

# Restoring the New York - New Jersey Harbor Estuary

## Restoration Progress 2017 - 2019





## Overview and Summary

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Restoration of the Hudson Raritan Estuary (HRE) continues to progress. Over the past three years, more than 40 projects were completed throughout the waterways and watershed in New York and New Jersey, with significant advancement made in restoring maritime forests, acquiring land for conservation, and improving aquatic connectivity for migratory fish and other creatures. While progress towards our goals for oysters and other in-water and shoreline habitat continues to be challenging, continued research and pilot projects have advanced practice. Over \$290 Million was spent in restoration in 2017-2019, with acquisition costs making up 85% of this total.

It has been 11 years since the Restoration Work Group adopted the Comprehensive Restoration Plan (CRP) for the Hudson Raritan Estuary and started tracking progress towards our shared goals: 12 Target Ecosystem Characteristics (TECs) that together define the structure, function and biological diversity of a restored estuary south of the Mario Cuomo (Tappan Zee) Bridge. This report highlights the progress towards these goals over the past three years (2017-2019) since the last Restoration Report. The CRP outlines goals per TEC for 2020 and 2050. As 2020 is almost upon us, it is a good time to assess achievement. The 2020 goals have proven to be largely appropriate; ambitious but achievable. For some of the TECs, we have more than doubled the 2020 goal, while for others there is limited progress. The number of TECs that satisfied the 2020 goal has jumped from three in last Restoration Report (2016), to five in this report. Success is controlled by many diverse factors including organizational priorities, opportunistic funding, and expectations of restoration success. For most of the TECs that did not reach the 2020 goal, such as Eelgrass Beds and Oyster Reefs, the restoration community is still largely in a research or piloting phase, reflecting the challenging practice and difficult environmental conditions. Exceptions include Wetlands restoration and Sediment Contamination that have established restoration techniques but are controlled by the high cost of these projects. Going forward, the 2050 goals will be reviewed to determine if they continue to reflect the priorities of the many public and private stakeholders in the restoration community.

One notable change to highlight is that the Restoration Work Group recently determined the need for a new way to track the Enclosed and Confined Waters TEC. Millions of dollars in capital investments were made to improve water quality in several confined waters since 2009, however that was not being reflected in the tracking method that was initially chosen. The ultimate goal of this TEC is for the water quality in these confined waters to match their receiving waters. The group decided that this could be tracked by metrics of significant effort including construction of green and gray infrastructure.

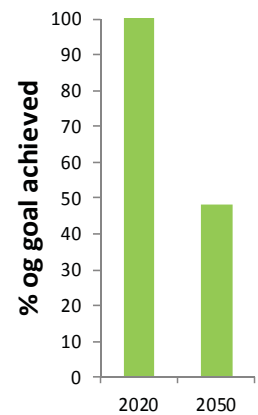


## Coastal and Maritime Forest

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

2050 Goal: 500 acres of maritime forest community among at least three sites and 500 additional acres of restored coastal forest/upland habitat.

The region's progress toward restoring Coastal and Maritime Forests is one of the most successful efforts. We have almost doubled the acreage set as our 2020 goal and have achieved nearly 50% of our 2050 goal. In the last three years there have been nine coastal forest restoration projects implemented, all efforts by NYC Parks, culminating in 78 acres of restored habitat. The two largest projects are located in Conference House Park and Cedar Beach on Staten Island, New York, restoring critical maritime forest habitat.

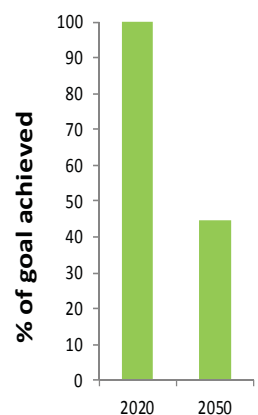


## Habitat for Waterbirds

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

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

North Brother Island was restored in 2016 to create habitat for long-legged wading birds such as great egrets, little blue herons, green herons, and black-crowned night-herons (collectively referred to as Harbor Herons). So far, the restoration on North Brother Island has not resulted in any usage by the waterbirds and more research is needed to determine what makes desirable breeding habitat in the Harbor for these species. Since 2016, no other island breeding habitat restorations have occurred, but Harbor Herons are still found on eight of the 18 islands in the Harbor Estuary<sup>1</sup>. Wetland restoration has continued throughout the Harbor, enhancing the foraging habitat needed by these species. Restoration partners continue to prioritize Harbor Herons, for example in 2018 a colony of green herons nesting on the mainland were protected from disturbance by NYC Parks.



Winston, T. 2018. New York City Audubon's Harbor Herons Project: 2018 Nesting Survey Report. New York City Audubon, New York, NY.



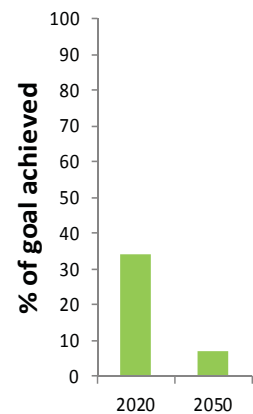
## Wetlands

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

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

Progress was made over the last two years towards the Wetland TEC, thanks largely to a 60 acre wetland restoration project in Staten Island. NYC Parks Department conducted a major removal of invasive plants at Oakwood Beach and Ocean Breeze, neighborhoods where damaged houses were bought-out following Hurricane Sandy. Additionally, eight acres were planted to create tidal marsh, brackish marsh, and scrub/shrub marsh habitat in Sayreville, New Jersey, as part of the cleanup of a Federal Superfund site. Restoration at this site is ongoing as some of the plantings were not successful, presumably due to a high pH in the soil. A large, \$14 million restoration was also just completed at Sunset Cove in Broad Channel, New York, that included coastal forest and grassland habitat restoration as well as wetland creation.

Wetland restoration progress is slow and steady. Though projects continue to be implemented, they are not occurring at the rate to which the TEC goals aspire, and after 11 years, we are only a third of the way to our 2020 goal.



### Sea Level Rise and Wetland Restoration

Several regional efforts are underway to protect wetland migration pathways; places where wetlands are likely and able to move with sea level rise. With sea level rise, these vulnerable ecosystems encounter the “coastal squeeze,” where urban land uses do not allow for the migration of wetlands, an ecological process that had occurred for thousands of years. This acknowledgment represents a change in restoration planning for wetlands: restoration opportunities must consider where these opportunities will be in the future. HEP’s Restoration Work Group and partners, including Scenic Hudson, Regional Plan Association, NYC Parks and others, are looking into the methods and opportunities to protect these pathways<sup>2</sup>.

Another tool to reduce sea level rise impacts is thin-layer deposition. This method usually consists of spraying sediment in a slurry on an existing marsh to mimic the deposition that occurs naturally with large storm events. Such natural deposition does not occur because the hardening of our shorelines and burial of tidal creeks has led to decreased sediment supply. While this restoration technique has been used widely in other parts of the country, it is relatively untested in our unique urban estuary. NYC Parks has piloted thin-layer deposition methods as well as outlined city-wide opportunities for this type of restoration.



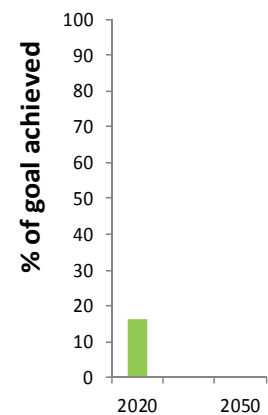
## Oyster Reefs

2020 Goal: 20 acres of reef habitat across several sites.  
2050 Goal: 2,000 acres of established oyster reef habitat.

In the past three years, the only new oyster restoration has been the lengthening of the living shoreline created by NY-NJ Baykeeper along the Raritan Bayshore at US Naval Station Earle. Though the lengthening of this line of concrete oyster castles does not contribute much acreage towards the TEC goal, importantly, for the first time, monitors found oyster spat in 2018, indicating that this reef may be self-sustaining. In 2018, the largest oyster restoration project to date, a five-acre project consisting of large reef balls and oyster shell gabions, was completed near the Mario Cuomo (Tappan Zee) Bridge. However, this restoration is mitigation for possible damage to wild oyster populations from the construction of the new bridge, and as mitigation, does not count towards our restoration goals. Oyster gardening continues to gain popularity and the Billion Oyster Project has added three “nursery” sites consisting of large cage structures. While they do not make up much in acreage, these sites increase the number of oysters reproducing in our estuary and increase awareness by engagement with students and other stakeholders.



Oyster wrapping piles in the Hudson River Park Estuarine Sanctuary; See Habitat for Fish Crabs and Lobsters



## Wetland Mitigation Banking in NYC

The Saw Mill Creek Mitigation Bank Pilot located in northwest Staten Island, was substantially completed in 2018. Initiated by NYC Economic Development Corporation in partnership with NYC Parks, this project undertook the restoration of 54-acres of Saw Mill Creek as a federal and state compliant wetland mitigation bank, the first of its kind in NYC. The restoration of tidal hydrology and salt marsh vegetation at the site was achieved through excavation of approximately 40,000 cubic yards of historic fill, old tires, and other garbage. Complete excavation was achieved in summer 2018, returning twice-daily tidal inundation across much of the restoration site for the first time in nearly half a century. Replanting of native plant species, primarily *Spartina alterniflora*, occurred in the spring of 2018 and 2019. On an on-going basis, invasive species will be removed as part of a five-year monitoring and maintenance plan required by federal mitigation banking rules. The mitigation bank has begun generating mitigation “credits” which are now available for purchase to permittees requiring mitigation. Credit sale proceeds will go first towards funding monitoring and maintenance, and then to capitalize a long term stewardship fund to be dedicated to the protection and maintenance of the restoration area in perpetuity.



Mussel Beach, New York, NY



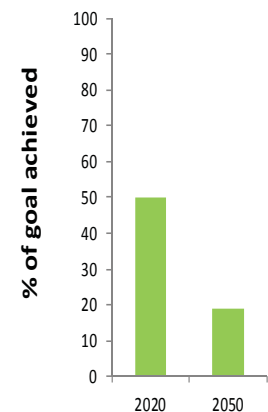
## Habitat for Fish, Crab and Lobsters

2020 Goal: create a set of two functionally-related habitats in each region.

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

Restoration towards the Habitat for Fish, Crabs and Lobsters TEC has progressed over the past three years since our last report. The purpose of this TEC is to drive restoration projects that enhance habitat by improving multiple ecosystems in a single project location. Recent academic research confirms that mutualistic restorations enhance restoration success,<sup>3</sup> and this consideration is reflected in an evolution in our thinking about restoring urban shorelines. Recent projects include a pocket park called Mussel Beach implemented by NYC Parks on the East River, and a pilot project by the Hudson River Park Trust enhancing pile fields in the Hudson by wrapping them in oyster-filled bags.

The new projects in the past three years have allowed us to reach 50% of our 2020 goal. In order to reach our 2020 goal, projects will need to be implemented in the Hudson Raritan Estuary regions that do not yet have projects: the Upper Bay; Jamaica Bay; Arthur Kill/Kill van Kull; and Lower Raritan River.



Derksen-Hooijberg, M., Angelini, C., Lamers, L. P., Borst, A., Smolders, A., Hoogveld, J. R., ... & van der Heide, T. (2018). Mutualistic interactions amplify saltmarsh restoration success. *Journal of applied ecology*, 55(1), 405-414.

PHOTO: I. Stinnette





## Tributary Connections

2020 Goal: restore connectivity or habitat within one tributary reach per year.

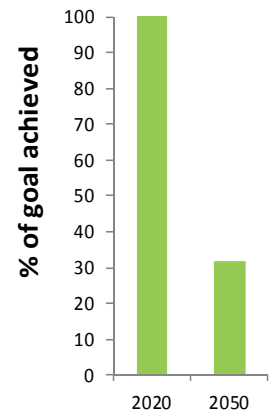
2050 Goal: continue rate of restoring and reconnecting areas.

During the past three years, there has been one major aquatic connectivity project, three minor ones and one riparian restoration project that count toward this TEC goal. We have now reached 100% completion of our 2020 goal.

A notable recent tributary connection project was the removal of the Weston Mill Dam in 2017. This removal opened up 4.7 miles of habitat to migratory fish on the Millstone River in Middlesex County, New Jersey. The dam removal was a true partnership project involving many agencies and local organizations, and was made possible by funds from a Natural Resources Damages settlement. Post-removal monitoring discovered American shad spawning in the newly opened habitat for the first time in 170 years.



Weston Mills Dam Removal



## Aquatic Connectivity Assessment

Aquatic connectivity is a key restoration goal for HEP and its partners. The assessment of barriers to fish passage has been recently prioritized regionally with the focus on turning from larger dams to smaller stream crossings and culverts. The adoption of the assessment protocols, training methods and collective database developed by the North Atlantic Aquatic Connectivity Collaborative (NAACC) has streamlined and galvanized this research effort. The NYSDEC and Hudson River Estuary Program started a project assessing stream crossings for the Hudson River watershed and HEP has initiated a project to do the same in New Jersey's waterways. These assessments can lead to a prioritization of culvert replacement projects (Tributary Connection Restorations) and have already resulted in restorations and grant funding for connectivity projects in the Hudson River watershed. The information collected during the NAACC assessment can also be used in models that assess culvert right-sizing for mitigating flooding and erosion. This can contribute to knowledge about how the culvert is handling stormwater flows now and under future climate change scenarios. HEP has piloted this project in two subwatersheds in coastal New Jersey and is seeking partners for continued assessments next year.



## Eelgrass Beds

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

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

Though eelgrass is largely extirpated in the Harbor Estuary, it has been set as a target ecosystem in the CRP with a reasonable goal: create pilot projects. For the first time since the adoption of the CRP in 2009, we have made some progress with the Eelgrass Beds TEC. A pilot eelgrass planting has been installed and monitored in Sunset Park, Brooklyn, New York. The project is tiny; managed by volunteers and unfunded, yet for every year of monitoring eelgrass remains, growing doggedly through often zero-visibility waters. The leader of this effort, Bart Chezar, has also reintroduced Sargassum, another native but extirpated submerged aquatic vegetation species. We need eelgrass pilot projects in two additional Hudson Raritan Estuary regions to satisfy our 2020 goal.

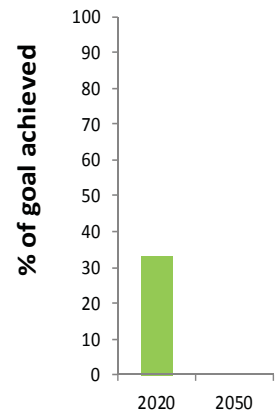


PHOTO: Eelgrass (left) and sargassum (right); Bart Chezar



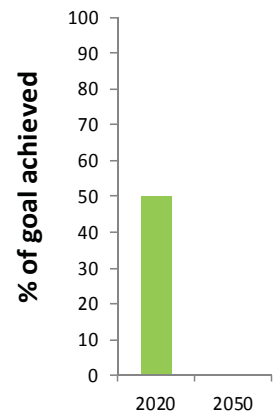


## Shorelines and Shallows

2020 Goal: develop new shorelines sites in two HRE regions.

2050 Goal: restore available shoreline habitat in three HRE regions

One shoreline project has been created in the past three years. Progress towards the 2020 TEC goal remains the same as the previous report (50%), because all of the shoreline projects thus far have been in one HRE region: Harlem River/East River/Long Island Sound. A project needs to be completed in a different region in order to satisfy the 2020 goal. Roberto Clemente State Park in Bronx, New York, was enhanced, including a softening of the shoreline to incorporate an intertidal area. This intertidal space lets river water flow through tide gates on the bulkhead and into a rocky tidal pool area that serves as habitat for crabs and small fish.



### Hudson Pile Fields Benthic Invertebrates Research

Pile fields, the legacy of historic piers that still exist as wooden piles sticking out of the sediment, have been extolled as good habitat for fish. There is no definitive answer, however, as to why and how fish and other estuarine organisms use the pile fields. In a 2017 project funded by HEP, Dr. Gary Taghon of Rutgers University attempted to address a small portion of the question by assessing if the structure of the benthic community may have some bearing on how the pile fields are used as habitat. Benthic infauna refers to spineless creatures that live in the river sediment, such as crabs and marine worms. These invertebrates tend to remain in place for the majority of their adult lifetimes. Because of this, the structure of benthic communities (which species are found in abundance), reflects local environmental conditions. This study was conducted in the Hudson River Park Estuarine Sanctuary on seven pile fields and proximal inter-pier areas.

Dr. Taghon found no difference between the benthic samples from inside the pile fields and those from sites nearby. Species diversity was found to be either “high” or “good” in all of the samples, based on a widely used index of benthic health. The species found were mostly those that are pollution tolerant, however it is likely that the sampling effort was not sufficient to capture the full diversity of those species that are considered more sensitive.

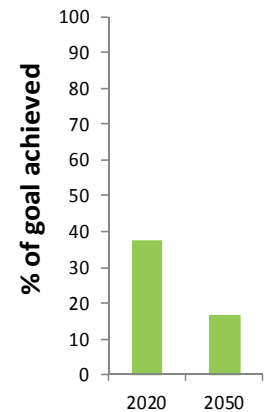


## Enclosed and Confined Waters

2020 Goal: improve the water quality of eight enclosed waterways.

2050 Goal: improve the water quality of all enclosed waterways.

To better enable tracking of our progress toward this TEC, the Restoration Work Group created a list of 18 priority waterways of concern (see map below). The Work Group also changed the wording of the Goal from “Upgrade the water quality...” to “Improve the water quality...” because “upgrade” implied that once a waterway received significant improvements, it no longer needed attention. The word “improved,” recognizes that significant infrastructure or restoration projects have been undertaken with the goal of improving water quality and that those projects are having a positive effect. These include construction of combined sewage overflow holding tanks, separation of storm and sanitary sewers, increasing flushing or removing barriers to tidal flow, or a concerted green infrastructure effort in the sewershed. Three of the 18 Enclosed and Confined Waterways have been selected to be listed as Improved. Lincoln Park in Secaucus, New Jersey, was restored in 2010 reconnecting an inland pond to the Hackensack River through a tidal wetland. Bergen and Paerdegat Basins in Jamaica Bay, New York, are two enclosed waterbodies with very poor water quality that have benefited from significant investment from the NYCDEP for grey and green infrastructure projects, including new sewer lines and wetland restoration.



MAP: The 18 priority Enclosed and Confined Waterbodies



## 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.

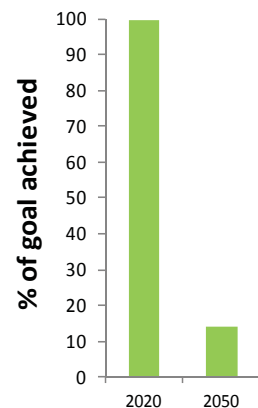
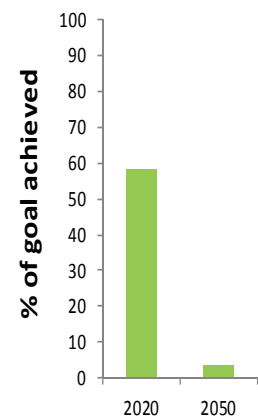
The only sediment contamination project since 2016 was the removal of less than one acre of sediment from a basin of the Gowanus Canal in Brooklyn. This dredging project represented a pilot of the larger Superfund cleanup expected in the Gowanus Canal over the next 4 years. The full Gowanus Superfund cleanup should be 10 acres, which would get us to nearly 100% of our 2020 goal. Looking forward, EPA reached a record of decision in fall of 2018 regarding Berry's Creek in Bergen County, New Jersey, which hopefully fast-tracks this cleanup process. The removal of contaminated sediments at Berry's Creek could be over 80 acres. The 17 miles of the Lower Passaic River is also advancing at various stages within the Superfund Program. The lower 8.3 miles of the river is in design phase for the removal of an estimated 500 acres of sediment, and the upper 9 miles interim remedial actions at targeted hot spots are under consideration by USEPA. In addition, potential remedies are advancing through the administrative process for the Newtown Creek Superfund site.

## 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.

Thanks largely to continuing buyout efforts of flood-prone properties in by the NYS Governor's Office of Storm Recovery and the NJDEP Blue Acres program, progress toward the 2020 goal for acquisition has nearly been met. In Staten Island, New York, over 115 acres of flood-damaged homes in three neighborhoods were purchased. In New Jersey over 20 acres were purchased near Raritan and Hudson River tributaries. Additionally, other partners including Trust for Public Land and Middlesex County have acquired parcels together totaling 28 acres. Over \$248 million has been spent on acquisition over the past three years, protecting for conservation and resiliency over 170 acres of land.







## Public Access

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

2050 Goal: all waters of the HRE are accessible.

Public Access is where progress continues to be the most advanced of all 12 TECs. We have achieved more than double the 2020 goal of creating one access point and upgrading one shoreline public access site each year. However, the 2050 goal, shows us that there is still a long way to go before all of the suitable shoreline is accessible. The largest new public access spaces created in the last two years are Domino Park in Brooklyn, New York, a private investment made pursuant to New York City's zoning requirements; Hunters Point Extension in Queens, a project led by NYC Parks; and the third phase of the Newark's Riverfront Park, in New Jersey, a municipal park that expands and links several existing waterfront parks along the Passaic River. The newly created waterfront spaces of the past two years increased the accessible waterfront by 1.7 linear miles.

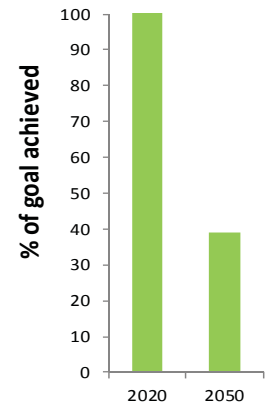
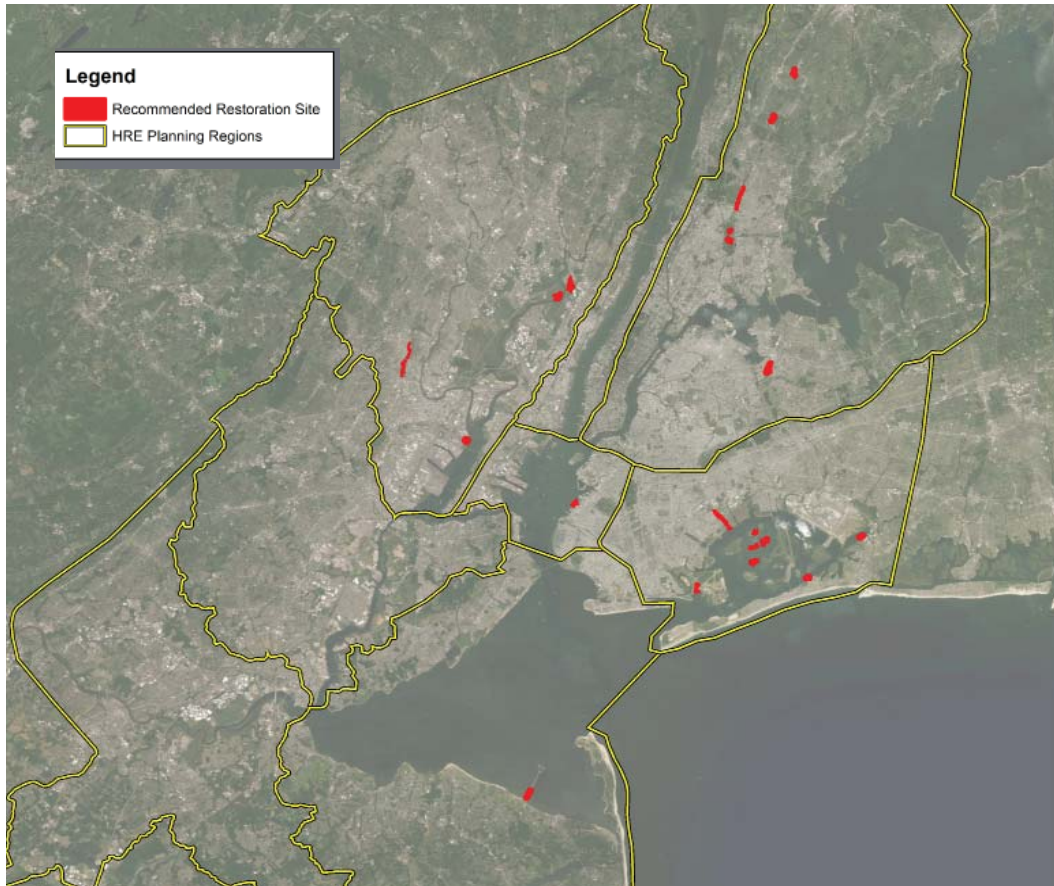


PHOTO: Newark Riverfront Park; The Trust for Public Land

## Hudson Raritan Estuary Ecosystem Restoration Feasibility Study Overview of Recommended Sites

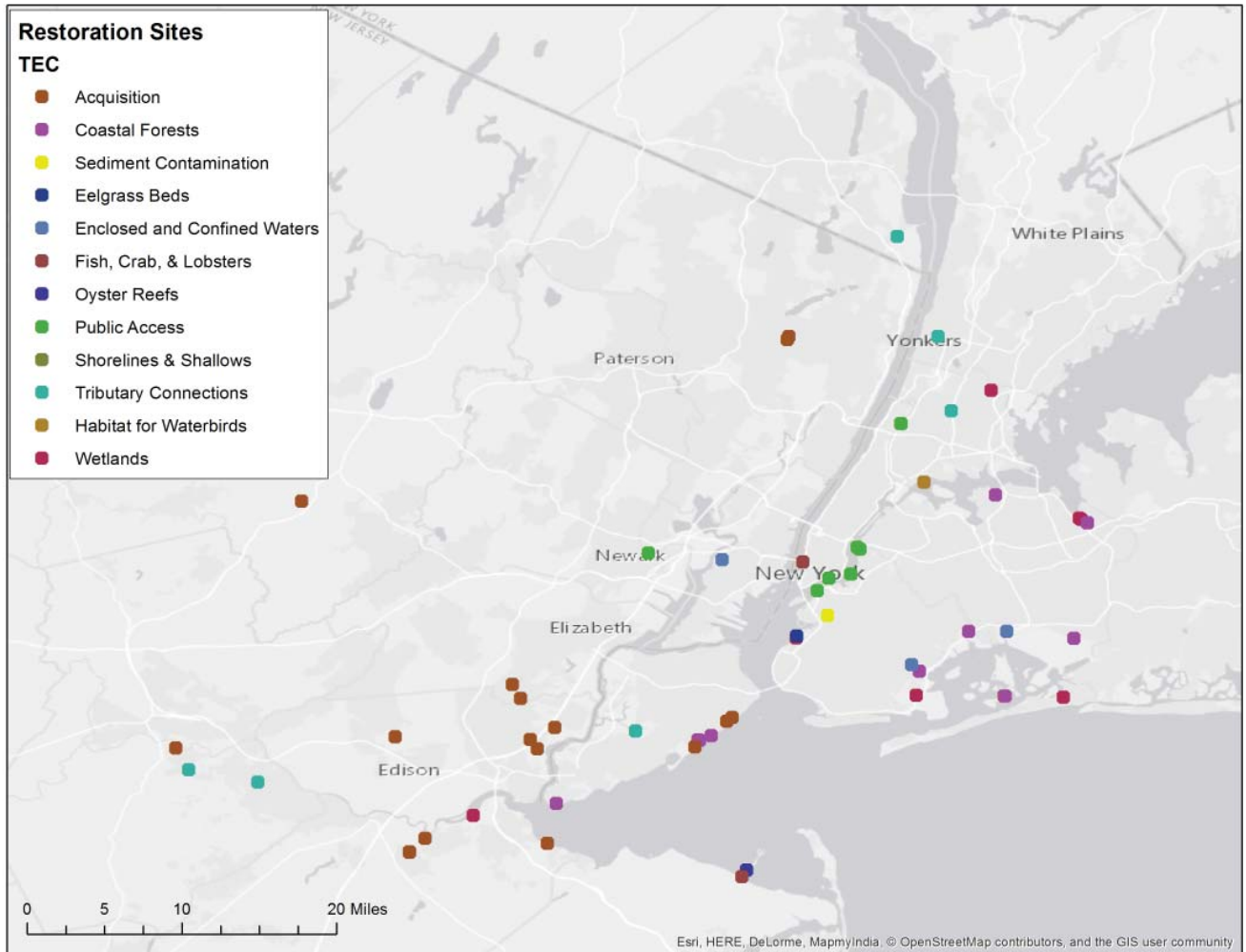


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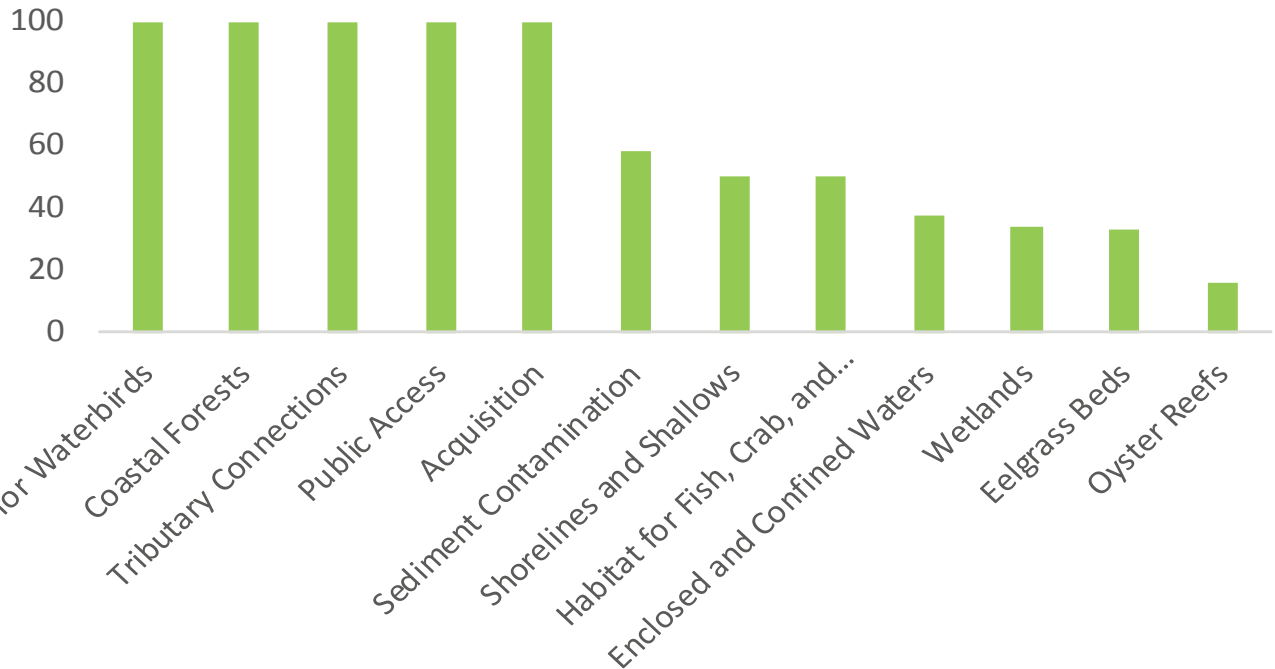
The New York District of the USACE and numerous study sponsors released the Hudson Raritan Estuary (HRE) Draft Integrated Feasibility Report and Environmental Assessment in February 2017. There were 33 restoration sites included in the Tentatively Selected Plan in the Lower Passaic River, Hackensack Meadowlands, Jamaica Bay, Flushing Creek, and Bronx River Basin. Subsequent analyses and the USACE Agency Decision Milestone in September 2018, resulted in the current recommendation of 20 restoration projects. Refined designs, fully funded costs, and regulatory compliance nears completion for these projects to complete the Final FR/EA in early 2020. This step will lead to a Chief's Report and a request for a subsequent Congressional construction authorization. If approved by the Chief and funded by Congress, these projects would advance to pre-construction engineering and design and construction phases with our many State, City and Non-Governmental Organization sponsors over the next 20 years and significantly advance progress towards the goals and targets of the HRE CRP.

# Map of all Projects 2017 - 2019





## Percent Completion Towards 2020 Goals



This report is a product of the Restoration Work Group of the NY-NJ Harbor & Estuary Program.  
Membership includes:

Hudson River Foundation  
National Oceanic and Atmospheric Administration  
New Jersey Audubon  
New Jersey Department of Environmental Protection  
New Jersey Sports and Exhibition Authority  
New York-New Jersey Baykeeper  
New York Department of Environmental Conservation  
New York City Audubon  
New York City Department of Environmental Protection  
New York City Parks Department  
Science and Technical Advisory Committee  
The Nature Conservancy  
The Trust for Public Land  
US Army Corps of Engineers  
US Environmental Protection Agency  
US Fish and Wildlife Service

NOVEMBER 1, 2019

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