

BENEFICIAL USE OF DREDGED MATERIALS FOR RESILIENT TIDAL MARSH RESTORATION AND CREATION

JAMAICA BAY MARSH ISLAND RESTORATION

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“The views, opinions and findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation.”



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New York District



AUTHORITY

- Section 204 of WRDA 1992 and Section 207 of WRDA 1996 encouraged USACE to incorporate beneficial uses of dredged material into constructing, operating, and maintaining its Civil Works navigation.



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SECTION 204/207 PROCESS

- Opportunities for beneficial use projects are identified
- Request letter from a potential non-federal sponsor to the District Engineer
- Feasibility study to demonstrate that federal participation is warranted/justified
 - Includes plan formulation, including all technical analysis, policy compliance determinations, real estate, and federal and non-federal environmental and regulatory compliance activities.
 - Report approved by the Division Commander.
- Funding request to initiate the design and implementation (D&I) phase.
 - Negotiation/execution of a Project Partnership Agreement (PPA).
 - Cost shared 65% federal and 35% non-federal.
 - 100% non-federal for operation, maintenance, repair, rehabilitation or replacement (OMRR&R) activities





42,000,000 Cubic Yards of Dredged Material From the Harbor Deepening Program From 2004 to completion in 2014



Would fill:



Central Park, New York City
(an area of 1.32 square
miles) to a depth of 31 feet.

3 buildings the size of the
Empire State Building each
year for ten years (total = 30
Empire State buildings)



A standard size football
stadium (100 x 50 yards)
to a height of 4.8 miles,
nearly the height as
Mount Everest (5.4 miles
high)



BENEFICIAL USE OF DREDGED MATERIAL FROM HARBOR DEEPENING

Brownfield Remediation



Bayonne Landfill: 4MCY
(+ many other landfills & Brownfields remediated)



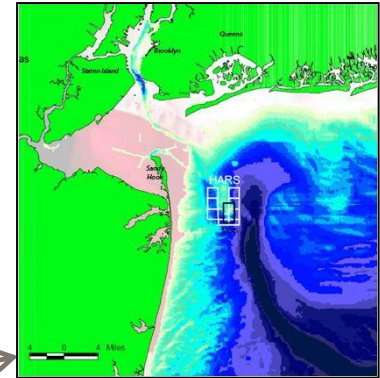
Lincoln Park: 339,000 CY

Beach Nourishment/Shoreline Stabilization



Plumb Beach: 155,000 CY

Remediation



Capping HARS (+O&M): ~56 MCY



Harbor Deepening Project:
~50 M CY



: ~11 MCY rock

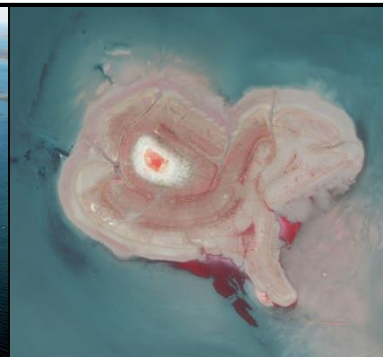


Capping NBCDF: 235,000 CY

Ecosystem Restoration: Jamaica Bay Marsh Islands



Elders East: 249,000 CY
40 acres



Elders West: 302,000 CY
40 acres



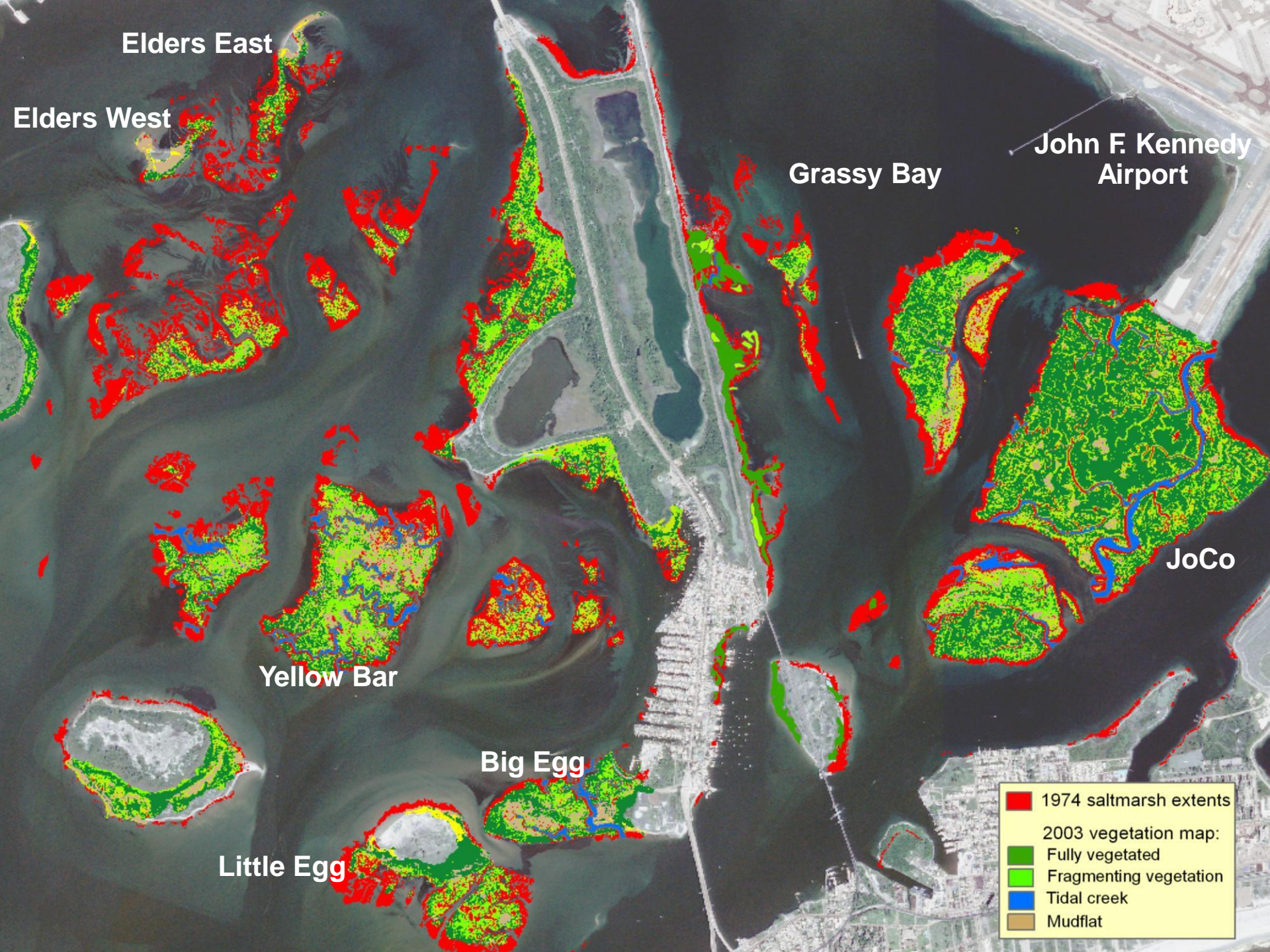
Yellow Bar: 375,000 CY
47 acres



Black Wall: 155,000 CY
20 acres



Rulers Bar: 92,000 CY
10 acres



Elders East

Elders West

Grassy Bay

John F. Kennedy
Airport

JoCo

Yellow Bar

Big Egg

Little Egg

- 1974 saltmarsh extents
- 2003 vegetation map:
 - Fully vegetated
 - Fragmenting vegetation
 - Tidal creek
 - Mudflat

PROJECT GOALS

- Restore salt marsh island habitat combatting a loss of 2,034 acres of tidal marsh from 1924 - 1999.
- Mitigation
 - Elders East - NY & NJ Harbor Deepening Project;
 - Rulers Bar - TBTA rehabilitation of scour protection of Marine Parkway Bridge)
- Evaluate various planting techniques
- Inform future restoration efforts



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Elders East 2006



2007



Elders East 2011

43 acres, ~\$17M



Jamaica Bay

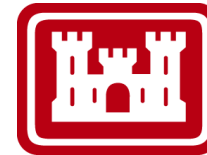
Marsh Islands Restoration
>1 million CY



40 acres, ~\$12M



RESTORATION OF ELDERS EAST AND ELDERS WEST



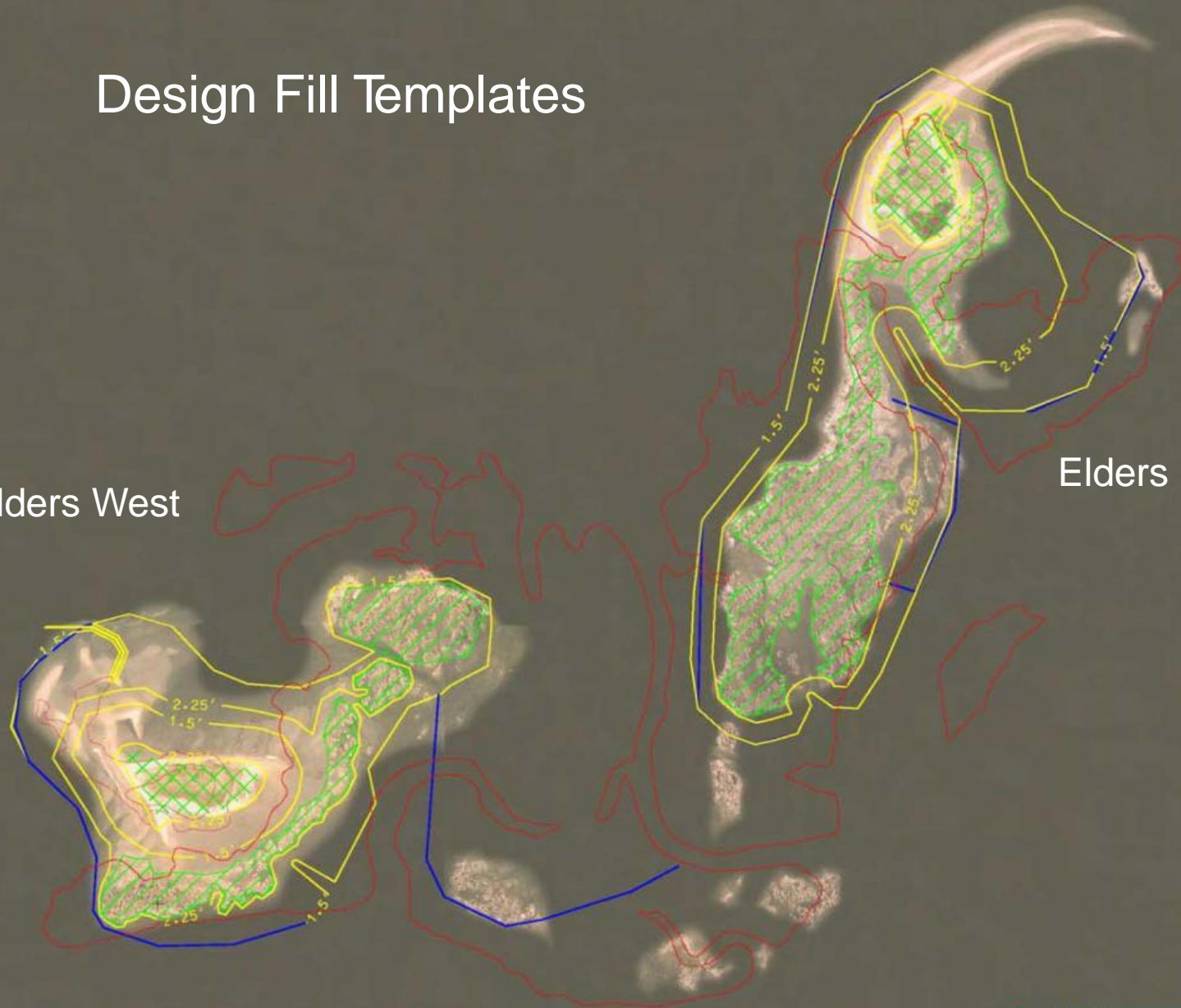
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Design Fill Templates

Elders West

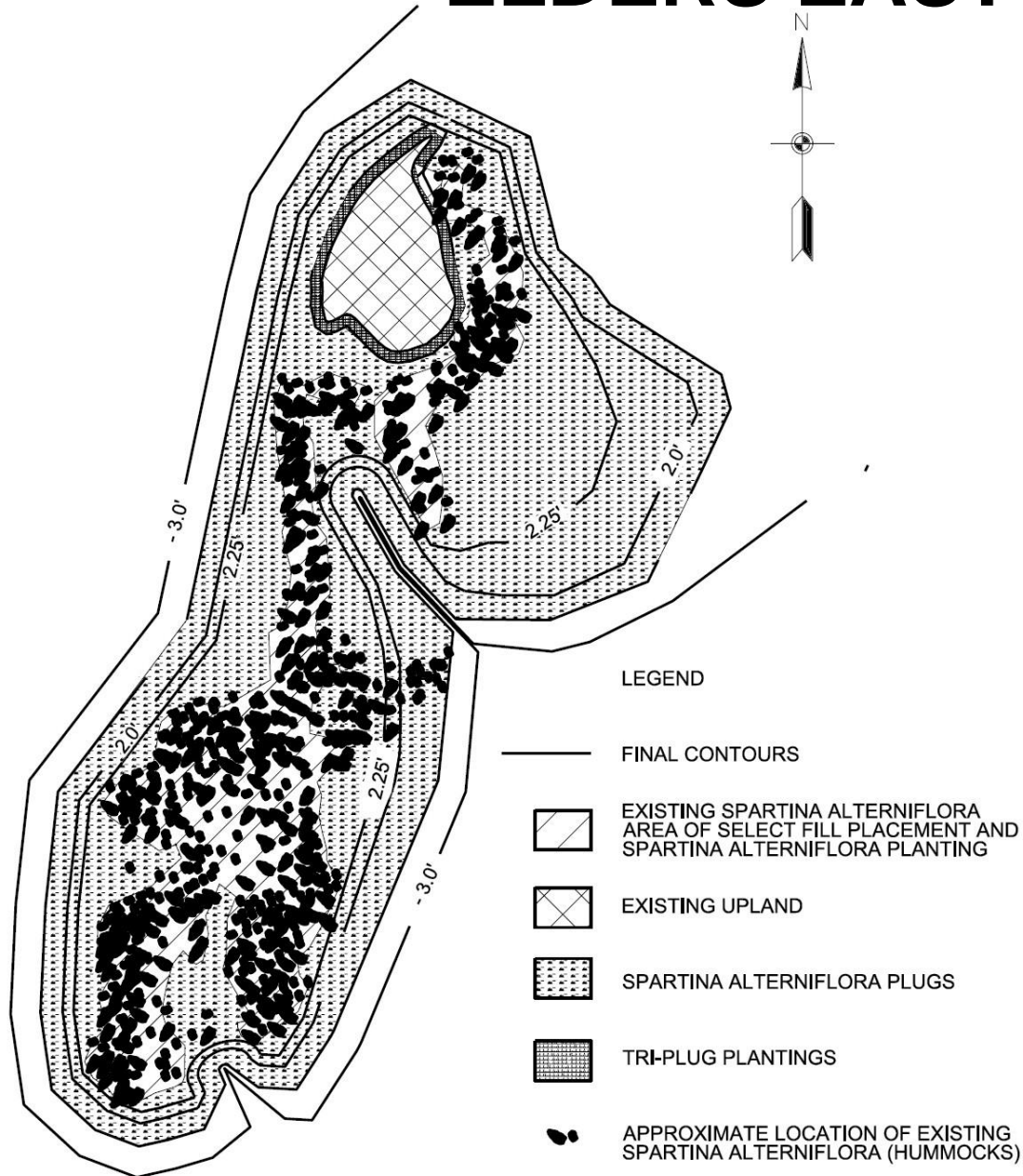
Elders East



LEGEND

- PROPOSED LOW MARSH AREA (+1.5 - +2.25)
- HISTORIC 1974 SHORELINE
- GEOTEXTILE TUBE PLACEMENT

ELDERS EAST



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ELDERS EAST

Fill Material:

Maintenance dredging of the Rockaway Inlet	158,000 yd ³
Dredging Ambrose Navigational Channel	46,000 yd ³
Purchased material to complete the design fill	<u>45,000 yd³</u>
Total	249,000 yd³

Vegetation:

Mixture of *Spartina alterniflora*, *Spartina patens*, and *Distichlis spicata*

Spartina alterniflora plugs 580,000

Spartina alterniflora pots 45,876

Tri-plugs (*S. alterniflora*, *Distichlis spicata*, and *S. patens*) were planted over a total of 16.2 ha (40.0 ac). 33,640

Most of the project (i.e., > 95%) was planted with *S. alterniflora*.



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JAMAICA BAY MARSH ISLAND CONSTRUCTION: SAND DELIVERY



JAMAICA BAY MARSH ISLAND CONSTRUCTION CONTAINMENT



BUILDING THE ISLAND - GRADING



VEGETATING THE ISLAND – TRANSPLANTING



RESTORATION OF ELDERS EAST

October 2006

October 2006



July 2010

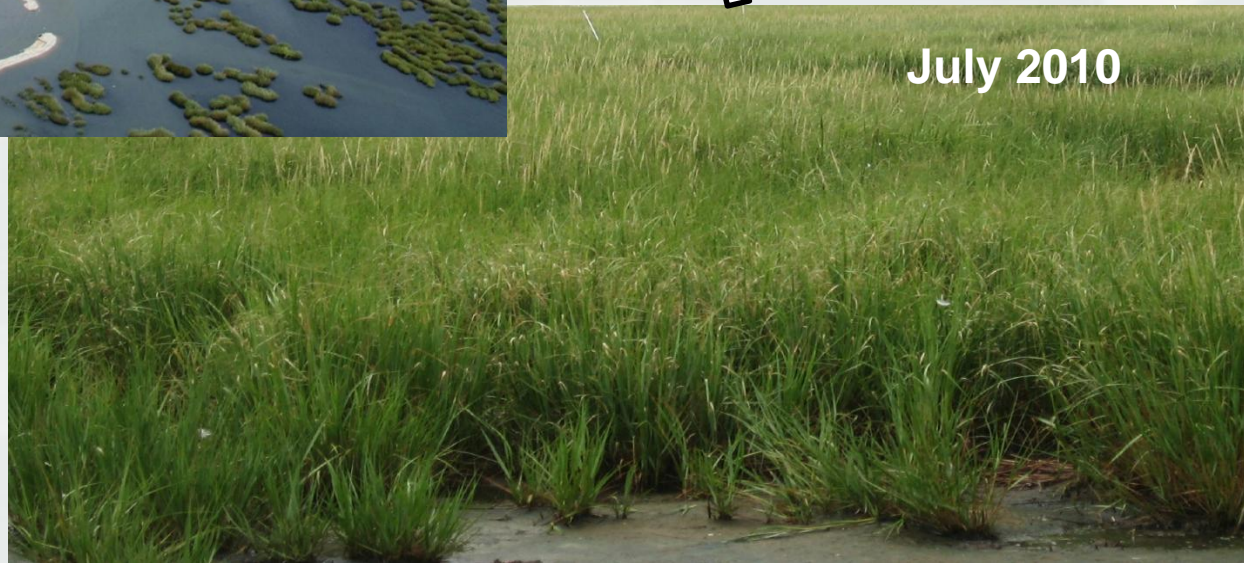


Photo courtesy of Galvin Brothers, Inc.

ELDERS WEST (near completion)

July 2010



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ELDERS WEST QUANTITIES

Fill Material:

Dredging Ambrose Navigational Channel 301,976 yd³

Vegetation:

No *Spartina alterniflora* plugs or pots, all the low marsh plants were relocated *Spartina* hummocks from the project site

High marsh transition planting: 85,580



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MONITORING RESULTS

Elders East (West and Yellow Bar)



- Total live vegetated canopy cover, above- and belowground productivity do not differ between the restored and reference marshes
- Low root:shoot ratios could indicate allocation of resources to aboveground annual tissue which could limit sediment organic accumulation
- The overall condition of nekton at these marshes has been stable
- Reference and restored marshes are more resilient to sea level rise when compared to control marshes

<http://dx.doi.org/10.21079/11681/23952>



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LESSONS LEARNED

Relocation method that conserved existing marsh vegetation

- Relocation of approximately 1.5 acres of existing *Spartina alterniflora* hummocks
 - required an additional year to achieve 50% canopy cover compared to the new plants at Elders East
 - By 2009, there was no difference in canopy cover or vegetation species composition, richness, and diversity

Comparison of a fertilizer versus no fertilizer treatment

- Temporary benefit for total canopy cover and stem density
- No apparent benefits for above- and belowground biomass, a critical component of marsh island establishment
- Total vegetative cover - approximately 10-20% less in each year at the No Fertilizer site vs Fertilizer treatment but no significant difference between the treatments was detected in 2010 and 2012.

Costs

- Dependent upon existing condition depth and the cost of the sand material and material transport
- Approximately 50 percent overfill would be needed to account for subsidence of sand following placement
- Size influenced by the amount of contiguous and sustainable acreage within the NYSDEC 1974 regulatory footprint within a given range of elevations.
- Past construction/monitoring indicated success of hummock replanting and use of tri-plugs (*Spartina alterniflora*, *Spartina patens*, *Distichlis spicata*) with optimal spacing of 18 inch on center.



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BLACK WALL and RULERS BAR PRE-RESTORATION



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U.S. ARMY

YELLOW BAR, BLACK WALL AND RULERS BAR MARSH ISLAND RESTORATION 2012



Yellow Bar: 46 acres, \$17.3M
Black Wall: 20 acres, \$2.1M 2007
Rulers Bar: 10 acres, \$1.311M

**Sponsors: NYSDEC,
NYCDEP, PANYNJ, NPS**

Planting Effort at Black Wall and Rulers Bar (July 2013):

**Jamaica Bay EcoWatchers, American Littoral Society,
Jamaica Bay Guardian and Community Volunteers**



MARSH ISLAND RESTORATION COSTS

Construction

	acres	Total	\$ Placement	\$ Planting
Elders East	43	\$17,237,126		
Elders West	40	\$11,948,300	\$7,199,000	\$4,749,300
Yellow Bar	47	\$19,642,857	\$6,937,500	\$7,293,548
Black Wall	20	\$2,100,000	\$2,100,000	\$705,000*
Rulers Bar	10	\$1,311,000	\$1,311,000	

* Volunteer Planting Program



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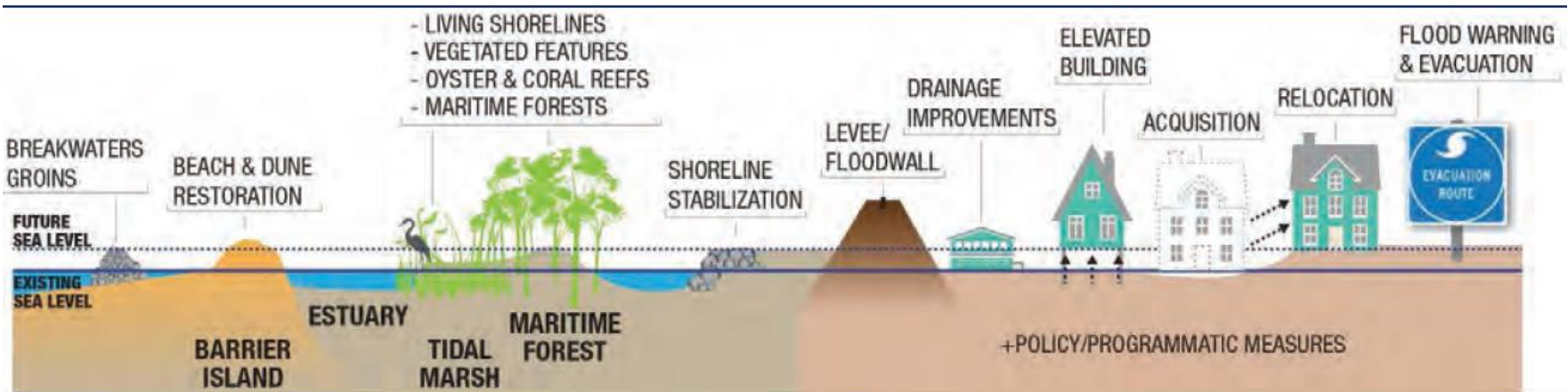
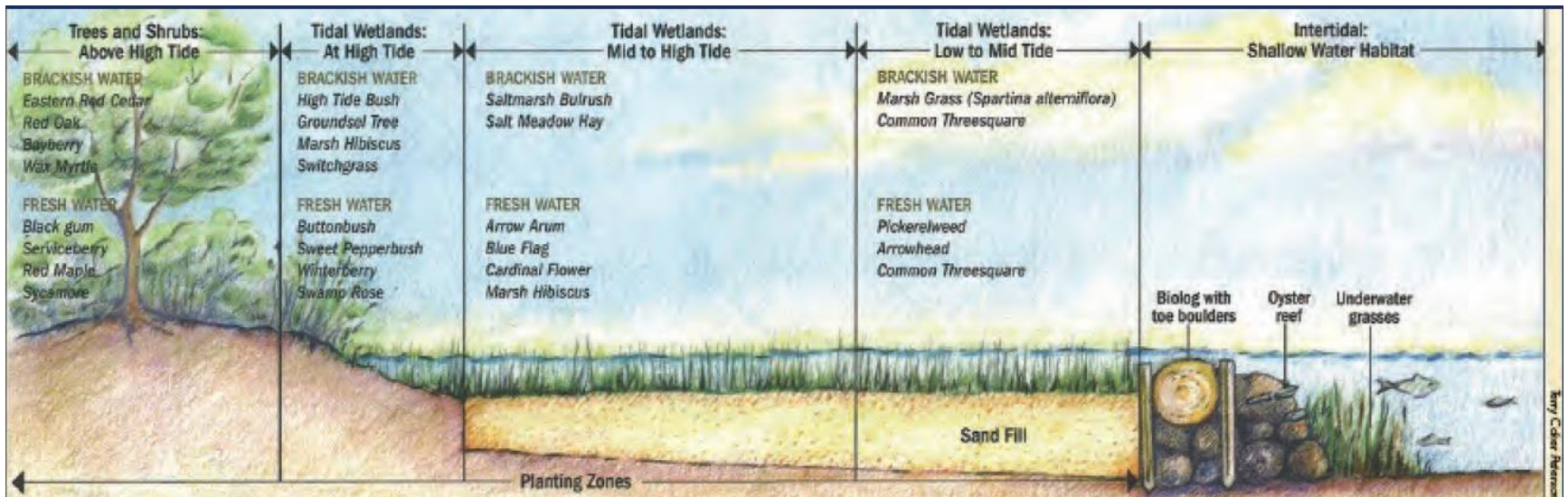
Jamaica Bay Planning Region Efforts



NATURAL/NATURE BASED FEATURES

GREEN ENGINEERING

Coastal Storm Risk Management Benefits



ACKNOWLEDGEMENTS

- National Parks Service (Gateway) - Patti Rafferty
- Port Authority of New York and New Jersey
- New York City Department of Environmental Protection
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- National Resources Conservation Service



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For More
Information

Questions?

<http://www.nan.usace.army.mil/Home.aspx>

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