Hudson-Raritan Estuary Ecosystem Restoration Feasibility Study

the WATERS we SHARE

Appendix B
Prior Reports and Ongoing Restoration Efforts within the Hudson Raritan Estuary

Draft Integrated Feasibility Report &
Environmental Assessment
February 2017

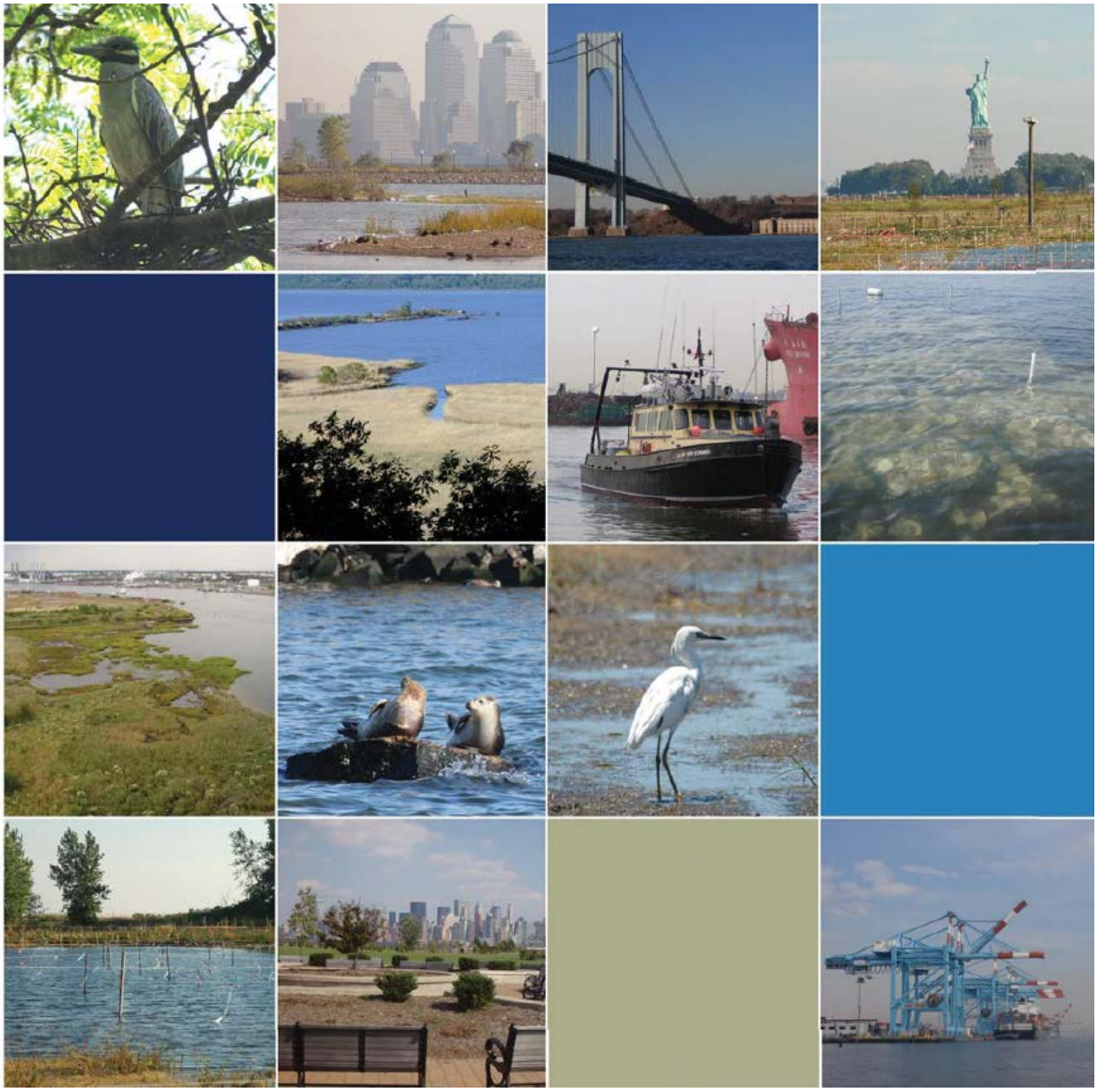
Prepared by the New York District,
U.S. Army Corps of Engineers

THE PORT AUTHORITY OF NY & NJ

NJSEA NEW JERSEY SPORTS & EXPOSITION AUTHORITY

NYC Environmental Protection

NYC Parks



Hudson-Raritan Estuary Ecosystem Restoration Feasibility Study
Appendix X: Title

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1. Introduction

The HRE Study Area is home to remarkable restoration and planning efforts. This appendix covers existing/prior reports (B-1) and ongoing (B-2) and completed (B-3) restoration and resilience projects conducted by the USACE and regional partners. These reports and restoration efforts serve as the foundation for the recommendations of this draft Feasibility Report/Environmental Assessment (FR/EA). Together with the actions recommended in this draft report, the ongoing and future restoration efforts will represent both a significant investment in several Hudson Raritan Estuary (HRE) Planning Regions and a tremendous step toward restoring lost ecological values and achieving the regional goals of the HRE Comprehensive Restoration Plan (USACE, 2016).

2. Prior Reports (B-1)

Highlighted prior reports considered during the development of this Draft FR/EA are provided in the following sections for the HRE region, each planning region, and/or "source" study. Additional reports can be found in Chapter 10, References.

2.1 Hudson Raritan Estuary Study Area

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2.2 **Jamaica Bay**

National Park Service (NPS), 2014. Gateway National Recreation Area, Final General Management Plan, Environmental Impact Statement. April 2014.

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2.6 **Lower Passaic River**

Note: Baseline information can be found on www.ourpassaic.org and information summarized in the USEPA Remedial Investigation Report (USEPA, 2014).

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Municipality Surveys

Bayonne/Hudson County (RM 0): James Monkowski, City of Bayonne, Municipal building, 630 Ave C., Bayonne, NJ 07002.

Belleville Township/Essex County (RM 8-10): Thomas Herits, 429 Stephens St. Belleville, NJ 07109. (11/10/06)

Borough of East Newark/Hudson County (RM 5.6-6.1): Robert B. Knapp, Acting Burough Clerk, 34 Sherman Avenue, East Newark, NJ 07029

City of Clifton, Passaic County: (RM 11-13 and RM 17): Ms. Macil Homza, Secretary, Clifton Environmental Protective Commission, City Hall, 900 Clifton Avenue, Clifton, NJ 07013. (10/13/06)

Elizabeth (south of RM0): Oscar Ocasio, Department of Planning & Community Development, 50 Winfield Scott Plaza, Elizabeth. (10/11/06)

East Rutherford/Bergen (RM 13): James Cassella, Mayor, 1 Everett Place, East Rutherford, NJ 07073 (10/20/06).

Essex (Third River): Lawrence Ferchak, Essex County Division of Mosquito Control, 99 W. Bradford Avenue, Cedar Grove, NJ 07009.

Passaic County (Clifton/Nutley line to Dundee Dam): Anthony DeNova, County of Passaic, 401 Grand Street, Paterson, NJ 07505. (10/26/06)

Rutherford Borough/Bergen County (RM12&13): Timothy Stafford, Borough Administrator, 176 Park Avenue, Rutherford, NJ 07070. (10/25/06)

Town of Harrison/Hudson County (RM 3.5 to 5.6): Peter Higgins, Harrison Redevelopment Agency, 600 Essex Street, Harrison, NJ 07029. (2/13/07)

Town of Kearny (RM 0.0-8.0): Michael J. Martello, Construction Code, 402 Kearny Avenue, Kearny NJ 07032. (1/26/07)

Township of Nutley Essex (RM 8-11): Dominic Ferry, 1 Kennedy Dr. Nutley, NJ 07110.

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Master Plans

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See Summary of Site Investigations conducted by governmental partnership agencies (USEPA, USACE, NOAA, USFWS, NJDOT and NJDEP) used for remedial action decisions and restoration planning outlined in Table 1 below.



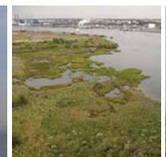



Table 2-1: List of Investigations Utilized to inform the remedy selection and restoration planning during the Lower Passaic River Restoration Project

Source: USEPA Remedial Investigation Report for the Focused Feasibility Study – Lower Eight Miles of the Lower Passaic River (Updated- Table 2-1 List of Investigations)

Investigation	Year	Study Name	Surveying Agency	Surveying Entity	Survey Extent (River Mile [RM])	Governing Work Plan
Sediment	2005	2005 Sedflume Testing	USEPA	USACE	RM0 to RM15	Malcolm Pirnie, Inc. August 2005a and January 2006b
	2005	2005 Gust Microcosm Testing	USEPA	Chesapeake Biogeochemical Associates	RM0 to RM15	Malcolm Pirnie, Inc. August 2005a and January 2006b
	2005	2005 USEPA High Resolution Sediment Coring	USEPA	Malcolm Pirnie, Inc.	RM0 to RM15	Malcolm Pirnie, Inc. August 2005a and January 2006b
	2005	Polytechnic Institute (RPI) and Lamont-Doherty Earth Observatory (L-DEO) Upper Passaic High Resolution Sediment Cores	RPI & L-DEO	RPI & L-DEO	Upper Passaic, above Dundee Dam	Malcolm Pirnie, Inc. August 2005a and January 2006b, Field Modification Form, March 23, 2007
	2006	2006 USEPA Low Resolution Sediment Coring	USEPA	Malcolm Pirnie, Inc.	RM0 to RM7	Malcolm Pirnie, Inc. August 2005a and January 2006b
	2007	2007 USEPA Upper Passaic High Resolution Sediment Coring	USEPA	Malcolm Pirnie, Inc.	Upper Passaic	Malcolm Pirnie, Inc. August 2005a and January 2006b
	2007-2008	2007-2008 USEPA Supplemental Sediment Programs	USEPA	Malcolm Pirnie, Inc.	RM0 to RM17	Malcolm Pirnie, Inc. December 2007
	2008	2008 USEPA Suspended-Phase High Flow Storm Event Sampling	USEPA	Malcolm Pirnie, Inc.	RM0 to RM17, tributaries and CSOs/SWOs	Malcolm Pirnie, Inc. December 2007
	2008	2008 Sedflume Consolidation Testing	USEPA	USACE	RM2.2	Malcolm Pirnie, Inc. August 2005a and January 2006b
	2008	2008 CPG Low Resolution Sediment Coring	USEPA	CPG	RM0 to RM17	ENSR, 2008
	2009-2010	2009-2010 CPG Benthic and Surface Sediment Program	USEPA	CPG	RM0 to RM17	AECOM, 2009
	2012	2012 CPG Low Resolution Supplemental Sampling Program	USEPA	CPG	RM0 to RM17	AECOM, 2011
	2013	2013 Low Resolution Second Supplemental Sampling Program	USEPA	CPG	RM 7.2 to RM 14.6	AECOM, 2012
Hydrodynamics	Nov 2004 to Sep 2005	November 2004 to September 2005 Malcolm Pirnie, Inc. Survey	USEPA	Malcolm Pirnie, Inc.	Upper 11 miles of Passaic	Malcolm Pirnie, Inc. August 2005a and January 2006b
	Aug - Oct 2004	August to October 2004 Rutgers University Survey First Deployment	USACE & NJDOT	Rutgers University	RM0 to RM6	Malcolm Pirnie, Inc., *et al.* , 2005a
	Nov 2004 to Jan 2005	November 2004 to January 2005 Rutgers University Survey Second Deployment	USACE & NJDOT	Rutgers University	RM 0 to RM6	
	Jul - Sep 2005	July to September 2005 Rutgers University Survey Third Deployment	USACE & NJDOT	Rutgers University	RM 0 to RM6	



Investigation	Year	Study Name	Surveying Agency	Surveying Entity	Survey Extent (River Mile [RM])	Governing Work Plan
	2005	NJDOT Environmental Dredging Pilot Study	USACE & NJDOT	TAMS/EarthTech & Malcolm Pirnie	Between RM2.6 and RM3	TAMS/EarthTech & Malcolm Pirnie, 2005
	2008-2009	Rutgers University and University of Delaware ADCP Study	Rutgers University	Rutgers University and University of Delaware	Arthur Kill, Kill van Kull, Newark Bay, Passaic River and Hudson River near Newark Bay	Not Available
	2009	TSI ADCP Moorings Study	USEPA	TSI	RMs 2.1, 3.2 and 4.1	Tierra Solutions, Inc., 2009, Revision 2
	2010	CPG Physical Water Column Monitoring Program	USEPA	CPG	RMs 1.4, 4.2, 6.7, 10.2 and 13.5	AECOM, 2010
Water Column	2005	2005 Large Volume Water Column Sampling Study	USEPA	Malcolm Pirnie, Inc.	Passaic	Malcolm Pirnie, Inc. August 2005a and January 2006b
	2005	2005 Small Volume Water Column Sampling Study	USEPA	Malcolm Pirnie, Inc.	Passaic	
	2005	2005 Semi-Permeable Membrane Device Study	USEPA	Malcolm Pirnie, Inc.	Passaic	
	2005	2005 USEPA High-Flow Water Column Suspended Solids Sampling	USEPA	Malcolm Pirnie, Inc.	Passaic	
	2005	NJDOT Environmental Dredging Pilot Study	NJDOT & USACE	TAMS/EarthTech & Malcolm Pirnie	Between RM 2.6 and RM3	TAMS/EarthTech & Malcolm Pirnie, 2005
	2009-2010	2009-2010 CPG Physical Water Column Monitoring	USEPA	CPG	Passaic	AECOM, 2010
	2010	CPG High-Flow Water Column Suspended Solids Sampling	USEPA	CPG	Passaic	AECOM, 2010
	2011-2013	CPG RI Water Column Monitoring/Small Volume Chemical Data Collection	USEPA	CPG	Passaic, Newark Bay, Second River, Third River, Saddle River, Hackensack River, Arthur Kill and Kill van Kull	AECOM, 2012
Ecological	1999	1999 Late Summer/Early Fall Environmental Sampling Program	USEPA	TSI	RM1 to RM7	TSI, 1999
	2000	2000 Spring Environmental Sampling Program	USEPA	TSI	RM1 to RM7	TSI, 1999
	2005	2005 Sediment Profile Imaging Survey of Sediment and Benthic Habitat Characteristics of the Lower Passaic River	USACE & NJDOT	Aqua Surveys, Inc.	RM0 to RM17	Aqua Survey, Inc., 2006
	2005	2005 Taxonomic Identification of Benthic Invertebrates	NJDOT & USACE	Aqua Surveys, Inc.	RM 0 to RM17	Aqua Survey, Inc., 2005
	2009-2010	2009-2010 CPG Benthic and Surface Sediment Program	USEPA	CPG	RM0 to RM17	Windward, 2009

Investigation	Year	Study Name	Surveying Agency	Surveying Entity	Survey Extent (River Mile [RM])	Governing Work Plan
	2009-2010	2009-2010 Fish Community and Tissue Collection Surveys	USEPA	CPG	RM0 to RM17	Windward, 2010
	2010	2010 CPG Habitat Identification Survey	USEPA	CPG	RM0 to RM17	Windward, 2011a
	2010	2010 CPG Summer/Fall Avian Community	USEPA	CPG	RM0 to RM17	Windward, 2011b
	2012	2012 background Fish Tissue Survey	USEPA	CPG	RM 17.4 to RM 21.5 (above Dundee Dam)	Windward, 2012
TSI Newark Bay	2005	TSI Newark Bay Study Phase I	USEPA	TSI	Newark Bay	Tierra, 2005
	2007	TSI Newark Bay Study Phase II	USEPA	TSI	Newark Bay	Tierra, 2007
Bathymetry and Geophysical Surveys	Nov-1989	November 1989 Topo-Metrics, Inc. for USACE	USACE	Topo-Metrics, Inc.	RM-0.5 to RM14.98	Not Available
	Mar-1995	March/April 1995 Ocean Surveys, Inc. for TSI	USEPA	TSI	RM0.87 to RM6.97	TSI, 1995
	Nov-1996	November 1996 Ocean Surveys, Inc. for TSI	USEPA	TSI	RM0.87 to RM6.95	TSI, 1995
	Apr-1997	April 1997 Ocean Surveys, Inc. for TSI	USEPA	TSI	RM0.87 to RM6.95	TSI, 1995
	Jun-1999	June 1999 Ocean Surveys, Inc. for TSI	USEPA	TSI	RM0.89 to RM6.97	TSI, 1995
	Aug-2001	August 2001 Ocean Surveys, Inc. for TSI	USEPA	TSI	RM0.89 to RM6.96	TSI, 1995
	Jul-2002	July 2002 TVGA Consultants for USACE	USACE	TVGA Consultants	RM-0.44 to RM8.01	Not Available
	Nov-2004	November 2004 Rogers Surveying, Inc. for USACE	USACE	Rogers Surveying, Inc.	RM-0.54 to RM17.42	Not Available
	2005	Aqua Survey Inc. Geophysical and Side Scan Sonar Survey	NJDOT & USACE	Aqua Survey Inc.	RM0 to RM17	Malcolm Pirnie, Inc. August 2005a and January 2006b
	Sep-2007	CPG - Multi-Beam (MB) and Single-Beam (SB) Bathymetry	USEPA	CPG	RM-0.50 to RM14.45 (MB) RM0.5 to RM8.21 and RM14.38 to RM16.54 (SB)	de Maximis, Inc., 2007
	Nov-2008	CPG - Multi-Beam and Single-Beam Bathymetry	USEPA	CPG	RM-0.5 to RM14.26	CPG, 2008
	Jun-2010	CPG - Multi-Beam Bathymetry	USEPA	CPG	RM-0.5 to RM14.27	CPG, 2010
	Oct-2011	CPG - Bathymetric Survey of Lower 14 Miles of the Passaic River After Hurricane Irene	USEPA	CPG	RM-0.5 to RM14.27	CPG, 2010, Field Modification Number: FM-110921

[a]: The original vertical datum for surveys was MLW as defined by the USACE. The transect density for the surveys was approximately 52 transects per mile.





Appendix B-2: Ongoing Ecosystem and Coastal Restoration within HRE Planning Regions with Tentative Selected Plan (Excludes Beach Nourishment)

Appendix B-2: Ongoing Ecosystem and Coastal Restoration (excludes beach nourishment) within HRE Planning Regions with Tentative Selected Plan Sites

Planning Region	Project Name	Agencies	Project Summary
Muliple	NY & NJ Harbor & Tributaries Coastal Storm Risk Management (CSRM) Study	USACE, NYSDEC, NJDEP, NYC	The NY-NJ Harbor & Tributaries is one of 9 focus areas identified in the North Atlantic Coast Comprehensive Study report (USACE, 2015). The purpose of this study is to investigate comprehensive approaches to improve community resilience and to manage risk of damages from future coastal storms and impacts of sea level rise (SLR). The project will identify and explore areas of coastal storm risk and develop the most feasible comprehensive combination of structural, non-structural, and/or natural and nature-based measures into alternatives that best manage risks from current and projected future coastal flooding in both the short and long term.
Muliple	Combined Sewer Overflow Abatement Program	NYCDEP and NYSDEC	In 2012, the NYSDEC and NYCDEP signed an agreement to reduce combined sewer overflows and improve water quality through the collection and treatment of sewerage prior to release into the HRE. Under this agreement, several long-term control plans for specific waterbodies and one for NYC were drafted to identify appropriate combined sewer overflow controls necessary to improve water quality. Overflow abatement measures include conducting environmental dredging of several tributaries within the City of New York to remove combined sewer overflow mounds that contribute to nuisance odors and dissolved oxygen deficits within affected waterbodies. These waterbodies include Paerdegat Basin, Flushing Bay, Flushing Creek, Gowanus Canal, Bergen Basin, Fresh Creek, Newtown Creek, and Thurston Basin.

Planning Region	Project Name	Agencies	Project Summary
Multiple	NYC Raised Shorelines	NYC	The NYC plans to raise bulkheads and build other shoreline structures in low-lying neighborhoods throughout the City, including a number of low- and moderate-income communities impacted by Hurricane Sandy, to minimize inland tidal flooding, which would worsen neighborhoods in the floodplain, threatening their economic viability and residential stability. The component planned for the Totenville area of Staten Island will continue to be coordinated with Living Breakwaters (DB#5) and Totenville Dunes (DB#597).
Multiple	Living Breakwaters	NYS GOSR	HUD's Rebuild by Design competition, supports the entire Tottenville section of the project, with breakwaters that are rocky sloped walls placed within the water column to attenuate wave energy, and social resilience frameworks in adjacent neighborhoods. The project will be the subject of a Draft EIS that will analyze it along with the Tottenville Dunes project (DB#597). Both projects are being coordinated with the area component of the NYC Raised Shorelines project (DB#695).
Multiple	Billion Oyster Project	NY Harbor School	NY Harbor School with goal to bring back one billion oysters - self sustaining oyster reefs to New York Harbor. **HRE - Small Scale Oyster Restoration recmmended advance the BOP program with NY Harbor School who will be construction sponsor.**
Multiple	South Shore of Staten Island Coastal Storm Risk Management	USACE, NYSDEC	Project is divided into two phases of study. Phase 1 (Ft. Wadsworth to Great Kills) analyzes solutions and recommends levees, floodwalls and non-structural measures to reduce hurricane and storm damage: Final Feasibility Report/EIS and ROD completed in December 2016. Phase 2 is evaluating study areas south of Great Kills to determine whether there is a Federal Interest in formulating one or more projects (i.e. CAP) to reduce coastal flood risks.

Planning Region	Project Name	Agencies	Project Summary
Multiple	Public Greenways	NYC, NYCDPR, NYCDOT, Byron and Bronx River Alliance, NYCEDC	Waterfront Greenway initiatives include: • MillionTrees NYC, a PlaNYC initiative, is a public-private program. In 2015, two (2) years ahead of schedule, MillionTrees NYC achieved the program goal of planting 1,000,000 trees in New York City. • The Manhattan Waterfront Greenway is a 32-mile multiuse trail that circumnavigates Manhattan Island, and includes over 23 miles of waterfront pathways and facilitates access to over 1,500 acres of parkland throughout the borough. The greenway builds on recent efforts to transform a long-neglected waterfront into a green attraction for recreational and commuting use. • Construction on the South Bronx Greenway and the Bronx River Greenway is underway encompassing 1.5 miles of waterfront greenway, 8.5 miles of inland green streets, and nearly 12 acres of new waterfront open space throughout the Hunts Point and Port Morris neighborhoods in the Bronx. The Bronx River Greenway extends for 23 miles along the Bronx River, from Westchester County to Soundview Park in the South Bronx. Approximately 19 miles of the greenway are currently in place with completion anticipated within the next decade. • The Brooklyn Waterfront Greenway will comprise 14 miles of landscaped, designated off-street pathways, enhanced sidewalks, and on-street bike lanes that will connect neighborhood parks and open spaces from Greenpoint to Bay Ridge. Six (6) miles have already been completed with eight (8) miles remaining. • The Jamaica Bay Greenway will be a 28-mile network of bicycle and pedestrian paths connecting more than 10,000 acres of parks and beaches. More than 10 miles are in place.

Planning Region	Project Name	Agencies	Project Summary
Multiple	Ecological Solutions to Coastal Community Hazards	NFWF, NJDEP, Sustainable Jersey, NJ Sea Grant Consortium	NJDEP will convene an experienced team of public and private stakeholders to address the need for community resiliency strategies and preventive actions for NJ's many ecologically significant coastal areas that are threatened by dense coastal development and climate change impacts. Hurricane Sandy emphasized the need for community resiliency strategies and preventative actions to minimize future impacts. Ecosystem-based infrastructure approaches can provide a cost effective solution that will protect critical habitat and people. However, there is no systematic approach for developing or providing green infrastructure nor is there a current system that can determine which communities would make good candidates for green infrastructure. The NJDEP will work with partners to systemically identify ecological resiliency strategies and develop them into successful, ready to use local actions. Twenty municipalities will receive green infrastructure viability assessments through this project. Nine pilot communities will then complete specific resiliency projects with project team assistance and be used as green infrastructure success models.
Multiple	Tottenville Shoreline Protection System	NYS GOSR, NYC	NYS GOSR project through NY Rising Community Reconstruction Program. The proposed project would construct resilient dune structures and plantings along a portion of the South Shore of Staten Island, which was expanded through regional coordination efforts. This on-shore project will be analyzed with the off-shore Living Breakwaters project (DB#5) in a single DEIS. Both projects are being coordinated with the area component of the NYC Raised Shorelines project (DB#695).

Planning Region	Project Name	Agencies	Project Summary
Jamaica Bay	Spring Creek South- FEMA Hazard Mitigation Grant Program	NYSDEC (USACE-IIS)	Phased FEMA HMGP project to implement coastal restoration to reduce future disaster damages and manage coastal storm risks for the Howard Beach community. NNBFs within ~245 acres including berm, coastal maritime forest, low and high marsh, dunes and living shoreline. Spring Creek South to be coordinated with NYS GOSR as part of its NY Rising Program: (1) Howard Beach Comprehensive Coastal Protection Study relating to the cost and feasibility of tide gates at Shellbank and Hawtree Basins and associated coastal protection measures (DB#696); and (2) Upper Hawtree Flood Protection and Drainage Improvements related to developing targeted protection strategies and drainage improvements along the northern edge of Hawtree Basin to limit flood impact to the community (DB# 697).
Jamaica Bay	Spring Creek North	USACE, NYCDPR	Continuing Authorities Program (CAP) Section 1135 Ecosystem Restoration of 7.6 acres of low marsh, 5.4 acres of high marsh, 22.1 acres of maritime upland for total of 35.1 acres of habitat.. 2017 plans to initiate Project Partnership Agreement and initiate design and implementation phase.
Jamaica Bay	Jamaica Bay Oyster Population Restoration	NFWF, NYCDEP	DOI's Sandy Coastal Resiliency grants administered by NFWF to NYCDEP to restore oyster beds across half an acre in the northeastern end of Jamaica Bay at the Head of Bay. Models from previous studies showed that the location site has ideal conditions that will promote oyster growth, recruitment, and larvae retention potential. **The HRE small scale oyster restoration recommended in the FR/EA expands this oyster restoration project.**

Planning Region	Project Name	Agencies	Project Summary
Jamaica Bay	Sunset Cove's Salt Marsh and Upland Habitat	NFWF, NYCDPR	DOI's Sandy Coastal Resiliency grants administered by NFWF to NYC Department of Parks and Recreation to restore 3 acres of salt marsh and 7 acres of upland habitat on Sunset Cove, a 12 acre parcel located on a former abandoned and derelict marina in Broad Channel, Queens. Nearly the entire island of Broad Channel was flooded during Hurricane Sandy with inundation ranging from 3-10 feet. The restored salt marsh will connect to adjacent wetland complexes within Jamaica Bay. The existing hardened shoreline will be rehabilitated and enhanced to improve water quality and provide oyster and shellfish habitat.
Jamaica Bay	Atlantic Coast of NY, East Rockaway to Rockaway Inlet, & Jamaica Bay Reformulation Study	USACE, NYSDEC, NYC	Reformulation study to incorporate longer term resilience, primarily coastal flood risk management. The preferred alternative includes a hurricane barrier from Coney Island to Breezy Point and interim risk offset measures within the Bay. In August 2016, USACE released for public comment the Draft Hurricane Sandy General Reevaluation Report (HSGRR), Draft Environmental Impact Statement (DEIS), and General Conformity (GC) Determination. Documents are available at: http://www.nan.usace.army.mil/Missions/Civil-Works/Projects-in-New-York/East-Rockaway-Inlet-to-Rockaway-Inlet-Rockaway-Be/. **Jamaica Bay shoreline sites recommended in this HRE FR/EA could serve as NNBFs and complement solutions from the reformulation effort.**
Jamaica Bay	Fresh Creek Coastal Protection	NYS GOSR	This NY Rising project would fund flood protection measures to capture storm surge and rising waters at the most vulnerable areas along Fresh Creek in Canarsie, Brooklyn. The target area is along Fresh Creek and E. 108th Street between Avenue J and N. **Fresh Creek Restoration recommendation wojuld complement this project.**

Planning Region	Project Name	Agencies	Project Summary
Jamaica Bay	Howard Beach Comprehensive Coastal Protection Study	NY State	This project will study the cost and feasibility of tide gates at Shellbank and Hawtree Basins and associated coastal protection measures. NYS GOSR will fund design/engineering services for this project and the Upper Hawtree Flood Protection and Drainage Improvements (DB#697).
Jamaica Bay	Upper Hawtree Flood Protection and Drainage Improvements	NY State	This project will develop targeted protection strategies and drainage improvements along the northern edge of Hawtree Basin to limit flood impact to the community, particularly the Coleman Square area of Old Howard Beach. NYS GOSR will fund design/engineering services for this project and the Howard Beach Comprehensive Coastal Protection Study (DB#696). **Hawtree Point restoration would be coordinated and complement this effort.**
Jamaica Bay	Howard Beach New York Rising Community Reconstruction Plan	NYRCR	After Hurricane Irene, Tropical Storm Lee, and Hurricane Sandy, affected communities such as Howard Beach received state funds to complete reconstruction plans. The Howard Beach Community is eligible for up to $18.4 million in implementation funds. Possible projects include ecosystem restoration, coastal protection, drainage improvements, infrastructure improvements, and business and residency solutions. **Hawtree Point restoration would be coordinated and complement this effort.**
Jamaica Bay	Bay Park Waste Water Treatment Plant Nitrogen Removal System	NY State	NYS has pledged to develop and construct a nitrogen removal system at Bay Park. (See DB#57 and DB#334 for other components.)
Jamaica Bay	Jamaica Bay Rockaway Inlet Federal Navigation Channel - Operation & Maintenance Dredging	USACE	The existing project provides for an entrance channel 20 ft deep at mean low water, 1,000 ft wide, about 1.7 mi long and connecting two interior channels with deep water in the Atlantic Ocean, of suitable hydraulic dimensions to maintain the present tidal prism in the bay. The channel extends from Rockaway Inlet into Jamaica Bay. **Dredge material can be beneficially used at Jamaica Bay marsh islands** or along the Rockaway Peninsula.

Planning Region	Project Name	Agencies	Project Summary
Jamaica Bay	South Valley Stream Shoreline Restoration	NYS GOSR	Restore the natural shoreline in South Valley Stream along “The Path” by constructing a living shoreline to buffer tidal flow, planting trees and other vegetation, repairing outfalls, and installing green infrastructure measures with educational signage to capture stormwater runoff.
Jamaica Bay	Riis Park Shoreline and Parking Lots	NPS	Replace 1-mile seawall and repair all parking lots and shoreline structures. Project includes work that was accomplished in 2013 and 2014 on ancillary components. The seawall assessment is complete and repair of Sandy damage is in design. The seawall has a large amount of non-hurricane damage that will not be covered by Sandy funding. The Sandy work will result in a stable seawall for the next 5 years. The remaining Riis parking area repairs are in pre-design. Project location is at Gateway National Recreation Area.
Jamaica Bay	West Pond Breach Repair	NPS	This project would repair storm damage due to a breach that occurred at the West Pond of the Jamaica Bay Wildlife Refuge at Gateway National Recreation Area, and make the West Pond embankment and loop trail resilient to coastal storms and flooding and protect environmentally sensitive conditions along the trail that support a diversity of Jamaica Bay habitat, wildlife and enhanced visitor experience. In February 2016, the National Park Service (NPS) selected the preferred alternative (Alternative B) and issued a FONSI.

Planning Region	Project Name	Agencies	Project Summary
Jamaica Bay	Fort Tilden Shore Access and Resiliency Project	NPS	Project will rebuild the damaged sections of Shore Road near Fort Tilden inside Gateway National Recreation Area in Jamaica Bay and Breezy Point. The EA identified the preferred alternative is Alternative D, which includes: (1) undamaged section of Shore Rd to remain, (2) pathway constructed along damaged and deconstructed roadway, (3) sand-trapping fences installed to facilitate dune accretion, (4) dunes planted with native vegetation, (5) existing bulkhead removed to -3 feet below existing ground line, (6) wooden groins removed completely, (7) demolition of buildings 15, 16, 17 and 18, and (8) Battery Kessler access secured and allowed to naturally decay. Funding will be combination of NPS Sandy Recovery funds and FHWA ERFO funds.
Jamaica Bay	Breezy Point Risk Mitigation System	NYCSBS	The proposed work concerns the protection of Breezy Point and Roxbury Beach from flooding. Both communities are located along a narrow peninsula, home to a residential community with a summer residency of 12,000 and year-round residency of 4,300. Rockaway Point Blvd., the main ingress and egress, was flooded during Sandy, preventing firefighters from combating a fire which consumed over 115 homes. Project proposes combined flood protection including double dunes, permanent PVC sheet pile walls, and additional deployable or permanent walls. Proposed designs are conceptual. FEMA's HMGP grant is phased, with FEMA phase 1 funding of $2.9 million (federal share) and $3,866,667 in total costs authorized, for analysis of cost effectiveness, technical feasibility, engineering and design, and Hydrologic and Hydraulics; as well as permits, NEPA and administrative cost recovery. NYC has submitted request to HUD to allocate $14.5 million in CDBG-DR funds as local match (25%). Construction funds are contingent on EA/FONSI and other deliverables that will be done as part of phase 1. If the phase 1 criteria are met and project passes review, it would be approved for phase 2, with FEMA then to consider remaining funds in an amount not to exceed 54,277,647.

Planning Region	Project Name	Agencies	Project Summary
Harlem River, East River, Western Long Island Sound	Shoelace Park Restoration	NYCDPR and NYCDEP	NYC Parks' ongoing efforts within Shoelace Park to conduct invasive species removal and native plantings and NYCDEP's CSO Abatement Program to improve water quality. **The HRE Bronx River- Shoelace Park site recommended in this FR/EA will complement these efforts.**
Harlem River, East River, Western Long Island Sound	Garth Woods, Bronx River Restoration	Westchester County Department of Planning	Restoration of Garth Woods site that will reallign the Bronx River channel to improve hydrology; remove invasive plant species and native planting. **The HRE Bronx River - Harney Road/Garth Woods site recommended in this FR/EA will be coordinated and complement the County's efforts.**
Harlem River, East River, Western Long Island Sound	Flushing Creek Environmental Dredging	NYCDEP	NYCDEP plans to dredge Flushing Creek and Bay to remove the top 3-ft of sediment and place clean cap material in order to improve benthic habitat, hydrology and odor control. **The HRE - Flushing Creek restoration project recommended in this FR/EA will be closely coordinated and timed with NYCDEP environmental dredging of adjacent creek.**
Harlem River, East River, Western Long Island Sound	Flushing Creek Long Term Control Plan	NYCDEP	NYCDEP is implementing green infrastructure plans to help mitigate stormwater from entering the sewer system by installing hundreds of streetside bioswales to manage stormwater on the streets and sidewalks. By 2030, DEP intends to manage 8% of Flushing Creek's watershed and 13% of Flushing Bay's watershed impervious cover with green infrastructure. **This program is important for the sustainability of the restoration project at Flushing Creek.**
Harlem River, East River, Western Long Island Sound	Roberto Clemente State Park Shoreline and Park Improvements	NYState	Improvements to approximately 16 acres of 25-acre Roberto Clemente State Park, including replacement of existing sheet pile bulkhead, reconstruction of adjacent esplanade, creation of tidal/intertidal natural habitat for plants and storm water absorption, and upland improvements. FEMA PA grant of $1.5 million for repair to concrete bulkhead. NYS issued FONSI July 21, 2014 as HUD responsible entity, which was used by FEMA EHP to support its environmental determination.

Planning Region	Project Name	Agencies	Project Summary
Harlem River, East River, Western Long Island Sound	Bronx River Shoreline at Starlight Park	NFWF	One of DOI's Sandy Coastal Resiliency grants administered by NFWF. The New York City Department of Parks and Recreation will carry out shoreline restoration efforts on the Bronx River, New York City's only freshwater river, to improve the river's recovery and increase community resiliency. Since the late 1990's, there has been a collaborative community and government effort to transform the Bronx River from an abandoned dumping ground into an ecological, economic, recreational, and educational resource. The restoration area is located in the South Bronx between Westchester Avenue and 172nd Street in the tidal estuary of the river. The project will revitalize floodplain functions for 1.7 acres, re-naturalize 740 feet of armored shoreline, and restore native saltmarsh grasses on half an acre of new wetland habitat. Further, 11 acres of parkland will be enhanced using stormwater best management practices and have reduced toxic substance exposure through the removal of contaminated fill. NFWF is administering a grant totaling $4,400,000, which includes $4,350,000 in DOI funds, and $50,000 in private foundation funds. Design was completed in April 2016. Bid packages for site remediation, wetlands creation, and Bronx River shoreline re-naturalization were due in April 2016. Comments from NYSDEC and USACE on 1st permit submission are being addressed.
Harlem River, East River, Western Long Island Sound	Hunts Point Resiliency	NYCEDC	One of the winning proposals from HUD's Rebuild by Design competition. The current scope of the project includes the continued study, analysis, planning, and stakeholder engagement related to the proposal and the design and construction of a resulting pilot project at Hunts Point in the Bronx. Total HUD CDBG-DR funds for the project is $45 million, with $20 million from the Rebuild by Design allocation, and $25 million reallocated by the City from other Sandy programs.

Planning Region	Project Name	Agencies	Project Summary
Newark Bay, Passaic River, Hackensack River	Diamond Alkali Superfund Site-Remedial Investigation/Feasibility Study	USEPA	RI/FS for lower 17-mile study area (including tributaries) from Dundee Dam to Newark Bay- Operable Unit 2 [Coordinated Restoration Program since 2003] and Newark Bay RI/FS (Operable Unit 3). **Restoration of Kearny Point and Oak Island Yard would be implemented after remediation and additional restoration opportunities in Newark Bay and Lower Passaic would be coordinated and sequenced with the superfund program.**
Newark Bay, Passaic River, Hackensack River	RBD Meadowlands Flood Protection Project	NJDEP	One of the winning proposals from HUD's Rebuild by Design competition. Funds will support the first phase of a flood protection project in the northern New Jersey meadowlands, within the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack. Such measures will be designed to address the impacts of coastal and riverine (fluvial) flooding on the quality of the human environment in the Project Area due to both sea level rise and storm hazards, including heavy rainfall events and intense coastal storm events. The approximate Project Area boundaries are: Hackensack River to the east; Paterson Plank Road and the southern boundary of Carlstadt to the south; State Route 17 to the west; and Interstate 80 and the northern boundary of the Borough of Little Ferry to the north.
Newark Bay, Passaic River, Hackensack River	Passaic River Main Stem-Tidal Passaic Study	USACE, NJDEP	Tidal and non-tidal re-evaluation, however only the tidal portion is included in the Sandy program. The study of the non-tidal areas upstream is being accomplished with regular Corps Civil Works Investigations funds. Authorized construction of levees, floodwalls, tidal gates, and pumping stations. Location includes the lower ~6 miles of the Lower Passaic River to Newark Bay including the shorelines of Newark, Harrison and Kearny. **HRE - Lower Passaic River Kearny Point and Oak Island Yard Sites must be coordinated.**

Planning Region	Project Name	Agencies	Project Summary
Newark Bay, Passaic River, Hackensack River	Joseph G. Minish Passaic River Waterfront Park	USACE, NJDEP	Construction of 1 mile of bulkhead (steel sheet piles with concrete cap) at Minish Passaic River Waterfront Park, Newark. Construction scheduled for late 2015. Phase I of the project includes 6,000 linear feet of bulkhead construction and 3,200 linear feet of riverbank grading and native plantings. Two bulkhead construction reaches have been completed north of Penn Station and construction is ongoing new to Jackson Street Bridge. Partners are working towards a project agreement for Phase II/III design and construction of a waterfront walkway and park.

Planning Region	Project Name	Agencies	Project Summary
Newark Bay, Passaic River, Hackensack River	Newark Bay Wetlands Restoration Project	NFWF	One of DOI's Sandy Coastal Resiliency grants administered by NFWF. The City of Newark, NJ will carry out restoration efforts on a 12 acre are located along the Newark Bay, a tidal bay located at the confluence of the Passaic and Hackensack Rivers, to improve wetland resiliency functions and habitat for threatened and endangered species. Due to its proximity to Newark Bay and regular tidal inundation, the restoration site provides an excellent opportunity for wetland restoration, enhancement, and preservation. Much of this site contains degraded wetlands that are being affected by invasive species or severe shoreline erosion along the Newark Bay. If left in its current state, the site will continue to erode thereby exposing itself to the effects of sea level rise and increasingly powerful Atlantic storms. Yellow and black-crowned night herons have been seen and documented within the parcel area. Unfortunately, the invasive species Phragmites australis occupies four acres of the site and continues to encroach upon many areas that would otherwise support native vegetation. Benefits from this restoration project includes the creation of desirable habitat, improvements to flood control, reduction in erosion into Newark Bay, and skilled workers who can become natural resource stewards. In October 2015, Newark's Department of Economic and Housing Development issued an RFP for "engineering design, permitting and construction oversight services for the stablization and restoration of a 12.1 acre tidal wetland located in the City of Newark on Newark Bay." **HRE-Oak Island Yard adjacent site that will result in habitat connectivity and increased benefits.**

Planning Region	Project Name	Agencies	Project Summary
Upper Bay	Red Hook Integrated Flood Protection System	NYCORR	This project in Red Hook, Brooklyn proposes a combination of permanent and long-term components (e.g., multi-purpose berms, deployable flood walls, street elevations, and landscape and drainage improvements). FEMA 404 HMGP advance assistance funds obligated. FEMA's Hazard Mitigation Grant Program-Advanced Assistance (HMGP-AA) program study. For subsequent project phases, the City and the State have committed $50 million in HUD CDBG-DR funds and $50 million in HMGP funds for a total of $100 million in funding to be used for environmental review, permitting, design, engineering and construction.
Upper Bay	Liberty State Park Restoration (HRE Project Authorized - WRDA 2007)	NJDEP (USACE)	Pending USACE appropriations, NJDEP- Office of Natural Resource Restoration plans to advance portions of the project and design a minimum of 40 new acres of salt marsh and 100 acres of upland enhancement including maritime forest. The vast majority of the restoration area is currently excluded from public use due to contaminated historic fill materials. Removal of contaminated material, clean soil placement, native re-planting, and tidal creek enhancement will also be included in the layout. This project will ultimately result in building a resilient coastal ecosystem, improving water quality and resiliency, and include a new publicly accessible area within Liberty State Park.
Upper Bay	Governors Island	NY Harbor School	Oyster restoration adjacent Governors island testing various restoration techniques. **HRE-Oyster restoration at this site expands NY Harbor School's restoration project**
Lower Bay	Oyster Restoration Project	NY/NJ Baykeeper	Oyster restoration at Naval Weapons Station Earle with testing a variety of oyster techniques (e.g., spat on shell, oyster castles, …). **The HRE - Oyster restoration at Naval Weapons Station Earle will expand NY/NJ Baykeeper's reef project.**

Planning Region	Project Name	Agencies	Project Summary
Lower Bay	Strengthening Coney Island's Resiliency Through Green Streets	NFWF, NYCDPR	DOI's Sandy Coastal Resiliency grants administered by NFWF to NYCDPR to carry out a project to improve resiliency in the Brighton Beach neighborhood on New York City's Coney Island, an area that has long been vulnerable to damage from storm surge and flooding and is expected to experience additional climate change risks from rising sea levels, increased storms, and precipitation. This community also experiences frequent localized flooding due to the area's topography and degraded road conditions. The project will install 11 green streets to mitigate localized flooding, capture and filter 2,583,482 gallons of stormwater runoff per year, and reduce pollutants from entering local waterways. Additional environmental benefits will also be provided including beautification, urban heat island effect mitigation, carbon sequestration, increased biodiversity, and improved air quality. This project will initiate Brighton Beach's transformation of the right-of-way to develop productive green space. Further, Brighton Beach will also serve as a model as New York City expands its green streets program to Coney Island and other communities in the Jamaica Bay Watershed. As of April 2016, the contract award is scheduled for Q3 2016, and construction is scheduled for Q4 of 2016. Funding includes a DOI grant of $990,000 and matching funds from NYC DPR of $333,333. An extension on the project has been issued until 6/14/18.
Lower Bay	Coney Island Creek	NYCEDC	This study would investigate hydrological management strategies that would prevent and mitigate upland flooding, improve waterfront open space, strengthen neighborhood connections, enhance infrastructure, and provide opportunity for economic development around the Creek.

Planning Region	Project Name	Agencies	Project Summary
Lower Bay	Monmouth Beach Marshes and Dunes	NFWF	One of DOI's Sandy Coastal Resiliency grants administered by NFWF. The borough of Monmouth Beach, NJ will restore and enhance two coastal landscapes that serve as natural barriers to the impacts of storms that were destroyed or severely weakened by Hurricane Sandy. The borough has a population of 3,200 and occupies two square miles, of which one square mile is upland. The borough lies between two bodies of water with Atlantic Ocean to the east side and Shrewsbury River to the west side. Given the proximity to both bodies of water, the borough was severely impacted by Hurricane Sandy which inflicted over $6 million of infrastructure damage to sewer systems, town buildings, a school, and waterfront structures. Additionally, streets were flooded with up to six feet of water and one third of citizens' homes were damaged or destroyed. A 5,000-foot coastal dune system along the Atlantic Ocean will be restored to help absorb and dissipate the ocean's wave energy during storms. The dune will be restored with local wildlife officials' input to provide optimum nesting habitat for endangered species including piping plovers, least terns, and black skimmers. Several marsh islands in the Shrewsbury River will also be restored and provide over 17 acres of habitat for wading and roosting birds, while reducing wave impacts to homes and infrastructure. The project is supported by $1,317,250 in DOI funds, $1,750,000 in in-kind services/materials from USACE, and $462,750 in NFWF private foundation funds.
Lower Bay	Great Kills Harbor Breakwater Study	NYC NYS	NYSDEC Hudson River Estuary Program and the New York City Mayor's Office of Recovery and Resiliency and Department of City Planning have released a study evaluating the use of offshore breakwaters to mitigate wave action and erosion at Great Kills Harbor, on the eastern shore of Staten Island. The study was funded through a partnership with the New England Interstate Water Pollution Control Commission. The report was completed last year.

Planning Region	Project Name	Agencies	Project Summary
Lower Hudson River	Enhance Liberty State Park Marshes and Upland Habitats	NFWF	One of DOI's Sandy Coastal Resiliency grants administered by NFWF. The New Jersey Department of Environmental Protection (NJDEP) - Office of Natural Resource Restoration will use Liberty State Park, a highly urbanized setting within Jersey City that sustained severe damage to buildings and infrastructure due to Hurricane Sandy, to plan one of the largest habitat restoration projects in New Jersey. NJDEP will design a minimum of 40 new acres of salt marsh and 100 acres of upland enhancement including maritime forest. The vast majority of the restoration area is currently excluded from public use due to contaminated historic fill materials. Removal of contaminated material, clean soil placement, native re-planting, and tidal creek enhancement will also be included in the layout. This project will ultimately result in building a resilient coastal ecosystem, improving water quality and resiliency, and include a new publicly accessible area within Liberty State Park. In Q1 2016, permitting options and obstacles with NJDEP and ACOE were discussed. A project timeline is being developed.

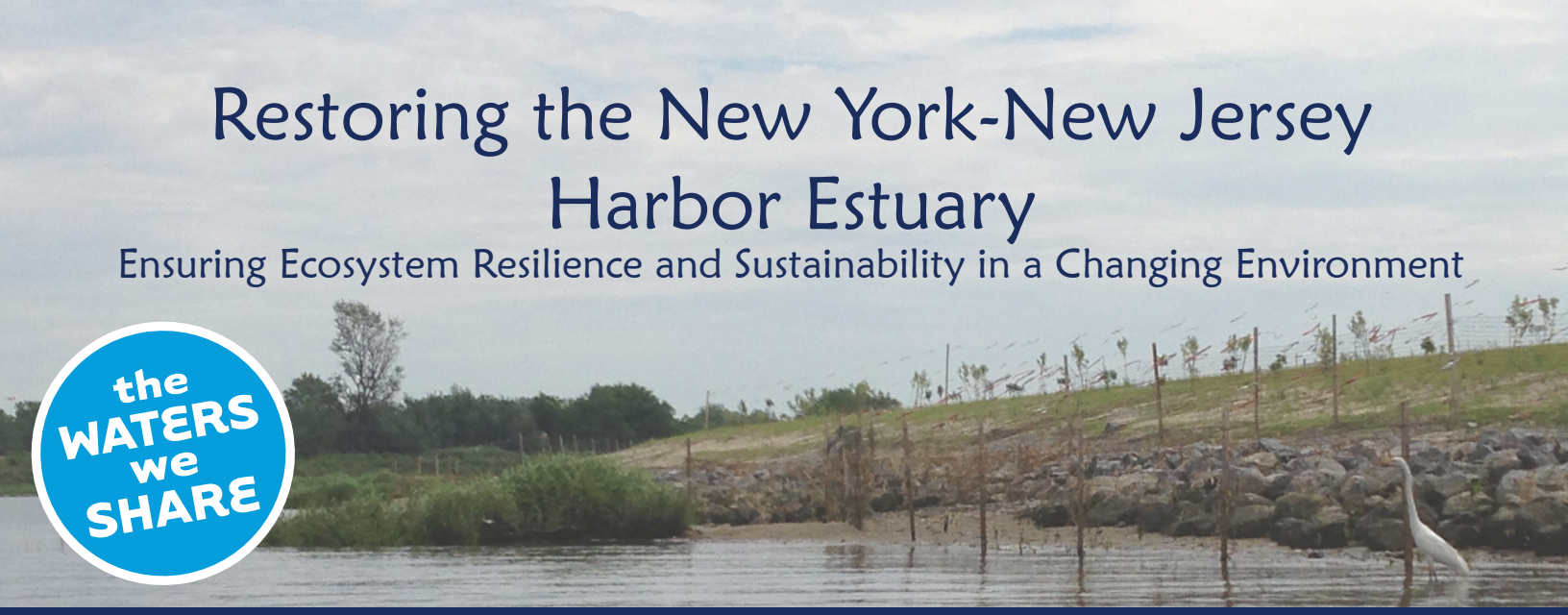
Appendix B-3

NY-NJ Harbor Estuary Progress 2009 – 2014

Progress 2014 - 2016

Restoring the New York-New Jersey Harbor Estuary

Ensuring Ecosystem Resilience and Sustainability in a Changing Environment



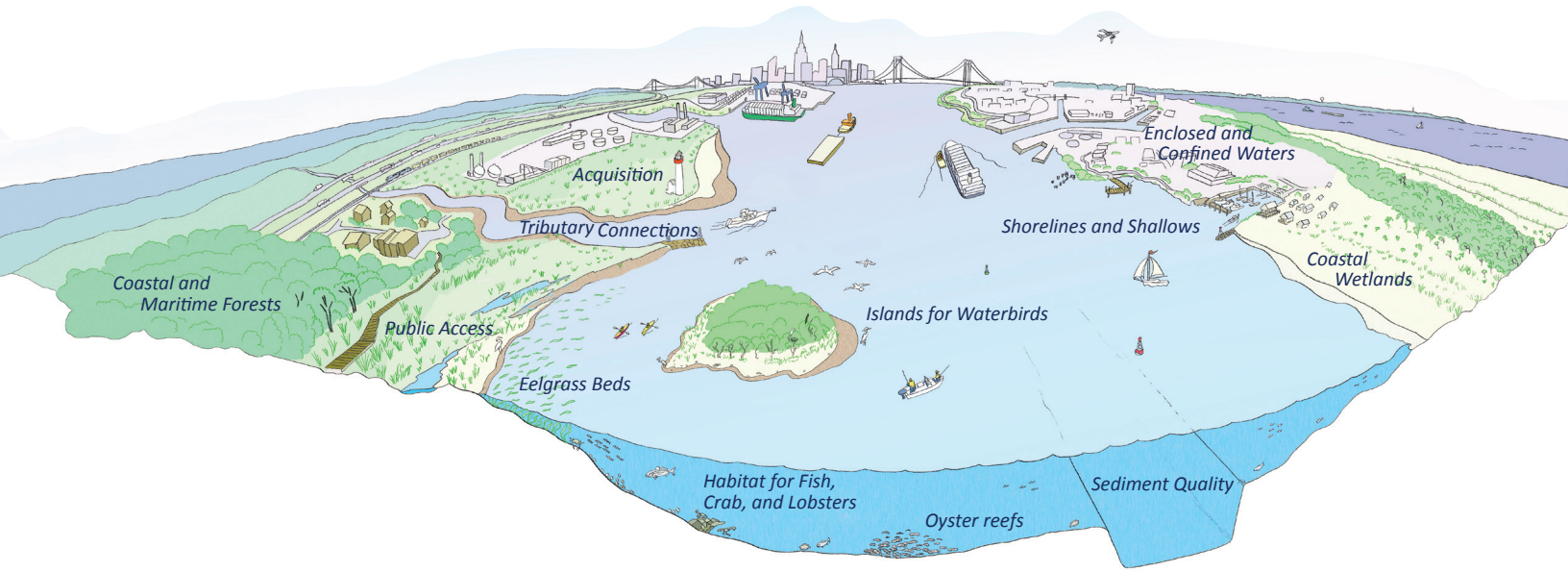
the WATERS we SHARE

PROGRESS 2009-2014 AND CHARTING THE PATH FORWARD

Overview and Summary

Restoration of the New York-New Jersey Harbor Estuary has advanced considerably since the release of the first draft of the *Hudson-Raritan Estuary Comprehensive Restoration Plan*, published in 2009 by the United States Army Corps of Engineers in partnership with the Port Authority of New York & New Jersey and the New York-New Jersey Harbor & Estuary Program. The plan set goals for each of 12 Target Ecosystem Characteristics to be met by 2020 and 2050. Some 2020 goals have already been met or exceeded, including targets for public access, habitat for waterbirds, coastal and maritime forests, and improving tributary connections critical to migratory fish. However, progress toward other goals such as oyster reefs and eelgrass beds, has proved more challenging.

Achieving these and other Comprehensive Restoration Plan goals will require substantial funding and leveraging efforts, above existing amounts. Funding provided for recovery and rebuilding efforts after Superstorm Sandy will provide one near-term possibility. Advancements in our understanding and development of additional data on shorelines and shallow water habitat, sediment management, and the ecological value and efficacy of "nature-based" resiliency features are critical to reaching these goals successfully.



The *Hudson-Raritan Estuary Comprehensive Restoration Plan* set goals for 12 Target Ecosystem Characteristics - *www.watersweshare.org*

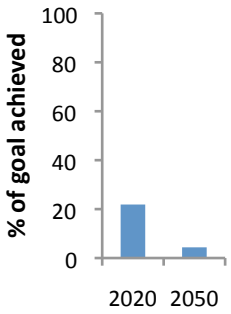
New York - New Jersey Harbor & Estuary Program
www.harborestuary.org

HUDSON RIVER FOUNDATION
for Science & Environmental Research

Reporting on progress and identifying the ways to address challenges was the agenda for *Restoring the New York-New Jersey Harbor Estuary*, a symposium held in New York City on June 3, 2014. The Restoration Work Group of the New York-New Jersey Harbor & Estuary Program convened a diverse audience of nearly 200 attendees. This report summarizes progress toward meeting 2020 and 2050 goals, remaining challenges to be addressed in the coming years, and actions identified at the workshops and community discussions during the symposium.[1]

Wetlands

2020 goal: create or restore a total of 1,000 acres of freshwater and coastal wetlands.
2050 goal: continue creating or restoring an average of 125 acres per year for a total system gain of 5,000 acres.
Since 2009: twenty wetlands restoration projects have been implemented, notably multiple large-scale island restoration projects in Jamaica Bay such as Yellow Bar Hassock, and at the recently opened Lincoln Park in New Jersey. Multiple near-term projects are expected in the next few years, including Sunset Cove Park, also in Jamaica Bay.



Kate Boicourt

Volunteers plant *Spartina* to help restore wetlands in Jamaica Bay.

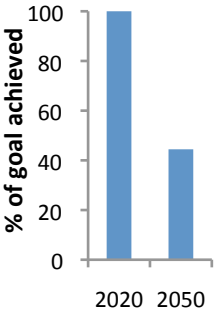
Since 2009: one potential nesting island and multiple known foraging wetlands were enhanced. As of the last harbor-wide survey, eight islands had nesting populations and nearby foraging habitat.

Carl Alderson

Multiple habitats were restored at Lincoln Park West in Jersey City.

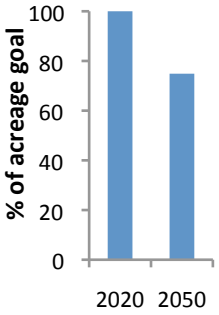
Habitat for waterbirds

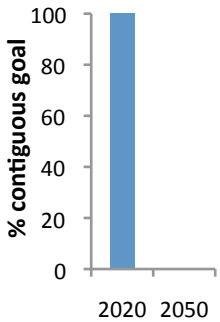
2020 goal: enhance at least one island without an existing waterbird population in Hudson-Raritan Estuary (HRE) regions containing islands and create or enhance at least one foraging habitat.
2050 goal: all suitable islands provide nesting sites and have nearby roosting and foraging habitat.



Coastal and maritime forests

2020 goal: establish one new coastal and maritime forest community of at least 50 acres and restore at least 200 acres among several coastal forest/upland habitat types.
2050 goal: 500 acres of coastal and maritime forest community among at least three sites and 500 acres of restored coastal forest/upland habitat.
Since 2009: over 100 percent of the 2020 goal for overall forest acreage was reached, as well as 100 percent of the contiguous forest goal. Innovative strategies, including converting former landfills into habitat (e.g. Brookfield in Staten Island), have helped achieve goals.

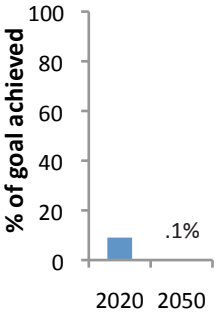




[1]See *Appendix A* on *www.watersweshare.org* for a list of specific projects.

Oyster reefs

2020 goal: 20 acres of self-sustaining, naturally expanding reef habitat across several sites.
2050 goal: 2000 acres of established oyster reef habitat.
Since 2009: nine percent of the 2020 goal was realized, and it will be challenging to attain both 2020 and 2050 goals. Oyster restoration will require additional large-scale research in this region. Efforts continue, particularly in the Bronx River and Raritan Bay, through oyster gardening programs, and a recently funded project in Jamaica Bay.

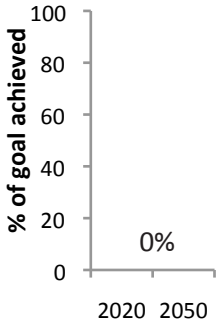



Peter Malinowski

A student holds an oyster he helped to grow on Governors Island.

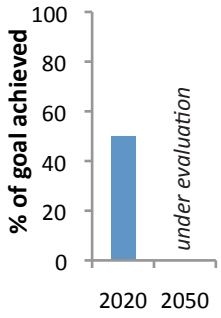
Eelgrass beds

2020 goal: create one bed in at least three regions
2050 goal: three established beds in each suitable HRE region.
Since 2009: eight test beds were created in two planning regions, but none have survived more than two years. Challenges include understanding and addressing water quality and sediment movement. Additional research into restoration techniques and opportunities is required.



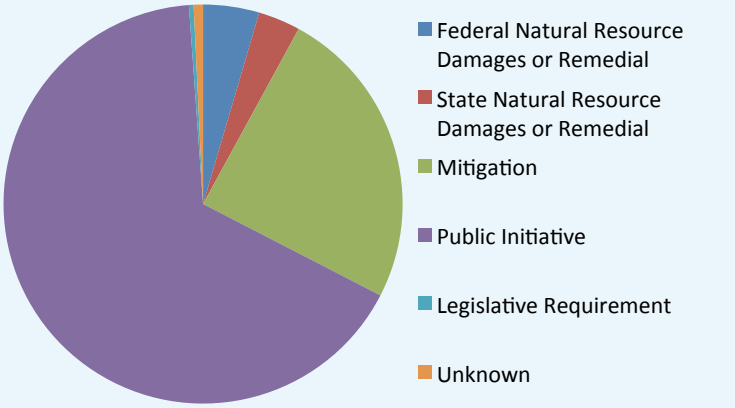
Shorelines and shallows

2020 goal: develop new shorelines and shallows sites in two HRE regions.
2050 goal: restore all available shoreline habitats in three HRE regions.
Since 2009: two projects were completed in two planning regions (Hunts Point Landing and Brooklyn Bridge Park) in New York City. These projects are challenging, but are critical to counteract significant historic losses of shallow water habitat. Further research is needed to address progress toward the 2050 goal and will be addressed in future reports.



How are projects funded?

Over $1 billion was spent on all targets between 2009 and 2014.[2] However, only roughly $240 million of that was spent on habitat restoration. Public access and acquisition investments totaled about $870 million. Additionally, Alderson and Bowers found that between 1987-2012, roughly one quarter of restoration projects were paid for due to Natural Resource Damages, mitigation, or other permit requirement or settlement, suggesting that the full picture of habitat gained is more nuanced.[3,4] In the near-term, many projects will be completed using funds authorized after Superstorm Sandy. A longer-term strategy for meeting goals requires increased funding from a diversity of sources, as well as addressing other impediments to restoration and acquisition. Additionally, new construction authorization in a future Water Resources Development Act resulting from the Hudson-Raritan Estuary Ecosystem Feasibility Study would serve as a major funding source in the future.

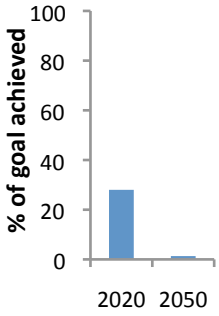


Funding sources of restoration in the harbor estuary between 1987-2012[4]

[2]Numbers are based on publicly-reported costs and communication with funders or project leads, and should be considered approximate.
[3]Compensatory mitigation for wetlands, unless in excess of requirement, is not counted toward these goals. See *Appendix B* on www.watersweshare.org.
[4]Carl W. Alderson, Bowers J., *Restoration of the New York/New Jersey Harbor - Harbor History Database*. NOAA Unpublished manuscript. June 2012.

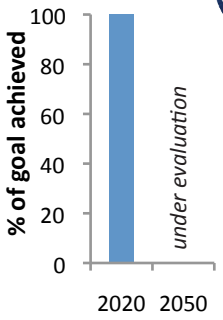
Sediment contamination

2020 goal: isolate or remove at least 25 acres of contaminated sediment.
2050 goal: isolate or remove at least 25 acres of contaminated sediment every two years.
Since 2009: seven acres of contaminated sediments were removed in the lower Passaic River (56,000 cubic yards). Outside of the region, a significant source of PCBs to the harbor was also reduced (2.7 million cubic yards) in the upper Hudson River. Removals in Newtown Creek, Gowanus, and the Passaic River are anticipated in the near term. A second iteration of the Contaminant Assessment and Reduction Project will launch in 2015, and targets for this goal may change as more is learned.



Public access

2020 goal: create one access and upgrade one existing access per year.
2050 goal: all waters of the HRE are accessible.
Since 2009: over 500 acres of new publicly accessible waterfront spaces (17 new and 16 upgraded) have been established, making this a notable success story for the harbor. New plantings and other work at many of these sites has also helped contribute toward other Target Ecosystem Characteristics. Determining progress toward the 2050 goal will be defined upon completion of the 2015 Public Access Assessment currently being conducted by the Estuary Program and partners.

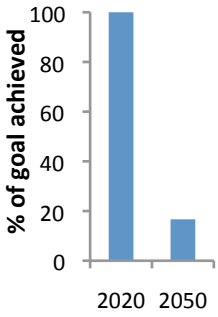


Gabriela Munoz

John McShane

Before and after images of the recently daylighted Saw Mill River, unearthed after 100 years of burial underground in Yonkers, New York.

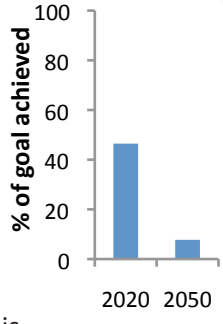
Tributary connections



2020 goal: restore connectivity or habitat within one tributary reach per year.
2050 goal: continue rate of restoring and reconnecting areas.
Since 2009: three large dam removals occurred in the Raritan River, and fish passage was established over the 182nd Street Bronx River dam. Dams and other obstructions prevent many key and threatened species from accessing critical habitat. Near-term projects are anticipated on the Bronx River.

Acquisition

2020 goal: acquire and preserve 1,000 acres of coastal property.
2050: acquire and preserve 200 acres of coastal property per year for a total of 6,000 acres.
Since 2009: acquisitions of over 100 acres in both South Brunswick and Raritan Township in New Jersey contributed to a total of nearly 500 acres. The high cost of property in this densely developed region makes this an ambitious target. Recent buy-out programs in flood prone areas will result in additional land acquisition for conservation and flood mitigation.

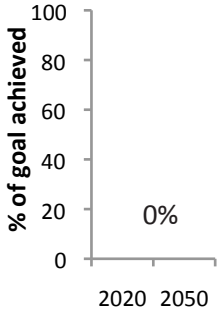


Courtesy Newark Riverfront Revival, www.newarkriverfront.org, Damon Rich

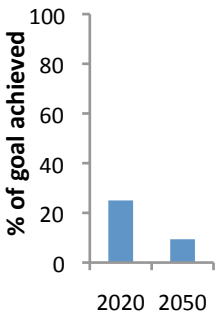
Newark Riverfront Park, located along the Passaic River in Newark, New Jersey, was opened to the public in 2013.

Enclosed and confined waters

2020 Goal: upgrade water quality of eight enclosed waterways.
2050: upgrade water quality of all enclosed waterways.
Since 2009: there have not been changes significant enough in water quality to count toward goals, based on the most recent information on impaired waters from the states of New Jersey and New York and the Environmental Protection Agency. However, improvements are underway at multiple sites through the Long Term Control Plans for combined sewer overflows now being permitted or implemented in the states of New York and New Jersey.



Habitat for fish, crab, and lobsters



2020 Goal: complete a set of two related habitats in each HRE region
2050 Goal: complete four sets of at least two related habitats in each HRE Region.
Since 2009: one project in each of two planning regions was completed—notably Calvert Vaux Park and Brooklyn Bridge Park in New York City. These projects are defined through enhancing and connecting multiple types of habitats spanning from shorelines and shallow waters to upland vegetation, a difficult challenge in the NY-NJ Harbor Estuary.

Hearing from the restoration community: key near-term actions

Symposium attendees participated in one of three breakout groups charged with discussing the following topics: *Setting priorities for a changing future, Moving forward on implementation, and Community engagement*. The outcome of these sessions was distilled into the following set of priorities and actions for the New York – New Jersey Harbor & Estuary Program and its Restoration Work Group.

Gabriela Munoz

Break-out group participants discuss ways to engage communities in estuary stewardship, such as the importance of direct outreach.

Setting priorities for a changing future

The urban context of the New York-New Jersey Harbor Estuary makes it one of the most challenging restoration and conservation environments in the nation. Climate change compounds the complexity of the management of this ecosystem. Superstorm Sandy has focused attention and brought resources to the possibility of employing existing habitat and "nature-based features" to reduce risks posed by coastal storms and sea level rise. There are many scientific, engineering, management, and monitoring challenges to making conservation and restoration part of a comprehensive approach to reducing climate-related risk. Even when new ideas seem promising, the design or funding process may be on a time frame that does not allow for required research and analysis through experimentation or pilot projects.

"How do we get some of these newer ideas for green infrastructure into the mix?"
- Debbie Mans, New York/New Jersey Baykeeper

Participants offered suggestions on how to examine and evaluate ways to meet resiliency goals and increase natural resource restoration and protection in an innovative, efficient and low-risk manner.

#1 Remove impediments to restoration implementation.

- Pursue additional ways to facilitate efficient and effective review of environmentally beneficial projects through permitting changes or improved guidelines.
- Support the development and use of standard monitoring protocols to enhance the understanding of habitat quality and services.
- Identify areas that have potential for advancing challenging restoration targets such as oysters and eelgrass that would be more likely to succeed with water quality improvements.

#2: Improve the understanding and incorporation of nature-based resiliency approaches.

- Define and pursue a shorelines characterization research plan to efficiently and effectively achieve habitat restoration and resiliency goals.
- Facilitate discussions with the Restoration Work Group and partners, expanding on the *Research Plan to Advance the Understanding of Potential Green Infrastructure Strategies in New York City* report, Rebuild by Design, and other projects to address research needs and data-sharing as well as incorporate strategies outlined in the *North Atlantic Coast Comprehensive Study*.[5,6,7]

#3: Increase the understanding of how sediment transport and quality, water quality, and management interact to support habitat in rising sea level conditions.

- Support projects that improve the understanding of how multiple factors interact along with rising sea levels so that these considerations can be effectively incorporated into restoration design and management.

#4: Improve the understanding of best restoration and conservation practices for urban ecosystems.

- Support research that improves the understanding of how to achieve desired habitat functions in urban ecosystems.
- Invest in case studies and pilot projects for restoration activities that test, implement, and evaluate new restoration techniques including living shorelines.

Moving forward on implementation

Restoration of urban habitat is costly but critical; a multi-faceted funding strategy is needed to reach restoration goals. Funding restoration projects is increasingly changing; there is a need for a nimble collaborative approach to funding and implementing projects, and aligning restoration goals to leverage appropriate funding sources.

"In the past we have been competitive with each other; it's important that we present a unified front. I would love to see us engage more with New Jersey."

- Venetia Lannon, New York State Department of Environmental Conservation

Gabriela Munoz

Venetia Lannon and Nancy Kete joined a panel focused on funding.

#5: Employ the NY-NJ Harbor & Estuary Program as a platform to explore diverse funding sources.

- Develop a comprehensive funding strategy for achieving restoration goals outlined in the *Hudson-Raritan Estuary Comprehensive Restoration Plan.*
- Articulate science and information needs so that new sources of funding can address these gaps as near-term opportunities arise.

[5]Zhao, Haihong; H. Roberts; J. Ludy; A. Rella; J. Miller; P. Orton; G. Schuler; L. Alleman; A. Peck; R. Shirer; J. Ong; M. Larson; K. Mathews; K. Orff; G. Wirth; L. Elachi. *Research Plan to Advance the Understanding of Potential Coastal Green Infrastructure Strategies in New York City*. 2014. NEIWPCC.
[6]USACE, 2015. *North Atlantic Coast Comprehensive Study: Resilient Adaptations to Increasing Risk Main Report* (January 2015)
[7]USACE- Engineer Research and Development Center (ERDC), 2015. *Use of Natural & Nature-Based Features (NNBF) for Coastal Resilience* (ERDC SR-15-1)

Community engagement

The New York-New Jersey Harbor Estuary is home to more than 20 million people and hosts more than 50 million visitors each year. There is increased public recognition that our shared waters are a valued resource and investments have provided more opportunities for accessing them. For public understanding and reverence to grow, the restoration community needs to do a better job of reaching out to residents and expanding awareness of how the estuary affects all of our lives. Increasing awareness is an important task and requires an approach that effectively engages the community.

"You also have to get out on the ground and build a level of trust with communities."
- John Rosser, Future City, Inc.

#6: Improve the public awareness of and engagement with the estuary and its health.

- Develop a better understanding of public awareness and engagement in estuary issues and identify specific audiences that may be better reached.
- Determine a strategy for reaching key audiences, including a means of supporting community-led outreach and engagement efforts through grant programs and coordinated partnership projects.
- Assess and communicate the ecological, social, and economic values of the estuary and restoration.

#7: Improve and increase public access to and from our waterways as a way to foster stewardship.

- Evaluate and support mapping of public access; identify areas of need; and recognize best practices.
- Target advocacy, grant programs, events, and other resources toward underserved areas.

Gabriela Munoz

Katerli Bounds and Leila Mougoui of New York City Parks paddle through the Arthur Kill to Pralls Island to restore heron nesting habitat.

How can you get involved?

Interested in learning about the estuary? Subscribe to *Tidal Exchange E-news* or check out *www.harborestuary.org.* Have a question about habitat restoration or want to nominate a site for inclusion in the *Hudson-Raritan Estuary Comprehensive Restoration Plan*? Contact us at habitat@harborestuary.org or check out *www.watersweshare.org*.

This report was produced by the New York - New Jersey Harbor & Estuary Program in partnership with its Restoration Work Group. Lead Authors: Kate Boicourt (New York-New Jersey Harbor & Estuary Program), Lisa Baron (Restoration Work Group Chair and US Army Corps of Engineers), and Robert Pirani (New York-New Jersey Harbor & Estuary Program). Contributing Authors: Hanem Abouelezz (National Park Service), Carl Alderson, (National Oceanic & Atmospheric Administration), Peter Weppler (US Army Corps of Engineers), Grace Jacob (New Jersey Dept. of Environmental Protection), Ruth Ehinger (New Jersey Dept. of Environmental Protection), Marit Larson (NYC Dept. of Parks & Recreation), Jim Lodge (Hudson River Foundation), Debbie Mans (New York/New Jersey Baykeeper), Marc Matsil (The Trust for Public Land), John McLaughlin (NYC Dept. of Environmental Protection), Andrew Peck (The Nature Conservancy), Rosalie Siegel (Port Authority of NY & NJ), Steve Zahn (NY State Dept. of Environmental Conservation).

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New York-New Jersey Harbor Estuary Program

HUDSON RIVER FOUNDATION for Science & Environmental Research, Inc.

Restoring the New York-New Jersey Harbor Estuary

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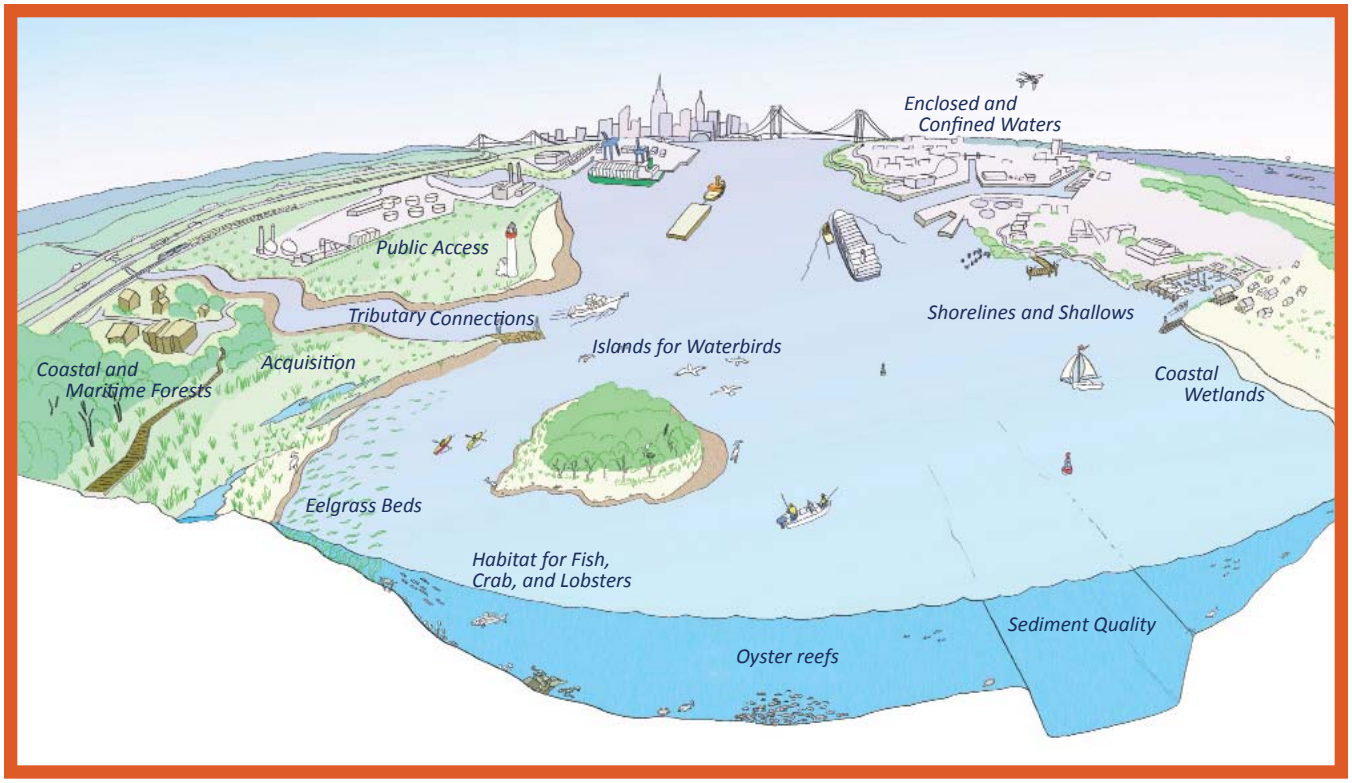
Restoration Progress 2014-2016

Overview and Summary

The New York – New Jersey Harbor Estuary is a vibrant and ecologically significant resource, despite its location at the heart of the North America's largest metropolitan area. Its open water, countless tidal tributaries, and wetlands are home to an amazing array of fish and wildlife. Through the creation of the Hudson Raritan Estuary Comprehensive Restoration Plan (HRE CRP), HEP and its partners have set goals for the conservation and restoration of 12 Target Ecosystem Characteristics (TECs) to be met by 2020 and 2050.* These shared aspirations for wetlands, habitat for waterbirds, tributary connections, oyster reefs, and other TECs provide a path towards a healthy and renewed urban ecosystem.

This report addresses the achievements made by the HEP Restoration Work Group Partners between 2014 and 2016, and overall progress towards the 2020 and 2050 goals Restoration progress made between the release of the HRE CRP in 2009 and 2014 was summarized in the previous HEP Restoration Progress Report (HEP 2015).

Due to a large influx of funding at the federal and state levels following Superstorm Sandy, the most significant progress toward the targets was in the acquisition category. More than 360 acres of flood-prone properties were acquired, primarily along the eastern shore of Staten Island and in the Raritan River watershed. Strong progress also continued in the coastal & maritime forest TEC, where over 33 acres of coastal forest were created. At least $450 million dollars was spent on restoration or protection of over 450 acres of habitat since 2014. But efforts to restore eelgrass beds, enclosed and confined waters, and oysters remain challenging.

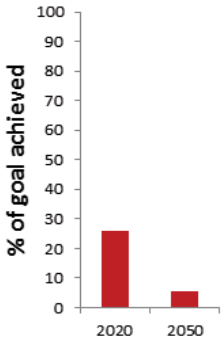


The *Hudson-Raritan Estuary Comprehensive Restoration Plan* set goals for 12 Target Ecosystem Characteristics - *www.watersweshare.org*

Wetlands

2020 goal: create or restore a total of 1,000 acres of freshwater and coastal wetlands.

2050 goal: continue creating or restoring an average of 125 acres per year for a total system gain of 5,000 acres.



Recent Projects: since 2014, one large-scale project in New Jersey (Woodbridge Waterfront Park, 38.5 acres) and a few smaller-scale projects in New York City have been completed. While a number of large-scale restoration projects have occurred in the past few years, they only make up 25% of the 2020 goal. A number of important upcoming projects (Spring Creek North and South in Jamaica Bay, future phases of Woodbridge Waterfront Park, and Teaneck Creek Park) are expected to be completed in the next few years, increasing the goal progress by 10%. Looking forward, the Hudson Raritan Estuary Restoration Feasibility Study has recommended 26 new wetland restoration sites (totaling approximately 424 acres) in Jamaica Bay, the Lower Passaic River, the Hackensack River, Flushing Creek, and the Bronx River (USACE, 2017).

GreatEcology

Restored wetlands at Woodbridge Waterfront Park, NJ

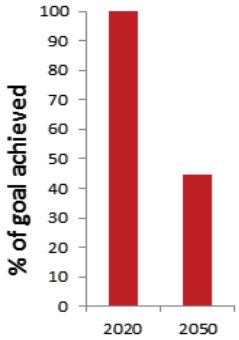
Funding is a primary limitation to meeting 2020 goals, though there are many funding opportunities highlighted in the Comprehensive Restoration Plan. These proposed investments in wetland restoration are important as wetlands are particularly vulnerable to the impacts of sea level rise and development, and can provide resiliency benefits.

Habitat for Waterbirds

2020 goal: enhance at least one island without an existing waterbird population in Hudson-Raritan Estuary (HRE) regions containing islands and create or enhance at least one foraging habitat.

2050 goal: all suitable islands provide nesting sites and have nearby roosting and foraging habitat.

Recent Projects: while the goal of enhancing one potential nesting island was met in 2014, no additional islands have since been enhanced. However, multiple foraging habitats have been restored, and eight out of 18 islands had nesting long-legged wading birds as of the 2015 nesting survey (Winston 2015). A number of islands that used to house nesting birds still have no nesting pairs (Shooters and Pralls Islands, Isle of Meadows, North Brother, among others). In the near-term, multiple large-scale wetland restoration projects and the repair of the West Pond berm breach in Jamaica Bay are expected to be completed in the next few years providing long-legged wading bird forage habitat.



Coastal and Maritime Forests

2020 goal: establish one new coastal and maritime forest community of at least 50 acres and restore at least 200 additional acres among several coastal forest and upland habitat types.

2050 goal: 500 acres of coastal and maritime forest community among at least three sites and 500

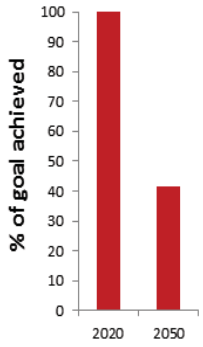
NYC Department of Parks and Recreation

Restored Maritime Forest at Cedar Grove Beach, Staten Island, NY

*The first draft of the HRE CRP was published in 2009 by the United States Army Corps of Engineers in partnership with the Port Authority of New York & New Jersey and HEP. The HRE CRP was revised and Version 1.0 was released in June 2016 representing a milestone of regional consensus for the NY and NJ Harbor Estuary.

additional acres of restored coastal forest and upland habitat.

Recent Projects: fewer coastal and maritime forest restoration projects were completed in the past two years compared to the annual average between 2009-2014, with a few larger projects on Governors Island and Oakwood and Cedar Grove Beaches (Staten Island), providing 15.4 of the 33.6 acres of coastal forest created. A number of smaller, less than one-acre projects were completed during this time frame in New York City and Monmouth County. In the next few years, Spring Creek North and South in Jamaica Bay will be restored, including an estimated nearly 224 acres of maritime forest, shrub, and grassland habitat.

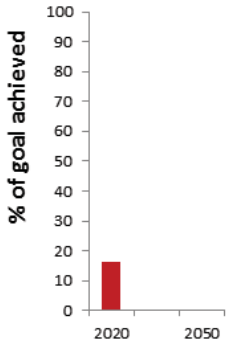


Oyster Reefs

2020 goal: 20 acres of self-sustaining, naturally expanding reef habitat across several sites.

2050 goal: 2000 acres of established oyster reef habitat.

Recent Projects: since the 2014 report, two pilot projects have been constructed. The first, in Ware Creek leading to Raritan Bay incorporated oyster spat set on "oyster castles" as part of a living shoreline project. In Thurston Basin in Jamaica Bay, a 0.5 acre reef was installed in 2016. Additionally, though not counted towards restoration goals, experimental restoration research led by the Hudson River Foundation and others was recently funded as partial mitigation for the Tappan Zee bridge expansion. Educational oyster gardens supported by the Billion Oyster Project and Urban Assembly New York Harbor School continue to expand and be monitored by students. Future sites and expansion of existing reef locations comprising 58 acres of oyster habitat at Bush Terminal Piers Park, Governor's Island, Soundview Park, Jamaica Bay and Naval Station Earle were recommended for construction by the HRE Feasibility Study (USACE 2017).



While oyster reefs once were prevalent habitat in the NY-NJ Harbor estuary, their restoration is challenging.

S.P. Sullivan, NJ Advance Media

A field technician at U.S. Naval Station Earle, Ware Creek, NJ

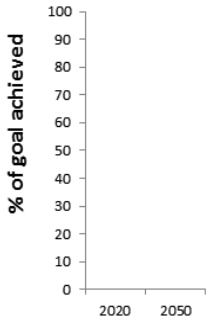
To increase in population naturally, oyster larvae have to successfully settle on viable oyster habitat and then survive to a spawning adult stage, both difficult in a harbor where there is little oyster habitat or spawning adult reef to be found, and where multiple factors (predation, disease, strong physical forces, pollution) impact success. The results of the Tappan Zee Bridge, Naval Station Earle and Soundview Park (Bronx, NY) projects will continue to inform the scientific understanding of best practices for restoring oysters in the harbor.

Eelgrass Beds

2020 goal: create one bed in at least three HRE regions.

2050 goal: three established beds in each suitable HRE region.

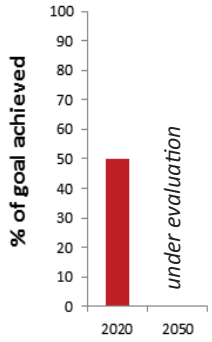
Recent Projects: while none have survived for multiple years, a number of experimental eelgrass restoration plots were created in Jamaica Bay, providing scientific insight into the issues affecting restoration potential. The difficulty in establishing plots in the bay is thought to be caused by a number of factors including: a large blue mussel set in 2011 settling on the leaves, sediment waves impacting early shoots, and predation. It is also possible that the small size of the beds may have negatively influenced survival. Much like oysters, eelgrass has been decimated in the harbor to the point of functional extirpation and will likely require significant



investment in larger projects to achieve success and remain established over time.

Shorelines and Shallows

2020 goal: develop new shorelines and shallows sites in two HRE regions.
2050 goal: restore all available shoreline habitats in three HRE regions.
Recent Projects: in 2014, a new shallow water area was established in Brooklyn Bridge Park – Pier 4 beach, with tide pools incorporated into the design. Expected near-term projects include living shorelines at Ware Creek and Newark Bay. While there have not been many projects for this target, and they are all located in the same HRE region (Harlem River/East River/Western Long Island Sound), there has also been a push to develop a greater understanding of sustainable shorelines. In 2015, HEP produced a report on developing a protocol for urban shoreline assessment (Reid et al. 2015). In 2014-2016, the Hudson River Sustainable Shorelines effort and HEP, among others, have conducted studies on the ecological and structural values associated with living shorelines.

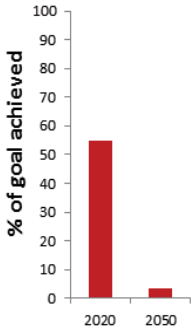


Kate Boicourt

Pier 4 Beach, Brooklyn Bridge Park, NY

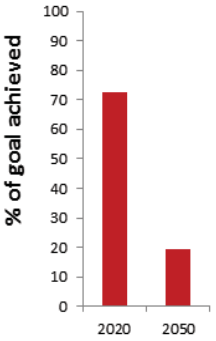
Sediment Contamination

2020 goal: isolate or remove at least 25 acres of contaminated sediment.
2050 goal: isolate or remove at least 25 acres of contaminated sediment every two years.
Recent Projects: contaminated sediment has been removed from three superfund sites in the Hudson-Raritan watershed. At the Horseshoe Road and Atlantic Resources superfund sites, sediments were removed from the Raritan River and disposed offsite. Additionally, a small amount of material was removed from the Gowanus Canal superfund site. In the longer term, additional contamination removal or stabilization is expected in these areas as well as in Newtown Creek and the Lower Passaic River. In 2016 the EPA released the Record of Decision for the cleanup of the lower 8.3 miles of the Lower Passaic River (removal of 3.5 million cubic yards), which was an important milestone towards restoration.



Tributary Connections

2020 goal: restore connectivity or habitat within one tributary reach per year.
2050 goal: continue rate of restoring and reconnecting areas.
Recent Projects: There has been one new project completed since 2014, the second phase of the Sawmill River daylighting in Yonkers. The 2014-installed 182nd Street fish ladder is now in place and has begun to pass eels and other species upstream. Other expected near-term projects include two upstream fish ladders in the Bronx River (Stone Mill Dam and Bronx Zoo), the potential Weston Mill Dam removal along the Raritan River, and culvert replacements further upstream in the Hudson River Watershed. Additionally, the Lawrence Brook Fish Ladder feasibility study presents an opportunity for future fish passage development. Going forward, the HRE Feasibility Study has also identified and developed a prioritization tool for ranking future fish passage projects (USACE 2017).



Kate Boicourt

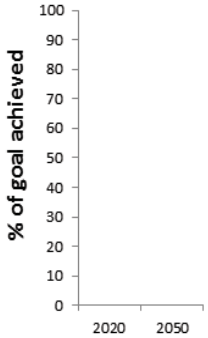
Gowanus Canal, Brooklyn, NY

Enclosed and Confined Waters

2020 Goal: upgrade water quality of eight enclosed waterways.

2050: upgrade water quality of all enclosed waterways.

Recent Projects: there are currently no examples of areas that have been improved to meet their designated use. There are, however, actions that have been undertaken, such as sewage treatment plant upgrades in Jamaica Bay, and a number of planning and regulatory efforts underway that are required to address unsatisfactory water quality conditions. The Long Term Control Plan and MS4 permitting processes in New York and New Jersey are being currently developed. If implemented, the plans will improve a number of water bodies, such as the Gowanus Canal in Brooklyn, the Passaic and Harlem Rivers, and Flushing Bay. These are longer-term projects requiring significant financial and construction efforts, that have multiple-year horizons of implementation.

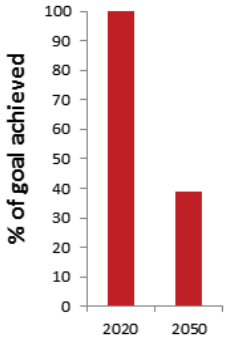


Public Access

2020 goal: create one access and upgrade one existing access per year.

2050 goal: all waters of the HRE are accessible.

Recent Projects: seven new access improvement projects were completed in both New York and New Jersey including the newly-acquired Swimming River Park along the Navesink River, New Stapleton Waterfront Park along the northeast coast of Staten Island, a small addition along the Harlem River (Muscota Marsh Park), as well as new walkways and esplanades



NYSDEC R2

Paddlers at the opening of the Old Place Creek boat launch, Staten Island, NY.

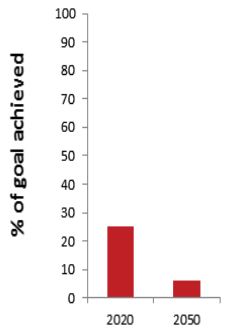
along the Harlem River waterfront. Additionally, the High Bridge, a pedestrian path connection between Manhattan and the Bronx, was restored and reopened for the first time in 45 years, and a new kayak launch and viewing platform were created in Old Place Creek on Staten Island. Upcoming expected projects include Woodbridge Waterfront Park in New Jersey and Sunset Cove Park in Jamaica Bay.

Habitat for Fish, Crab, and Lobsters

2020 Goal: complete a set of two related habitats in each HRE region

2050 Goal: complete four sets of at least two related habitats in each HRE region.

Recent Projects: no projects have been completed since the last report. Calvert Vaux Park in Brooklyn, NY, which was restored in 2013, provides habitat for a number of wildlife, and serves as spawning habitat for horseshoe crabs. Many of the projects recommended for construction by the HRE Feasibility Study restore fish, crab and lobster habitat throughout five of the planning regions.

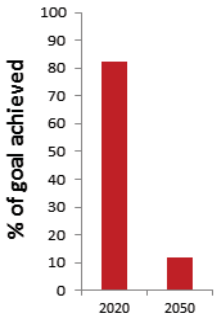


Acquisition

2020 Goal: acquire 1000 acres of habitat for protection.

2050 Goal: continue to acquire at a rate of 200 acres per year (6,000 acres) for a total of 7,000 acres.

Recent Projects: significant progress toward this goal was made in the past two years. This progress was primarily due to many purchases of small flood-prone properties in both New York and New Jersey (over 200 were less than one-quarter acre in size) by the States of New York and New Jersey. There were also a few larger-parcel purchases, such as the 89-acre addition to Freneau Woods and the 17-acre Big Brook Park in Monmouth County, NJ.



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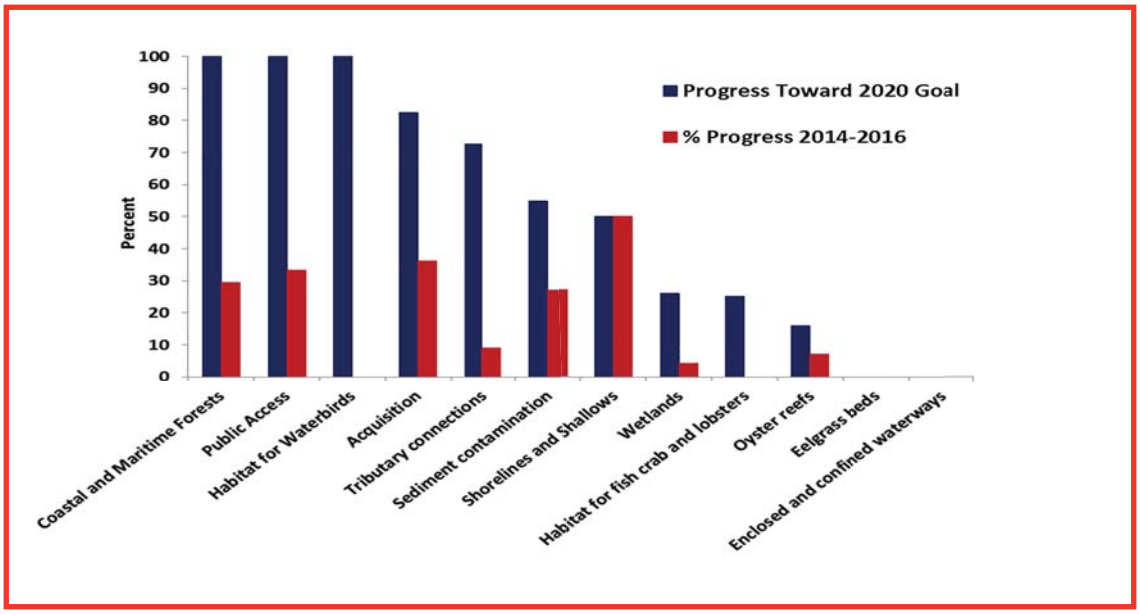
Google Street Veiw September 2013

NYSDEC R2

One of the many houses acquired by the State of NY in Oakwood Beach, Staten Island, NY. The houses were demolished and the lots were planted with native grasses until it is determined what will be done with these flood-prone lots.



Lead Authors: Kate Boicourt (HEP, now Waterfront Alliance), Isabelle Stinnette (HEP), and Lisa Baron (HEP Restoration Work Group Chair and USACE). Contributing Authors: Robert Pirani (HEP), Carl Alderson, (National Oceanic & Atmospheric Administration), Lauren Alleman (The Nature Conservancy), Susan Elbin (NYC Audubon), Peter Weppler (US Army Corps of Engineers), Grace Jacob (New Jersey Dept. of Environmental Protection), Ruth Ehinger (New Jersey Dept. of Environmental Protection), Marit Larson (NYC Dept. of Parks & Recreation), Jim Lodge (Hudson River Foundation), Debbie Mans (New York/New Jersey Baykeeper), Susan Maresca (NY State Dept. of Environmental Conservation), Marc Matsil (The Trust for Public Land), John McLaughlin (NYC Dept. of Environmental Protection), Lisa Oberreiter (Passaic Valley Sewerage Commissioners), Andrew Peck (The Nature Conservancy), Ken Scarlatelli (NY State Dept. of Environmental Conservation), Nellie Tsipoura (NJ Audubon).

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Meeting Key Challenges

In 2014, participants in HEP's Bi-Annual Restoration Conference made suggestions on how to achieve habitat restoration and protection goals. These suggestions will be incorporated into HEP's Draft Action Agenda, to be released in May, 2017. Objectives for the habitat and ecological health section include 1) Making progress towards restoring the estuary's Target Ecosystem Characteristics 2) improving the quality and likely success of habitat restoration practices 3) supporting restoration monitoring and the utility of monitoring data and 4) Advancing the understanding and incorporation of climate change impacts in habitat management and restoration. The NY-NJ Harbor & Estuary Program and partners are already working towards these objectives including the following developments since 2014:

Making progress towards restoring the estuary's Target Ecosystem Characteristics.

- Goals are nearly met for some targets, but others are hindered by cost, implementation challenges, and regulatory concerns. Small-scale projects for shorelines, eelgrass, and shallows and oyster reefs have continued. Research and collaboration, such as through the Oyster Restoration Research Partnership, HRE Feasibility Study and a current project to investigate the amounts and spatial patterns of eelgrass in the Hudson River, is expected to continue to shed light on status and opportunities. Significantly increased efforts will need to be made to further the eelgrass beds target.

Improving the quality and likely success of habitat restoration practices

- A standard monitoring protocol for urban shorelines was piloted in the Harbor in 2014-2015, and the Hudson River Sustainable Shorelines program is currently piloting a rapid assessment protocol.
- Pilot projects incorporating oysters are underway or planned in New York City, and at US Naval Weapons Station Earle in Middletown, NJ at Ware Creek.

Supporting restoration monitoring and the utility of monitoring data

- There is still a need to increase consistency among resiliency metrics and monitoring, something that HEP, the Science and Resilience Institute at Jamaica Bay, NYSDEC, NYCDPR and other partners, plan to pursue as a follow-up to the previously-published *Research Plan to Advance the Understanding of Potential Green Infrastructure Strategies in New York City* report.

Advancing the understanding and incorporation of climate change impacts in habitat management and restoration

- An evaluation of all HRE CRP restoration opportunities was conducted to determine which sites provide the potential to serve as NNBFs for coastal resilience. These sites are presented in the HRE Feasibility Report and Environmental Assessment (USACE 2017).
- The North Atlantic Division of the US Army Corps of Engineers recently released a Comprehensive Study, the goals of which were to provide a risk management framework and support resilient coastal communities and robust, sustainable coastal landscape systems including natural and nature-based features.
- With respect to wetlands habitat, the New Jersey Department of Environmental Protection and NYC Department of Parks and Recreation are developing methods and tools for evaluating existing wetland condition and opportunities for potential restoration, given sea level rise predictions.
- Efforts to monitor the ability of regional wetlands to adapt to sea level rise and studies of sediment dynamics near marshes in Jamaica Bay are being undertaken by the NYC Department of Parks and Recreation and Rutgers University.

How can you get involved?

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