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Wetland Loss – A Closer Look at Wetland Loss Research Activities in Jamaica Bay

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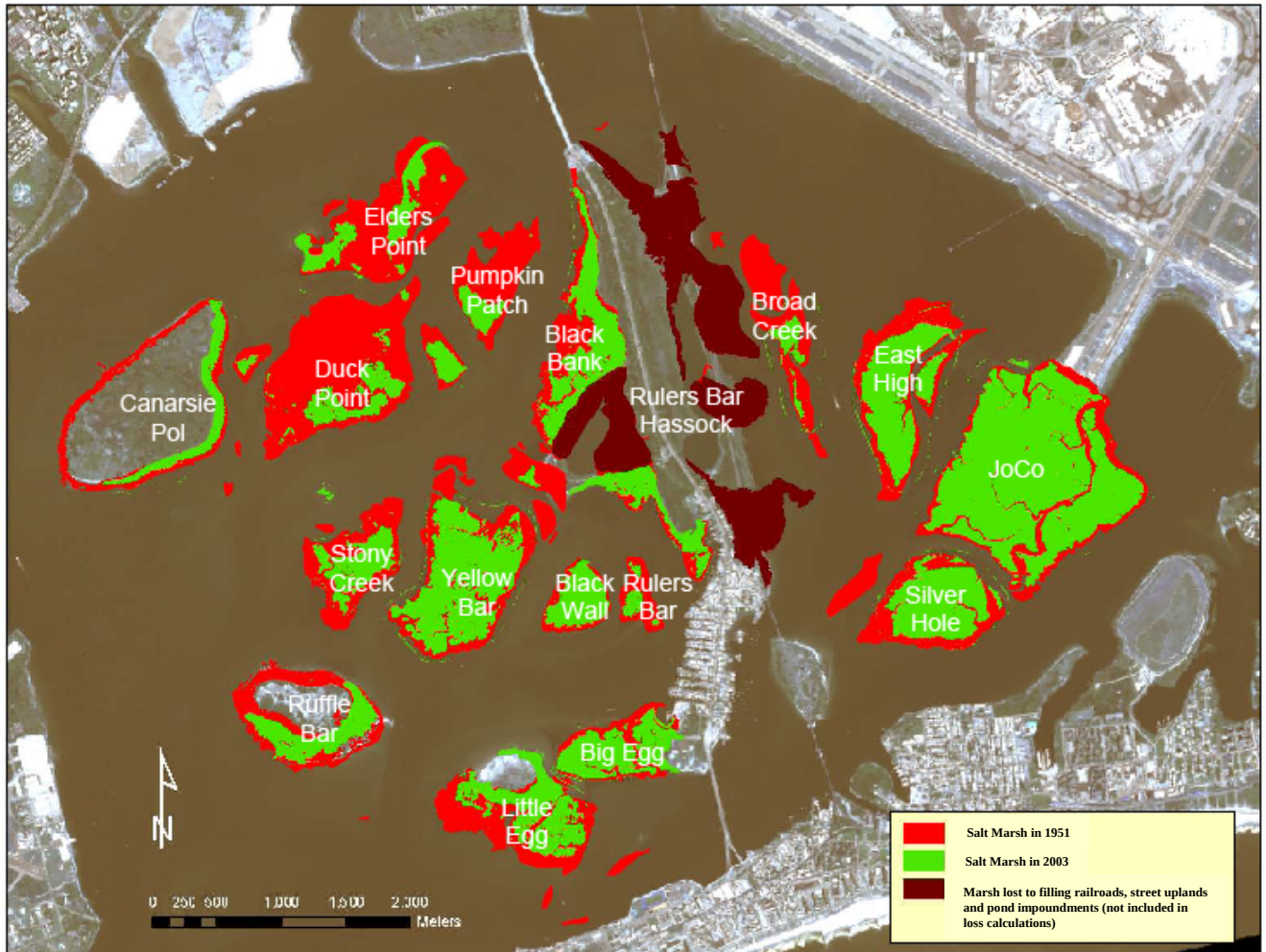
Northeast Region

Wetland Loss in Jamaica Bay

- Research: Rate of loss
  Sediment Elevation
  Biogeochemistry
  Sediment Budget
  Circulation
- Restoration: Big Egg
  Elders Point East
- New Initiatives and Research Needs

Marsh Island Loss in Jamaica Bay



1951-2003

Figure from GATE & Jamaica Bay Watershed Protection Plan Advisory Committee, 2007

Marsh Island Loss in Jamaica Bay

Jamaica Bay Marsh Islands: Total Vegetated Marsh				
	1951	1974	1989	2003
Vegetated Marsh (acres)	2347	1610	1333	876

Jamaica Bay Marsh Islands: Rate of Marsh Loss			
	1951-1974	1974-1989	1989-2003
Average Rate of Loss (acres/year)	17	18	33

Tables from GATE & JBWPPAC, 2007

Marsh Elevation & Accretion

- Evaluate relationship between marsh elevation change and rates of relative sea level rise
- Understand the surface and subsurface processes that influence marsh elevation change

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Why is marsh elevation important?

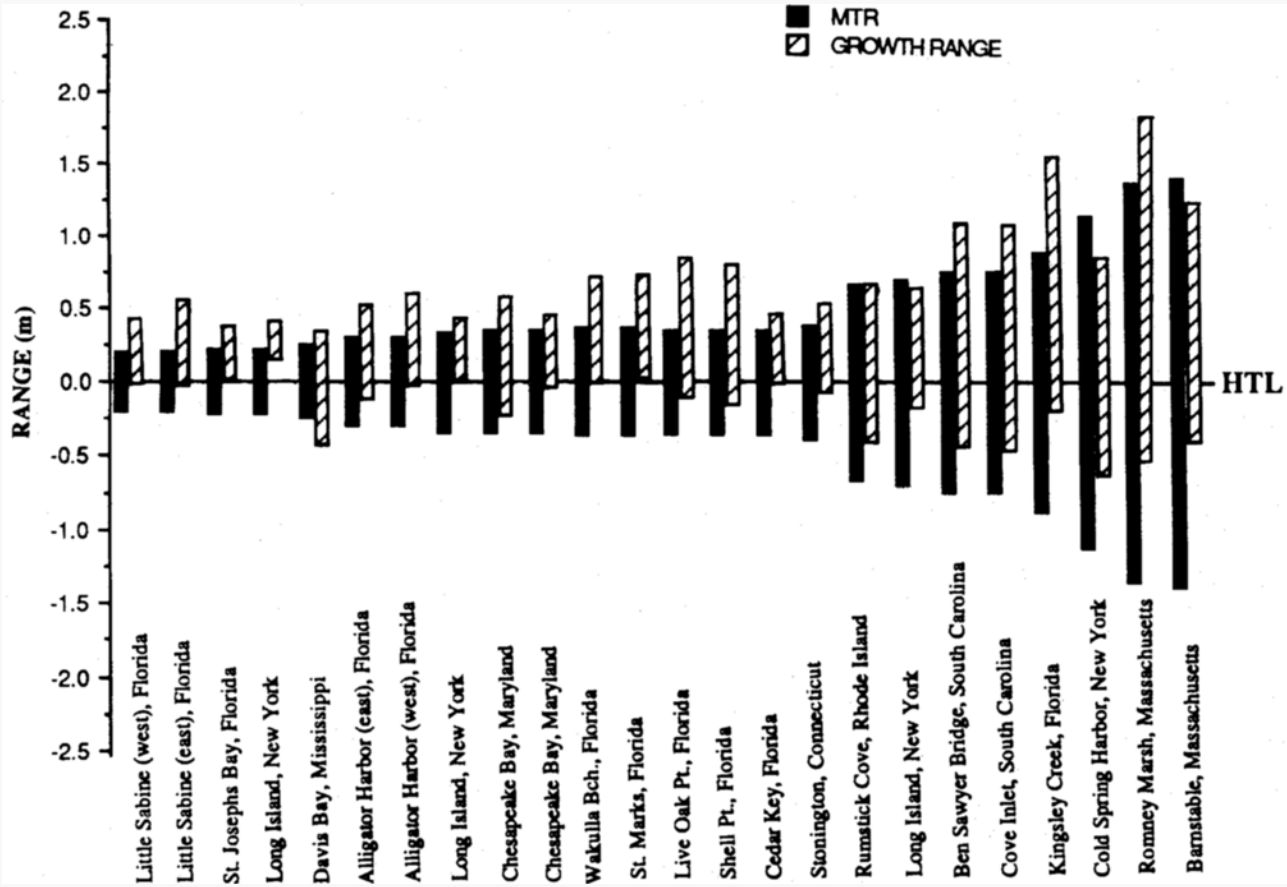

Figure from McKee and Patrick, 1988

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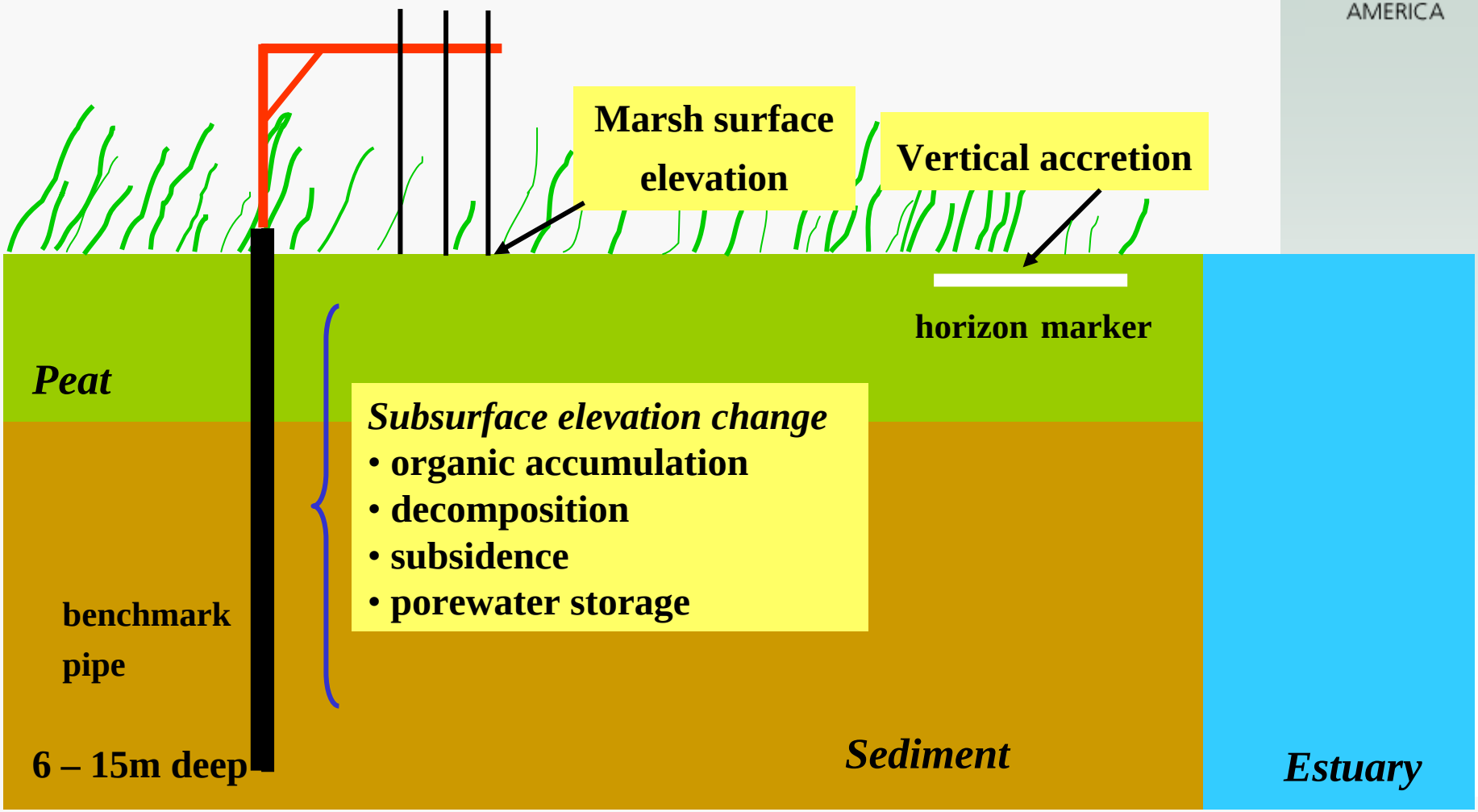
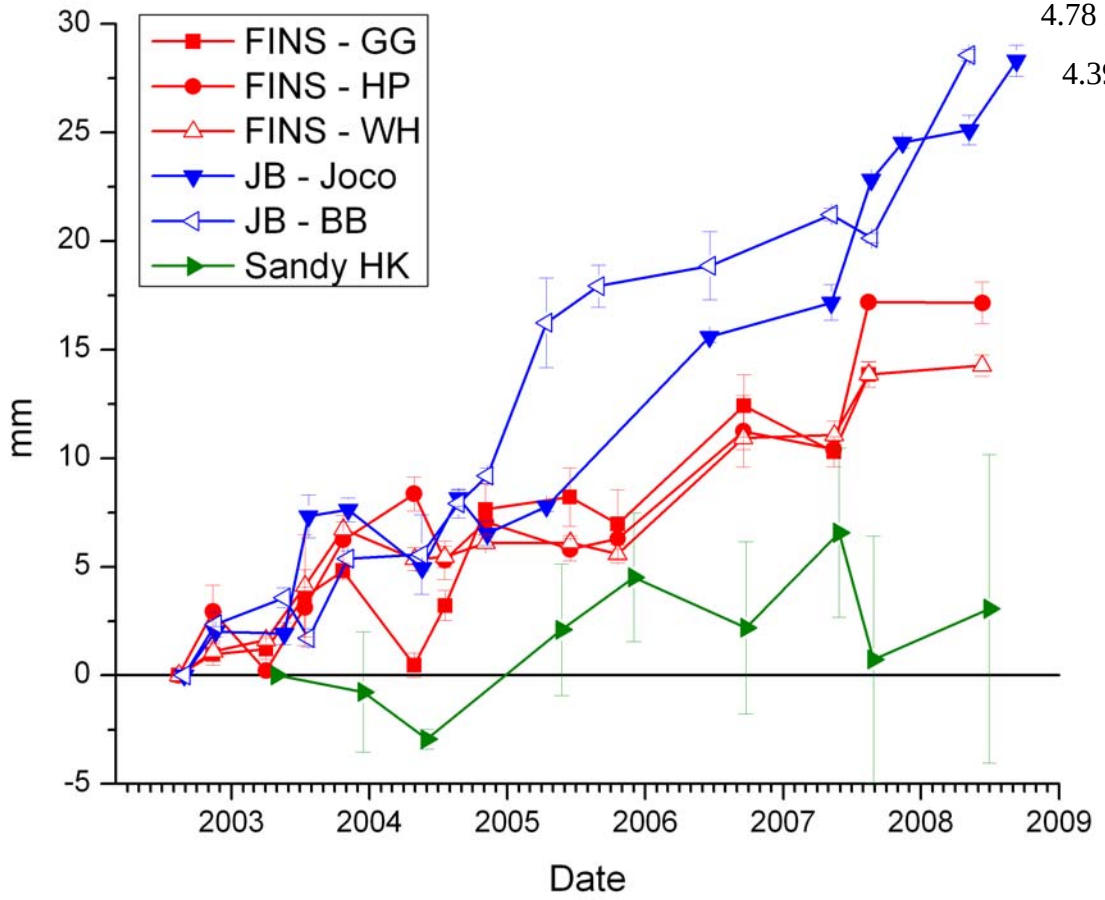
Surface Elevation Table (SET)



Marsh Surface Elevation Change



4.78 mm y^{-1} (JB-BB - deteriorating)

4.39 mm y^{-1} (JB-JoCo - stable)

Unpublished data Cahoon & Lynch, USGS

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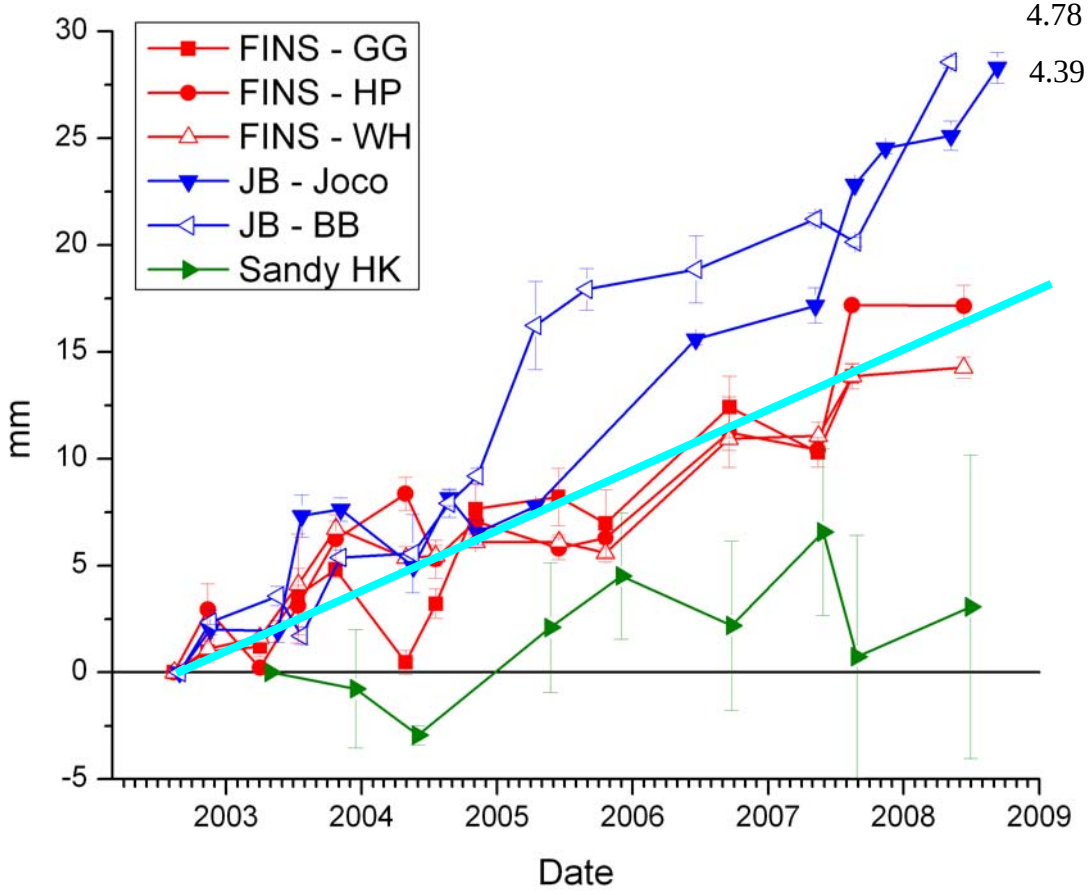
Marsh Surface Elevation Change



4.78 mm y^{-1} (JB-BB - deteriorating)

4.39 mm y^{-1} (JB-JoCo - stable)

140 y sea-level rise

2.73 mm y^{-1} (Battery)

Unpublished data Cahoon & Lynch, USGS

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Big Egg Marsh Experimental Restoration

Photo courtesy of George Frame

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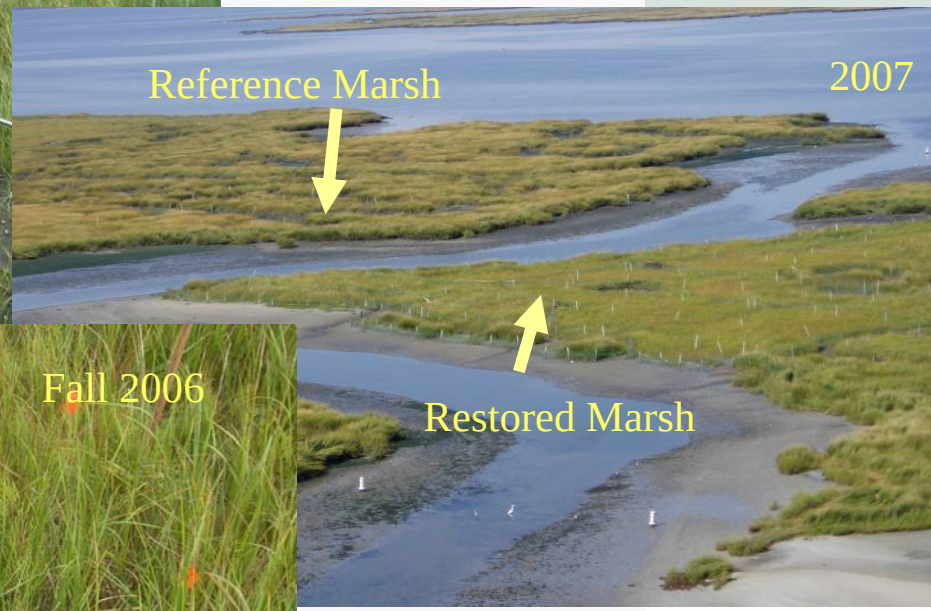
Big Egg Marsh Restoration



Big Egg Marsh
Restoration Monitoring

- Determine factors contributing to the success or failure of the restoration
- Evaluate various restoration techniques
- Identify problems requiring remedial action (adaptive management)
- Better understand factors contributing to salt marsh loss

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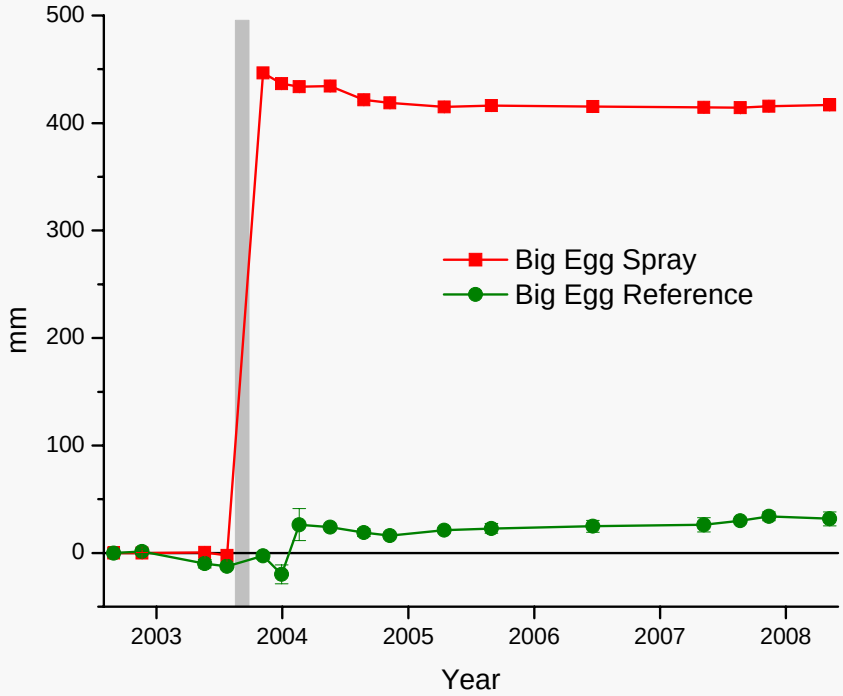
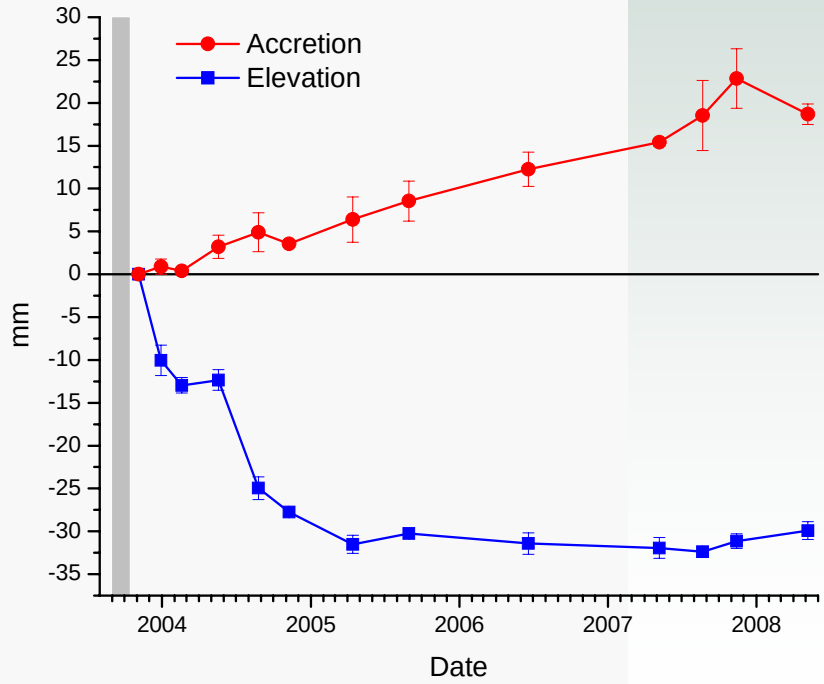
Will the restored Big Egg Marsh be sustainable?





Unpublished data Cahoon & Lynch, USGS

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Elders Point East Marsh Experimental Restoration

Photo courtesy of Alex Kolker

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Elders Point Marsh Restoration

Elders Point East Marsh Restoration Monitoring

- Determine factors contributing to the success or failure of the restoration
- Evaluate various planting techniques
- Identify problems requiring remedial action (adaptive management)
- Better understand factors contributing to salt marsh loss

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How does restoration monitoring contribute to an understanding of wetland loss?

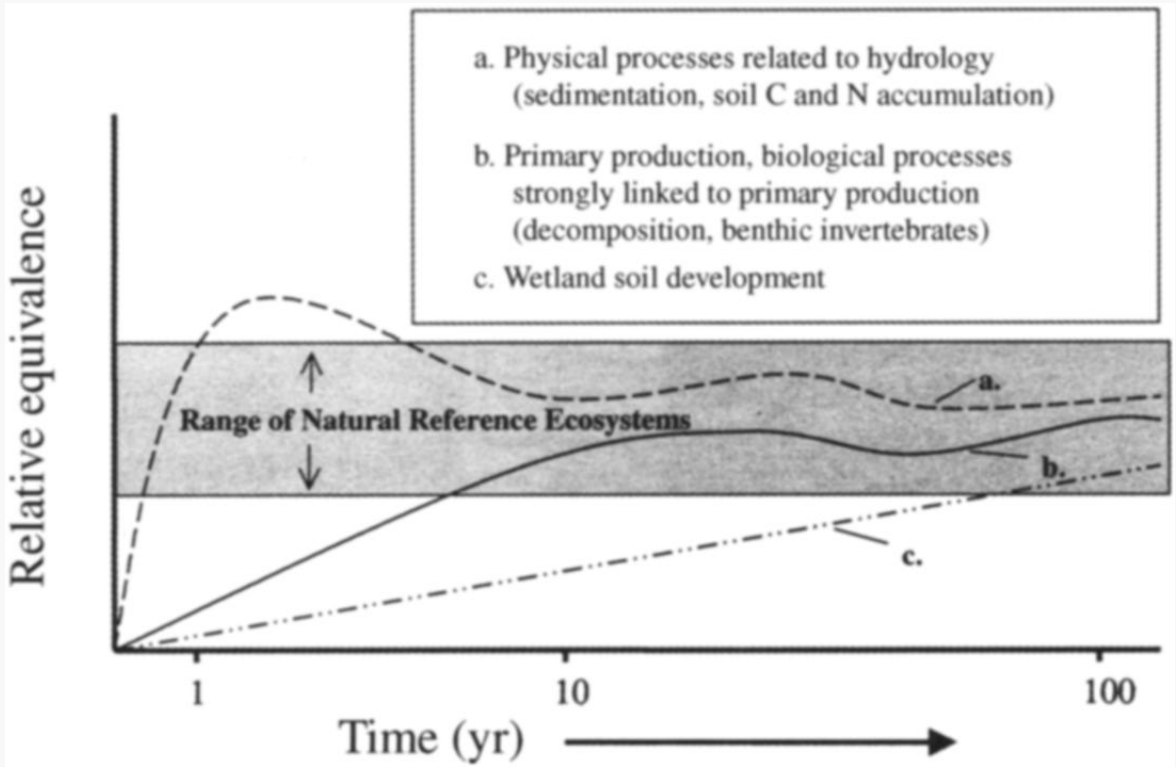

Figure from Craft et al. 2003

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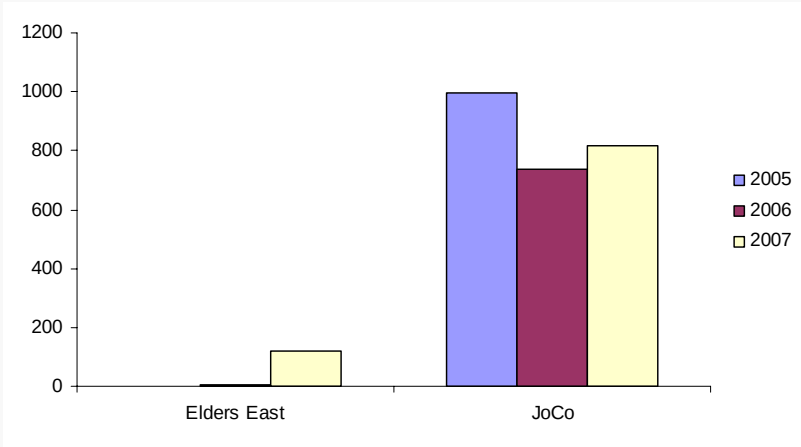
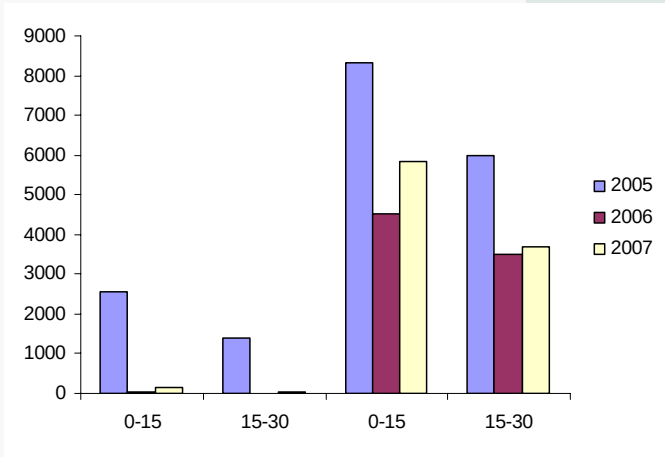
Mean Total Biomass

Aboveground



Sample Site

Belowground



Elders East JoCo

Sample Site and Depth Interval

Unpublished data Rafferty, NPS

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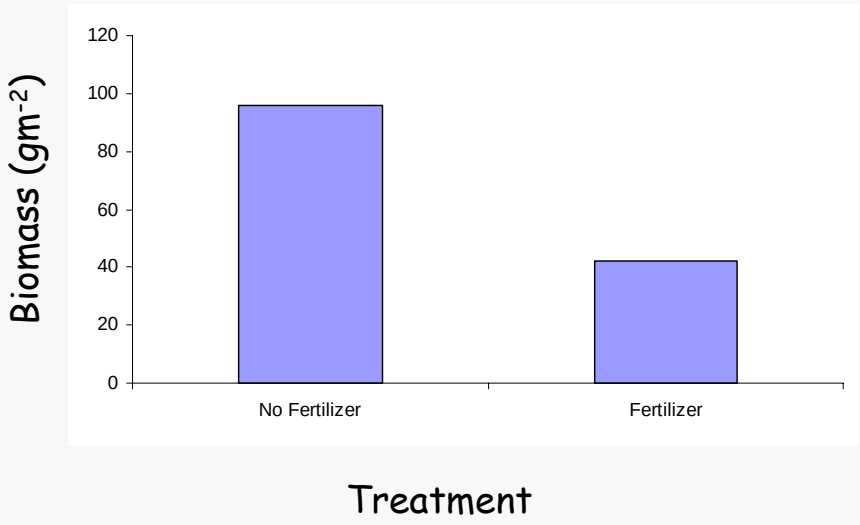
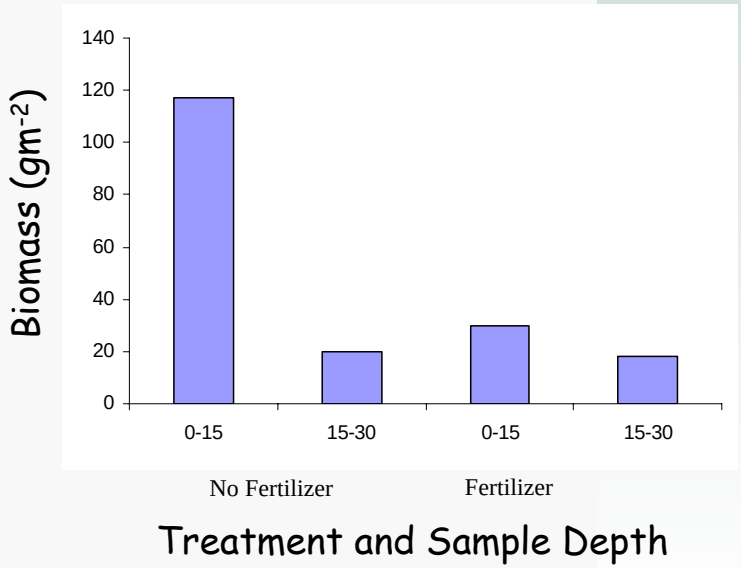
No Fertilizer and Fertilizer Plots





Unpublished data Rafferty, NPS

Biogeochemistry

- Evaluate the role of nutrients and hydrogen sulfide in marsh loss
- Characterize the biogeochemistry of Jamaica Bay salt marsh islands
- Understand the evolution of biogeochemical processes in a newly restored salt marsh

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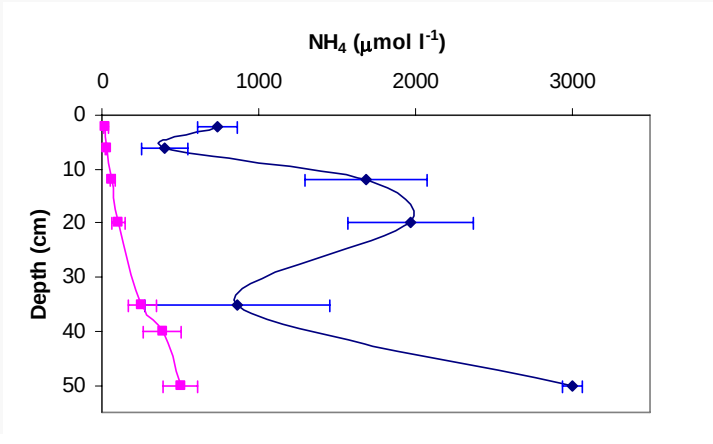
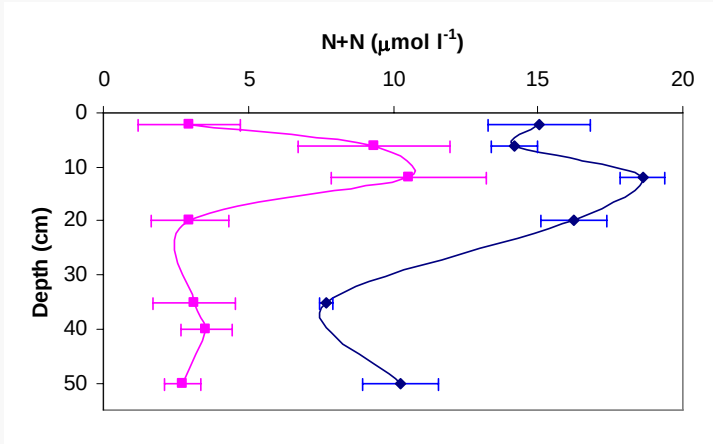
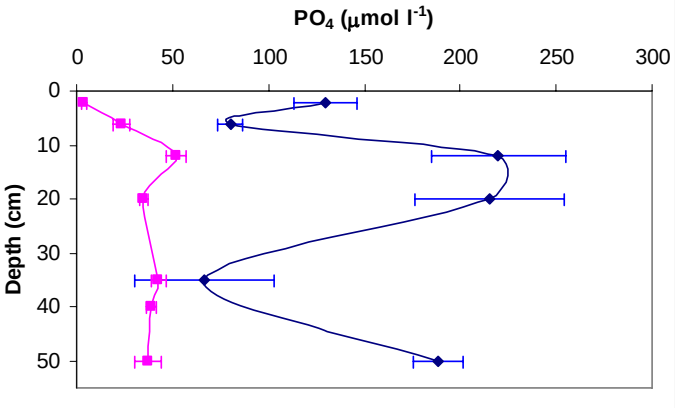
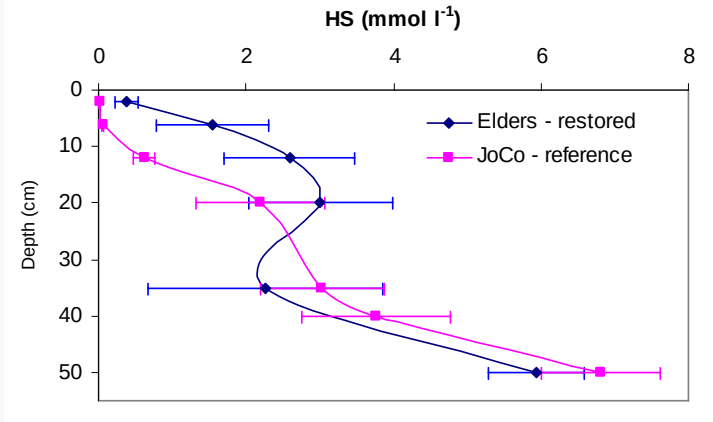
Porewater Nutrients and Hydrogen Sulfide

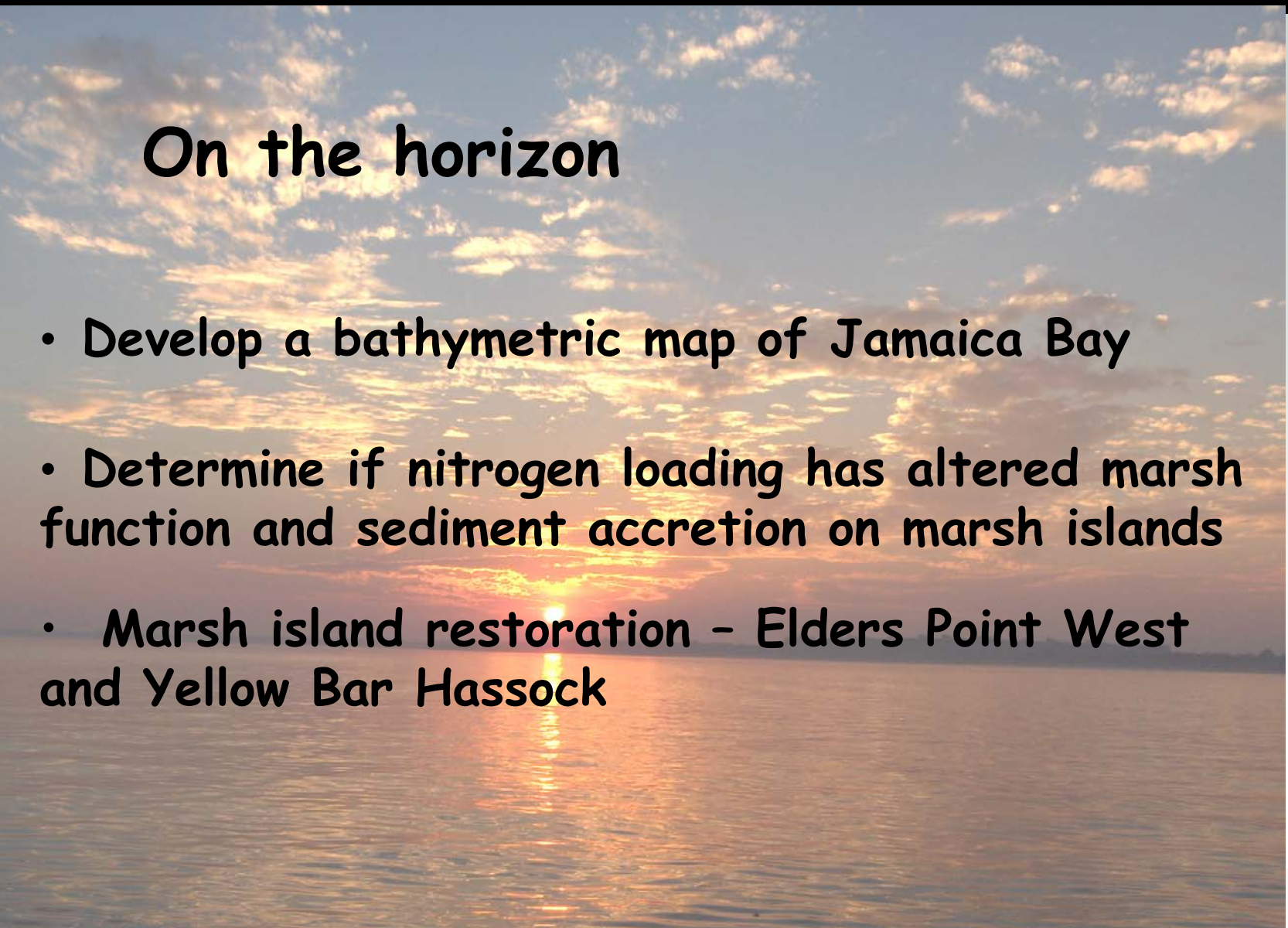








Unpublished data Cochran, Stony Brook University



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On the horizon

- Develop a bathymetric map of Jamaica Bay
- Determine if nitrogen loading has altered marsh function and sediment accretion on marsh islands
- Marsh island restoration – Elders Point West and Yellow Bar Hassock

Thoughts on Future Research

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Causes of Marsh Loss

- Elevation data to determine hydroperiod and assess vulnerability of individual marsh islands to sea level rise
- Assess historic nutrient loads and other urbanization factors in relation to marsh loss statistics
- Role of dense *Ulva* mats in trapping resuspended sediment
- Develop comprehensive model to integrate our accumulating knowledge on JB marsh loss (e.g., nutrients, altered circulation, sea-level rise, Rockaway barrier changing geomorphology, others)

Jamaica Bay Habitat Functions

- Compare the functions of marsh vs. mudflat in terms of bird utilization, nursery area, benthic community support, wave and storm energy attenuation, etc.

http://www.nps.gov/gate/naturescience/upload/JBAY-Research%20Opportunities.pdf