



NYC Parks

Shoreline and shallow water enhancement in the New York Harbor

October 23, 2025

Hudson River Environmental Society

Ecological Assessment at 25 salt marshes across NYC

Desktop Analysis

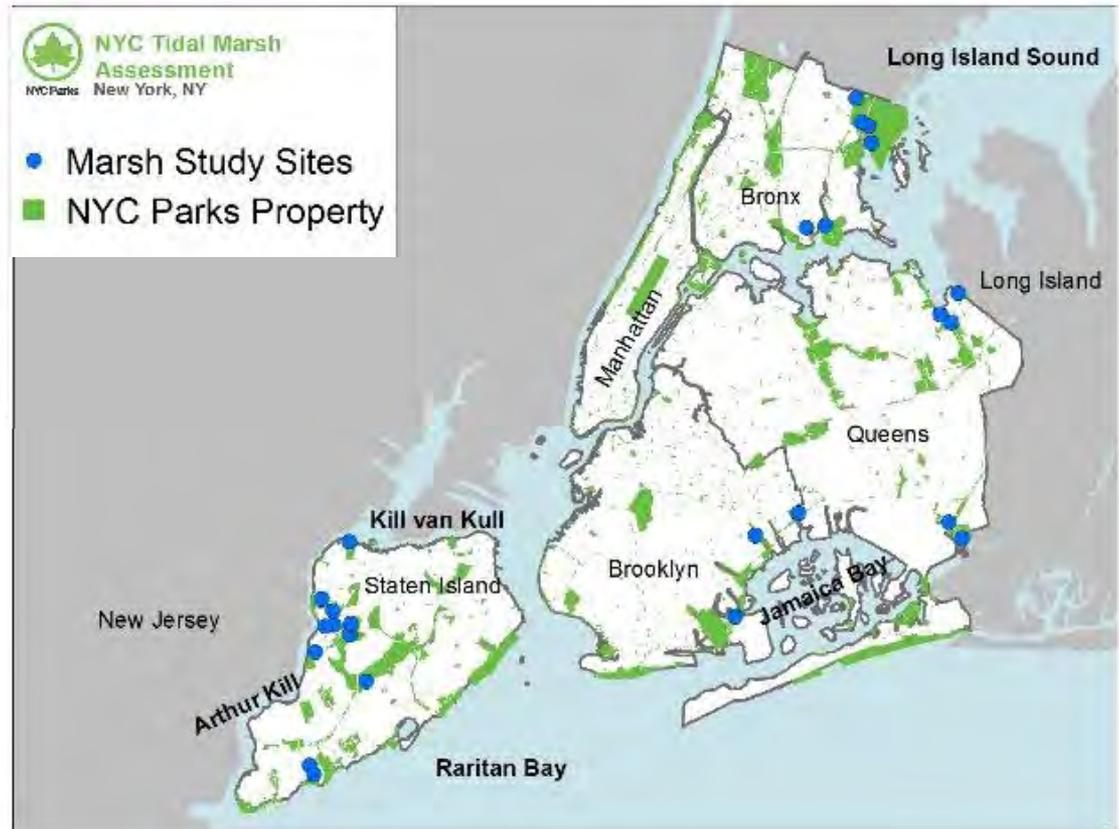
- Historic Loss Analysis
- Sea Level Affecting Marshes Model (SLAMM)

Rapid Ecological Assessments

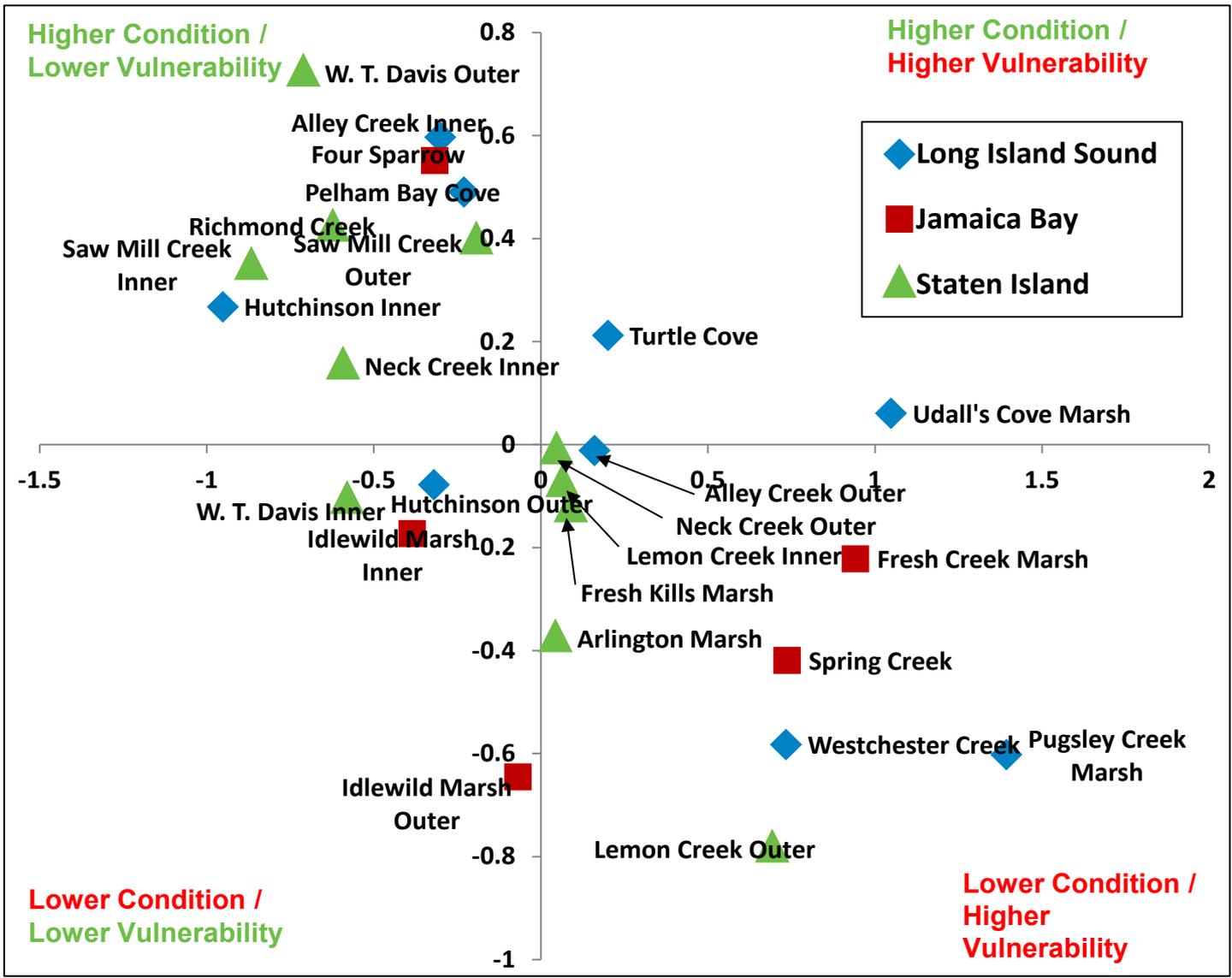
- Mid-Atlantic Tidal Rapid Assessment Method (MidTRAM)
- NAC Salt Marsh Assessment (NAC SMA)



Conditions and vulnerability indices



Condition

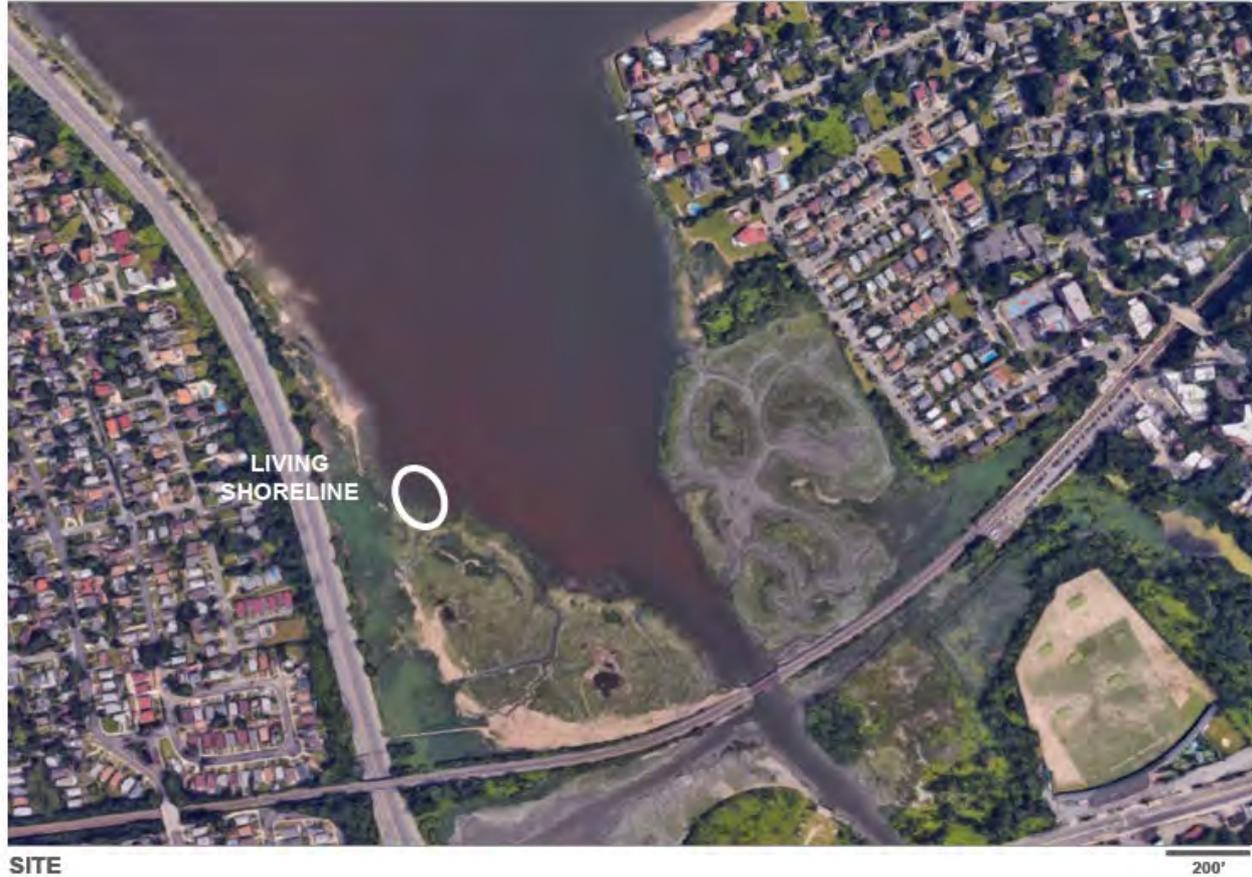
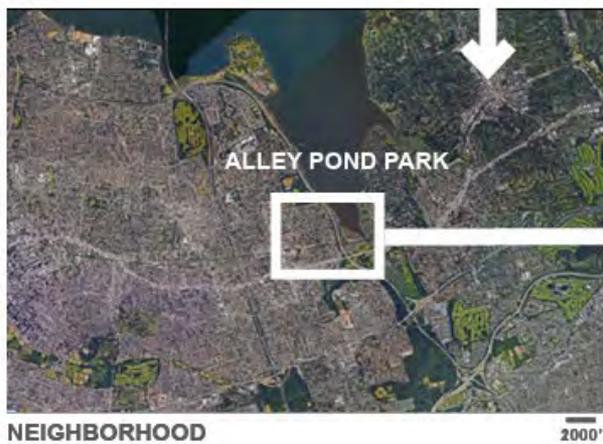


Vulnerability

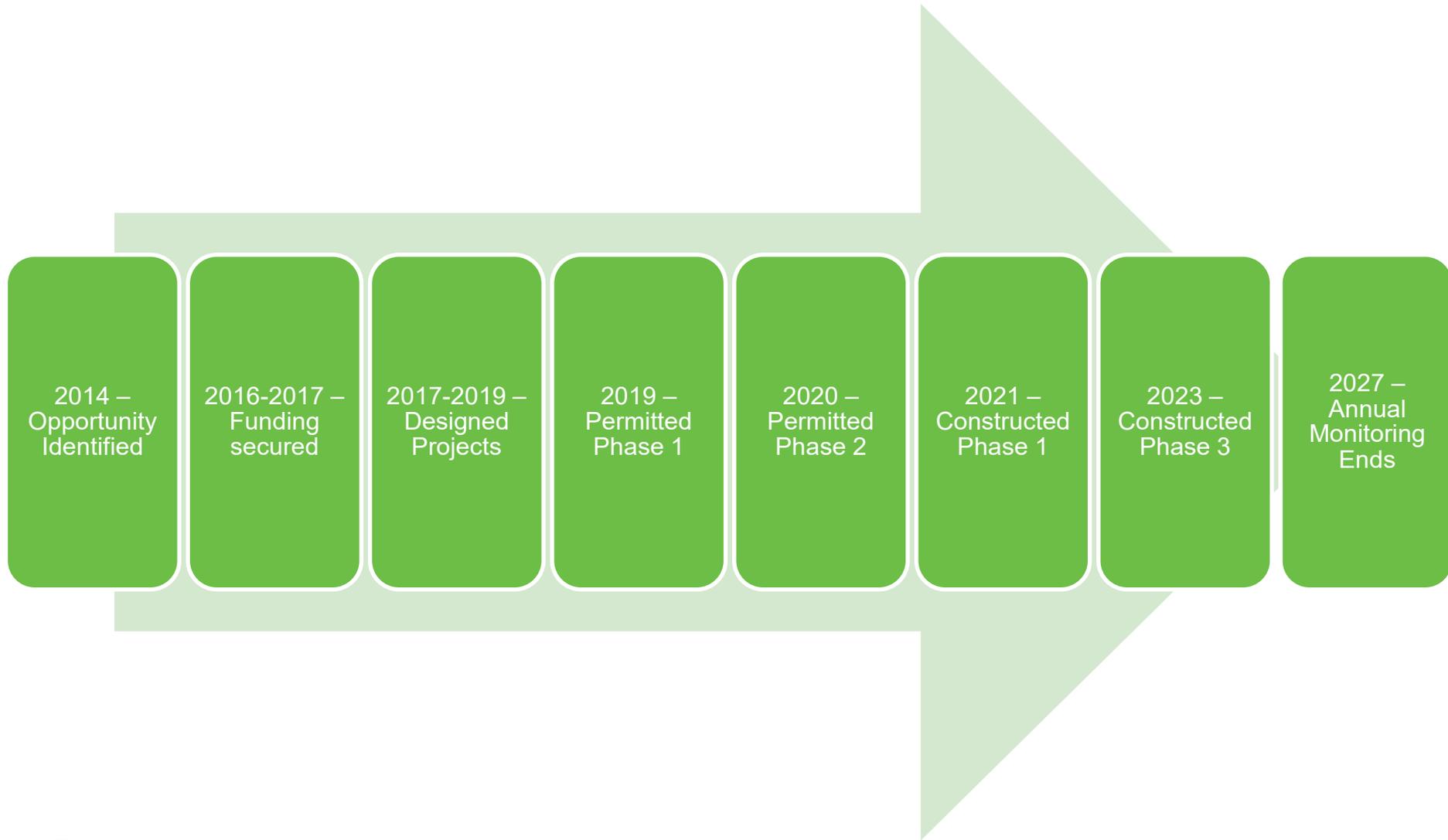


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Project location



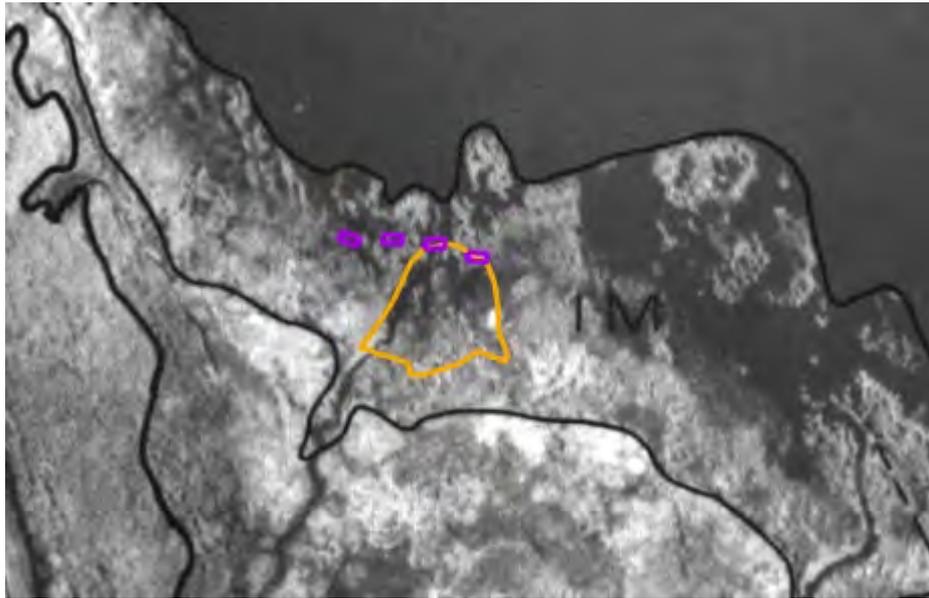
Project timeline



Trends analysis results (1974-2012 salt marsh area change)



Trends analysis results (1974-2012 salt marsh area change)



1974



2012

-  2023 Sand Placement Area
-  Oyster Castles

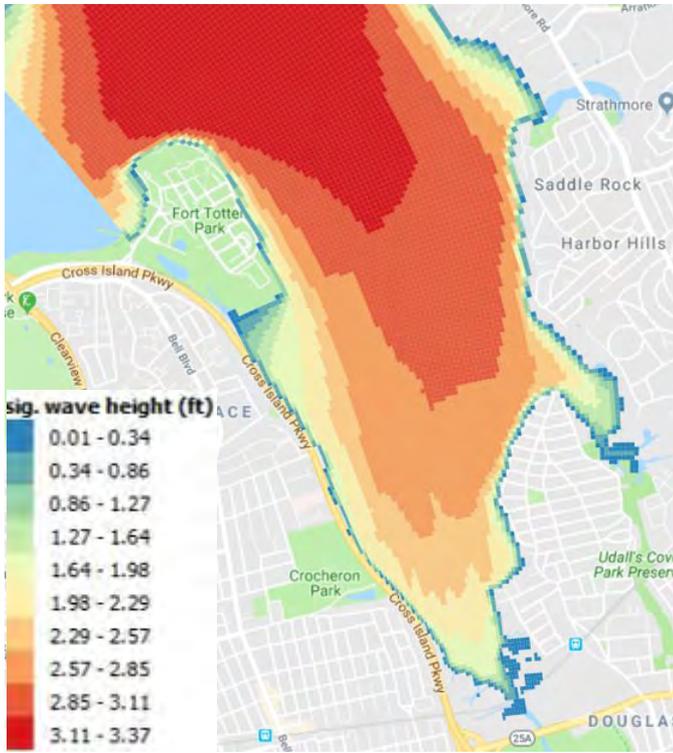
Project goals

- Stabilize and prevent further erosion of existing marsh by dampening wave energy
- Create a protective structure with more ecological function than a breakwater or rock sill
- Provide a toe for the restored marsh
- Restore tidal elevations and re-establish eroded salt marsh



Pre-restoration site conditions (Nov 2020)

Site analysis

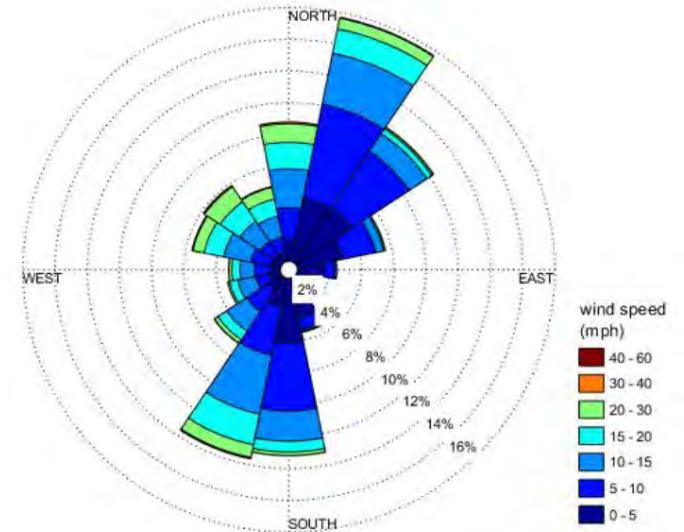


- Design wave height was 100-year joint probability windspeed from 330 degrees that results in a 1.0-2.6 feet wave height



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Wind Rose, Annual, 2004-2018
NOAA Station KPTN6, King's Point, NY



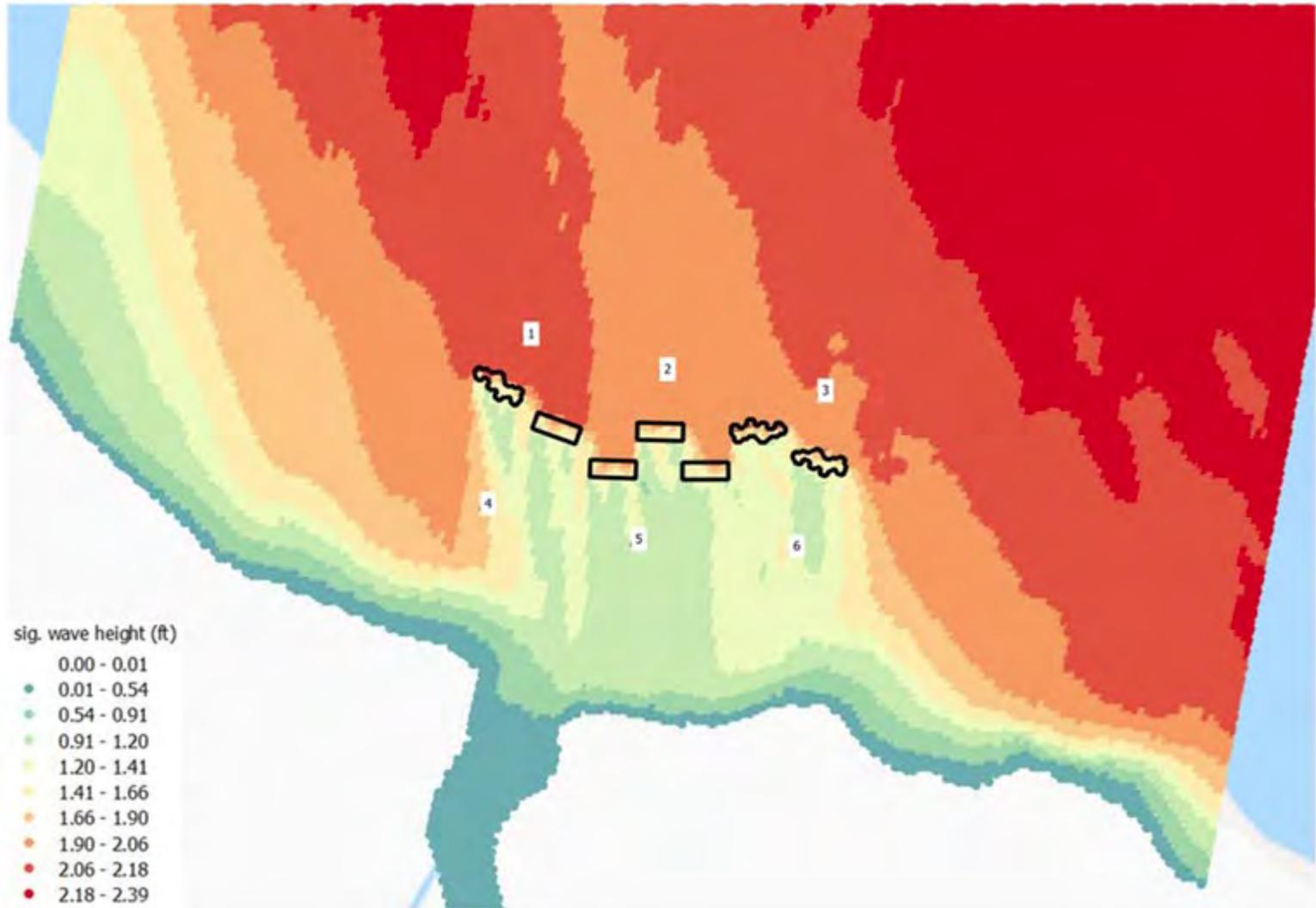
Wind events w/ astronomic tide

Return period	Wind speed	Sig. wave height	Peak wave period	Water level
yr	mph	ft	s	ft MSL
1	43.7	2.0	3.2	4.4
5	49.5	2.1	3.2	4.5
10	51.7	2.2	3.3	4.5

Design considerations

- Avoid a toe that armors the site around the full perimeter of the restoration
 - Wanted a lower impact toe
 - Allow for movement of horseshoe crabs and other wildlife
- Transplant some material and evaluate efficacy
- Sediment placement on existing marsh (particularly in between hummocks) is necessary to meet grade
- +++

Design considerations



Biobenchmarks

Updated: 08/19/2019 All elevations in feet relative to NAVD88.

TIDAL DATUM	NYCDPR BIO-BENCHMARK DATA ⁽¹⁾	KINGS POINT TIDE GAGE	PROPOSED PLANT ZONES	PROPOSED PLANT ZONE ELEVATION RANGES
MEAN HIGHER HIGH WATER (extent of HM)	4.96	3.64	HIGH MARSH	3.5-5.0
MEAN HIGH WATER (avge SPPA)	3.76	3.28	HIGH MARSH / LOW MARSH TRANSITION	3.5-4.0
MEAN HIGH WATER (lowest SPPA)	3.25			
MEAN HIGH WATER (highest SPAL)	3.94			
MEAN HIGH WATER (avge SPAL)	1.37			
MEAN TIDE LEVEL (lowest SPAL)	-1.72	-0.3	LOW MARSH	1.5-3.5
MEAN LOW WATER		-3.88	[MUDFLAT]	

All elevations in ft. NAVD88.

(1) Derived from NYCDPR biobenchmark survey with RTK (ES, CH, KA) on 12/17/18

Construction – Phase 1



Construction – Phase 2



Monitoring Methods

Metric	Method	Data
Vegetation	Percent cover, <i>Spartina alterniflora</i> stem density & stem diameter, stem height, mapping plant loss	Plant survival, fauna recruitment, habitat condition
Epifauna	Count snails, mussels, and crabs	
Elevation	Survey grade GPS (RTK)	Elevation and sand fill change, subsidence, erosion, accretion

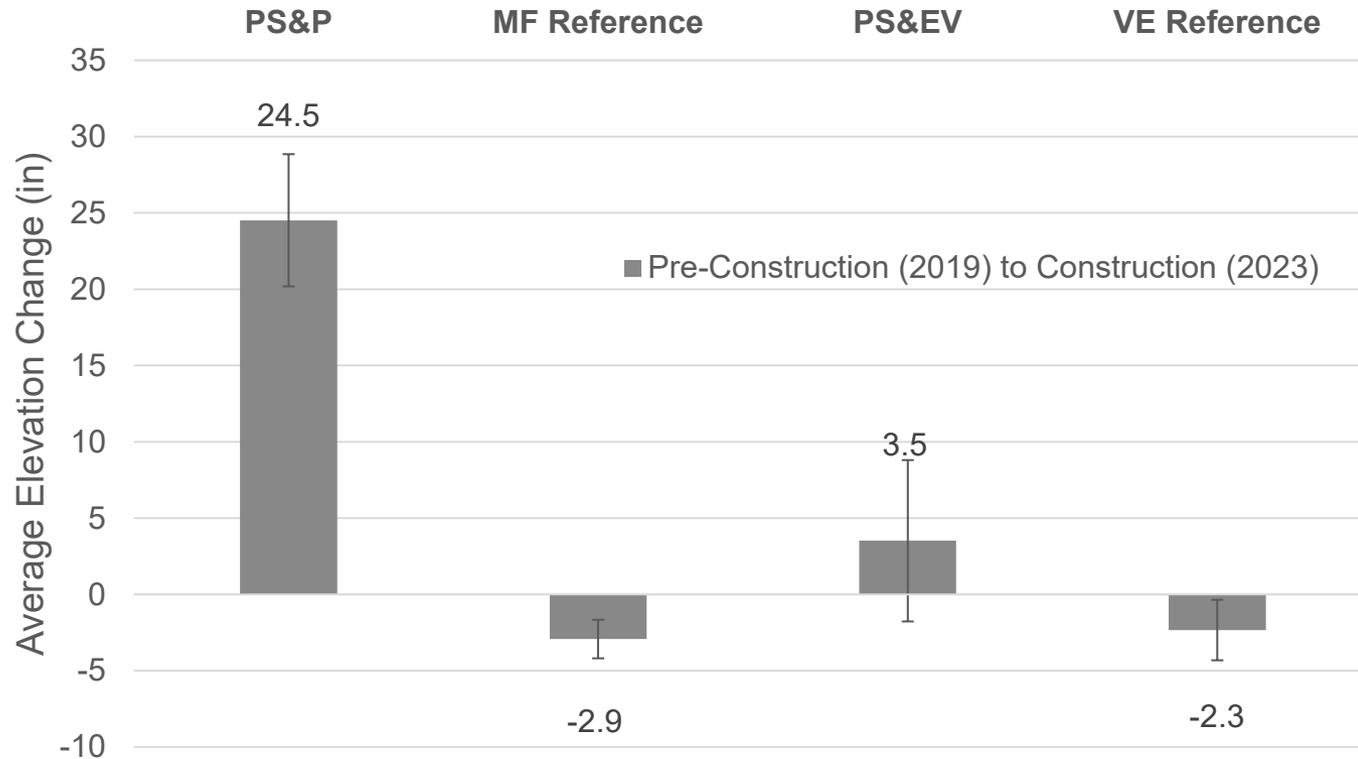
Sampling design: 15-1m² plots in high marsh, 15-1m² plots in low marsh in the restored site and a reference site

Analysis: Analysis of variance (ANOVA) comparing across sampling areas

Outcomes: Determine if adaptive management is needed to improve site condition (additional planting, erosion control, debris removal, fence repair)



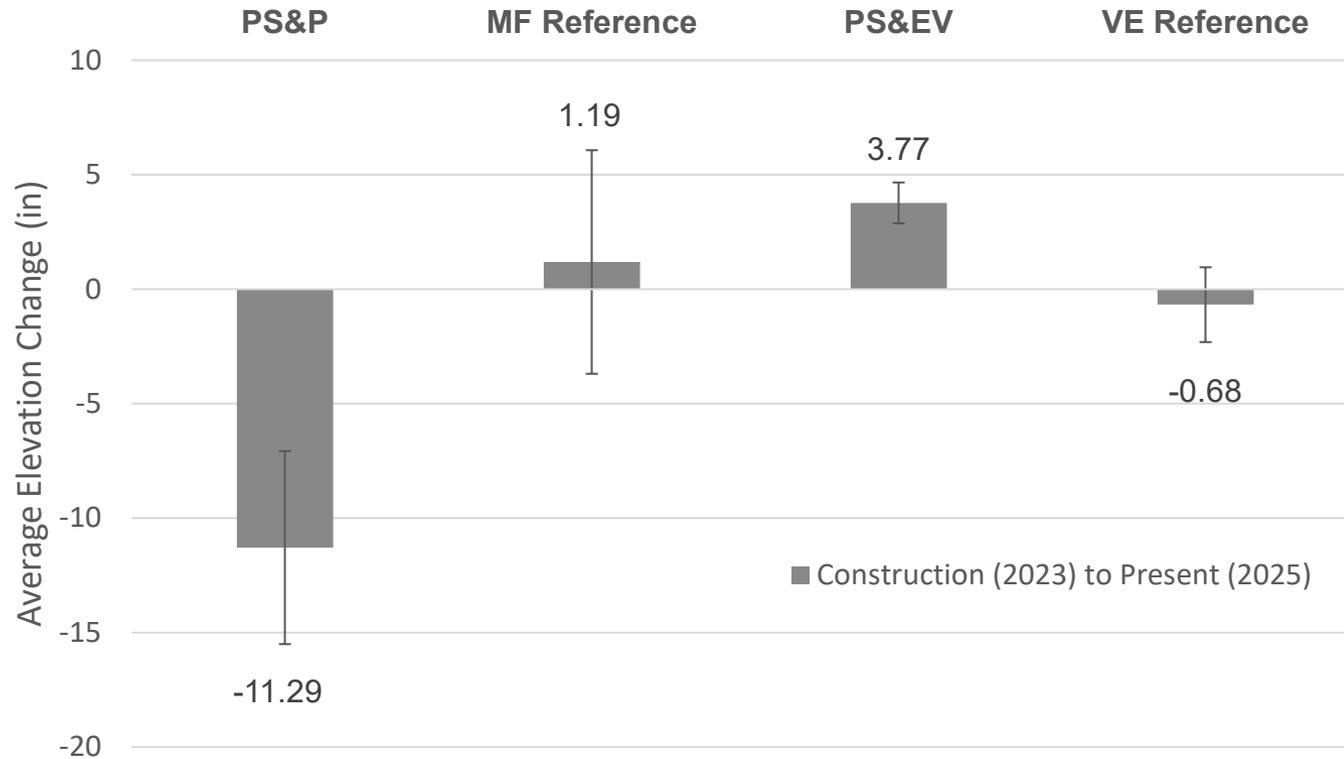
Post-construction sand placement results: 2019 to 2023



Average elevation change in inches by monitoring area from 2019 (pre-construction) to 2023 (year of construction). PS&P= Placed Sand and Planted, PS&EV= Placed Sand and Existing Vegetation, MF = mudflat, VE= Vegetated Edge.

- Post-construction, the elevation of the more waterward section of the site (placed sand and planted) increased by 24 inches while the landward section of the site (placed sand and existing vegetated edge) has increased by over three inches.
- Reference site elevation decreased slightly (~2-3 inches on average)

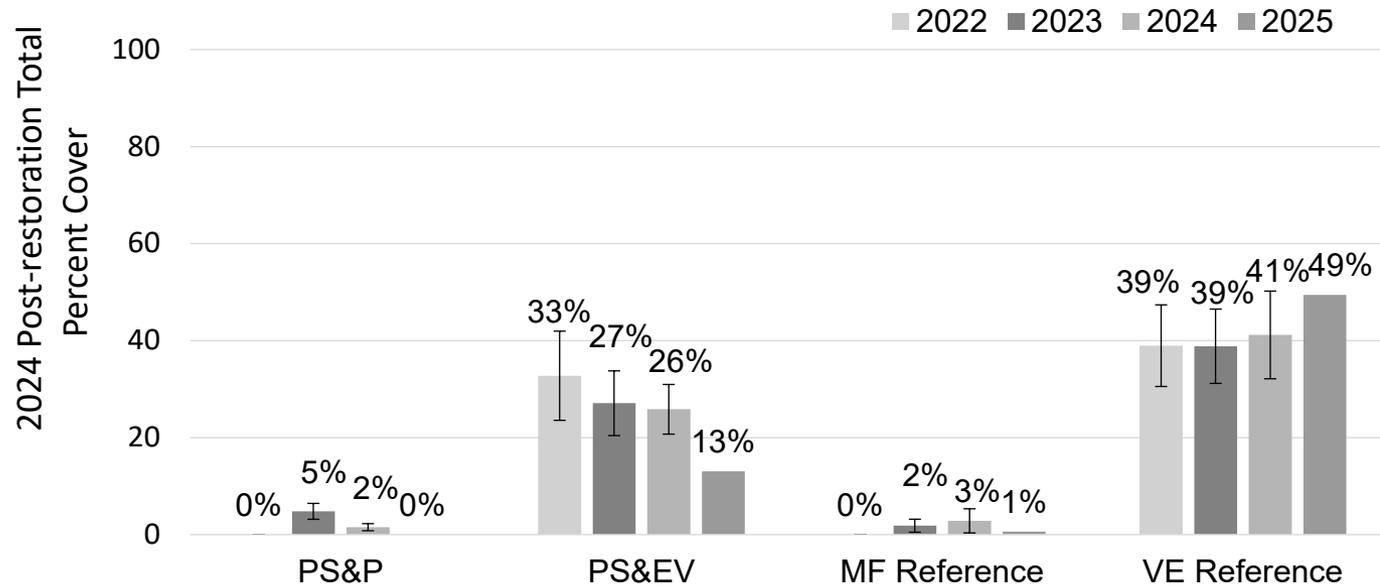
Post-construction sand placement results: 2023 to 2025



Average elevation change in inches by monitoring area from 2023 (year of construction) to 2025 (present). PS&P= Placed Sand and Planted, PS&EV= Placed Sand and Existing Vegetation, MF = mudflat, VE= Vegetated Edge.

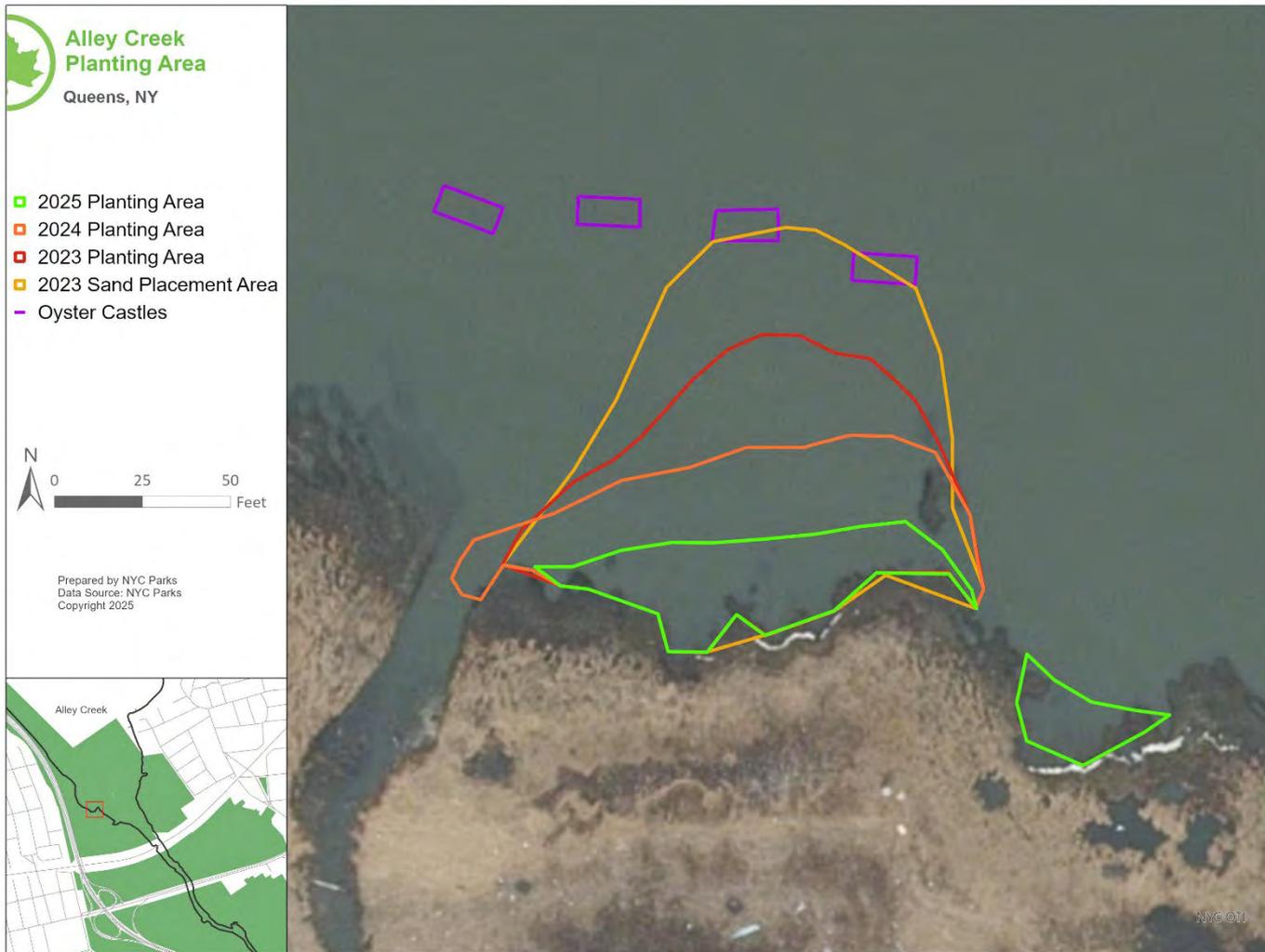
- Post-construction, the elevation of the more waterward section of the site (placed sand and planted) has decreased by 11 inches while the landward section of the site (placed sand and existing vegetated edge) has increased by over three inches.
- Reference sites are generally stable (+/- 1 inch on average)

Post-construction sand placement results



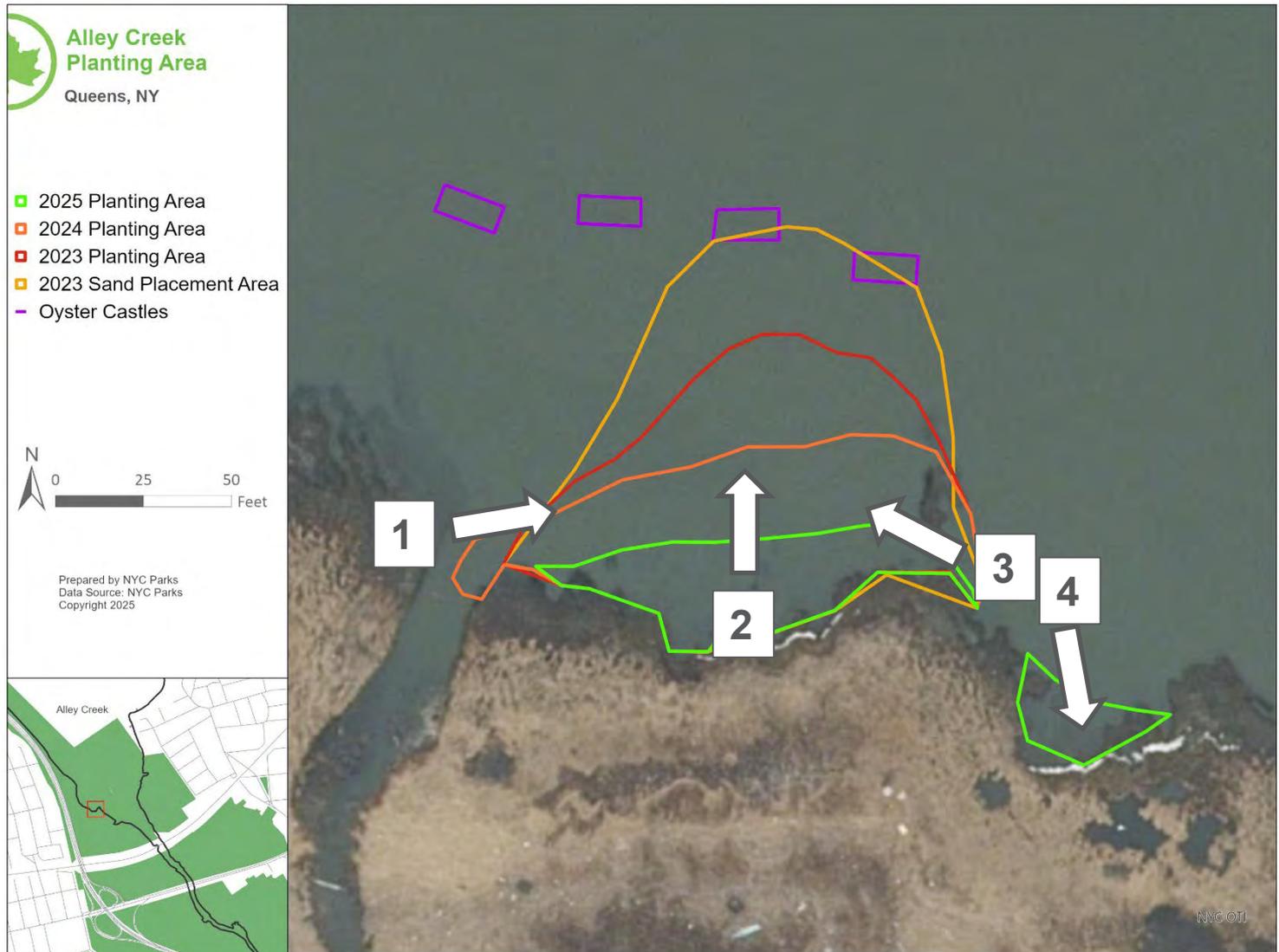
- Vegetation cover remains higher in reference sites
- Vegetation cover is higher in sites with placed sand sites on existing vegetation vs sand placed on mudflat

Post-construction sand placement results



- Planting area (above EI 0.5ft) shifting landward and long the shoreline
- Adaptive management – follow the sand and plant in higher areas – new planting areas along shoreline where sand has accumulated

Site photos



1

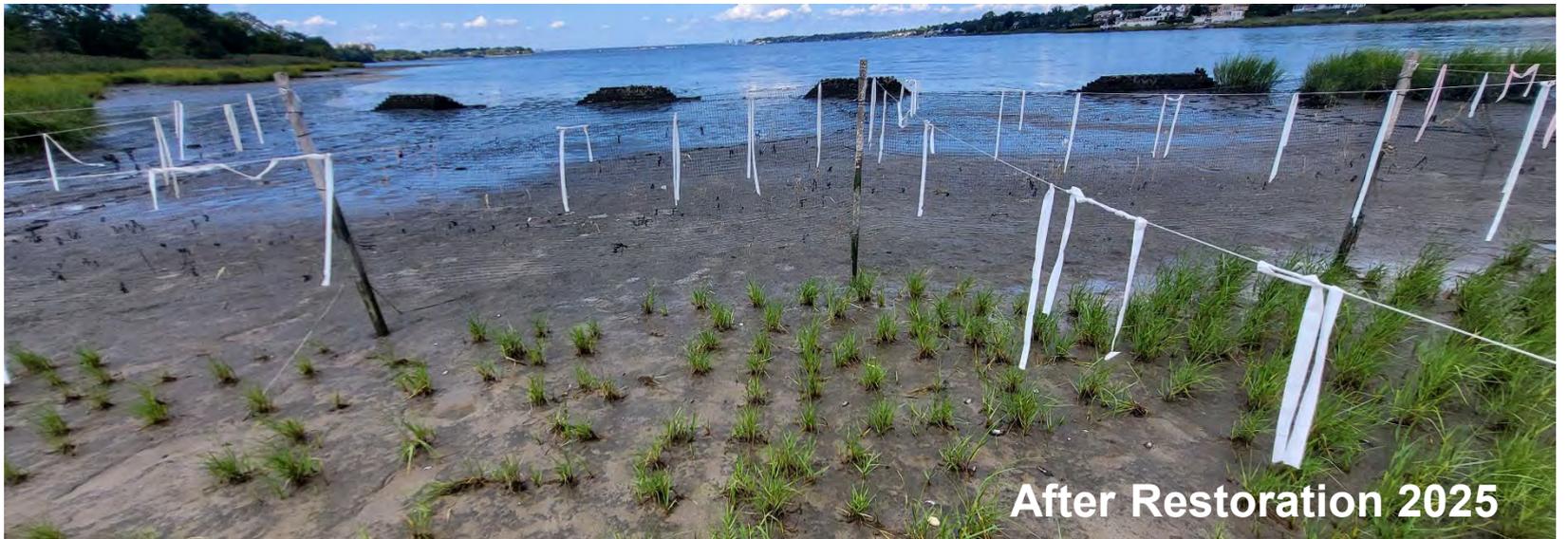




Before Restoration 2022



After Restoration 2023



After Restoration 2025

3



Before Restoration 2020



After Restoration 2023



After Restoration 2025





After Restoration – Winter 2025



After Restoration – Spring 2025



After Restoration- Summer 2025

1



During Restoration – Summer 2023



Ice in Winter 2025



Post-Restoration 2025

3



After Restoration 2023



Ice in Winter 2025



After Restoration 2025



Adaptive Management

Plant survival

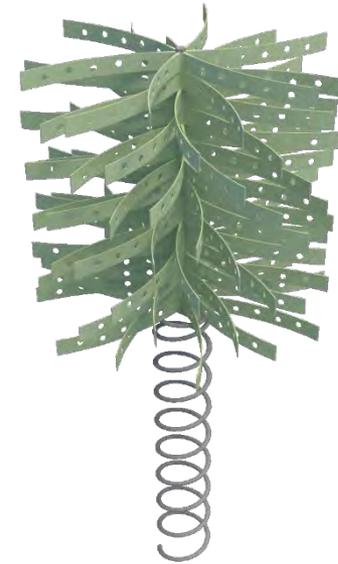
- Maintain goose fence (if possible) – ice scour impacts fence in winter
- Follow sand – plant in new locations where sand had accumulated

Sand movement

- Successful multi season plant establishment
- Experiment with Marsh Guards
- Experiment with Christmas tree fascines (used at West Pond in Jamaica Bay)

Future projects

- Need larger energy dissipation structures closer to the placement site
- Use more coarse sand/ avoid using very fine sand
- Potentially select sheltered/less exposed sites – consider winter ice scour
- Include using marsh guards or fascines while plants establish



Marsh Guard from Coastal Technology Corp.



JBRPC Christmas tree fascines at West Pond in Jamaica Bay

Lessons Learned

- Existing plants grew through thinner areas of sand (~6 inches)
- Crabs, snails, and birds are present in the site post-restoration
- Coir log effective at containing sand
- Pumping sand slurry from an upland location would have been a preferred implementation approach in a natural setting
- Don't forget to permit marine debris removal in adaptive management

Thank you!

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