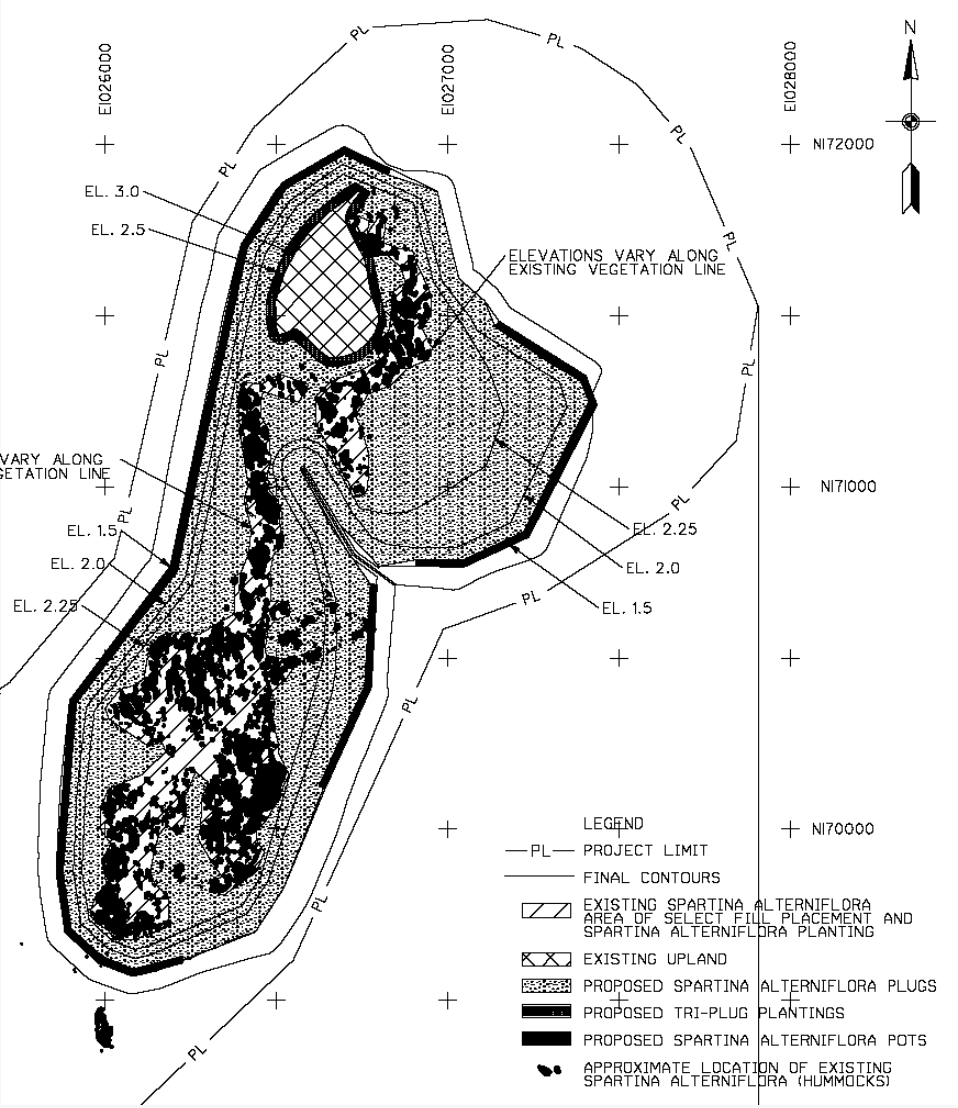

248,597 yd^3 sediment

39.2 acres planted & fenced

636,770 SPAL plugs

325,482 SPAL pots

48,048 triplugs (SPAL, DISP, SPPA)

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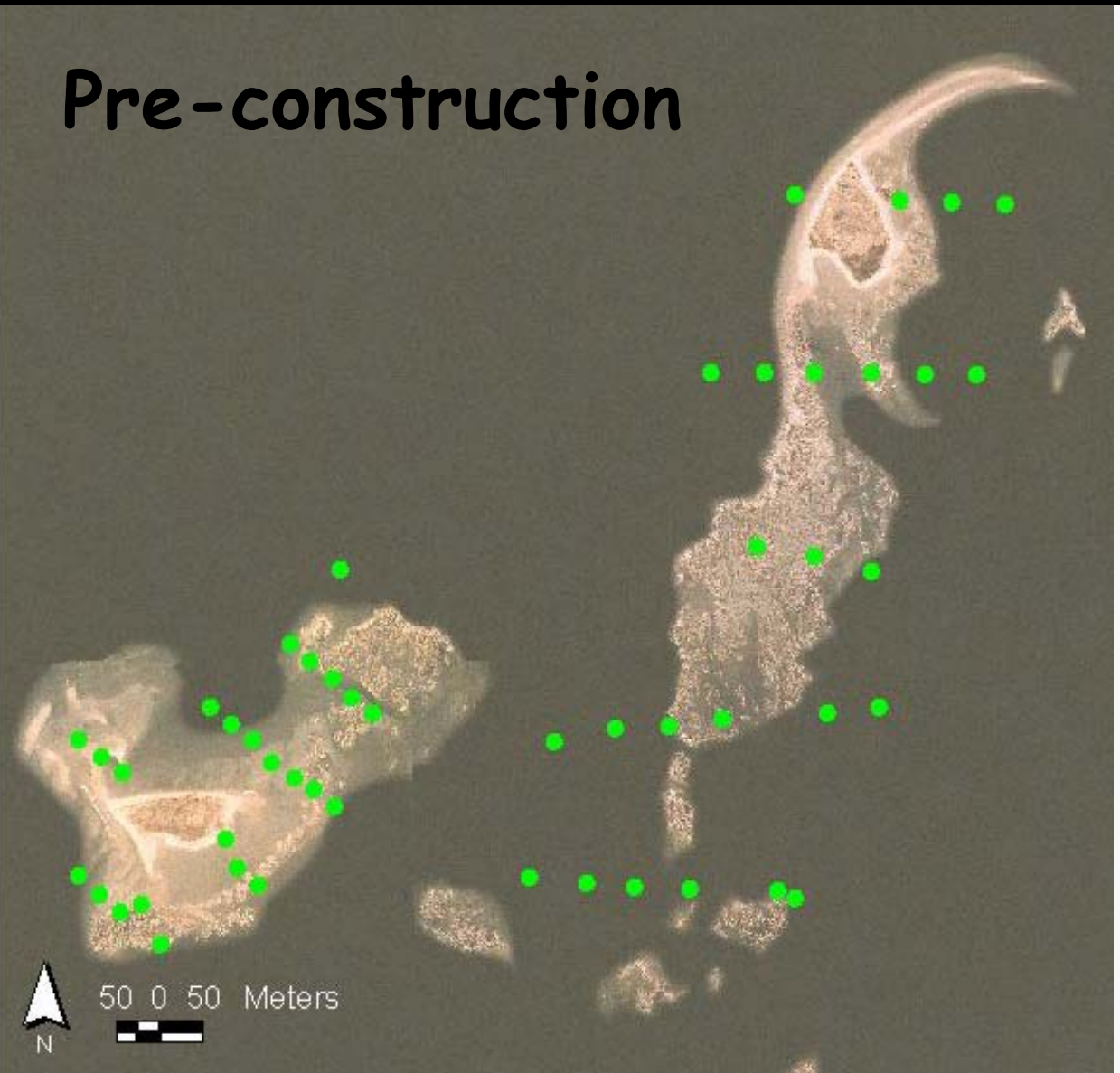

Project construction

Photo courtesy of Galvin Brothers, Inc.

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The Monitoring Team:

National Park Service - GATE
- Doug Adamo
- Kathryn Mellander
- George Frame

National Park Service - NER
- Patti Rafferty
- Charles Roman
- Mary Foley

US Army Corps of Engineers
- Mellissa Alvarez
- Kerry Anne Donohue
- Mike Morgan

University of Rhode Island
- Mary-Jane James-Pirri
- Mark Christiano
- Roland Duhame

Stony Brook University
- Kirk Cochran

US Geological Survey
- Don Cahoon
- Jim Lynch

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Monitoring and Adaptive Management Team

NATIONAL PARK SERVICE

STATE OF NEW YORK DEPARTMENT OF STATE

THE PORT AUTHORITY OF NY & NJ

NOAA

U.S. FISH & WILDLIFE SERVICE

NYS Department of Environmental Conservation

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DEP

Monitoring and Adaptive Management Goals:

- Understand causes of success and/or failure
- Identify problems requiring remedial action
- Implementat remedial actions
- Better understand Jamaica Bay marsh loss

Monitoring Parameters

- Vegetation
- Nekton
- Benthic Macro-invertebrates
- Goose/Waterfowl Grazing Impacts
- Landscape Analysis
- Habitat Change Analysis
- Sediment Elevation and Accretion
- Photo Monitoring
- Sediments
- Interstitial Water Quality

Adaptive Management Parameters

- Vegetation canopy cover
- Elevation
- Perimeter change
- Habitat change

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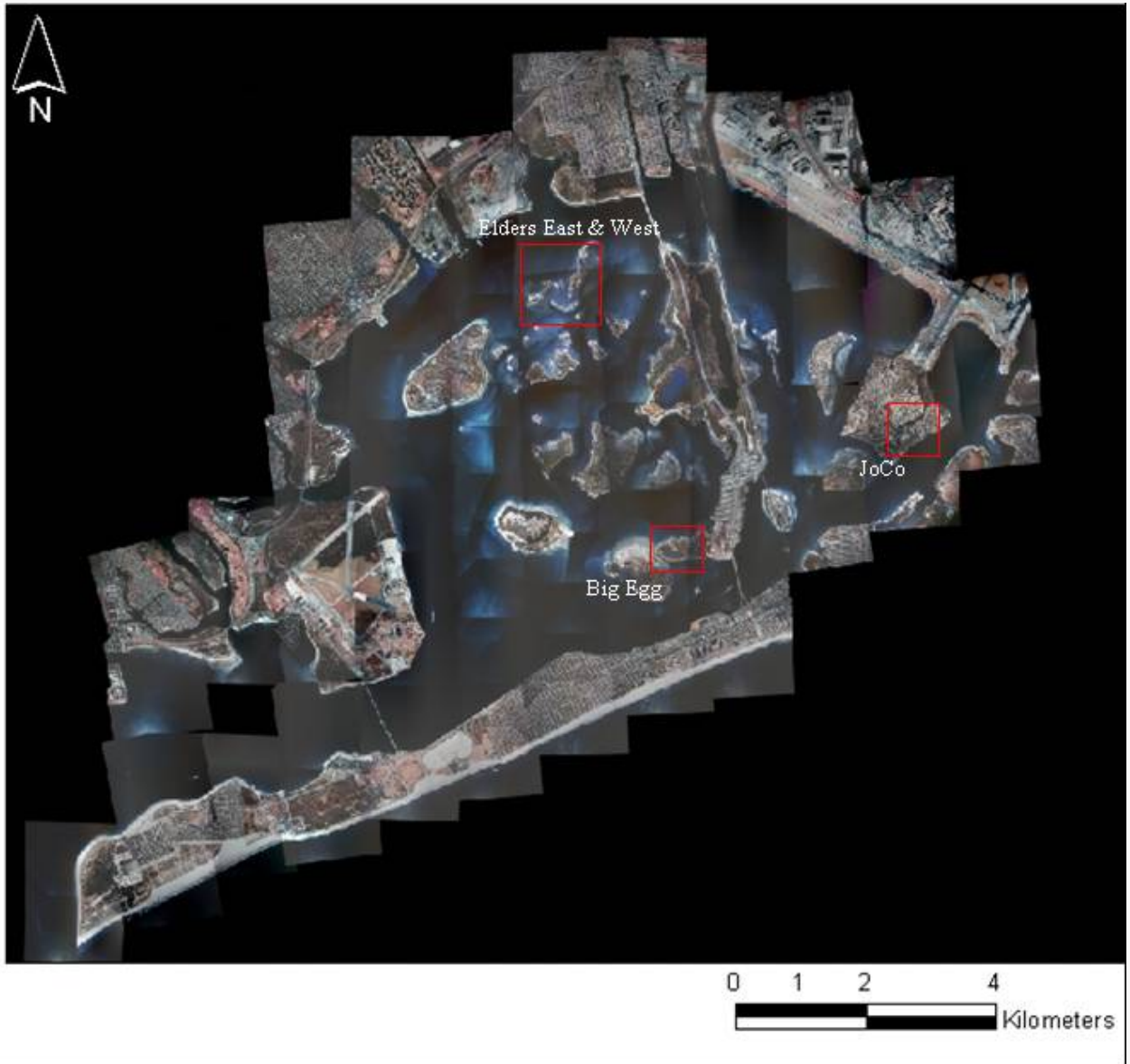

Monitoring Design

Before
After
Control
Impact

Vegetation Monitoring Questions

<u>Elders-specific questions</u>

- *What is the response of the salt marsh vegetation to restoration?*
- *Are vegetation communities in the restored and reference marsh converging? What is the temporal scale of this convergence?*
- *How does fertilization of vegetation plugs affect restoration of salt marsh vegetation? Does fertilization of vegetation plugs affect the root to shoot ratio of vegetation planted for salt marsh restoration?*
- *How does natural recruitment of vegetation evolve in a salt marsh following restoration? How does vegetation planting affect restoration of salt marsh vegetation communities?*
- *What factors are responsible for changes in salt marsh vegetation communities (water level, sediment characteristics, biogeochemistry, etc.)?*

<u>Jamaica Bay Ecosystem Related Questions</u>

- *How are the vegetation communities changing in Jamaica Bay?*
- *Are restored salt marshes in Jamaica Bay supporting sustainable vegetation communities?*

VEGETATION

Species Composition
Canopy Coverage
Stem Density
Plant Height
Belowground biomass
Aboveground biomass

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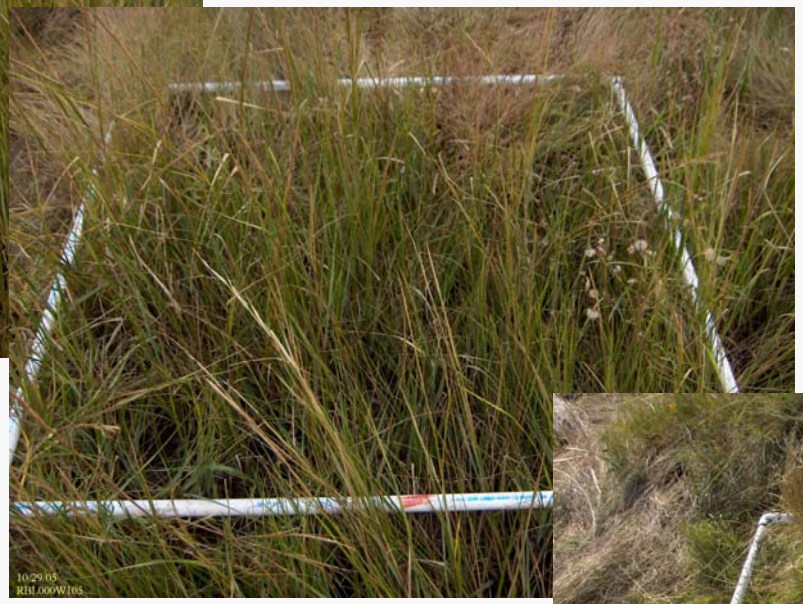
VEGETATION



JoCo
Reference Marsh

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VEGETATION

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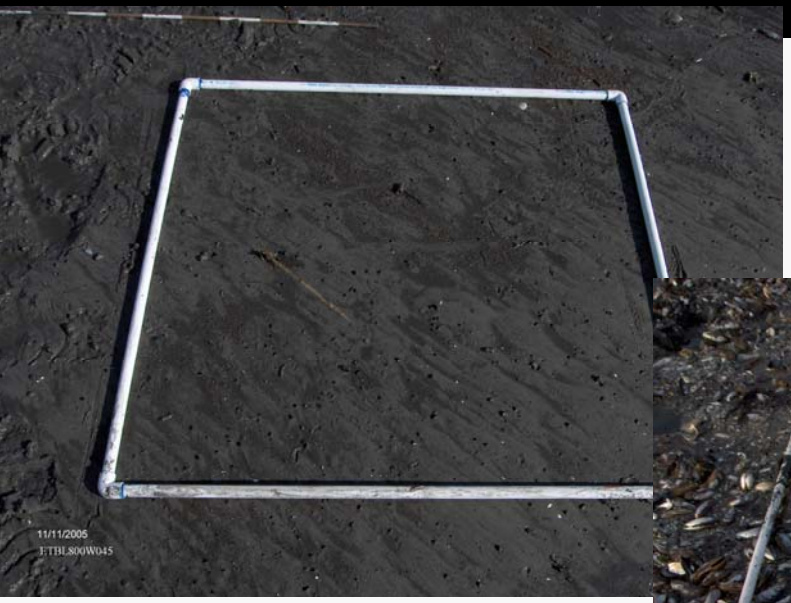

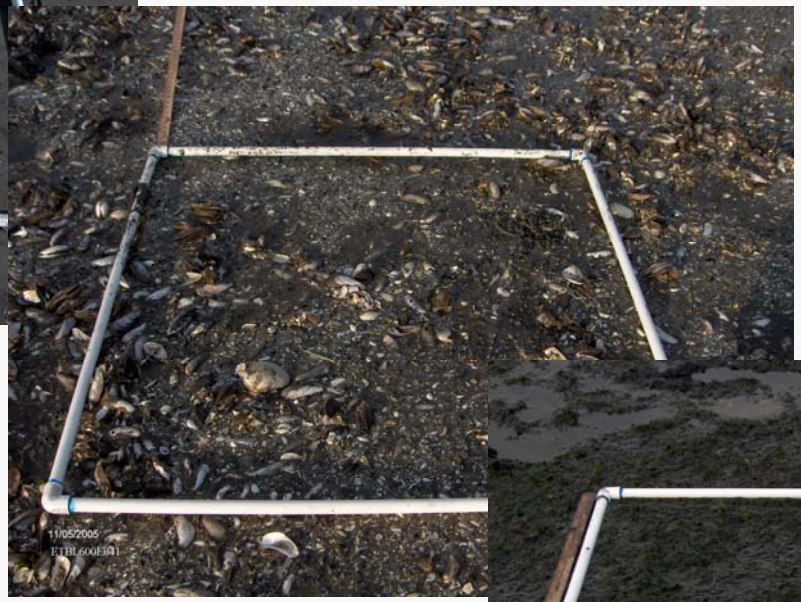

Elders East
Pre-Construction (2005)

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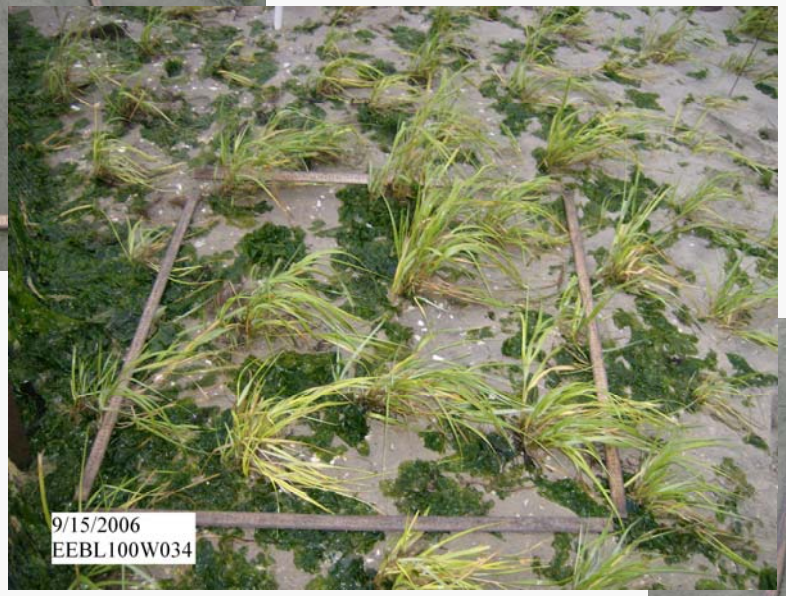
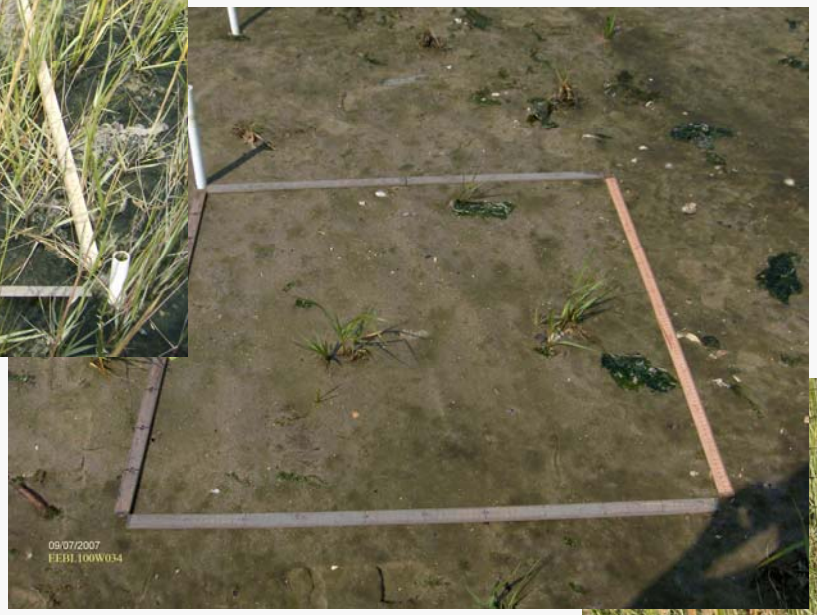
VEGETATION



Elders East Restoration (2006)

VEGETATION



Elders East Restoration (2006)

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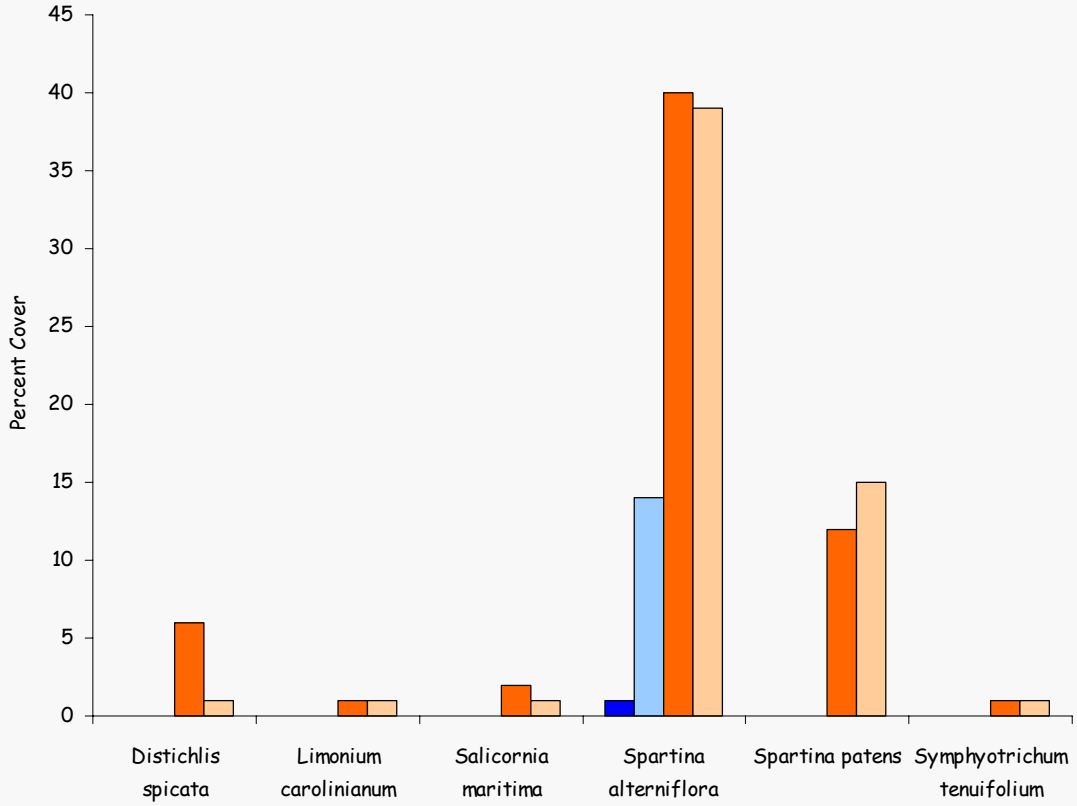
Percent cover live vegetation



-Vegetation community changed (live *S. alterniflora* increased)

-Stem density of live *S. alterniflora* increased

Nekton Monitoring Questions

Elders-specific questions

- *What is the response of nekton (species composition and abundance) to restoration of a deteriorating marsh?*
- *What is the time-frame for nekton communities to achieve functional equivalency when compared to reference marshes?*
- *What are relationships between nekton changes and other components, such as vegetation, benthos, birds, water quality?*

Jamaica Bay Ecosystem Related Questions

- *How are species composition and abundance changing in response to increasing marsh deterioration throughout Jamaica Bay?*
- *What is the status of non-native nekton species?*

Nekton

Species Composition
Species Abundance

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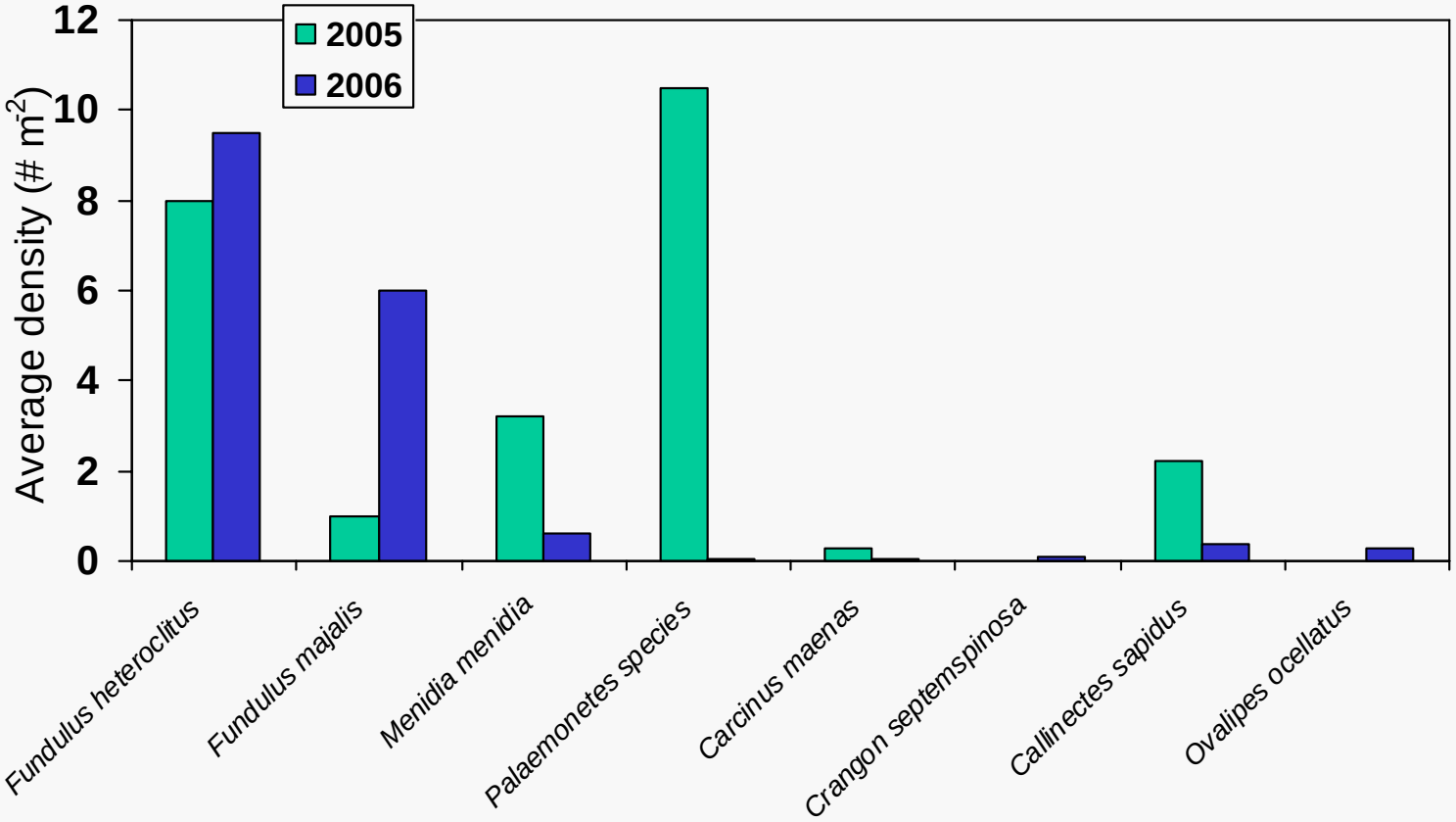
Elders East nekton density



- Shift from shrimp to fish after restoration (based on percent of catch)
- Nekton community changed (*F. heteroclitus* & *F. majalis* increased, *M. menidia*, *C. sapidus*, & *P. pugio* decreased after restoration)

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Photo courtesy of Schewen Bian, USACE

Coir Logs

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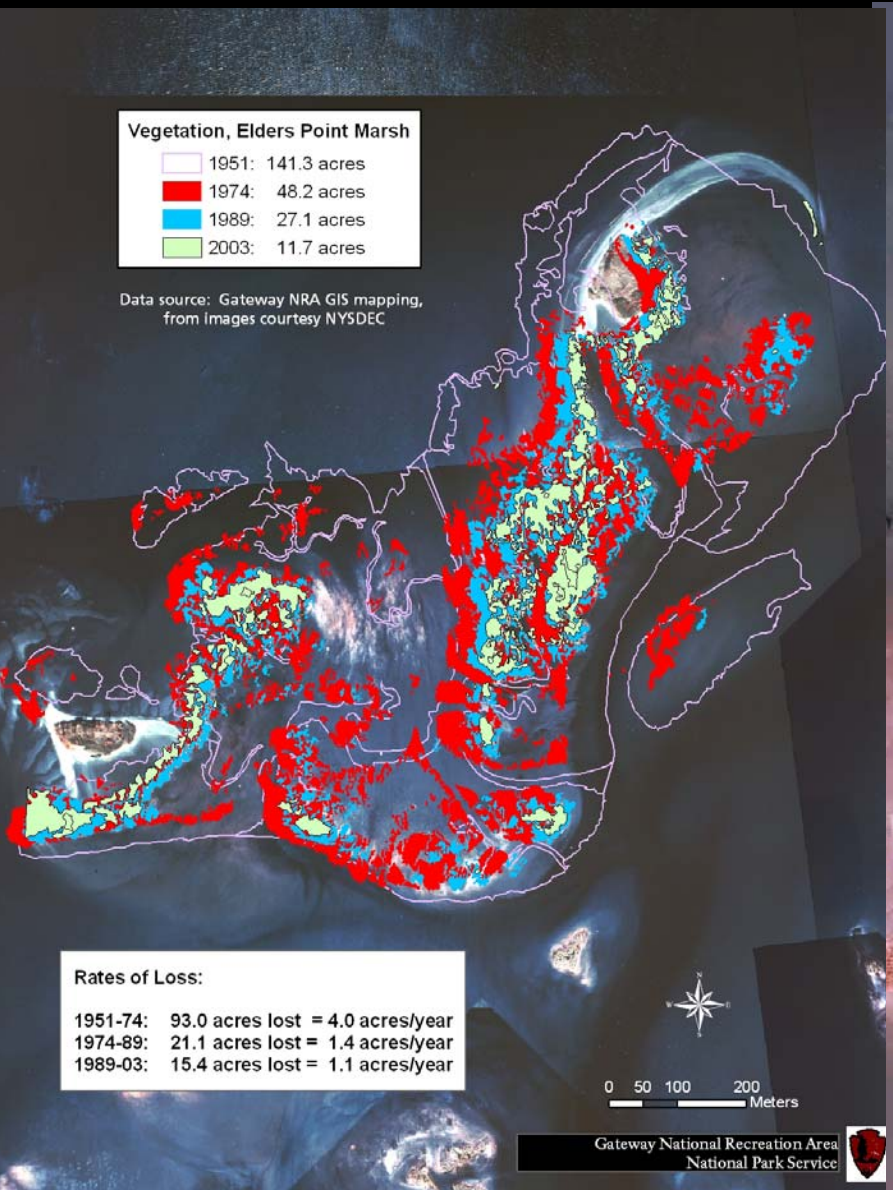

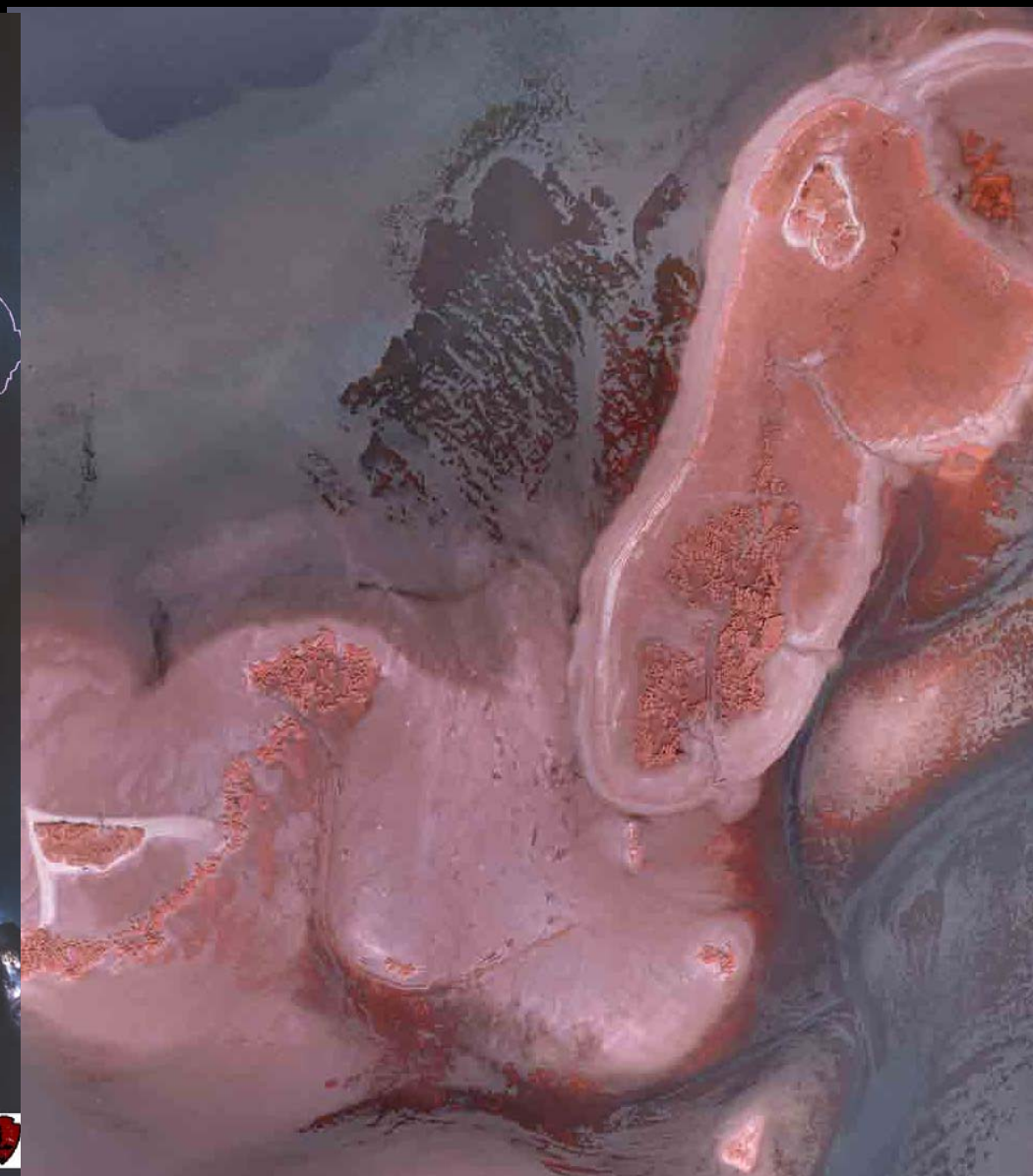

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Sediment Trap

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Select

Fill

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Hummock Relocation 2006

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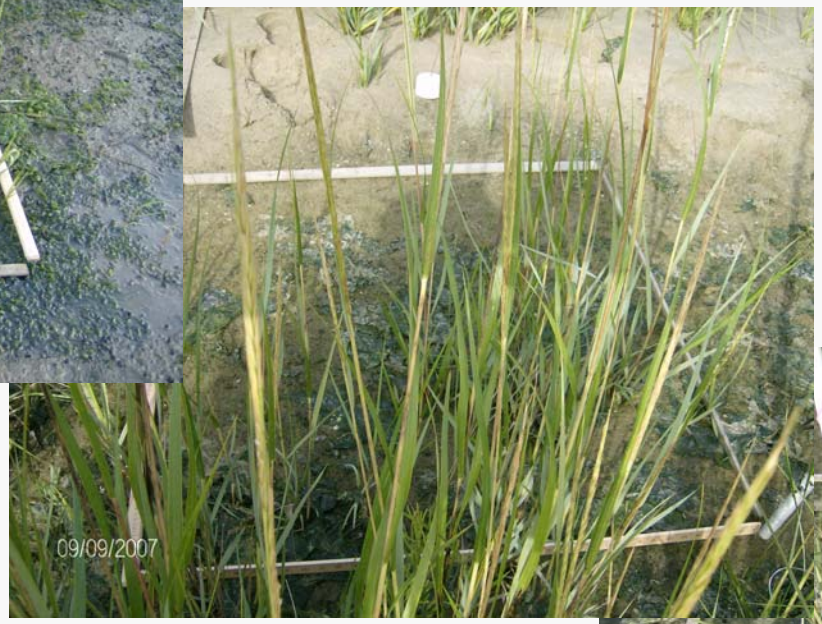

Hummock Relocation 2007

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Perimeter

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Perimeter

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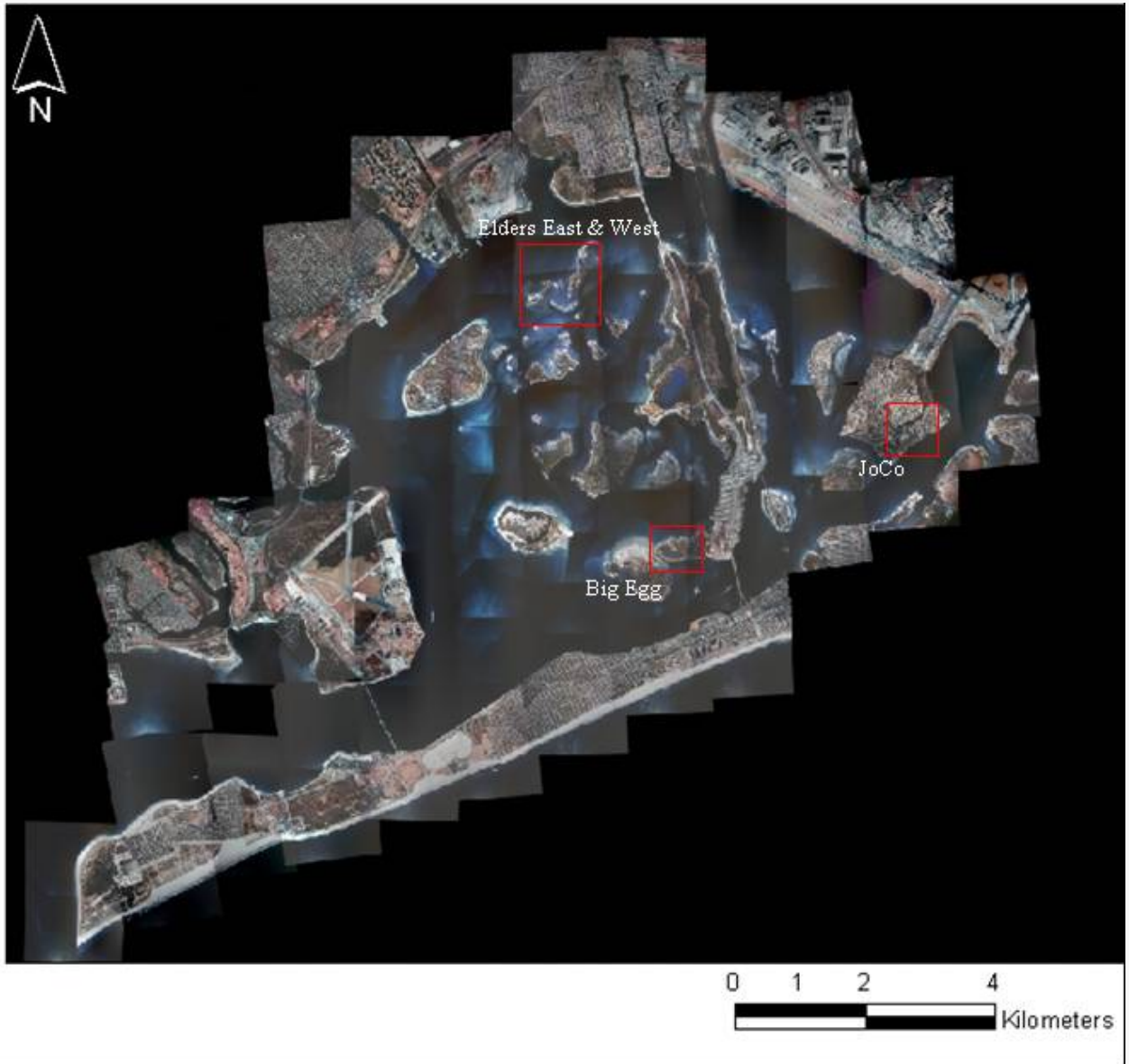

Elders Point West

Yellow Bar

Elders Point West

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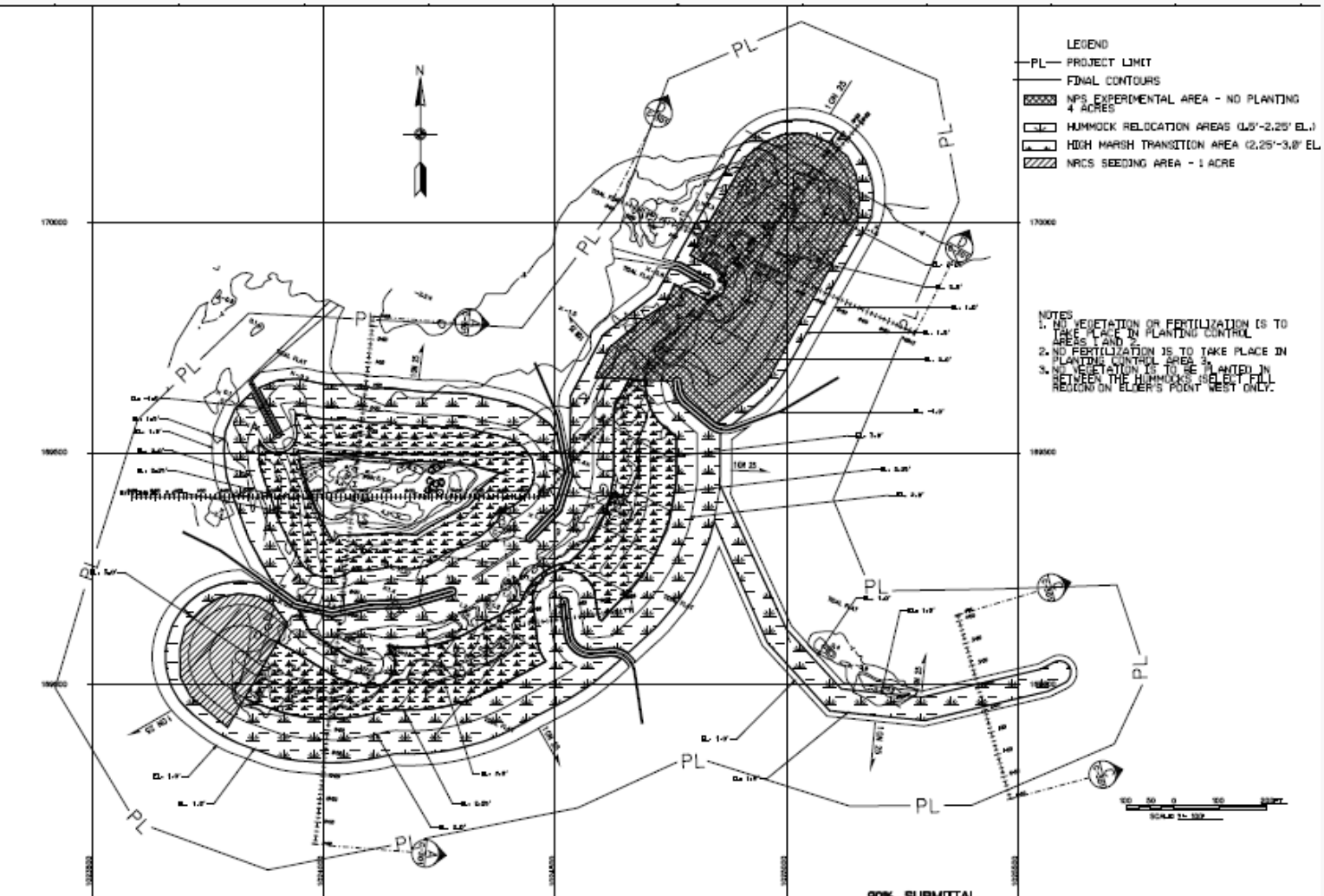

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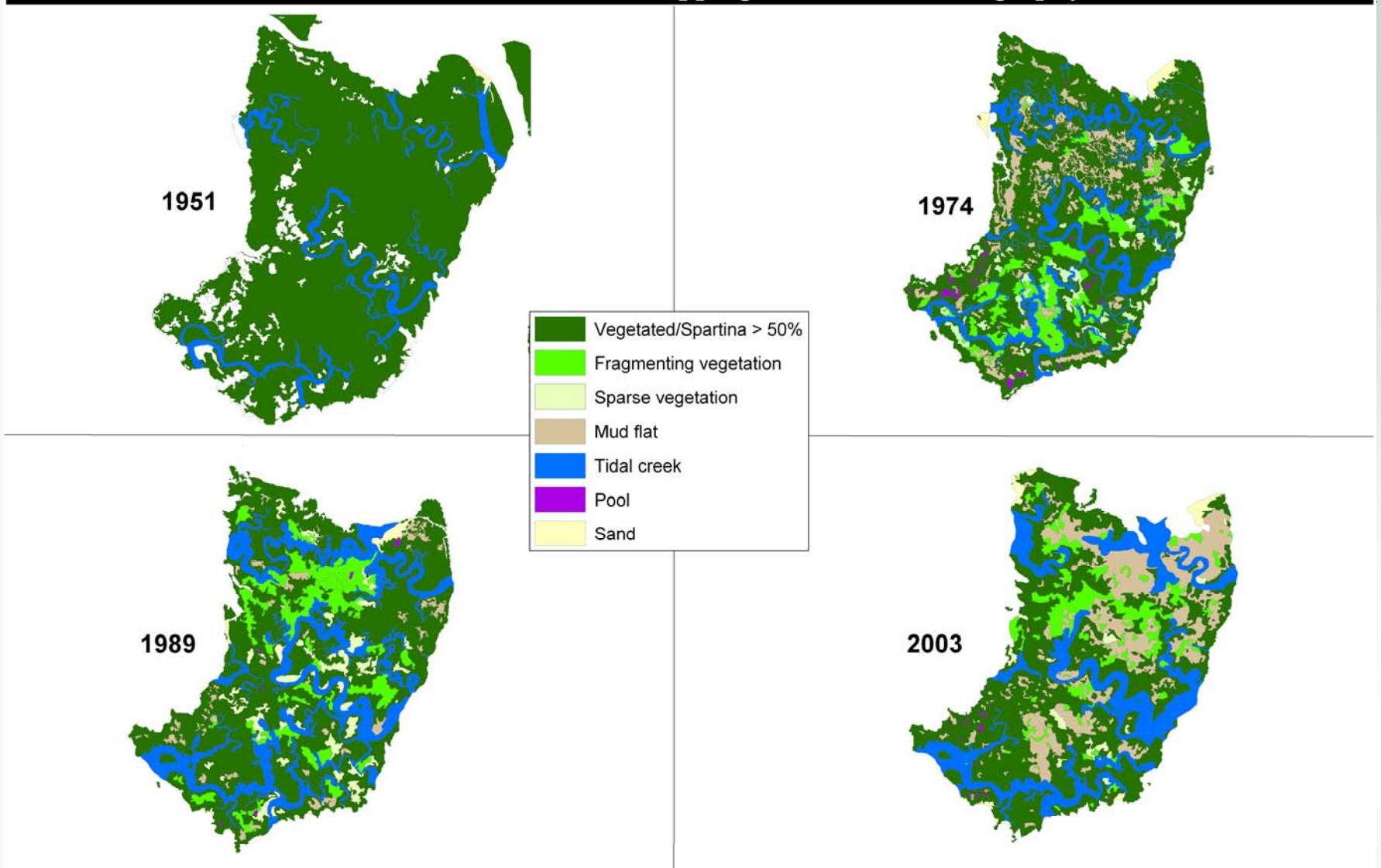
Yellow Bar Marsh: On Screen Mapping from Aerial Photography



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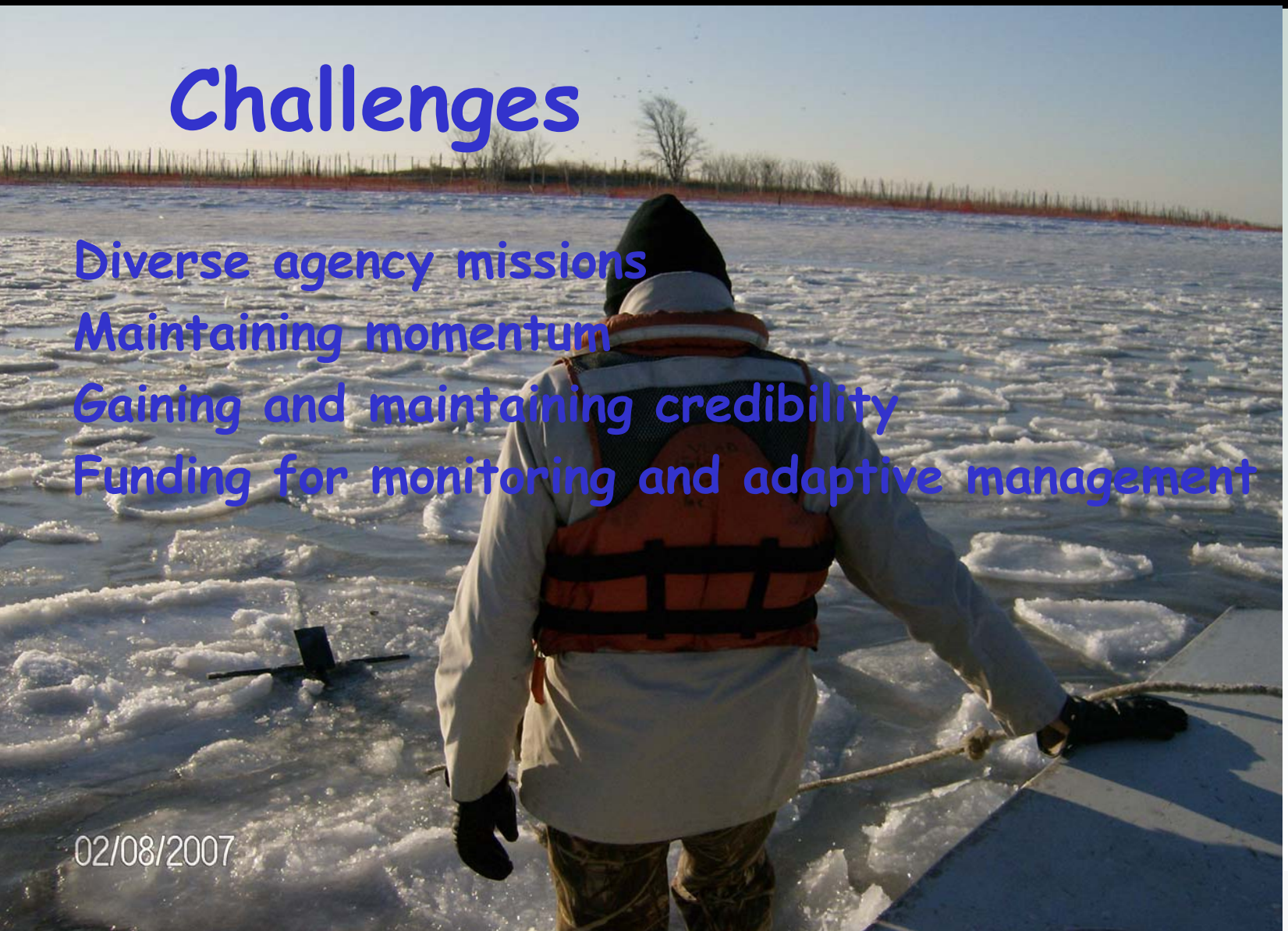
Challenges

- Diverse agency missions
- Maintaining momentum
- Gaining and maintaining credibility
- Funding for monitoring and adaptive management



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