

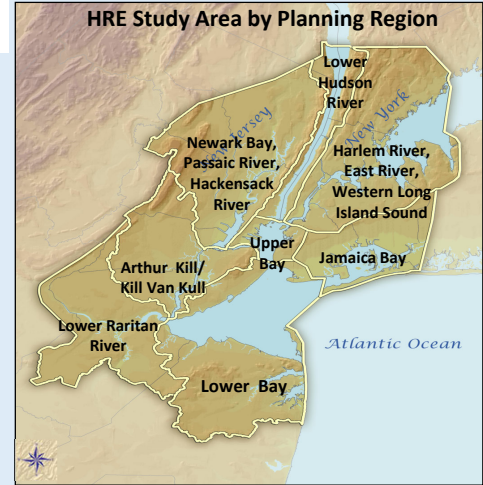
Hudson Raritan Estuary (HRE) Ecosystem Restoration Project, New York and New Jersey

Integration of six feasibility studies (four authorizations) with ten sponsors/partners:

- HRE (8 Planning Regions)
- HRE - Lower Passaic River
- HRE – Hackensack Meadowlands
- Flushing Creek and Bay
- Bronx River Basin
- Jamaica Bay Marine Park, and Plumb Beach



1



Purpose: The purpose of the study was to **restore significant ecological function, structure, and dynamic process** that have been degraded throughout the Hudson Raritan Estuary. Restoration is needed due to the long-term historic habitat degradation and loss via urbanization and industrialization.

Nationally Significant Estuary

2

Institutional Significance:

- Estuary of National Importance- National Estuary Program
- Ecosystems of National Significance
- One of the largest estuaries in the U.S
- Second largest Port in the U.S.
- HRE Comprehensive Restoration Plan (Regional Goals)
- Regionally Significant Coastal Habitat
- Migratory Bird Treaty Act
- Urban Waters Federal Partnership (Passaic & Bronx Rivers)
- National Estuarine Research Reserve System

Technical Significance:

- Wetland habitat is extremely scarce and actively declining nationally (99% freshwater >85% of estuarine wetlands)
- Provides habitat for 27 Federally-listed species of special status, 2 candidate species, 400 plant and animal species of special emphasis
- Atlantic Flyway - stop-over point for >500 avian species



Public Significance:

- Home to over 13 million people
- Collaboration with over 120 federal and state agencies, academic institutions, nonprofit and community organizations to restore the HRE

Key Problems

3



Lost/Degraded Wetlands



Disappearing Marsh Islands



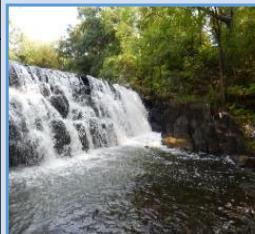
Hardened Shorelines

- Significant habitat loss within study area:
>85% estuarine wetlands lost
> 99% freshwater wetlands lost
~2,000 acres of marsh islands in Jamaica Bay lost
- Filled, eroded, and hardened shorelines
- Loss of ~100% of oyster reefs
- Barriers to fish passage impede spawning and access to habitat
- Scarce habitat and lack of connectivity
- Bed and bank erosion
- Decrease in habitat diversity
- Increase in invasive species
- Poor benthic habitat
- Altered hydrology degrades habitat
- Straightened and deepened channels degrade habitat
- Loss of >95% of eelgrass beds
- Poor sediment and water quality

Objectives

4

1. Restore the structure, function, and connectivity, and increase the extent of **estuarine habitat**.
2. Restore the structure and function, and increase the extent of **freshwater riverine habitat**.
3. Restore the structure and function, and increase the extent of **marsh island habitat** in Jamaica Bay.
4. Increase the extent of **oyster reefs**.



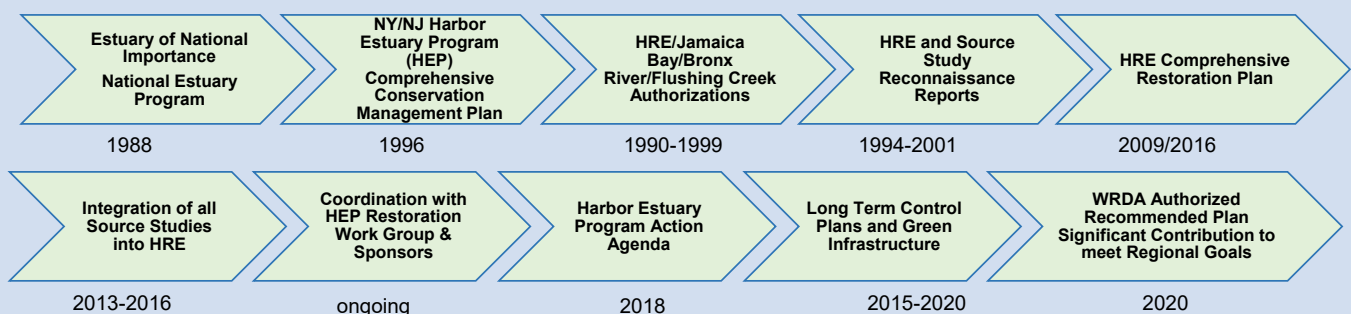
Fish Passage Barriers



Degraded/Eroding Shorelines

Comprehensive Restoration Strategy

5

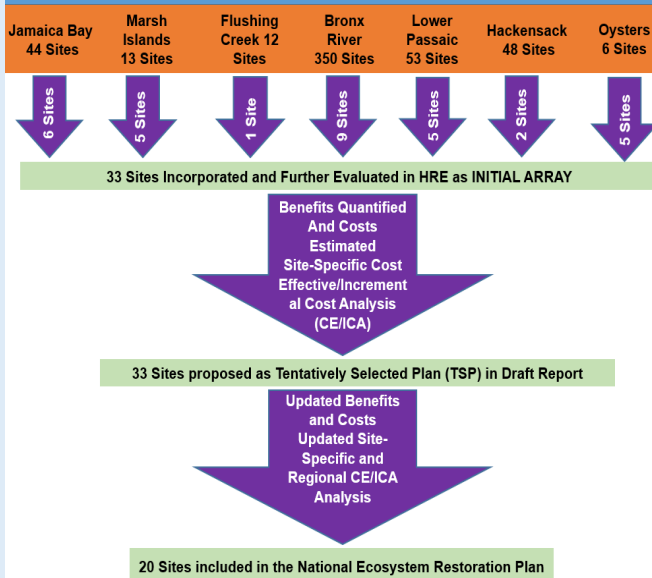


U.S. ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT



Hudson-Raritan Estuary Ecosystem Restoration Study

500+ Restoration sites originating from the Comprehensive Restoration Plan (CRP), USACE "source" studies, and the New York-New Jersey Harbor & Estuary Program Restoration Work Group



- Site Screening of 500+ Sites among the 6 "source" studies
- Criteria (including physical constraints, known upland contamination, real estate, sponsor readiness, habitat value, etc.)
- 99 Alternatives were developed at 33 sites
- Management Measures considered: excavation, invasives removal, regrading, native plantings, stream bed restoration, in-stream structures (j-hooks, cross vanes), streambank reestablishment, channel dredging, oyster reefs, fish ladders
- Cost estimated/benefits quantified with approved models including Evaluation of Planned Wetlands, Oyster Habitat Suitability Model and Watershed Scale Connectivity Toolkit
- Plan Evaluation and Comparison: Site and Regional (1,256 plans) Cost Effectiveness/Incremental Cost Analysis, planning objectives, secondary decision factors
- 20 Sites Recommended for construction

Environmental Compliance- 2020

- ✓ Environmental Assessment completed
- ✓ All coordination completed (Endangered Species Act, Fish and Wildlife Coordination Act Report, Essential Fish Habitat)
- ✓ Section 106, Programmatic Agreement
- ✓ Preliminary Water Quality Certificates and Coastal Zone Consistency
- ✓ Supported by State and Federal Resource Agencies

7

The Recommended Plan

- The **National Ecosystem Restoration (NER) Plan** is the restoration of **20 restoration sites** within the HRE that address long-term and large-scale degradation of aquatic habitat.
- Restoration supports Comprehensive Restoration Plan's regional goal, "to develop a mosaic of habitats that provides society with renewed and increased benefits from the estuary environment".
- **NER Plan** provides restoration of approximately:
 - ✓ 381 acres of **estuarine wetlands** including 16 acres/30,650 linear feet of tidal channels;
 - ✓ 50 acres of **freshwater riverine wetlands**;
 - ✓ 27 acres of **maritime forest/uplands**;
 - ✓ 39 acres of **shallow water habitat**;
 - ✓ 52 acres of **oyster habitat**;
 - ✓ 1.6 miles of **streambank restoration**;
 - ✓ 72 acres of **bed and channel restoration**; and
 - ✓ **Two fishways** would be installed and three weirs would be modified to re-introduce or **expand fish passage (24 miles)** along the Bronx River.
- **Future spin-off feasibility studies** to be carried out under the existing HRE authority.



Cost Summary (FY25 Price Levels)

8

Project Total First Cost	\$542,909,000	Project Total Fully Funded Cost	\$720,799,000
Project Total Fully Funded Federal Cost (65%)	\$468,519,350	Project Total Non-Federal Share (35%)	\$252,279,650

Costs for each HRE Site in Following Table

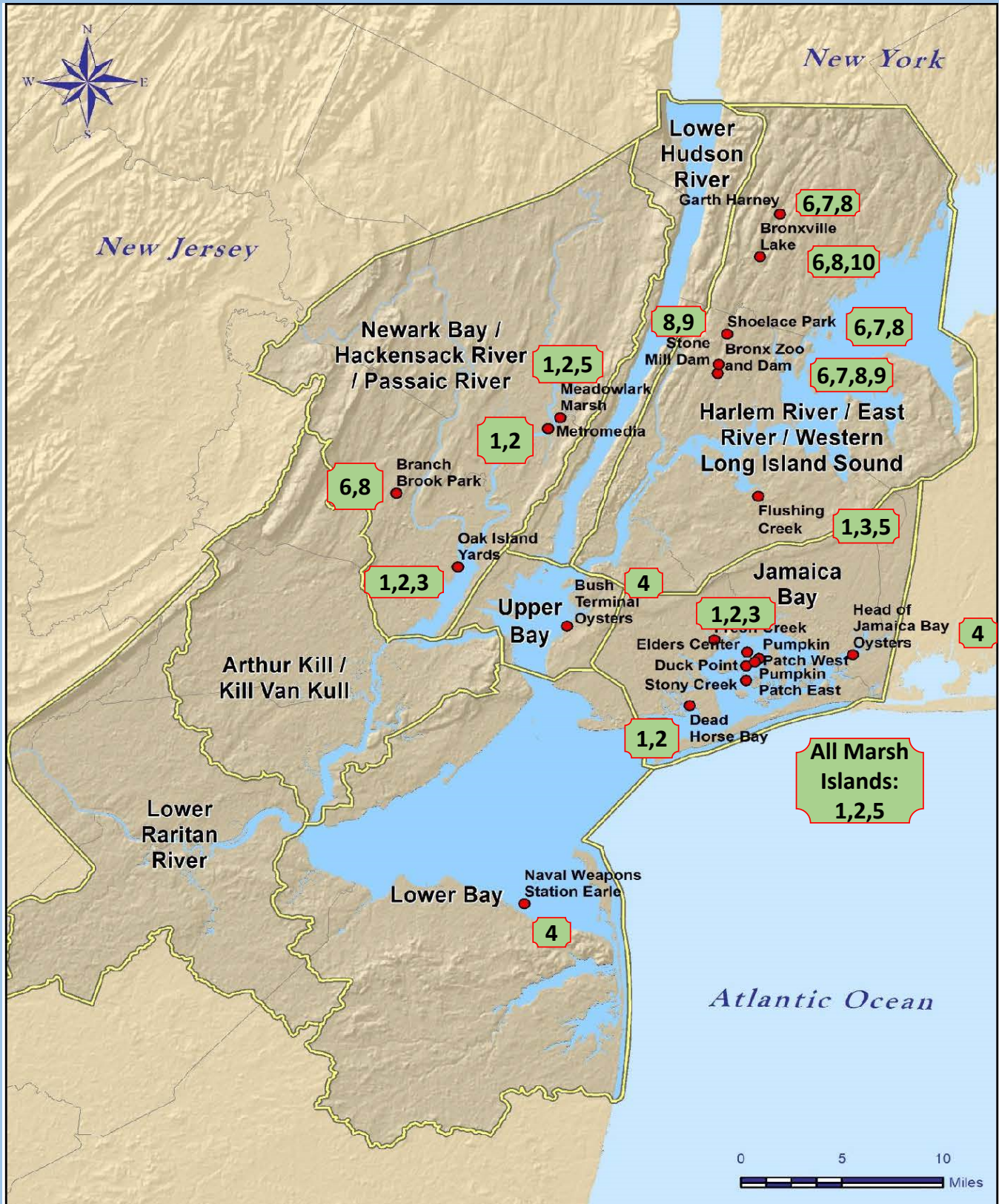
Significance of Recommended Plan

9

621 Total Acres of Nationally Significant Habitat Restored

- Restoration of 431 acres of wetland habitat that is extremely scarce and actively declining nationally
- Habitat supports 27 Federally-listed species
- Key stop-over points for migratory birds (>500 species) along the Atlantic Flyway
- Estuarine marshes/wetlands serve as nursery, feeding, spawning sites and refuge to predators
- Reconnecting scarce and fragmented habitat
- Connectivity for migratory fish (anadromous and catadromous)
- Marsh island restoration of 175 acres of habitat in Jamaica Bay to counteract the loss of >2,000 acres providing ecosystem benefits and secondary coastal storm risk management benefits to coastal communities

Recommended Sites and Measures/Habitat Type at Each Site



Restoration Measures/Habitat Types

- | | |
|------------------------------|---------------------------|
| 1. Estuarine Wetlands | 6. Freshwater Wetlands |
| 2. Tidal Channel Restoration | 7. Streambank Restoration |
| 3. Maritime Forest | 8. Bed Restoration |
| 4. Oyster Reefs | 9. Fish Passage |
| 5. Shallow Water Habitat | 10. Sediment Forebay |

Engineering and Design Phase: 2022- Stony Creek Marsh Island, Flushing Creek, Oysters at Naval Station Earle and Bronx Zoo & Dam/Stone Mill Dam Projects; 2024- Fresh Creek Project, Duck Point Marsh Island and Garth Woods/Harney Road

HUDSON RARITAN ESTUARY ECOSYSTEM RESTORATION PROGRAM - AUTHORIZED PROJECTS (FY2025 Price Levels)							
Site	Authorized Project: Habitat Types and Actions (Acres/Linear Feet/Miles)	Local Sponsor	Phase Cost	Total (\$)	Federal (65%)(%)	Non-Federal (35%) (\$)	Status
Jamaica Bay Planning Region – Perimeter Sites							
Dead Horse Bay	Low Marsh (19 acres); High Marsh (5.4 acres); Scrub/Shrub (6.2 acres); Upland (8 acres) Tidal Channels (2.31 acres) [Total Habitat: 40.91 acres]	NYCDEP NYSDEC	Total Project	\$73,276,000	\$47,629,400	\$25,646,600	
			Engineering & Design	\$5,594,000	\$3,636,100	\$1,957,900	
			Construction	\$67,682,000	\$43,993,300	\$23,688,700	
Fresh Creek	Low Marsh (16.1 acres); High Marsh (4.4 acres); Scrub/Shrub (3.6 acres); Maritime Forest (10.7 acres); Bed/Channel Restoration (45.08 acres) [Total Habitat: 79.88 acres]	NYCDEP	Total Project	\$52,275,000	\$33,978,750	\$18,296,250	*\$500,000 provided in FY23 Appropriations Bill *DA to be executed in FY24
			Engineering & Design (FY24)	\$5,000,000	\$3,250,000	\$1,750,000	
			Construction	\$47,275,000	\$30,728,750	\$16,546,250	
Total Cost:				\$125,551,000	\$81,608,150	\$43,942,850	
Jamaica Bay Planning Region – Marsh Islands							
Stony Creek	Low Marsh (26 acres); High Marsh (22.5 acres); Scrub/Shrub (3.49 acres); Tidal Channels (1.43 acres); Shallows (8.67 acres) [Total Habitat 62.09 acres using 151,360 CYD of dredge material]	NYCDEP	Total Project	\$31,257,000	\$20,317,050	\$10,939,950	* Funding provided in FY22 Appropriations Bill (\$300,000) and Bipartisan Infrastructure Law (BIL) (\$19,461,500) *DA executed 7/28/22 *30% designs completed
			Engineering & Design (FY22)	\$3,182,300	\$2,068,495	\$1,113,805	
			Construction	\$28,074,700	\$18,248,555	\$9,826,145	
Duck Point	Low Marsh (24.9 acres); High Marsh (5.6 acres); Scrub/Shrub (8.1 acres); Tidal Channels (1.03 acres); Shallows (7.57 acres) [Total Habitat: 47.2 acres using 213,776 CYD of dredge material]	NYCDEP	Total Project	\$31,772,000	\$20,651,800	\$11,120,200	*Funding provided (\$2,750,000) by the BIL FY23 Summer Spend Plan *DA to be executed in FY24
			Engineering & Design (FY24)	\$3,500,000	\$2,275,000	\$1,225,000	
			Construction	\$28,272,000	\$18,376,800	\$9,895,200	
Pumpkin Patch West	Low Marsh (13.7 acres); High Marsh (8.61 acres); Scrub/Shrub (.9 acres); Tidal Channels (0.74 acres); Shallows (3.88 acres) [Total Habitat: 27.83 acres using 327,686 CYD of dredge material]	NYCDEP	Total Project	\$35,974,000	\$23,383,100	\$12,590,900	
			Engineering & Design	\$3,882,000	\$2,523,300	\$1,358,700	
			Construction	\$32,092,000	\$20,859,800	\$11,232,200	
Pumpkin Patch East	Low Marsh (15.6 acres); High Marsh (10.1 acres); Scrub/Shrub (3.1 acres); Tidal Channels (0.58 acres); Shallows (5.22 acres) [Total Habitat: 34.6 acres using 351,952 CYD of dredge material]	NYCDEP	Total Project	\$42,782,000	\$27,808,300	\$14,973,700	
			Engineering & Design	\$4,259,000	\$2,768,350	\$1,490,650	
			Construction	\$38,523,000	\$25,039,950	\$13,483,050	
Elders Center	Low Marsh (15.2 acres); High Marsh (10.9 acres); Scrub/Shrub (1.4 acres); Tidal Channels (0.95 acres); Shallows (5.49 acres) [Total Habitat: 33.94 acres using 284,891 CY of dredge material]	NYCDEP	Total Project	\$33,628,000	\$21,858,200	\$11,769,800	
			Engineering & Design	\$3,389,000	\$2,202,850	\$1,186,150	
			Construction	\$30,239,000	\$19,655,350	\$10,583,650	
Total Cost:				\$175,413,000	\$114,018,450	\$61,394,550	

HUDSON RARITAN ESTUARY ECOSYSTEM RESTORATION PROGRAM - AUTHORIZED PROJECTS (FY2025 Price Levels)							
Site	Authorized Project: Habitat Types and Actions (Acres/Linear Feet/Miles)	Local Sponsor	Phase Cost	Total (\$)	Federal (65%)(%)	Non-Federal (35%) (\$)	Status
East River, Harlem River and Western Long Island Sound Planning Region							
Flushing Creek	Low Marsh (9.76 acres); High Marsh (2.47 acres); Scrub/Shrub (1.8 acres); Maritime Forest (3.89 acres); Shallows (1.37 acres)[Total Habitat = 19.29 acres]	NYCDEP	Total Project	\$22,002,000	\$14,301,300	\$7,700,700	* Funding provided in FY22 Appropriations Bill (\$300,000) and BIL (\$2,428,700) *DA executed 7/28/22 *Field sampling in Progress
			Engineering & Design (FY22)	\$4,198,000	\$2,728,700	\$1,469,300	
			Construction	\$17,804,000	\$11,572,600	\$6,231,400	
Bronx Zoo & Dam/Stone Mill Dam	Bronx Zoo & Dam: Emergent Wetlands (1.16 acres); Forested Scrub/Shrub Wetland (0.48 acres); Invasives Removal/Native Plantings (0.42 acres); Streambank (750 linear feet); Fish Passage Opening (0.8 river miles opened) [Total Habitat: 2.06 acres]		Total Project	\$22,631,000	\$14,357,850	\$7,731,150	*Funding provided in FY22 Appropriations Bill (\$300,000) and BIL (\$2,912,300) *DA executed 7/29/22 *Engineering Documentation Report 2/24
		NYC Parks	Engineering & Design (FY22)	\$4,942,000	\$3,212,300	\$1,729,700	
	Stone Mill Dam: nvasive Removal/Native Planting (.03 acres); Bed Restoration (0.5 acres); Fish Passage Opening (~7 river miles opened +16 miles following upstream weir modifications) [Total Habitat: 0.53]		Construction	\$17,689,000	\$11,497,850	\$6,191,150	
Shoelace Park	Emergent Wetland (2.07 acres); Forested Scrub/Shrub Wetland (1.1 acres); Invasives Removal/Native Planting (7.9 acres); Bed Restoration (5.7 acres); Streambank (7,415 linear feet) [Total Habitat: 16.77 acres]	NYC Parks	Total Project	\$32,104,000	\$20,867,600	\$11,236,400	
			Engineering & Design	\$4,977,000	\$3,235,050	\$1,741,950	
			Construction	\$27,127,000	\$17,632,550	\$9,494,450	
Bronxville Lake	Emergent Wetland (0.86 acres); Forested Scrub/Shrub Wetland (2.49 acres); Invasives Removal/Native Planting (1.39 acres); Bed Restoration (0.65 acres); Sediment Forebay (0.3 acres) [Total Habitat: 5.69 acres]	Westchester County	Total Project	\$26,095,000	\$16,961,750	\$9,133,250	
			Engineering & Design	\$4,726,000	\$3,071,900	\$1,654,100	
			Construction	\$21,369,000	\$13,889,850	\$7,479,150	
Garth Woods - Harney Road	Emergent Wetland (0.82 acres); Wet Meadow (1.67 acres); Forested Scrub/Shrub Wetland (0.57 acres); Invasive Removal/ Native Planting (1.63 acres); Bed Restoration (2.19 acres); Streambank (200 linear feet) [Total Habitat: 6.88 acres]	Westchester County	Total Project	\$15,308,000	\$9,950,200	\$5,357,800	*\$500,000 provided in BIL FY23 Summer Spend Plan *DA to be executed in FY24
			Engineering & Design (FY24)	\$3,620,000	\$2,353,000	\$1,267,000	
			Construction	\$11,688,000	\$7,597,200	\$4,090,800	
Total Cost:				\$118,140,000	\$76,438,700	\$41,159,300	

HUDSON RARITAN ESTUARY ECOSYSTEM RESTORATION PROGRAM - AUTHORIZED PROJECTS (FY2025 Price Levels)							
Site	Authorized Project: Habitat Types and Actions (Acres/Linear Feet/Miles)	Local Sponsor	Phase Cost	Total (\$)	Federal (65%)(%)	Non-Federal (35%) (\$)	Status
Newark Bay, Hackensack River and Passaic River Planning Region							
Oak Island Yards	Low Marsh (5.32 acres); High Marsh (0.85 acres); Scrub/Shrub (0.44 acres); Maritime Forest (2.85 acres); Tidal Channel Restoration (1.36 acres) [Total Habitat: 10.82 acres]	NJDEP	Total Project	\$28,641,000	\$18,616,650	\$10,024,350	
			Engineering & Design	\$4,239,000	\$2,755,350	\$1,483,650	
			Construction	\$24,402,000	\$15,861,300	\$8,540,700	
Essex County Branch Brook Park	Emergent Wetland Creation (10.25 acres); Forested Scrub/Shrub Wetland (8.8 acres); Invasives Removal/Native Planting (8.91 acres); Bed Restoration (18.09 acres) [Total Habitat: 46.05 acres]	NJDEP	Total Project	\$93,543,000	\$60,802,950	\$32,740,050	
			Engineering & Design	\$5,016,000	\$3,260,400	\$1,755,600	
			Construction	\$88,527,000	\$57,542,550	\$30,984,450	
Metromedia Tract	Low Marsh (26.5 acres); High Marsh (11.7 acres); Scrub/Shrub (13.8 acres); Tidal Channel Restoration (2.79 acres); Shallows (6.51 acres) [Total Habitat: 61.3 acres]	NJDEP NJSEA*	Total Project	\$79,006,000	\$51,353,900	\$27,652,100	
			Engineering & Design	\$5,283,000	\$3,433,950	\$1,849,050	
			Construction	\$73,723,000	\$47,919,950	\$25,803,050	
Meadowlark Marsh	Low Marsh (56.2 acres); High Marsh (6.5 acres); Scrub/Shrub (5.4 acres); Tidal Channel Restoration (4.6 acres) [Total Habitat: 72.7 acres]	NJDEP NJSEA*	Total Project	\$66,199,000	\$43,029,350	\$23,169,650	
			Engineering & Design	\$6,298,000	\$4,093,700	\$2,204,300	
			Construction	\$59,901,000	\$38,935,650	\$20,965,350	
Total Cost:				\$267,389,000	\$173,802,850	\$93,586,150	
Oyster Reef Restoration (Multiple Planning Regions)							
Naval Weapons Station Earle	Oyster restoration with oyster castles, shell and gabions (10.0 acres)	NJDEP NY/NJ Baykeeper*	Total Project	\$12,546,000	\$8,154,900	\$4,391,100	* Funding provided in FY22 Appropriations Bill (\$300,000) and BIL (\$1,175,500) *DA executed 9/14/22 * 30% designs completed
			Engineering & Design (FY22)	\$2,270,000	\$1,475,500	\$794,500	
			Construction	\$10,276,000	\$6,679,400	\$3,596,600	
Bush Terminal	Oyster restoration with spat on shell, oyster castles and gabions (31.9 acres)	NYC Parks NY Harbor School*	Total Project	\$11,192,000	\$7,274,800	\$3,917,200	
			Engineering & Design	\$3,354,000	\$2,180,100	\$1,173,900	
			Construction	\$7,838,000	\$5,094,700	\$2,743,300	
Head of Jamaica Bay	Oyster restoration with spat on shell and gabions (10.1 acres)	NYCDEP	Total Project	\$9,733,000	\$6,326,450	\$3,406,550	
			Engineering & Design	\$3,060,000	\$1,989,000	\$1,071,000	
			Construction	\$6,673,000	\$4,337,450	\$2,335,550	
Total Cost:				\$33,471,000	\$21,756,150	\$11,714,850	

HUDSON RARITAN ESTUARY ECOSYSTEM RESTORATION PROGRAM - AUTHORIZED PROJECTS (FY2025 Price Levels)							
Site	Authorized Project: Habitat Types and Actions (Acres/Linear Feet/Miles)	Local Sponsor	Phase Cost	Total (\$)	Federal (65%)(%)	Non-Federal (35%) (\$)	Status
HRE Program Summary							
Jamaica Bay Planning Region: Perimeter Sites	Low Marsh (35.1 acres); High Marsh (9.8 acres); Scrub/Shrub (9.8 acres); Maritime Forest/Upland (18.7 acres); Tidal Channels (2.31 acres) and Bed/Channel (45.08 acres)[Total Habitat Restoration: 120.79 acres]	NYSDEC NYCDEP		\$125,551,000	\$81,608,150	\$43,942,850	
Jamaica Bay Planning Region: Marsh Islands	Low Marsh (95.4 acres); High Marsh (57.71 acres); Shrub/Scrub (16.99 acres); Tidal Channel Restoration (4.73 acres); Shallows (30.83 acres) Using 1,329,665 CY of dredged material [Total Habitat Restoration: 205.66 acres]	NYCDEP		\$175,413,000	\$114,018,450	\$61,394,550	
Harlem River, East River Western Long Island Sound Planning Region	Low Marsh (9.76 acres); High Marsh (2.47 acres); Scrub/Shrub (1.8 acres); Maritime Forest (3.89 acres); Shallows (1.37 acres); Emergent Wetland (4.91 acres); Wet Meadow (1.67 acres); Forested Scrub/Shrub (4.64 acres); Invasive Removal/Native Planting (11.37 acres); Bed Restoration (9.04 acres); Sediment Forebay (0.30 acres); Fishway Opening (23.70 miles opened); Streambank (8,365 linear feet) [Total Habitat Restoration: 51.22 acres]	NYCDEP NYC Parks Westchester County Planning		\$118,140,000	\$76,438,700	\$41,159,300	
Newark Bay, Hackensack River, and Passaic River Planning Region	Low Marsh (88.02 acres); High Marsh (19.05 acres); Scrub/Shrub (19.64 acres); Maritime Forest (2.85 acres); Tidal Channel Restoration (8.75 acres); Shallows (6.51 acres); Emergent Wetland (10.25 acres); Invasive Removal/Native Planting (8.91 acres); Forested Scrub/Shrub (8.8 acres); Bed Restoration (18.09 acres) [Total Habitat Restoration: 191.57 acres]	NJDEP NJSEA*		\$267,389,000	\$173,802,850	\$93,586,150	
Oyster Reef Restoration	Oyster restoration using spat on shell, gabions, oyster castles or shell [Total Habitat: 52.0 acres]	NJDEP NYC Parks NY/NJ Baykeeper" NY Harbor School*		\$33,471,000	\$21,756,150	\$11,714,850	
All Sites	Low Marsh (228.28 acres); High Marsh (89.03 acres); Scrub/Shrub (48.23 acres); Maritime Forest/Upland (25.44 acres); Emergent Wetland (15.16 acres); Shallows (38.71 acres); Wet Meadow (1.67 acres); Forested Scrub/Shrub (13.44 acres); Invasive Removal/Native Planting (20.28 acres); Tidal Channels (15.79); Channel/Bed Restoration (72.21 acres); Sediment Forebay (0.3 acres); Bank Stabilization (8,365 linear feet); Fish Passage (23.7 miles opened); Oyster Reef (52 acres) [Total Habitat Restored: 620.54 acres]	All		\$719,964,000	\$467,624,300	\$11,120,200	

Engineering and Design Phase Initiated

* Construction Partner

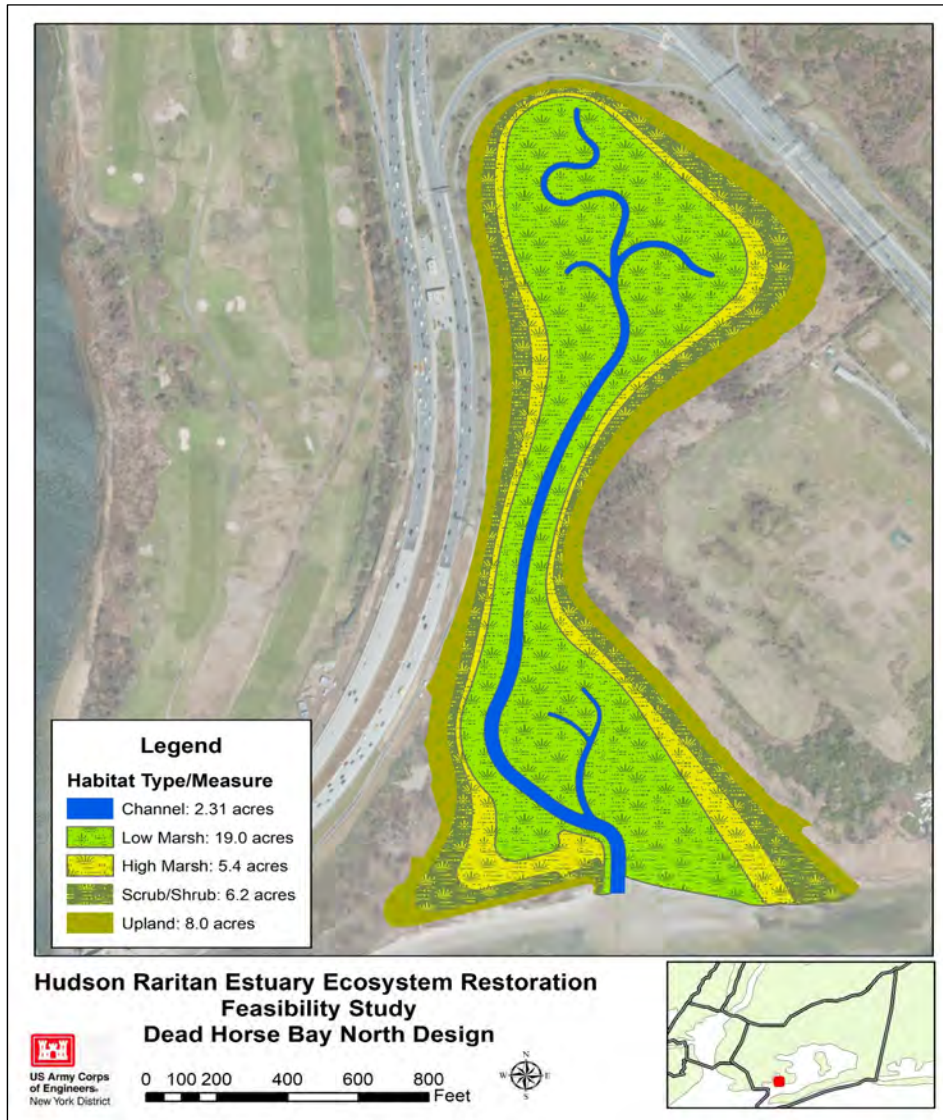
DA: Design Agreement

BIL: Bipartisan Infrastructure Law

Note: Total costs are rounded.

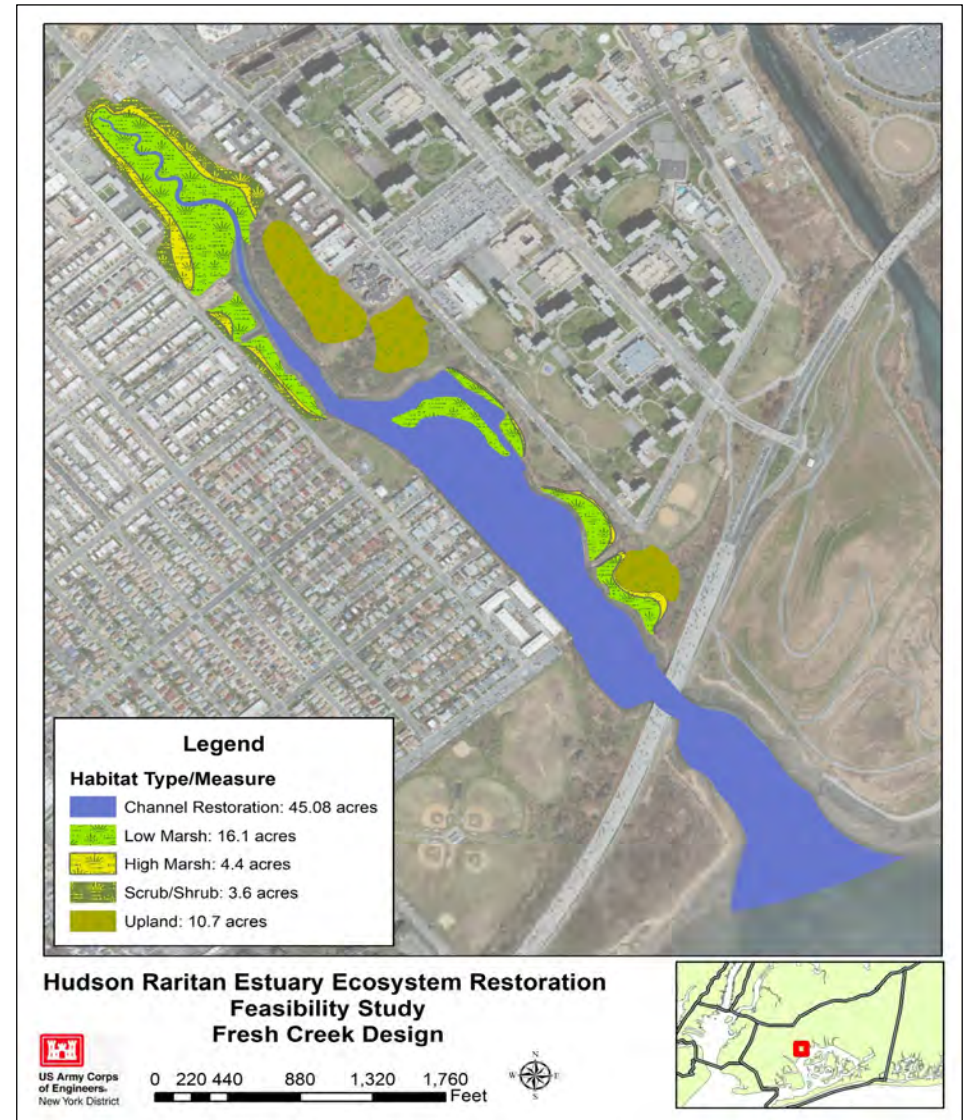
Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Jamaica Bay Perimeter Sites

Dead Horse Bay



40.91 acres of Habitat Restoration

Fresh Creek



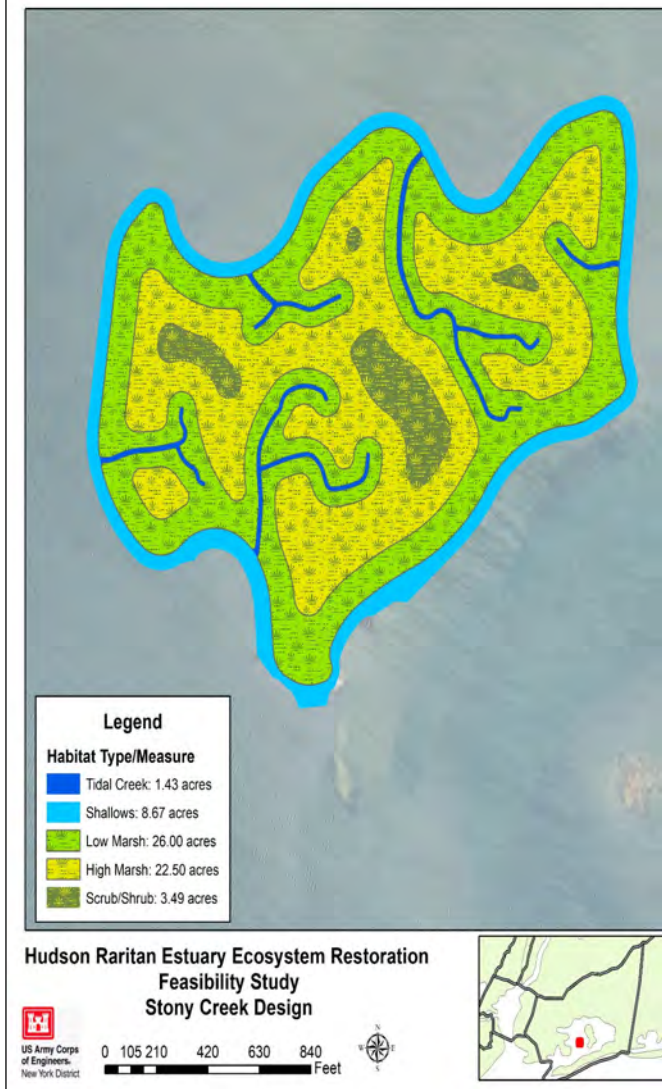
79.88 acres of Habitat Restoration
Engineering and Design Initiated 2023

Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Jamaica Bay Marsh Island Sites

Duck Point



Stony Creek



Pumpkin Patch West



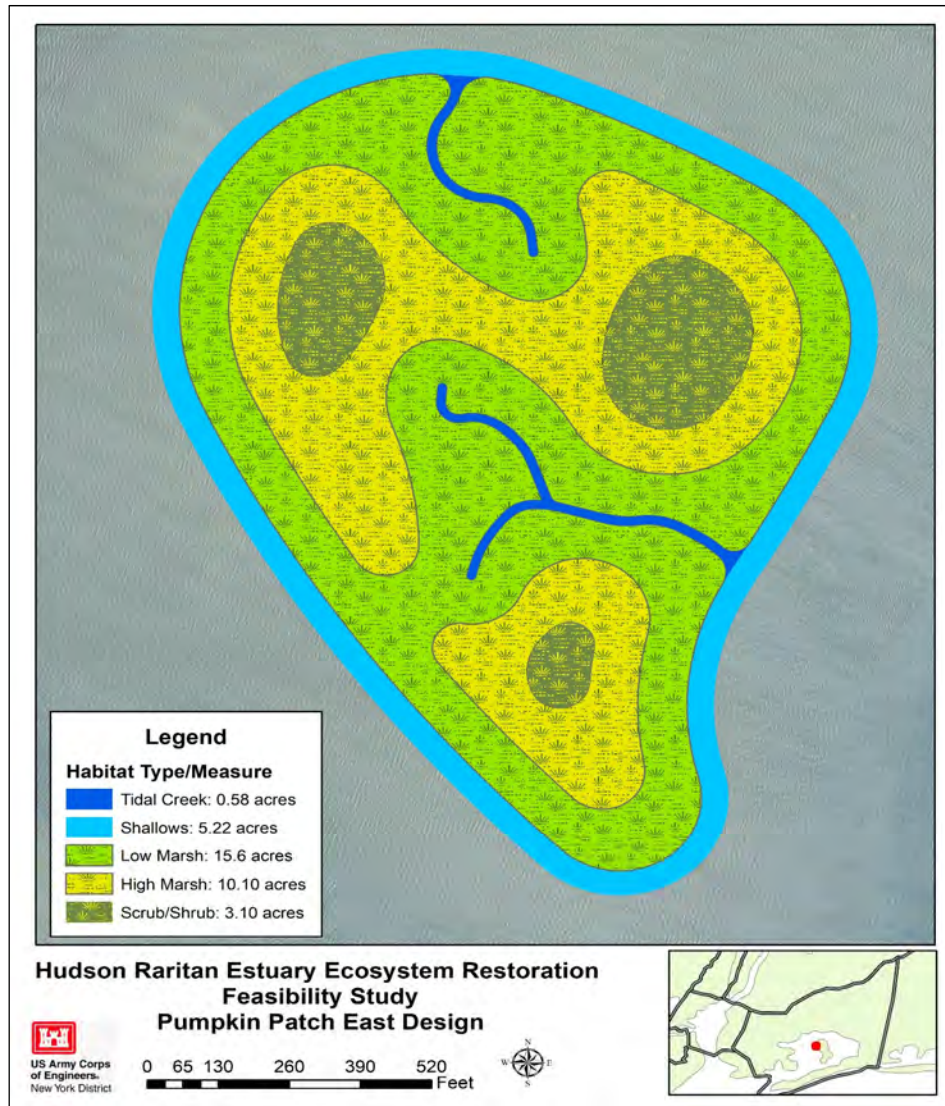
39.63 acres of Habitat Restoration using
213,776 CY of dredged material

62 acres of Habitat Restoration using
151,360 CY of dredged material
Engineering and Design Initiated 2022

23.95 acres of Habitat Restoration using
327,686 CY of dredged material

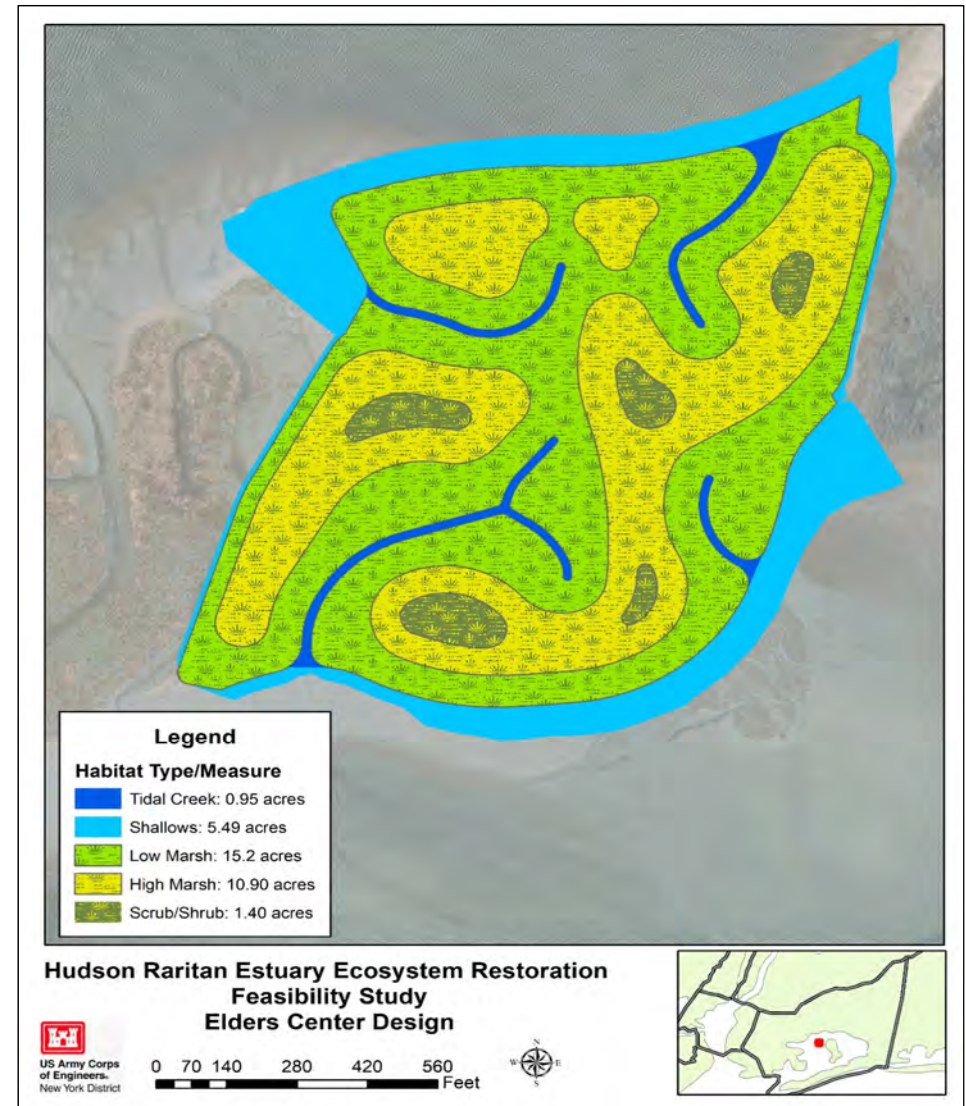
Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Jamaica Bay Marsh Island Sites

Pumpkin Patch East



29.38 acres of Habitat Restoration using 351,952 CY of dredged material

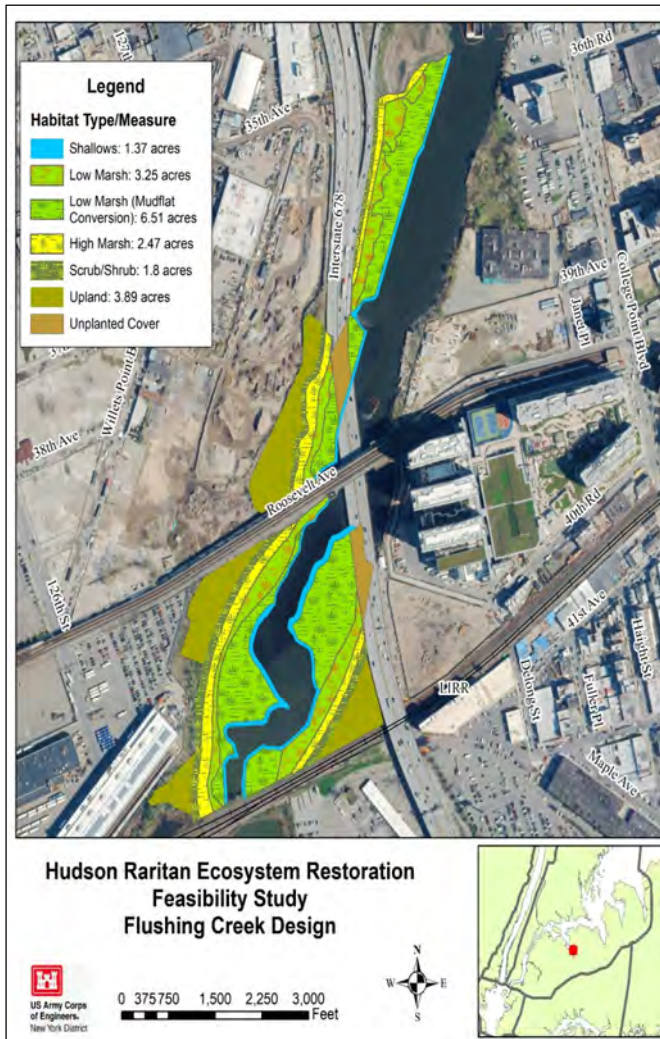
Elders Center



28.45 acres of Habitat Restoration using 284,891 CY of dredged material

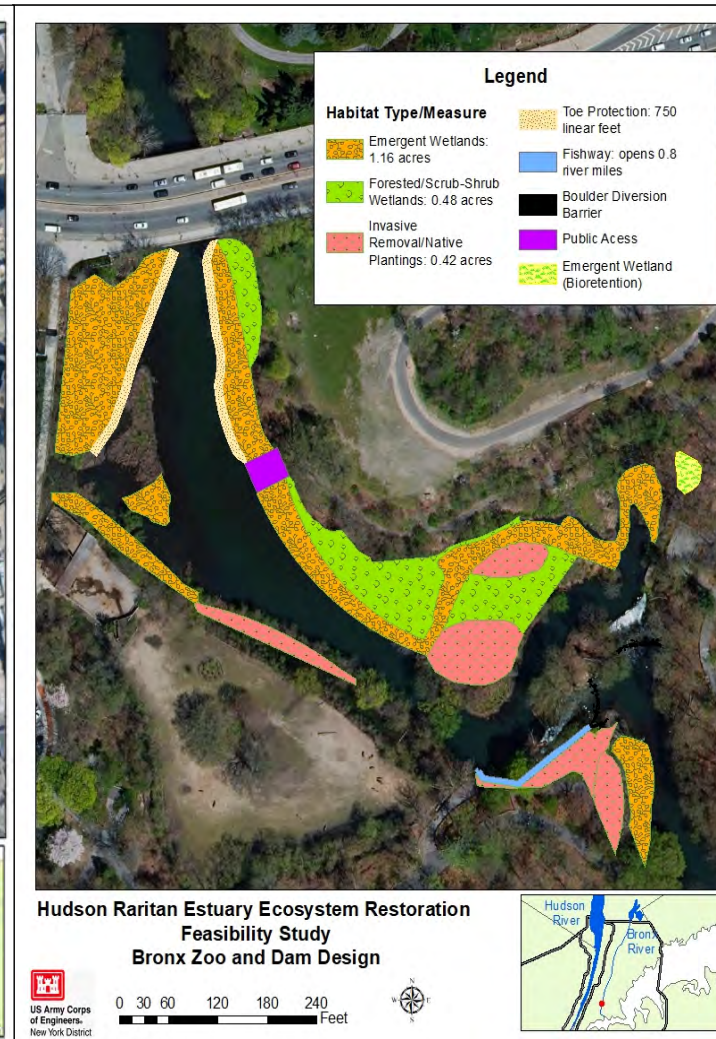
Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Flushing Creek and Bronx River Sites

Flushing Creek



19.29 acres of Habitat Restoration
Engineering and Design Initiated 2022

Bronx Zoo and Dam



2.15 acres of Habitat Restoration
0.8 River Miles Opened
Engineering and Design Initiated 2022

Stone Mill Dam



0.53 acres of Habitat Restoration
~7 River Miles Opened
Engineering and Design Initiated 2022

Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Flushing Creek and Bronx River Sites

Shoelace Park



Hudson Raritan Ecosystem Restoration Feasibility Study Shoelace Park Design

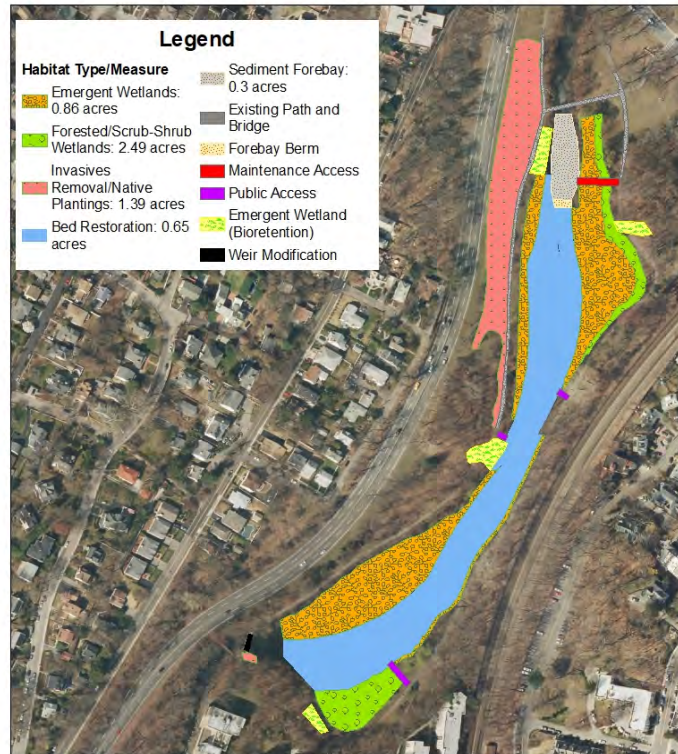


0 100 200 400 600 800 Feet



16.77 acres of Habitat Restoration

Bronxville Lake



Hudson Raritan Ecosystem Restoration Feasibility Study Bronxville Lake Design



0 50 100 200 300 400 Feet



5.69 acres of Habitat Restoration

Garth Woods – Harney Road



Hudson Raritan Ecosystem Restoration Feasibility Study Garth Harney Design



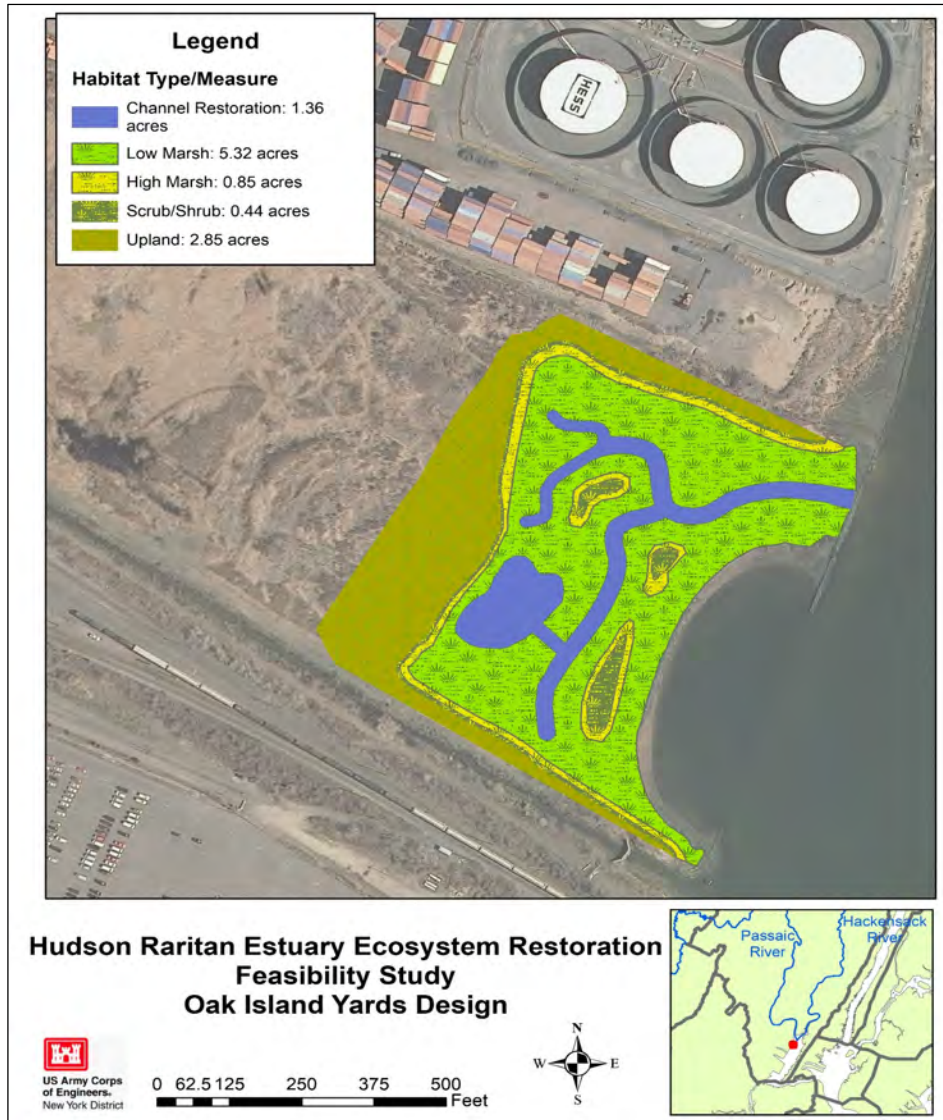
0 62.5 125 250 375 500 Feet



6.88 acres of Habitat Restoration

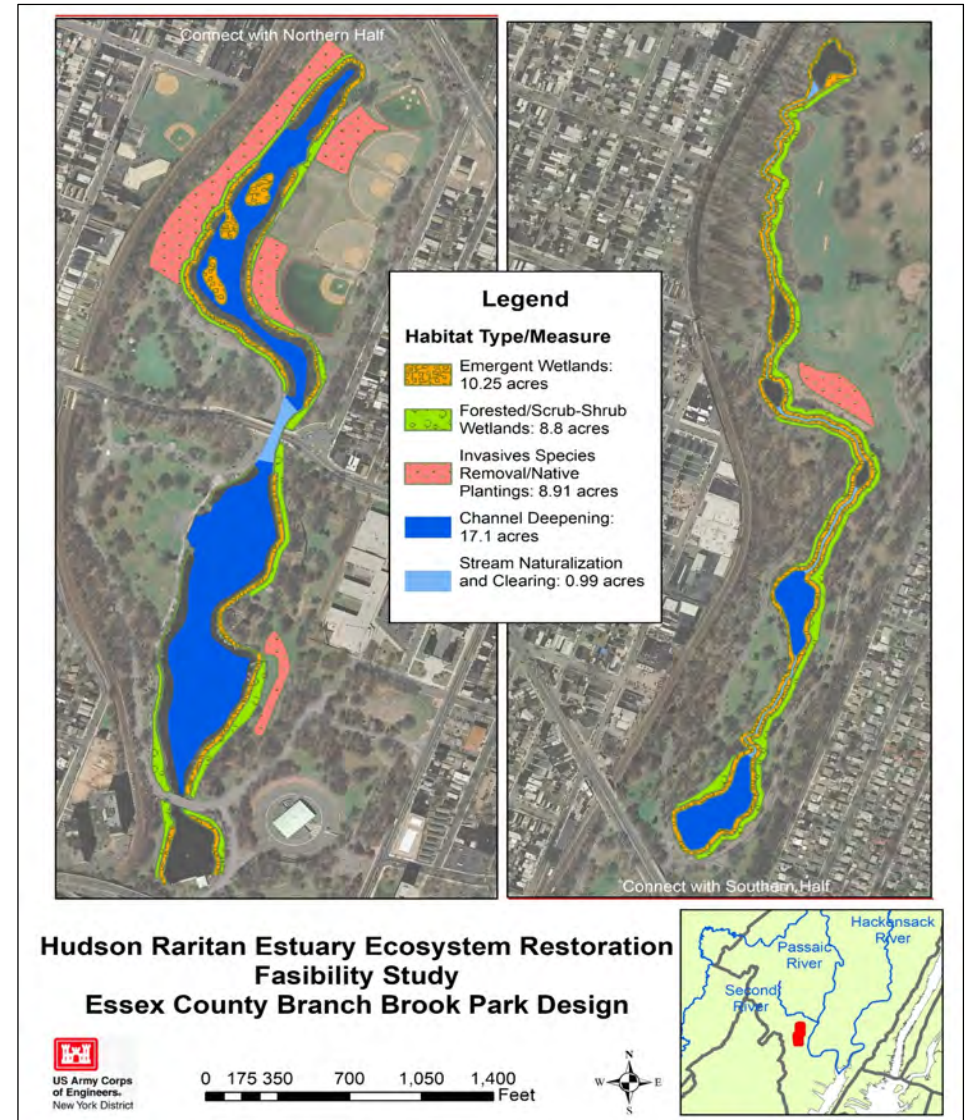
Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Lower Passaic Sites

Oak Island Yards



10.82 acres of Habitat Restoration

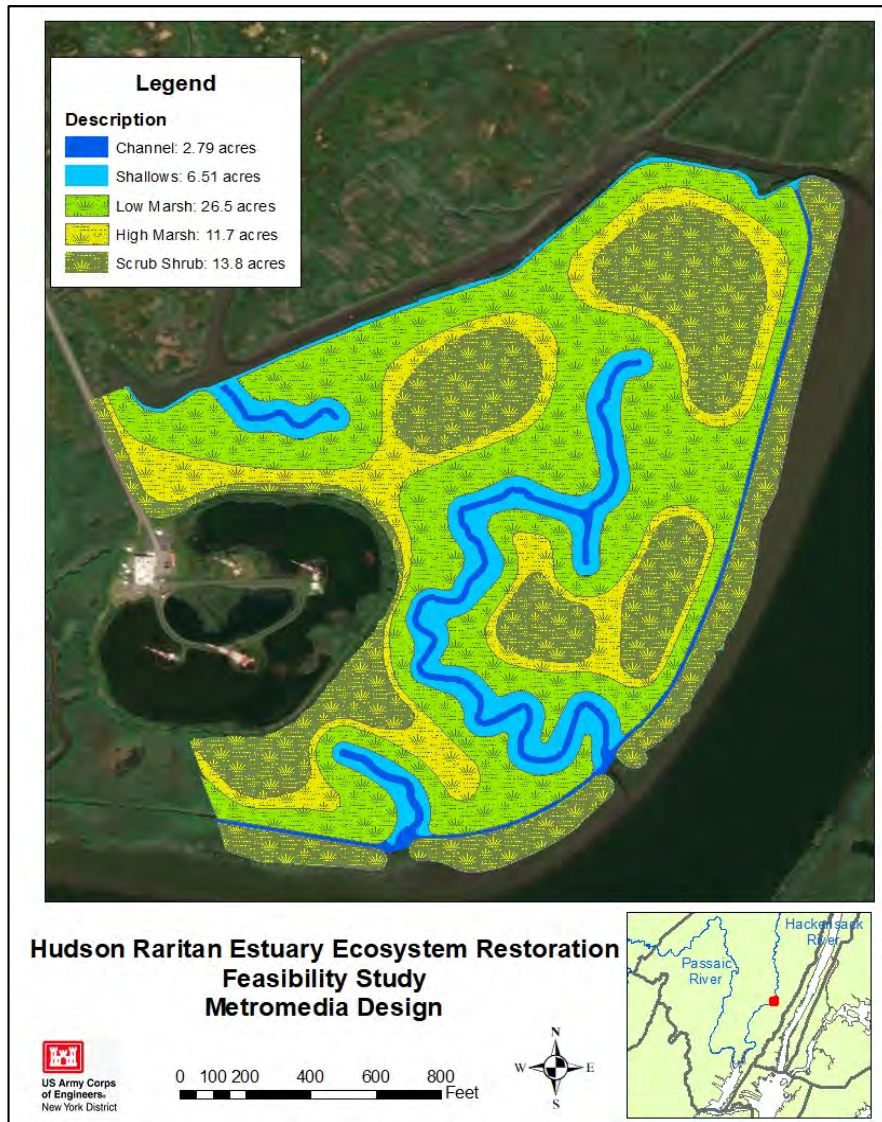
Essex County Branch Brook Park



46.05 acres of Habitat Restoration

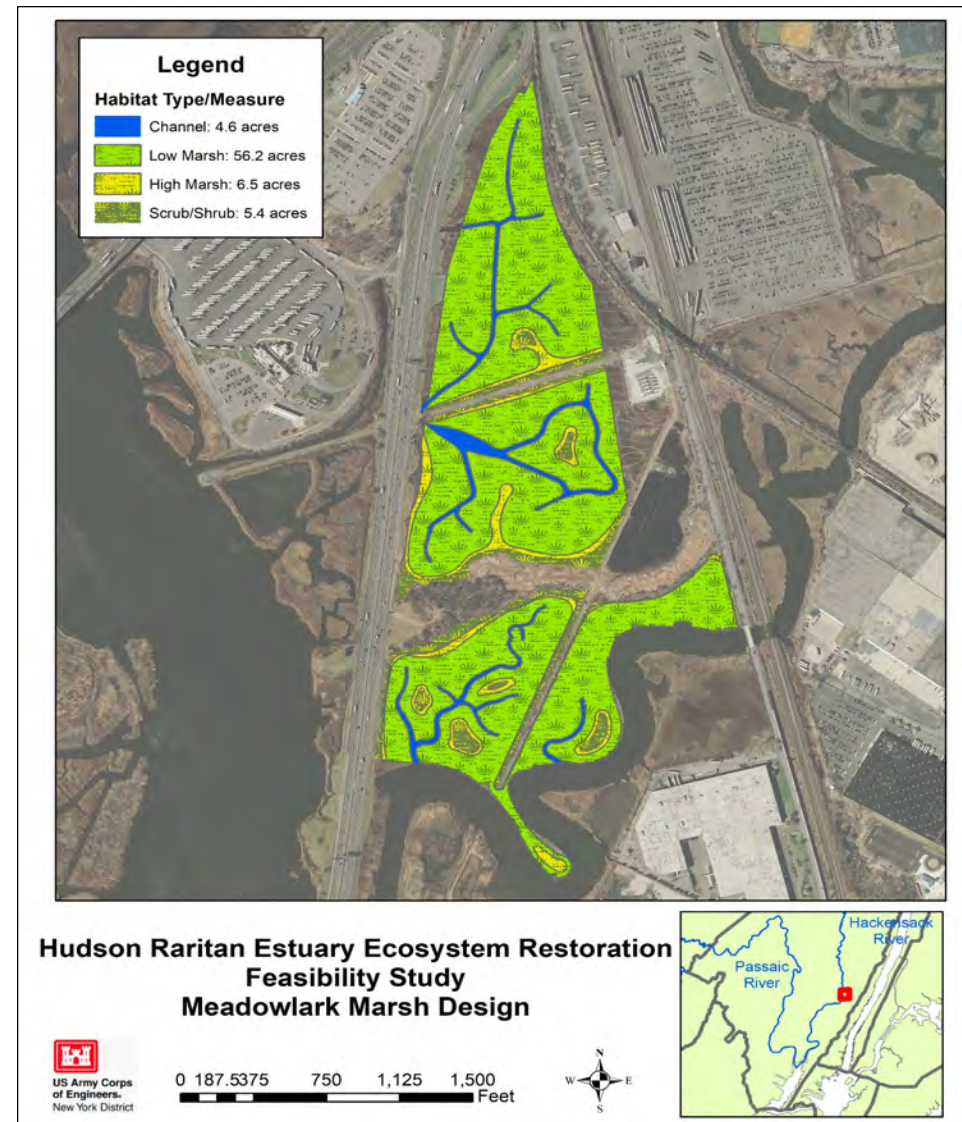
Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Hackensack River Sites

Metromedia Tract



61.3 acres of Habitat Restoration

Meadowlark Marsh



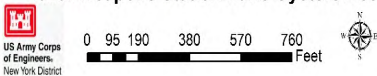
72.7 acres of Habitat Restoration

Hudson Raritan Estuary Ecosystem Restoration Recommended Plan – Oyster Reef Restoration Sites

Naval Weapons Station Earle



Hudson Raritan Estuary Ecosystem Restoration
Feasibility Study
Naval Weapons Station Earle Oysters Design

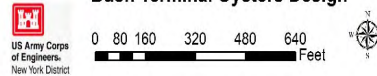


Restoration of 10 acres using Gabions and
Oyster Pyramids
Engineering and Design Initiated 2022

Bush Terminal



Hudson Raritan Estuary Ecosystem Restoration
Feasibility Study
Bush Terminal Oysters Design

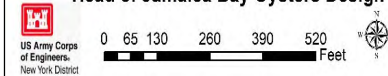


Restoration of 31.9 acres using Spat on Shell and
Gabions

Head of Bay



Hudson Raritan Estuary Ecosystem Restoration
Feasibility Study
Head of Jamaica Bay Oysters Design



Restoration of 10.1 acres using Gabions, Hanging
Super Trays, Oyster Pyramids and Spat on Shell