Action Agenda

2017-2022

HUDSON RIVER FOUNDATION

NY/NJ HARBOR & ESTUARY PROGRAM

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www.hudsonriver.org/NYNJHEPActionAgenda.pdf

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ACKNOWLEDGEMENTS

This draft document was prepared by the staff of the NY–NJ Harbor & Estuary Program and Hudson River Foundation with the assistance of HEP's Policy, Management and Citizens Advisory Committees; technical work groups addressing Water Quality, Restoration, and Public Access issues; and the participants at HEP's public workshops and conferences. The members of the Citizens Advisory Committee can be found on page 56. Technical work group members are listed at the start of the relevant sections of the report. The report was written by Robert Pirani, Ariane Giudicelli (former HEP staff), Isabelle Stinnette, Rosana Da Silva, Sarah Lerman-Sinkoff, James Lodge and Kate Boicourt (former HEP staff). Graphic design and data visualization by Sara Eichner and the Spatial Analysis and Visualization Initiative at Pratt Institute.

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Base map data: Terrain: USGS DEM. Watershed: National Hydrology Dataset (NHD) Subsection. Waterfront Parks and Public Spaces: NY NJ HEP. Waterbodies: NHD. Rivers: ESRI. States & Counties: USGS National Atlas. Icons: Noun Project: Linseed Studio, Andrew Vasiliev, Colleen Wilson. Cover photo: Shutterstock.

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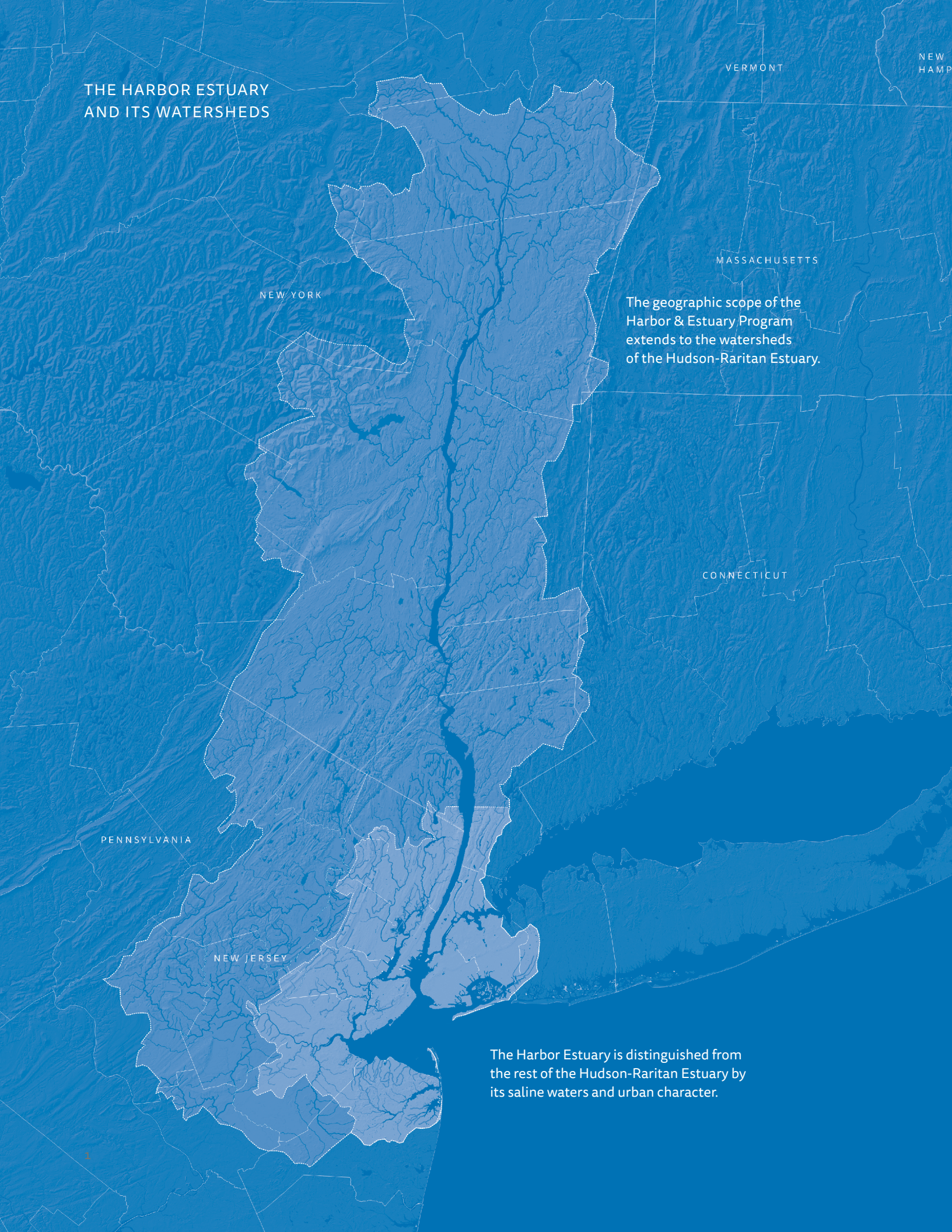

THE HARBOR ESTUARY
AND ITS WATERSHEDS
VERMONT
NEW HAMP
MASSACHUSETTS
NEW YORK
The geographic scope of the Harbor & Estuary Program extends to the watersheds of the Hudson-Raritan Estuary.
CONNECTICUT
PENNSYLVANIA
NEW JERSEY
The Harbor Estuary is distinguished from the rest of the Hudson-Raritan Estuary by its saline waters and urban character.

Purpose and Overview of this Document

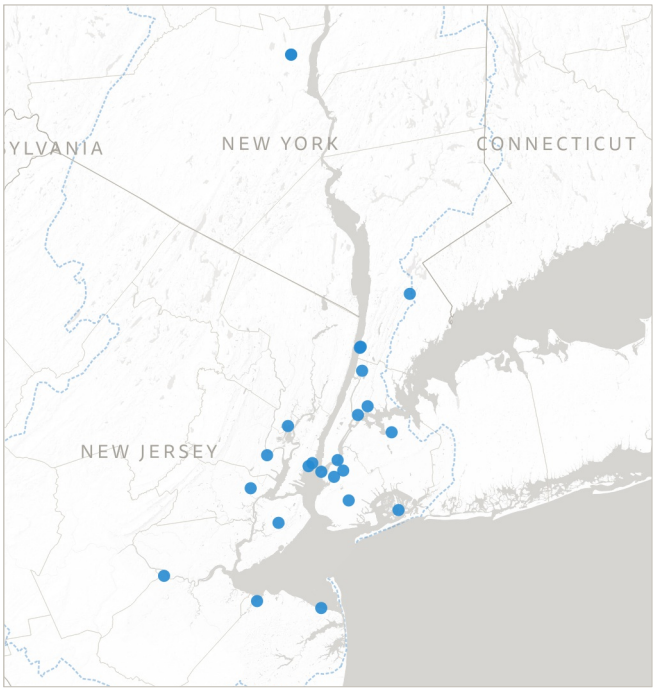
The 2017-2022 Action Agenda presents the shared priorities of the NY – NJ Harbor & Estuary Program (HEP) and the commitment of the program and HEP's partners to address them. It describes our five long-term goals and outlines specific objectives and actions that HEP and partners will advance over the next five years.

These concrete steps will help meet HEP's mission of bringing the benefits of the Clean Water Act to the people and wildlife of the Estuary by: Reducing the sources of pollution so that the waters of the Harbor Estuary will meet the fishable/swimmable goal of the Clean Water Act, where attainable; Protecting and restoring the vital habitat, ecological function, and biodiversity that provide society with renewed and increased benefits; Improving public access to the waters of the Estuary and the quality of experience at public spaces along the waterfront; Supporting port and associated maritime operations so that they are both economically and ecologically viable; and Fostering community stewardship and involvement in decisions about the Harbor.

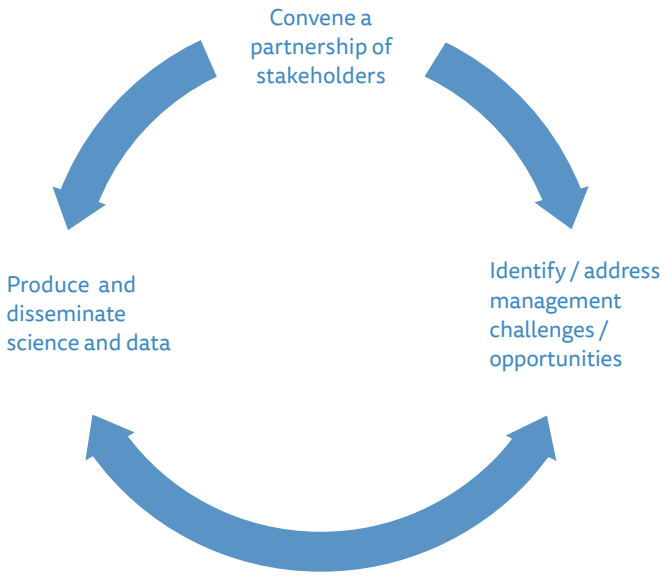
Together with HEP's State of the Estuary report and Environmental Monitoring Plan, this Action Agenda is a cornerstone of the revised Comprehensive Conservation and Management Plan required under Section 320 of the Clean Water Act. This document was created through a series of discussions with HEP's government, utility, civic and academic partners and the public. These conversations were organized through our Management Committee and Citizens Advisory Committee as well as several technical work groups addressing Water Quality, Restoration, and Public Access issues. These priorities also reflect the voices of more than 500 people at 25 outreach events—large and small—organized by HEP and more than 30 civic partners. The Action Agenda and accompanying reports were ultimately approved by the Policy Committee, the governing body of HEP.

Implementing these actions will require concerted attention by HEP and our many partners. Our success in addressing them and making progress towards our goals is contingent on these partnerships and the leadership knowledge and resources they provide.

LOCATION OF PUBLIC WORKSHOPS



HOW HEP ADDS VALUE



The New York–New Jersey Harbor Estuary and the Harbor & Estuary Program

The New York – New Jersey Harbor Estuary is the biggest public resource in the nation's largest and most densely developed metropolitan area. There are more than 250 square miles of open water and approximately 1,600 miles of shoreline from the Mario Cuomo (Tappan Zee) Bridge south to Sandy Hook, NJ, including the lower reaches of the Hudson, Passaic, Hackensack, and Raritan rivers. A complex system of open bays, tidal straits, and drowned valleys, the Harbor Estuary is distinguished from the rest of the Hudson-Raritan Estuary by its saline waters and urban character. The Estuary's watershed extends for more than 16,000 square miles, about three-quarters of which drains to the Hudson River and its 65 major tributaries.

The mixing of fresh and sea water in this tidal estuary has created a rich, productive and diverse ecosystem. Every day, roughly 57 billion gallons of salt water comes in from the ocean on the incoming tide and an average of 80 billion gallons a day goes out, driven by tides and the flow of fresh water from the Hudson and other rivers. This fresh water includes about two billion gallons a day of sewage, mostly treated in one of 25 publicly owned treatment plants that line the shoreline. This tidal flux and the nutrients that it carries helps support 12 square miles of tidal wetlands, more than 200 fish and over 300 bird species.

The Estuary also provides an amenity for the more than 14 million people living in the counties encompassing the Estuary's core waters. Five million people live within a ten-minute walk from the shoreline. There are more than 500 waterfront parks and public spaces that are accessible to the public. The shorelines of these public spaces—ranging from small urban street-ends and esplanades to sandy beaches and marshes—stretch for about 600 miles or 37% of the 1,600-mile waterfront. In both states millions of residents and visitors swim, boat, and enjoy the view. There are about 139 places where the public can launch a human powered boat, and 14 public swimming beaches.

Our harbor waters are a critical economic engine. Almost 200,000 people work at jobs directly associated with port and maritime operations. The whole regional economy benefits from hosting the nation's third largest port operation, and its capacity to affordably and reliably deliver goods to the marketplace. These waters are also a critical part of the region's public transportation system with more than 38 million ferry trips every year.

The public's desire for a healthy and vibrant ecosystem in our region, supported by excellent water quality, is stronger than ever. Millions have rediscovered the Estuary through more than 41,000 acres of waterfront parkland and lively public programs at and on the water. Savvy businesses, including maritime operators, excursion boats, and creators of waterfront residences and commercial spaces, understand how cleaner water creates value. There is robust public participation in water-based activities, workshops, forums and events.

HEP takes a watershed approach to address its management goals: the geographic scope of the Program extends to the watersheds of the rivers that drain to the harbor, notably the Hudson, Raritan, Passaic and Hackensack.

Managing this public resource and its many services and uses is the shared responsibility of at least five core federal agencies, two states, 11 major sewerage agencies, hundreds of counties, cities and towns, and millions of property owners. Critical stakeholders include maritime businesses and several hundred civic and community-based organizations.

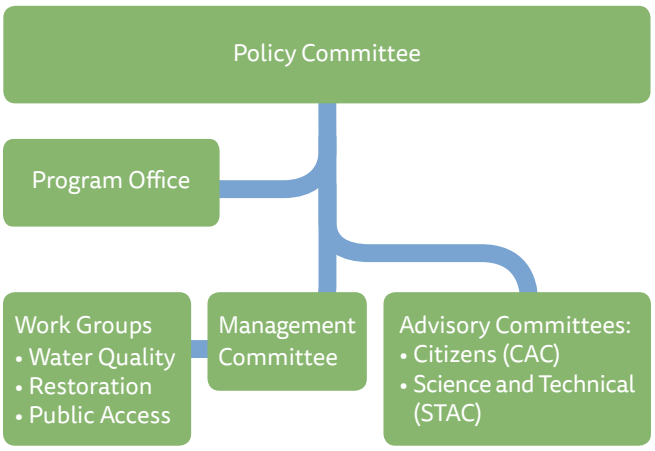
Success requires addressing core challenges posed by this Harbor and Estuary: a large population and dense urban development; a legacy of toxics left by past industrial uses; enclosed bays and tributaries that magnify the impacts of pollution; communities with concentrations of pollution and poverty that limit access to decision makers; and limited funding and political attention in a very crowded public agenda. These ongoing challenges are compounded by the likely impacts of a changing climate including rising air and water temperatures, increases in incidences of extreme weather from large storms to rainfall, and rising sea levels.

The New York – New Jersey Harbor & Estuary Program (HEP) helps bring stakeholders together around common goals. One of the Nation's 28 Estuaries of National Significance, HEP was created by the U.S. Environmental Protection Agency (EPA) at the request of the governors of New York and New Jersey in 1988 under the Clean Water Act as an ongoing effort to develop and implement a consensus driven plan to protect, conserve and restore the Estuary. HEP decisions and activities are carried out by staff and partners organized through the committees and work groups convened by the Program. Management of the Program is one of the many activities of the Hudson River Foundation, including underwriting scientific research that provides the

non-federal match to funds received under Section 320 of the Clean Water Act. This critical match is highlighted as an important resource for addressing research actions identified in this document.

HEP and its partners work together to enable people and wildlife to benefit from the fishable and swimmable waterways called for under the Clean Water Act. HEP provides a forum to develop and implement actions that improve the health of the Estuary by convening interested stakeholders from across familiar divides of geography and expertise, producing and disseminating science and data to illuminate the issues, and collaborating with others to identify and address management challenges and opportunities in a way that is environmentally and economically responsible. HEP takes a watershed approach to address its management goals: the geographic scope of the Program extends to the watersheds of the rivers that drain to the harbor, notably the Hudson, Raritan, Passaic and Hackensack. Because of common challenges and opportunities, the Program and this Action Agenda is focused on the tidal waters of the Estuary south of the Mario Cuomo (Tappan Zee) Bridge.

HEP ORGANIZATIONAL CHART



Progress Since the 1996 Comprehensive Conservation and Management Plan

The 1996 Comprehensive Conservation and Management Plan (CCMP) outlined a comprehensive strategy to achieve HEP's overall goal of establishing and maintaining a healthy and productive ecosystem with full beneficial uses.

Thanks to the hard work of HEP's many partners, the Estuary and surrounding waterfront communities have seen many positive changes in the subsequent 20 years. Significant capital investments in waste and stormwater treatment have accelerated improvements in water quality. The closure and restoration of landfills has eliminated a significant source of pollutants while restoring grassland and wetland habitat. Management changes in the disposal of dredged material and control of floatable debris have greatly reduced impacts to people and wildlife. The creation of waterfront parks has sharply improved recreational opportunities.

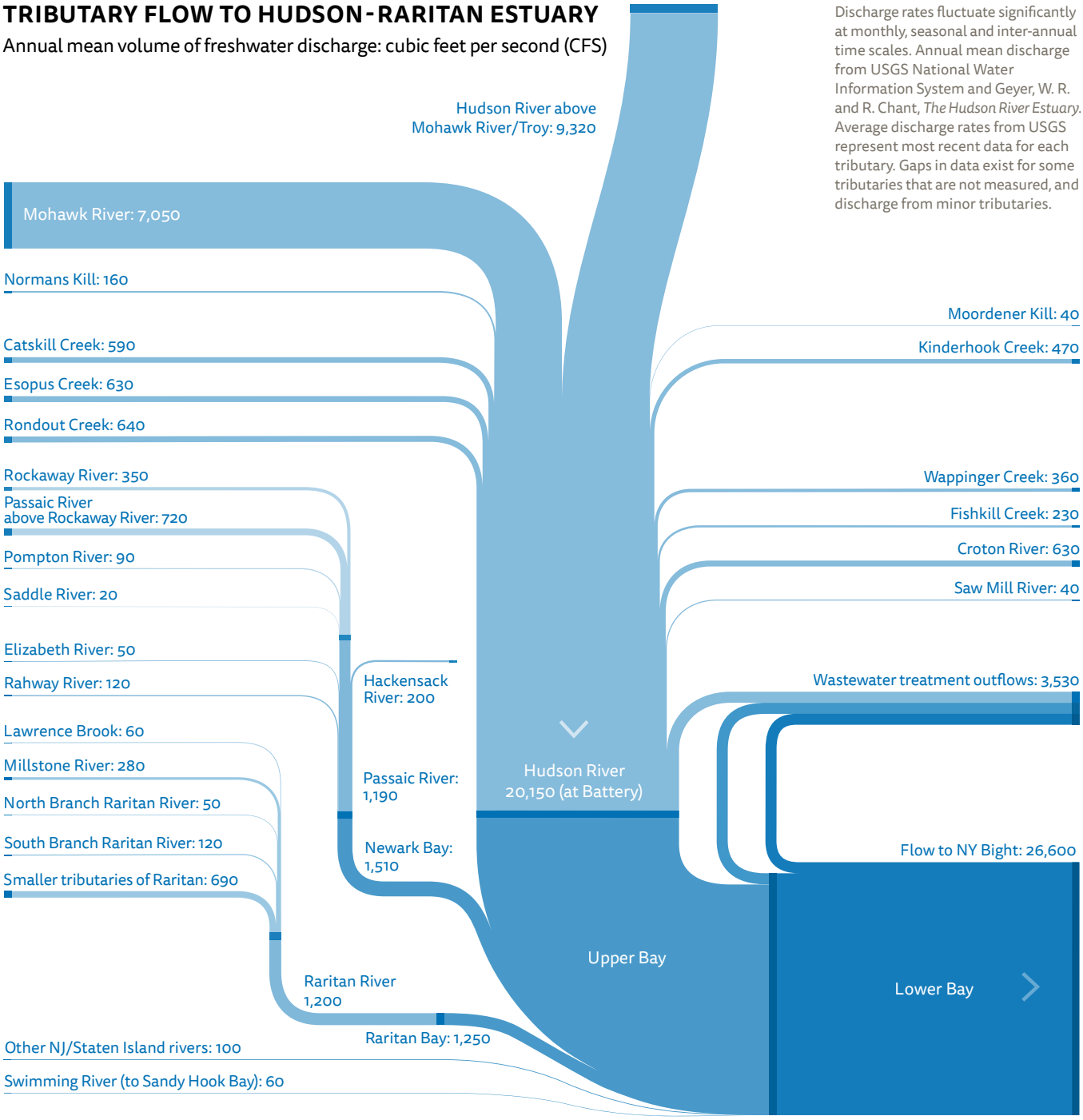
An assessment of the progress on all 76 objectives contained in the 1996 CCMP was produced to help ensure that the Estuary's remaining challenges are accounted for in the 2017-2022 Action Agenda and to recognize the role of HEP's partners in addressing these issues. The summary table is available at **www.hudsonriver.org/NYNJHEP1996CCMPProgress**. The 1996 CCMP also included the New York Bight Restoration Plan; This Action Agenda focuses on the Estuary boundaries defined by the National Estuary Program.

The original 1996 CCMP can be found here: **www.hudsonriver.org/NYNJHEP1996CCMP.pdf**.

Historic trends showing improvements in water quality, habitat quality and quantity, public access, and other indicators of the health of the ecosystem can be seen in the 2018 State of the Estuary report available here: **www.hudsonriver.org/NYNJHEPStateoftheEstuary.pdf**.

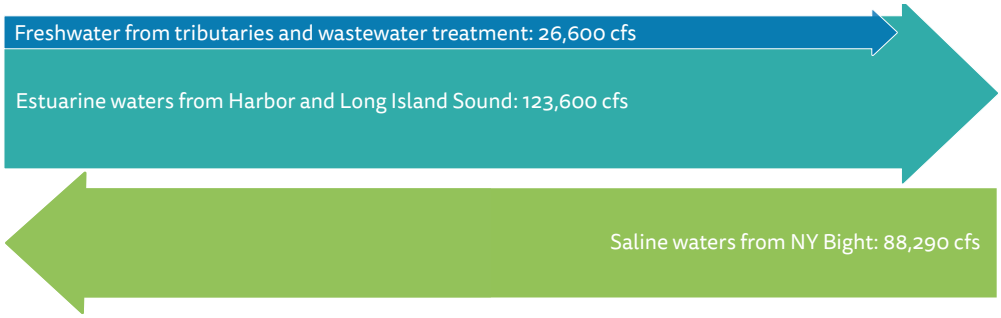
TRIBUTARY FLOW TO HUDSON-RARITAN ESTUARY

Annual mean volume of freshwater discharge: cubic feet per second (CFS)



Discharge rates fluctuate significantly at monthly, seasonal and inter-annual time scales. Annual mean discharge from USGS National Water Information System and Geyer, W. R. and R. Chant, *The Hudson River Estuary*. Average discharge rates from USGS represent most recent data for each tributary. Gaps in data exist for some tributaries that are not measured, and discharge from minor tributaries.

TIDAL AND FRESHWATER FLOW IN THE HUDSON-RARITAN ESTUARY



Freshwater from tributaries and wastewater treatment plants is a component of the larger tidal flows in the Estuary. Saltwater is more dense than freshwater, making the flow of water in the Hudson and Harbor two-layered. The saline layer flows from the New York Bight landward under the freshwater layer flowing seaward.

Overview of Action Agenda

This Action Agenda defines our shared set of priorities and the commitment of HEP's partners to address them. It describes our five long-term generational goals, and the specific 17 objectives and the 40 actions that the Program will address over the next five years.

These are the collective steps that HEP and its partners will take to advance progress towards HEP's long term goals to improve water quality, protect and restore vital habitat and ecological health, improve public access and stewardship, support port and maritime uses, and foster community engagement. Details about the proposed actions, key partners and resources that will be needed can be found in the pages that follow. Importantly, these priorities reflect and incorporate an assessment of how a changing climate will likely impact these goals and objectives.

This Action Agenda represents the consensus of our guiding Policy Committee, including the Regional Administrator of the US Environmental Protection Agency (EPA), the Commander of the New York District of the United State Army Corps of Engineers (USACE) and the Commissioners of the New York State Department of Environmental Conservation (NYSDEC) and New Jersey Department of Environmental Protection (NJDEP) as well as representatives from the Port Authority of New York & New Jersey (PANYNJ), New York City Department of Environmental Protection (NYCDEP), local government in New Jersey; HEP's Citizens Advisory Committee (CAC) and Science and Technical Advisory Committee (STAC); and the Hudson River Foundation (HRF).

It was formulated with a clear understanding of where HEP adds value to the many efforts underway to improve the Harbor: when convening partners and moving toward consensus is appropriate and timely; when science, data, or best management strategies are not readily available or clearly defined; and when actions need to be oriented on a watershed basis across jurisdictions or management silos.

The specific Goals, Objectives and Actions were created through a series of discussions and review with HEP's government, utility, civic and academic partners. These conversations were organized through our working Management Committee, technical work groups addressing Water Quality, Restoration, Public Access and 25 outreach events—large and small—organized by HEP and more than 30 civic partners that launched the creation of the Action Agenda.

HEP's public participation process was designed to reach Harbor Estuary residents at all levels of engagement, from leaders of stewardship organizations and the membership of those organizations to the public at large. More than 500 individuals participated directly in major conferences focused on Raritan Bay and habitat restoration issues, 18 standalone two-hour workshops, and five presentations at stakeholder meetings and conferences. This public input was refined through additional discussion with members of HEP's Citizens Advisory Committee. Following publication and release of the Draft Action Agenda for Discussion at our State of the Estuary Conference in May of 2017, HEP received 62 comments from 18 agencies, organizations or individuals. Suggested changes were reviewed by topic experts as well as with Citizens Advisory, Management, and Policy Committees. This final draft was approved by the Policy Committee in June 2018. Responsibility for undertaking these actions rests with the staff of HEP, other Hudson River Foundation staff, and the members of HEP's Management Committee, with support from the Citizens

TOWARDS AN ACTION AGENDA FOR THE NY-NJ HARBOR ESTUARY

Advisory Committee and technical work groups. Specific core partners are identified for each action as appropriate. In particular, HEP works closely with the New York State Hudson River Estuary Program, the Raritan River Initiative at Rutgers University, and many other partners whose geographic scope and mission overlaps with that of HEP.

Undertaking these actions requires resources. The Action Agenda identifies the kind and level of funding that will be required for each priority, including leveraging provided by program staff and the leveraging of staff time from our many partners. As appropriate, the actions reference the need for grant funding to support larger (>$200,000) and smaller (<$200,000) research, planning, or demonstration projects; major capital investments; and on-going operating or programming needs.

HEP and the Hudson River Foundation are the likely but not exclusive administrators for grants and funding supporting project-level priorities. As appropriate, HEP will propose using Clean Water Act 320 funding and the non-federal match provided by the Hudson River Foundation to undertake these projects as part of its annual work plan. HEP will also seek, in partnership with others, new public and private grants. Existing and possibly new federal, state and local government authorities, funding sources, and programs will be the vehicles for meeting major capital and long term operational needs. Existing and potential new sources of funding have been identified in HEP's report **Options for Funding Priorities: NY–NJ Harbor & Estuary Program** (www.hudsonriver.org/NYNJHEPFundingOptions.pdf).

As this Action Agenda offers a consensus vision for realizing shared goals for the Estuary, HEP's State of the Estuary Report and Environmental Monitoring Plan provide a snapshot of the region's collective progress in realizing the benefits of the Clean Water Act and the means for monitoring continued success.

Each Action references short-term and long-term outcomes that can be used to track progress over time. HEP's progress will be revisited in five years, and suggested revisions of this living document will be proposed.

How will Climate Change Affect the Ability of the NY–NJ Harbor & Estuary Program to Reach Our Goals

The impacts of a changing climate will pose an additional challenge to meeting the Action Agenda's goals. Warmer air and water temperatures, increases in the number and intensity of extreme weather events, and rising sea levels are already changing baseline conditions and affecting people and wildlife. These changes are expected to increase in the future. Understanding the Estuary's vulnerability to these specific stressors will help shape how the Program allocates its resources and where it places staff and research emphasis for the next five years and beyond.

With the assistance of an advisory committee of climate experts and the input of HEP's core partners, the Program has identified and evaluated 17 specific risks as to their relative likelihood of occurrence, the consequence and spatial extent of this impact. The complete assessment is available at **www.hudsonriver.org/NYNJHEPClimateVulnerabilityReport.pdf**.

This analysis shaped the priorities reflected in this Action Agenda. Several HEP Objectives and Actions directly seek to address these risks, including:

- **Ensure incorporation of climate change impacts in habitat management and restoration** (Habitat Objective D), because projected sea level rise will reduce wetland and other coastal habitat, particularly in areas where there are barriers to upland migration;
- **Assess the potential impacts of climate change on water quality, including supporting research and helping establish a long-term monitoring framework** (Water Quality Actions E1 and E2). Together with seeking improvements to current stormwater management practices through the Long Term Control Plans (LTCP) and Municipal Separate Sewer System (MS4) permit process (Water Quality Objective B), steps will help address how increased temperature, precipitation and extreme events will impact wastewater and stormwater infrastructure, and may exacerbate episodes of low dissolved oxygen;
- **Advance understanding and consideration of water quality in the analysis of hazard mitigation and coastal resilience projects** (Water Quality Action WQ-E-3). Maladaptive human responses to climate change can impair water quality, damage habitat, and reduce public access, limiting public enjoyment and appreciation.

Other risks, while significant, were judged to be either less important for the Estuary or more appropriate for other agencies and institutions to address.

ALIGNING WITH OTHER EFFORTS

The Estuary benefits from the work of the many public programs and research institutes who have ongoing missions to protect and restore our waterways and watersheds. In particular, there are a number of publically sponsored and vetted efforts whose broad purposes align closely with HEP's goals and the activities described in this Action Agenda. Below is a brief summary with links to these important efforts.

Hudson-Raritan Estuary Comprehensive Restoration Plan (HRE CRP) *(www.watersweshare.org)*

Lead: USACE	Area: Harbor Estuary south of the Mario Cuomo (Tappan Zee) Bridge to Sandy Hook/Rockaway.	The HRE CRP was adopted by HEP as its Habitat Restoration strategy. Implementation of the HRE CRP is primarily addressed in the Habitat actions and the Restoration Work Group.

Hudson River Estuary Program Action Plan *(www.dec.ny.gov/lands/4920.html)*

Lead: NYSDEC Hudson River Estuary Program	Area: NYS Portion of the Hudson River Estuary and its watershed, from the Troy Dam south to the Verrazano Narrows	Key collaborations include assessing the impacts of climate change and coastal adaptation measures; restoring shoreline connections and shallow-water habitat; and supporting stewardship and educational activities.

Hudson River Estuary Comprehensive Restoration Plan *(www.thehudsonweshare.org/)*

Lead: The Nature Conservancy/Partners Restoring the Hudson	Area: Hudson River Estuary from the Troy Dam to the Mario Cuomo (Tappan Zee) Bridge	Specific HEP priorities related to Hudson River CRP ecological goals include shoreline and shallow water habitat and sediment management.

Sustainable Raritan River Initiative Action Plan *(raritan.rutgers.edu/)*

Lead: Sustainable Raritan River Initiative (SRRI)	Area: Raritan River and its estuary and watershed	Important actions that are aligned include restoration of oysters and tributary connections, management of stormwater, and establishment of a no discharge zone. A joint conference on focused on Raritan Bay in 2015 identified other common areas of interest.

Jamaica Bay Watershed Protection Plan *(www.nyc.gov/html/dep/html/ dep_projects/jamaica_bay.shtml)*

Lead: NYCDEP	Area: Jamaica Bay	Areas of collaboration include oyster restoration and—in partnership with the Science & Resiliency Institute at Jamaica Bay—improving monitoring of restoration projects.

Long Island Sound Study *(longislandsoundstudy.net/)*

Lead: USEPA	Area: Long Island Sound	Areas of collaboration include coordinating monitoring and modeling of water quality and supporting community steward-ship activities in the East River.

NYS Ocean Action Plan *(www.dec.ny.gov/lands/84428.html)*

Lead: NYSDEC	Area: New York State Coastal waters including New York Bight and the Estuary	Key common areas of interest include supporting research on marine mammals and climate change.

ACRONYM KEY

CAC	Citizens Advisory Committee
EPA	U.S. Environmental Protection Agency
GLEC	Great Lakes Environmental Center
HEP	NY – NJ Harbor & Estuary Program
HRF	Hudson River Foundation
HRPT	Hudson River Park Trust
IEC	Interstate Environmental Commission
NEIWPCC	New England Interstate Water Pollution Control Commission
NJDEP	New Jersey Department of Environmental Protection
NJHDG	New Jersey Harbor Dischargers Group
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NYCDEP	New York City Department of Environmental Protection
NYCDPR	New York City Department of Parks and Recreation
NYCEDC	New York City Economic Development Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSGOSR	New York State Governor's Office of Storm Recovery
PA NY/NJ	Port Authority of New York & New Jersey
RFF	Resources for the Future
RWG	Restoration Work Group
SRIJB	Science and Resiliency Institute at Jamaica Bay
STAC	Science and Technical Advisory Committee
SWIM Coalition	Stormwater Infrastructure Matters Coalition
TFW	Trash Free Waters Partnership
TNC	The Nature Conservancy
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture

GLOSSARY

BMPs	Best Management Practices
CARP	Contaminant Assessment and Reduction Project
CCMP	Comprehensive Conservation and Management Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CSOs	Combined Sewer Overflows
GIS	Geographic Information System
HAB	Harmful Algal Bloom
HARS	Historic Area Remediation Site
HRE CRP	Hudson-Raritan Estuary Comprehensive Restoration Plan
HRECOS	Hudson River Environmental Conditions Observing System
LTCPs	Long Term Control Plans
MS4	Municipal Separate Sewer System
NNBF	Natural and Nature Based Features
OASIS	New York City Open Accessible Space Information System
PCBs	Polychlorinated Biphenyls
RCRA	Resource Conservation and Recovery Act
REMAP	Regional Environmental Monitoring and Assessment Program
STEW-MAP	Stewardship Mapping and Assessment Project
TECs	Target Ecosystem Characteristics
TMDL	Total Maximum Daily Load
WWTPs	Wastewater Treatment Plants

Summary Table

Goals and Objectives

WATER QUALITY

Reduce the sources of pollution so that the waters of the Estuary will meet the fishable/swimmable goal of the Clean Water Act, where attainable

OBJECTIVES

A Improve coordination and begin to establish consensus amongst regulatory agencies on science, standards and design conditions in shared waters

B Accelerate creation, adoption and implementation of Long Term Control Plans and MS4 Permits

C Address monitoring gaps and lack of information for key locations, parameters and state and local track-down programs

D Share water quality information in a clear and easy to understand way with the public, focusing on uses and potential public health risks

E Assess the potential impacts of climate change on water quality

HABITAT AND ECOLOGICAL HEALTH

Protect and restore the vital habitat, ecological function, and biodiversity that provide society with renewed and increased benefits

OBJECTIVES

A Make progress towards restoring the Estuary's target ecosystem characteristics

B Improve the quality and likely success of habitat restoration

C Support restoration monitoring and the utility of monitoring data

D Advance understanding and incorporation of climate change impacts in habitat management and restoration

PUBLIC ACCESS AND STEWARDSHIP

Improve public access to the waters of the Estuary and the quality of experience at public spaces along the waterfront

OBJECTIVES

A Increase public access and new possibilities for contact recreation, particularly in areas of higher need

B Improve stewardship and programming at existing public access sites, particularly in areas of highest need

C Promote and expand awareness of public access opportunities and issues

PORT AND MARITIME

Support port and associated maritime operations so that they are both economically and ecologically viable

OBJECTIVES

A Improve understanding and management implications of changing sediment contamination in the Estuary, including the timeline for achieving HARS suitable sediments in the navigation channels

B Help design and implement port and maritime improvement projects that are more environmentally friendly

COMMUNITY ENGAGEMENT

Foster community understanding and involvement in decisions about the Estuary

OBJECTIVES

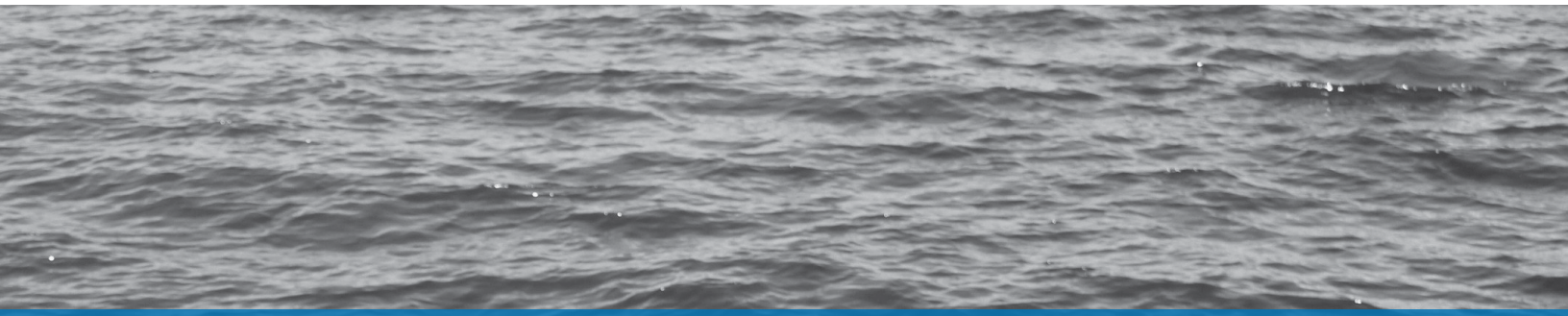
A Increase and improve the quality of citizen science efforts

B Support Urban Waters Federal Partnerships in target waterways

C Enhance public understanding of the Harbor Estuary

Water Quality

GOALS, OBJECTIVES, *and* PRIORITY ACTIONS



WATER QUALITY WORK GROUP

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Marzooq Al-Ebus, NJDEP
Kate Anderson, USEPA
Francisco Artigas, Meadowlands Environmental Research Institute (MERI)
Pinar Balci, NYCDEP
Rick Balla, USEPA
Rob Buchanan, NYC Water Trail Association
Kimberly Cenno, NJDEP
Shino Tanikawa, NYSWCD
Mick DeGraeve, Great Lakes Environmental Center (GLEC)/NJHDG
Michael Dulong, Riverkeeper
Brent Gaylord, USEPA
Biswarup Guha, NJDEP
Wayne Jackson, USEPA
Josh Kogan, USEPA
Jim Lodge, HRF
Keith Mahoney, NYCDEP
Michele Langa, NYNJ Baykeeper
Bridget McKenna, NJHDG
Jeff Myers, NYSDEC
Rosella O'Connor, USEPA
Lisa Oberreiter, NJHDG
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Michele Putnam, NJDEP
Susan Rosenwinkel, NJDEP
Clay Sherman, NJDEP
Stan Stephansen, USEPA
Chris Sturm, NJ Future
Dennis Suszkowski, HRF, STAC Co-Chair
Dan Van Abs, Rutgers/Jersey Water Works
Judith Weis, Rutgers, STAC Co-Chair
Rick Winfield, USEPA
Steve Zahn, NYSDEC

Reduce the sources of pollution so that the waters of the Harbor Estuary will meet the fishable/swimmable goal of the Clean Water Act, where attainable.

Water quality affects everything that HEP and our partners strive for. It is key to healthy habitats and biodiversity, safe public recreation, sustainable sediment management, and long-lasting public stewardship. Indeed, thanks to committed public leadership and billions of dollars in investments, the region has made great strides in attaining the goals of the Clean Water Act. The region's stakeholders have reaped many ongoing benefits from this work, most notably the transformation of the waterfront as a driving amenity for urban living.

But many challenges lie ahead if this progress is to be sustained. Primary issues include pathogen contamination, excessive levels of nutrients and low dissolved oxygen, legacy toxic pollution, floatable debris, and microplastics and other contaminants that are of emerging concern. In addition, the likely effect of climate change on future water quality, especially impacts of higher temperatures, sea level rise and shifting precipitation patterns, is unknown.

Over the next five years, HEP seeks to make substantial progress on achieving the visionary goal of the Clean Water Act: opening more waters to primary contact recreation and shellfishing, making them suitable for fish survival and reproduction, and eliminating the impacts of toxic contamination and floatable debris on community and ecosystem health. HEP plays an important role in helping public agencies, scientific community, and the civic organizations define what "where attainable" means for these bi-state waters, and communicating that understanding to the public.

HEP will continue to convene stakeholders through technical workgroups and workshops to ensure that open dialogue is maintained across jurisdictions and agencies and promote data sharing. Fostering stewardship through targeted project opportunities such as pathogen monitoring and trash reduction will also continue to be a main focus. HEP will also work with HRF to prioritize funding for specific research projects through the Hudson River Fund that will help advance these goals.

The New York – New Jersey Harbor Estuary lies at the heart of the largest and most densely populated urban area in the country. While considerable investments have been made in upgraded systems and newer technology, the region is also served by wastewater collection and treatment systems and stormwater management provided by older and sometimes outdated infrastructure that is expensive and technically difficult to upgrade and maintain. Responsibility is fragmented across political jurisdictions and agency responsibilities. The region's long history of industrial activities left a legacy of toxic contamination. Continued poor water quality, especially in smaller bays and tributaries, limits public access and awareness in many communities.

Major sources of pollutants in the region include discharges from wastewater treatment plants (WWTPs), legacy industrial contamination, combined sewer overflows (CSOs) and stormwater. Government, utilities, and landowners have invested billions of dollars in an attempt to minimize and control these sources and will continue to do so for the foreseeable future. WWTPs are being upgraded to address nutrient pollution. Gray and green infrastructure is being planned and implemented to address pathogens from CSOs and stormwater runoff through Long Term Control Plans (LTCPs) and Municipal Separate Storm Sewer System (MS4) Permits, and sediment dredging has begun in some Superfund and other hotspot locations to reduce legacy toxics.

Although these efforts have significantly improved water quality over the years, the cost for the remaining work will be significant and the timelines are long. Upgrades through new capital investments must be balanced with the general need for improved asset management of an aging water infrastructure system. There is a clear need for additional support, financially and through coordination, collaboration, research and communication with the numerous stakeholders to address the four pollutants that currently limit public use and ecological health of the Estuary—pathogens, nutrients, toxics, and floatable debris—as well as the likely impacts of emerging contaminants and climate change.

The presence of pathogenic bacteria in both marine and freshwaters is the result of fecal contamination from untreated waste and stormwater. State and federal agencies use these indicators to determine whether waters are safe for primary contact recreation (swimming) and consuming shellfish. Generally, water quality in the Harbor has improved with regards to swimming and other contact recreation, with impacts limited primarily by wet-weather events that result in stormwater discharges and CSOs. This is not the case in all waters of the Harbor however, because of either dry-weather contamination or the limited dilution and flushing in smaller bays and tributaries. Pathogen levels still severely limit shellfish consumption, as the shellfish standard is more stringent than the swimming standard.

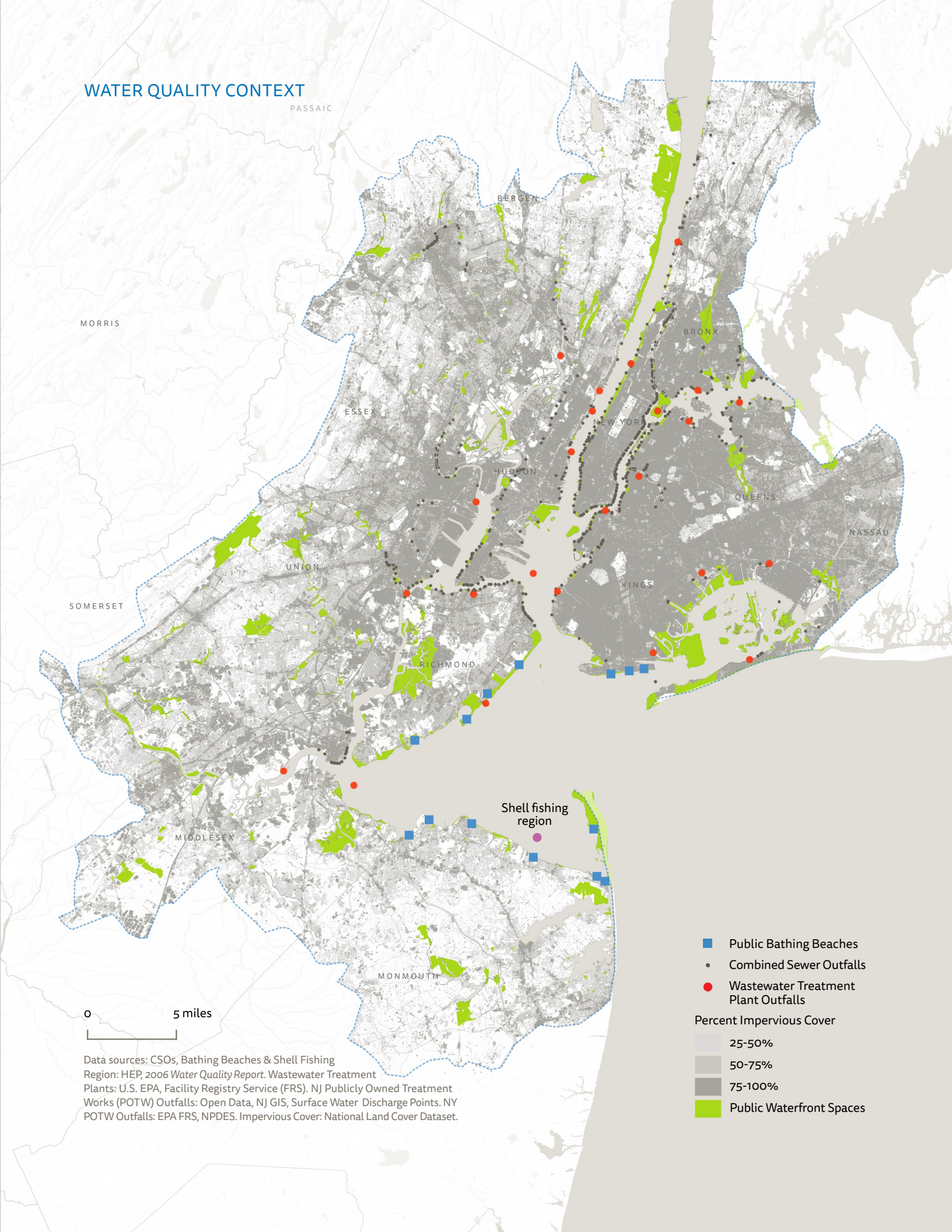
While nutrients such as nitrogen are essential to plant growth, excessive amounts can cause a number of issues such as low dissolved oxygen and algal blooms, which can result in fish kills. Much has been done in the Harbor to reduce nutrient loads. However, some waterbodies are still lagging behind in terms of dissolved oxygen levels and cannot currently support fish reproduction and survival.

Toxic contamination—from both legacy and more recent sources—remains a significant and challenging issue to address in the region's water, soil and air. It affects wildlife and is the reason that many fish species are unsafe to consume. Toxic contaminants include heavy metals, persistent pollutants such as PCBs and dioxins, as well as a variety of pharmaceuticals and chemicals found in personal care products. Microplastics have become a new concern, as they can be harmful to wildlife and human health.

Floatable debris includes any man-made materials originating from deliberate littering, decaying shoreline structures, vessel discharges, CSOs and other sources. This debris is unsightly and negatively impacts our economy, and can also be hazardous to boaters and wildlife. The quantity of debris in the Harbor has been greatly reduced since the 1980s, when floatables caused many beach closures, but there are still areas where persistent trash remains a problem. Addressing floatable debris at the source is key to the Estuary's health.

One of the great challenges of this generation is understanding and adapting to climate change. In this Estuary, warmer air and water temperatures, shifting precipitation patterns, and sea level rise will be major stressors affecting ecosystem and community health. Increased precipitation and high volume storms will increase the stress on sewage and wastewater infrastructure, leading to increased combined sewer overflow events, increased floatable debris, and difficulty in treating water. In addition to causing more severe droughts, temperature increases combined with shifting precipitation patterns may reduce the total amount of dissolved oxygen that can be held in water, potentially exacerbating existing dissolved oxygen problems in both extent and severity, affecting fish survival and health. In particular, areas that are less well-flushed and where the main sources of fresh water are sewage treatment plants, such as Jamaica Bay and the Hackensack River, are more susceptible. There are significant needs in terms of research and monitoring to understand how water quality may be impacted and possible adaptive responses.

WATER QUALITY CONTEXT



Data sources: CSOs, Bathing Beaches & Shell Fishing Region: HEP, *2006 Water Quality Report*. Wastewater Treatment Plants: U.S. EPA, Facility Registry Service (FRS). NJ Publicly Owned Treatment Works (POTW) Outfalls: Open Data, NJ GIS, Surface Water Discharge Points. NY POTW Outfalls: EPA FRS, NPDES. Impervious Cover: National Land Cover Dataset.

Summary Table ~ GOALS AND OBJECTIVES

Water Quality

Reduce the sources of pollution so that the waters of the Harbor Estuary will meet the fishable/swimmable goal of the Clean Water Act, where attainable.

OBJECTIVE A *Improve coordination and begin to establish consensus amongst regulatory agencies on science, standards and design conditions in shared waters*

WQ-A-1 **DIALOGUE**
Maintain an ongoing dialogue across agency and state boundaries.

WQ-A-2 **CONSISTENT STANDARDS**
Support the states and EPA in their development of consistent (where possible) water quality standards that are both scientifically defensible and protective of appropriate highest attainable uses in shared waters.

WQ-A-3 **NO DISCHARGE ZONES**
Help establish a No Discharge Zone for vessel waste in Raritan Bay.

OBJECTIVE B *Accelerate creation, adoption and implementation of Long Term Control Plans and MS4 Permits*

WQ-B-1 **LTCP/MS4 COMMUNICATION**
Communicate the benefits and outcomes of LTCP, MS4 work and associated infrastructure improvements to the public.

WQ-B-2 **GREEN INFRASTRUCTURE SUPPORT**
Support implementation of green infrastructure opportunities in CSO and MS4 communities.

WQ-B-3 **SHARED WATERS**
Synthesize information on LTCP/CSO controls and MS4 permit implementation to determine the effects on shared waters.

WQ-B-4 **CSO EVENTS NOTIFICATION**
Advance Means and Methods for Public Notification of CSO Events.

WQ-B-5 **TRASH REDUCTION**
Reduce sources and develop solutions for trash and floatables in both CSO and MS4 areas.

OBJECTIVE C *Address monitoring gaps and lack of information for key locations, parameters and state and local track-down programs*

WQ-C-1 **PATHOGEN MONITORING**
Design an intensive pathogen monitoring and notification plan in select near-shore areas.

WQ-C-2 **DISSOLVED OXYGEN MONITORING**
Address monitoring gaps and lack of information, including the need for real-time monitoring, relevant to DO requirements for different life stages of benthic and pelagic fauna.

WQ-C-3 **EMERGING COMTAMINANTS**
Support and share research to help assess the fate, transport and ecosystem impact of known contaminants and those of emerging concern, in particular microplastics.

OBJECTIVE D *Share water quality information in a clear and easy to understand way with the public, focusing on uses and potential public health risks*

WQ-D-1 **HARBOR-WIDE REPORT**
Prepare an updated Joint Harbor-Wide Water Quality Report.

WQ-D-2 **WATERWAY STORIES**
Develop briefs and stories about water quality conditions of individual waterways and watersheds.

OBJECTIVE E *Assess the potential impacts of climate change on water quality*

WQ-E-1 **CLIMATE IMPACTS**
Support and share research to assess climate change impacts on water quality and hydrology.

WQ-E-2 **CLIMATE MONITORING**
Identify parameters and potential for establishing a long-term monitoring program to assess climate change impacts on temperatures and other water quality variables.

WQ-E-3 **CLIMATE ADAPTATION**
Advance understanding and consideration of water quality in the analysis of hazard mitigation and coastal resilience projects.

CHALLENGES	INDICATORS
LIMITED SWIMMING *OBJECTIVES A, B, C, D & E*	**LIMITED SWIMMING** • *Enterococcus* • *Fecal Coliform* • *CSO Discharge* • *Debris Collected by Skimmers and Booms* • *Debris Collected on Beaches*
FISHING IS IMPAIRED *OBJECTIVES B, C, D & E*	**FISHING IS IMPAIRED** • *Dissolved Oxygen* • *Water Temperature* • *Chlorophyll a* • *pH* • *Turbidity* • *Transparency (Secchi)* • *Salinity* • *Nitrogen* • *Dissolved Organic Carbon* • *Dissolved Inorganic Phosphorous* • *Metals, PAHs, Dioxin in Sediments* • *PCBs* • *Chemical Contaminants of Emerging Concern* • *Microplastics* • *Harmful Algal Blooms*

WATER QUALITY ACTIONS

OBJECTIVE A

Improve coordination and begin to establish consensus amongst regulatory agencies on science, standards and design conditions in shared waters

WQ-A-1

DIALOGUE

Maintain an ongoing dialogue across agency and state boundaries.

NEED

Water quality management in the Estuary is complicated by the distinct political jurisdictions of New York and New Jersey, which dictate regulatory approaches and can make communication difficult. For example, water quality standards may differ between states and thus determining what constitutes "achievement" for a shared waterbody may be unclear. Defining the end goals is crucial for measuring success. Continued dialogue across agencies is therefore a key element in meeting the fishable/swimmable goal of the Clean Water Act.

DESCRIPTION

HEP and its Water Quality Work Group (WQWG), and in particular the regulatory agency partners, will work together to advance discussion of new science/research related to pathogens, nutrients and dissolved oxygen, and toxic contaminants. HEP will work with its partners to identify the most important issues and relevant ways to share information.

The WQWG was formed under HEP in 2013 to help address complex issues and facilitate communication across agencies and organizations working towards the common goal of cleaner, healthier waters. Its membership includes EPA, NYSDEC, NJDEP, NYCDEP, New Jersey Harbor Dischargers Group, and representatives of the scientific and civic community. The WQWG meets at least quarterly and more frequently when necessary.

KEY PARTNERS: Water Quality Work Group
RESOURCES: Staff and Leveraging
TIMELINE: 2017-2022

OUTCOMES

Short-term:

- Agreement on shared goals for water quality improvement.
- Clear definitions of impairment status and fully supported uses.
- Discussions will also help frame and advance action A-2.

Long-term:

- State agencies have a shared vision for water quality improvements, including appropriate standards and uses, and work cooperatively towards achieving it.

WQ-A-2

CONSISTENT STANDARDS

Support the states and EPA in their development of consistent (where possible) water quality standards that are both scientifically defensible and protective of appropriate highest attainable uses in shared waters.

NEED

Due to different laws, policies and management approaches in NY and NJ, water quality criteria, attainable uses, and intermediate goals for water quality improvement often differ. This is problematic when considering the impact of improvements for shared waters and can lead to confusion among stakeholders and the public.

DESCRIPTION

EPA is working with the two states on developing a roadmap for how best to align their standards. Building from this collaborative effort, HEP will work with EPA and the two states to identify and discuss how best to translate differing standards and data on water quality parameters of shared waters, including how to communicate those conditions and goals to stakeholders and the public. Discussion items could include hydrology, hydrodynamics, design period, return period, target indicator, water quality standards, and boundary conditions. This effort could start with a focus on a particular water body, such as Raritan Bay and/or a specific pollutant of concern, such as pathogens or nutrients.

These discussions will help inform the collaboration on the water quality modeling effort proposed as Action B-3 and help provide a basis for communication about these shared waters to the public. The result will be better consistency between states on Long-Term Control Plans (LTCP) and Municipal Separate Stormwater Sewer System (MS4) permits. HEP's work will assist the principal parties as they develop long term goals for other water quality improvements in shared waters. This effort will start with the members of the Water Quality Work Group but could involve other stakeholders.

KEY PARTNERS: EPA, NYSDEC, NJDEP, Water Quality Work Group
RESOURCES: Staff and Leveraging
TIMELINE: 2017-2019

OUTCOMES

Short-term:

- Agreement on translation and communications for specific water quality criteria/standards for one or more shared waters.

Long-term:

- Coordination between agencies on LTCP and MS4 implementation and other water quality improvements affecting shared waters.
- Unified public communication strategies on water quality status and public health effects for shared waters.

WATER QUALITY ACTIONS

OBJECTIVE A

Improve coordination and begin to establish consensus amongst regulatory agencies on science, standards and design conditions in shared waters

WQ-A-3

NO DISCHARGE ZONES

Help establish a No Discharge Zone for vessel waste in Raritan Bay.

NEED

Microbial pathogens from sewage wastes pose direct threats to human health and limit shellfishing and recreational uses. While wastes discharged by vessels to surface water are often treated by marine sanitation devices, they still pose some risk and contain chemical additives, such as chlorine. HEP's 2015 Raritan Bay Conference focused attention on the need to continue water quality improvements to the Bay, and benefits of sustaining and expanding its beneficial uses. No Discharge Zone (NDZ) designations are a key component of larger strategies for protecting navigable waters and educating the public about water quality.

DESCRIPTION

HEP will work with the two states, EPA and other partners to advance establishment of a no discharge zone in the Bay. The New England Interstate Water Pollution Control Commission recently completed a Vessel Waste No Discharge Zone Designation Petition for Raritan Bay on behalf of the New York State Department of Environmental Conservation and the New Jersey Department of Environmental Protection. The petition provides the justification required for designation, primarily that there are adequate vessel waste pump-out facilities. HEP will provide a forum for discussion of this initiative with key stakeholders and will work with agencies to publicize the initiative when it is adopted.

KEY PARTNERS: HRF, EPA, NYSDEC, NJDEP, NGOs, NEIWPCC, Sea Grant, USCG and Commercial and Recreational Vessel Communities.
RESOURCES: Staff and Leveraging
TIMELINE:2017-2018
OUTCOMES

Short-term:

- Establishment of a No Discharge Zone Designation for Raritan Bay.

Long-term:

- Improvements in water quality and greater public enjoyment of this important water body.
- Greater public awareness of the Bay, its resources and the need for continued water quality improvements.

Photo:
NY – NJ Harbor Estuary Program

OBJECTIVE B

Accelerate creation, adoption and implementation of Long Term Control Plans and MS4 Permits

WQ-B-1

LTCP/MS4 COMMUNICATION

Communicate the benefits and outcomes of the implementation of LTCP, MS4 permits and associated infrastructure improvements to the public.

NEED

Billions of dollars are being invested in crucial projects to improve water quality in both NY and NJ. Stakeholders, including ratepayers and local government officials, are often unaware of what work is currently underway, the intricacies of the projected changes, and what improvements will mean for their communities.

DESCRIPTION

HEP will develop factsheets, story maps, and/or other material intended for a broad audience to describe what LTCPs, MS4 and other infrastructure improvements will achieve in terms of water quality improvements and how. This effort will likely focus on one or more specific nearshore areas such as sections of the Hudson River, Coney Island Creek, Harlem River, Passaic River, or Raritan Bay. A key focus will be the importance of improved stormwater management given climate change projections. The effort will be conducted in partnership with appropriate public agencies, utilities, and civic partners such as Jersey Water Works and the SWIM Coalition. This grant funded work could contribute to broader campaigns conducted by civic partners in support of needed capital investment for LTCP and MS4 implementation.

HEP will also participate in public outreach opportunities with states and permittees in LTCP development.

KEY PARTNERS: EPA, NYSDEC, NYCDEP, NJDEP, NJCSO Group, SWIM Coalition, Jersey Water Works
RESOURCES: Staff and Leveraging; Grant Funded Project <$200,000; Major Capital Investment
TIMELINE: 2017-2020. This action will begin in 2018 with a focus on one waterbody to start. Additional materials will be developed for other waterbodies during 2019 and 2020.

OUTCOMES

Short-term:

- Clear information describing what the LTCPs and MS4 work will achieve for specific waterbodies, including timelines and associated costs, and what this will mean in terms of waterbody uses.

Long-term:

- Greater support from local government, business and community stakeholders.
- Investments and other steps to improve water quality management Infrastructure.

WQ-B-2

GREEN INFRASTRUCTURE

Support implementation of green infrastructure opportunities in CSO and MS4 communities.

NEED

Green infrastructure is a crucial tool for improving water quality in urban areas. Local communities and private property owners require assistance in terms of planning, designing, and managing implementation options that suit their particular watershed.

DESCRIPTION

HEP will work with a variety of stakeholders, in particular community representatives, local government, transportation agencies and development interests to encourage implementation of green infrastructure in advancing their Long-Term Control Plans. A key focus will be the importance of stormwater management, streambank protection and mitigating local flooding given climate change projections. This effort will include sponsoring workshops and review of technical guidance offered by agencies and permittees. A key partner is the Jersey Water Works collaborative. Grant funding will be required for work on targeted projects or locations. Implementation of green infrastructure will require securing major capital funding and meeting on-going operating needs. Advancing adoption and implementation of local stormwater utilities will also be a point of emphasis given their ability to generate resources.

KEY PARTNERS: EPA, NYSDEC, NYCDEP, NJDEP, NJCSO Group, SWIM Coalition, Jersey Water Works, local government, transportation agencies, private developers and property owners
RESOURCES: Staff and Leveraging; Grant Funded Project >$200,000; Major Capital Investment; On-Going Operating
TIMELINE: 2017-2020. HEP began supporting green infrastructure implementation efforts in 2016, focusing on one community in NJ and supporting statewide efforts through Jersey Water Works. HEP will target an additional community and/or projects in NJ or NY to be completed by 2020.

OUTCOMES

Short-term:

- Implementation of one large-scale, or several small-scale, green infrastructure project(s) in a CSO target community.
- Advancement of efforts to establish stormwater utilities and/or adoption in one local CSO community.

Long-term:

- Reduced number of CSO overflow events in targeted communities.

WATER QUALITY ACTIONS

OBJECTIVE B

Accelerate creation, adoption and implementation of Long Term Control Plans and MS4 Permits

WQ-B-3

SHARED WATERS

Synthesize information on LTCP/CSO controls and MS4 permit implementation to determine the effects on shared waters.

NEED

The combined effects of controls and permits on NY and NJ's shared waters are uncertain. The timelines for the LTCPs and MS4 permits currently underway in NYC and NJ are varied and complex and expected water quality improvements following implementation are unclear.

DESCRIPTION

HEP will advance the creation of a unified modeling framework that will predict expected outcomes of combined LTCP/CSO implementation in a specific shared waterbody. The modeling efforts will focus on areas such as the Raritan Bay that do not meet primary contact recreation goals and/or fish survival and reproduction goals. Key partners include EPA, state agencies, utilities, local municipalities, Jersey Water Works and the SWIM Coalition. This action will build on other actions to improve coordination and communication about shared water bodies, including the "road map" discussions proposed in Action A-2. While it is anticipated that such a modeling effort will build on existing efforts, including work being done in both states on LTCPs, preparing such a model will require significant additional grant funding or sponsorship by the regulated utilities. A specific first step in this action will be to develop the scope of work for the modeling framework.

KEY PARTNERS: EPA, NYCDEP, NYSDEC, NJDEP, NJHDG
RESOURCES: Grant Funded Project >$200,000
TIMELINE: An appropriate bi-state waterbody will be selected as a pilot area by 2018. Modeling will be completed by 2020.

OUTCOMES

Short-term:

- Creation of a project-specific modeling framework for bi-state waters.
- Identification of expected water quality improvements following implementation of controls for the modeled waterbody.

Long-term:

- Observable water quality improvements for all pollutants addressed by the controls in all shared waters.

WQ-B-4

CSO EVENT NOTIFICATION

Advance Means and Methods for Public Notification of CSO Events.

NEED

CSO discharges can occur with as little as one tenth of an inch of rain and can pose significant health risks to humans that come into contact with this water. The vast majority of the public is not aware of these discharges or the hazards they create.

DESCRIPTION

HEP will engage agencies, utilities and user groups to share lessons learned and identify additional pilot projects. This effort will build on the experience of programs such as NYSDEC's NY-Alert Sewage Pollution Right-to-Know program, the NYCDEP text messaging pilot program and CSO Advisory Web Page, the NJ CSO Group's public notification web application that predicts CSO events and public signage installed by the City of Hoboken with the goal of adding value and improving these existing and in some cases mandated efforts. New grant funding will be required to undertake any pilot projects.

KEY PARTNERS: NYCDEP, NJDEP, NYSDEC, EPA, NJCSO Group, local municipalities and community groups
RESOURCES: Staff and Leveraging; Grant Funded Project <$200,000
TIMELINE: 2018-2020. HEP will begin reaching out to align with and expand current efforts in 2018. A pilot project will be undertaken in 2019.

OUTCOMES

Short-term:

- Communities are more aware of CSO overflow events in their local waterbodies and know not to come into contact with the water during these times.

Long-term:

- Individuals and CSO communities are helping to reduce the number of CSO discharge events through personal choices and support LTCP and other water quality improvements.

OBJECTIVE B

Accelerate creation, adoption and implementation of Long Term Control Plans and MS4 Permits

WQ-B-5

TRASH REDUCTION

Reduce sources and develop solutions for trash and floatables in both CSO and MS4 areas.

NEED

Trash and debris in the Estuary are a persistent problem. While various clean-up programs and techniques are essential, innovative solutions that expand the engagement of stakeholders are necessary to make a lasting impact.

DESCRIPTION

HEP will continue working with stakeholders to develop sustainable, long-lasting, proactive solutions to trash prevention and detection, concentrating on addressing land-based sources. Efforts will build on partnerships created during the "Stopping Trash Where It Starts" NEIWPCC funded project in collaboration with Montclair State University. Potential projects include developing innovative monitoring techniques to identify debris hotspots, creating a shoreline 311 system and/or Unified Phone Application to report on floatables and overflowing trash booms, compiling metrics on floatables collected to assess trends and determine if current measures are having desired effects, and encouraging adoption of trash "hotspots" through stewardship grants. HEP will also assess the feasibility of piloting a trash water wheel or similar trash trap device in a Harbor tributary. Undertaking any of these projects will require additional grant funding.

KEY PARTNERS: NY/NJ TFW Partnership, NYCDEP, NJHDG, NJCSO Group, NGOs, Community Groups

RESOURCES: Staff and Leveraging; Grant Funded Project >$200,000

TIMELINE: 2017-2019. HEP began a trash track down project with Montclair State University through a NEIWPCC grant in 2016. Future projects will be pursued starting in 2018 through 2020.

OUTCOMES

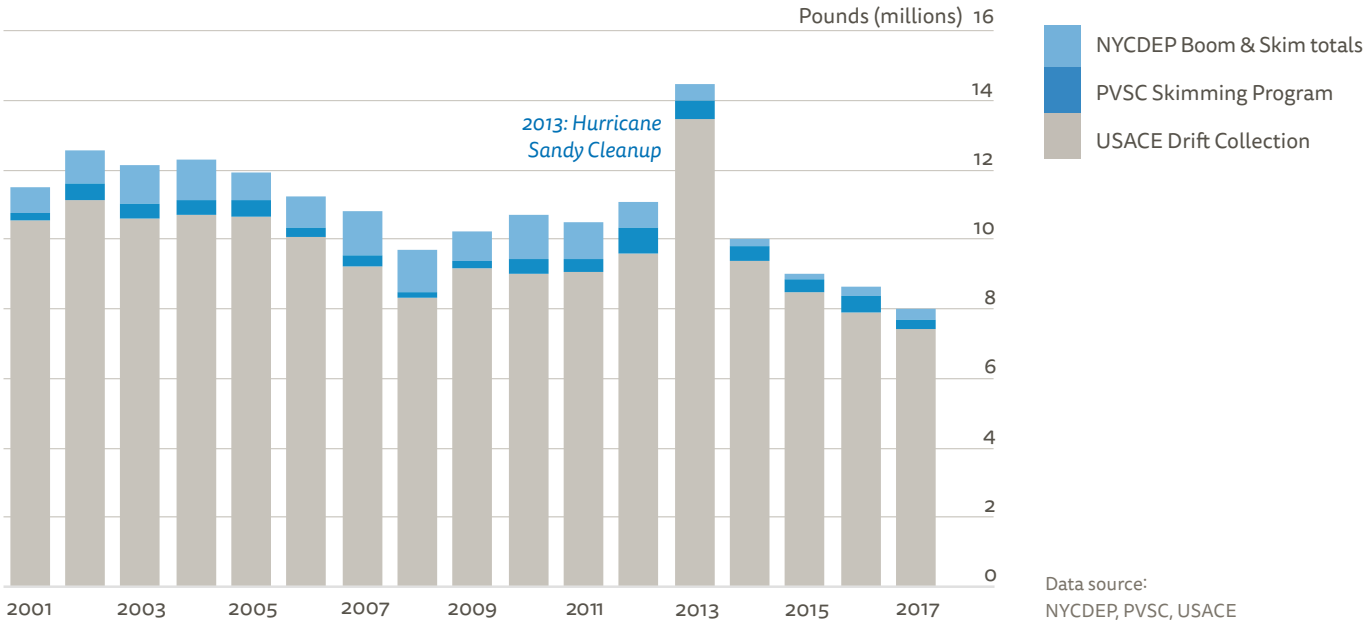
Short-term:

- Community awareness of the negative impacts of disposable items on the environment.
- Increased use of reusable bags, bottles and travel mugs.
- Local business buy-in into waste-free alternatives for dishware and carry-out items.

Long-term:

- Significantly reduced floatable debris in the Estuary.

Total Floatable Debris Collected by Boom and Skim Programs



Data source:
NYCDEP, PVSC, USACE

WATER QUALITY ACTIONS

OBJECTIVE C

Address monitoring gaps and lack of information for key locations, parameters and state and local track-down programs

WQ-C-1

PATHOGEN MONITORING

Design an intensive pathogen monitoring and notification plan in select near-shore areas.

NEED

While there has been significant overall improvement in pathogen levels in the Estuary over the past 20 years, water quality in many near-shore areas remains unknown. Routine agency sampling is typically conducted mid-channel via boat, while recreational season shoreline sampling only occurs at designated beaches. Many residents and visitors boat and swim in areas that are either being monitored infrequently or not at all.

DESCRIPTION

HEP funded two groups to conduct pathogen sampling in near shore areas of Staten Island and the Raritan Bayshore in 2016. This effort was made possible by a close partnership with the Interstate Environmental Commission (IEC). HEP will continue and expand its work with IEC and other partners to develop a systematic approach for determining pathogen levels for near shore areas in reference to contact recreation and other uses. This effort will also involve EPA, state agencies, and NGOs involved in Citizen Science efforts. Another parameter of interest is harmful algal blooms (HABs). Monitoring for HABs could occur during pathogen sampling efforts. The pathogen effort could also involve working with states and utilities to accelerate track down efforts to identify 'dry weather' sources of bacterial contamination. It will require new grant funding to support local collection efforts.

KEY PARTNERS: IEC, NYCDEP, NJDEP, EPA, NJHDG, NJCSO Group, NYSDEC, State and local health departments, NGOs

RESOURCES: Staff and Leveraging; Grant Funded Project >$200,000; On-Going Operating

TIMELINE: 2017-2022. HEP will work with partners beginning in 2017 to develop a monitoring plan and needs. Monitoring will be conducted as needed through 2022.

OUTCOMES

Short-term:

- Routine monitoring at select sites during the recreational season.
- Valuable data that will help to fill in data gaps and complement other sampling programs.
- Early warning to agencies of potential water quality issues, such as HABs.

Long-term:

- Improved understanding of recreational water quality in the Estuary.
- An established monitoring program that provides high quality data.

OBJECTIVE C

Address monitoring gaps and lack of information for key locations, parameters and state and local track-down programs

WQ-C-2

DISSOLVED OXYGEN MONITORING

Address monitoring gaps and lack of information, including the need for real-time monitoring, especially relevant to DO requirements for different life stages of benthic and pelagic fauna.

NEED

Sufficient dissolved oxygen is essential for all aspects of an aquatic organism's lifecycle. In order to accurately measure levels of DO in an aquatic system, and the effects they may have on the biota, continuous measurements are crucial but very frequently lacking. Targeted projects addressing these data gaps are necessary to fully grasp what standards are sufficiently protective of aquatic life requirements.

DESCRIPTION

HEP will continue building on the HEP/HRF Great Lakes Environmental Center (GLEC) DO study and upcoming work in the Hackensack River. The GLEC study was conducted during 2015-2016 and evaluated the effects of projected and measured low DO on marine organisms in the Estuary. GLEC is continuing their investigations in 2017 by focusing on the Hackensack River in NJ on behalf of NJHDG. HEP will provide a forum for reviewing the results of the ongoing-study of the Hackensack River and discussing its implications for DO criteria. Consistent standards are needed to provide for protection of aquatic life. This forum may also discuss the role of nutrients in DO impairments and the need to consider nutrient loading reductions. In addition, one project possibility is to design an intensive monitoring plan in select areas to capture fluctuations in surface and bottom DO, in addition to reviewing the HRECOS continuous monitoring data. EPA's REMAP data will also be reviewed for any relevant information on benthic organisms. Conducting additional monitoring will require new grant funding.

KEY PARTNERS: NYCDEP, NJHDG, NJDEP, NYSDEC, NGOs, Academia
RESOURCES: Staff and Leveraging; Grant Funded Project >$200,000
TIMELINE: 2017-2020. HEP will explore funding possibilities for a project beginning in 2017. If funding allows, a project will be completed by 2020.

OUTCOMES

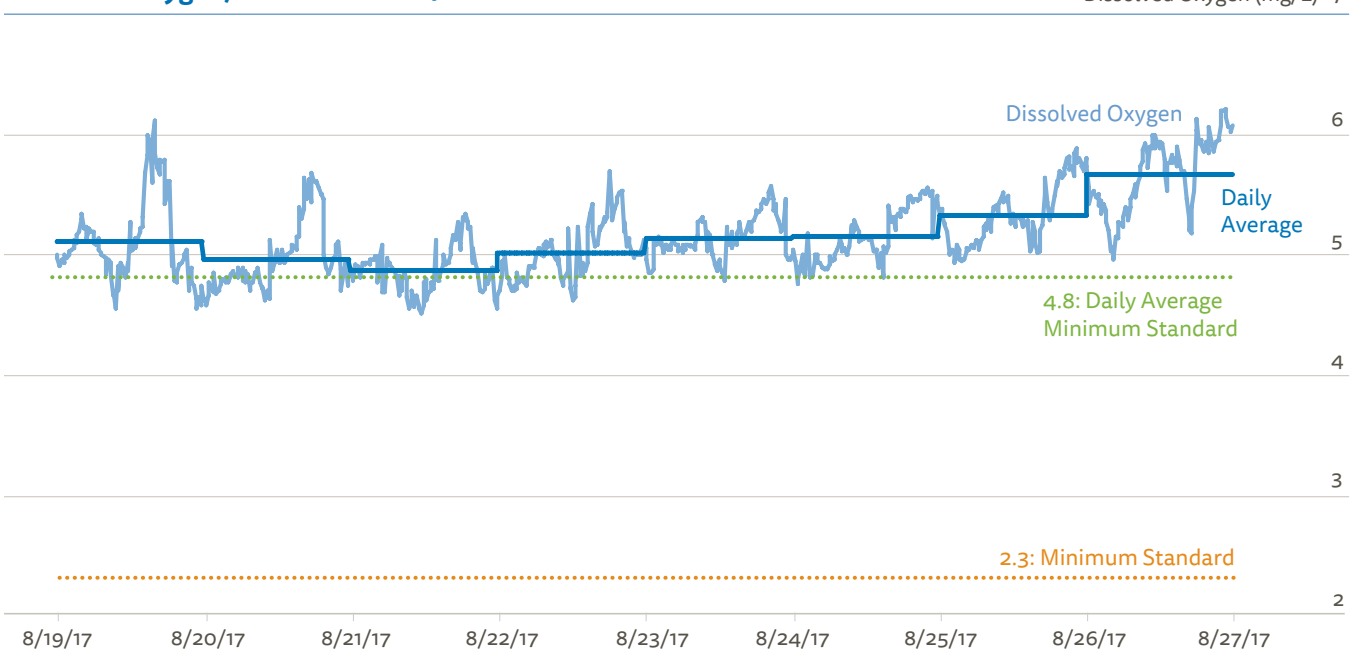
Short-term:

- Understanding DO requirements for certain species in the Estuary.
- Valuable data will help to fill in spatial and temporal data gaps.

Long-term:

- Site-specific DO criteria where appropriate.
- DO criteria fully protective of all stages of aquatic life.

Dissolved Oxygen, HRECOS Pier 84



OBJECTIVE C

Address monitoring gaps and lack of information for key locations, parameters and state and local track-down programs

WQ-C-3

EMERGING CONTAMINANTS

Support and share research to help assess the fate, transport and ecosystem impact of known and emerging contaminants, in particular microplastics, in the Harbor Estuary.

NEED

In addition to the Estuary's legacy of toxic contamination, a variety of newer chemicals, pharmaceutical by-products, and microplastics, are now a cause for concern. For many of these substances, their effects on organisms in terms of reproduction and survival are unknown, including their effects on human health.

DESCRIPTION

HEP and partners will build on the Harbor Toxics Total Maximum Daily Load (TMDL) work and recent sampling conducted by Riverkeeper/Cornell University to look at the feasibility of undertaking a risk assessment for our region. Similar work is being conducted both in the Netherlands and under EPA CERCLA/RCRA to characterize and develop response actions for various emerging contaminants, including working with states to accelerate track down efforts of contaminants. HEP and the HRF will also support projects that document the impact of these new and emerging contaminants in the Estuary, such as the microplastic trawling surveys conducted by Baykeeper in the Harbor as well as sediment/beach sampling and will advance research opportunities into shellfish and fish consumption of microplastics. HEP will also encourage research and development of novel tools and controls to prevent and remove microplastics, such as that developed by the Rozalia Project (**www.rozaliaproject.org**) to prevent microfibers from entering our waterways. HEP and HRF could also support a program to track down and reduce ongoing sources of toxic contaminants, as identified through the Contaminant Assessment and Reduction Project (CARP). These assessments and projects will require new grant funding.

KEY PARTNERS: EPA, NYCDEP, NJHDG, NJDEP, NYSDEC, NGOs, Academia, Community Groups

RESOURCES: Staff and Leveraging; Grant Funded Project >$200,000

TIMELINE: 2017-2022. HEP and HRF will explore possibilities for funding a research project beginning in 2018.

OUTCOMES

Short-term:

- Additional data on concentrations and distribution of contaminants in the estuary.
- Better understanding of fish and shellfish microplastics consumption.

Long-term:

- Reduce effects of microplastic consumption on human health.
- Limit ecosystem impacts of various widespread contaminants.

Data source: HRECOS

OBJECTIVE D

Share clear and easy-to-understand water quality information with the public, focusing on uses and potential public health risks

WQ-D-1

HARBOR-WIDE REPORT

Prepare an updated Joint Harbor-Wide Water Quality Report.

NEED

The last joint harbor report was published in 2011. This report combined data collected throughout the Harbor by NYCDEP and NJHDG and gave a clear picture of water quality trends in both NY and NJ waters. Presenting this data in a joint fashion is a key communication tool for interested stakeholders and users of the region's waters.

DESCRIPTION

HEP will work with NYCDEP, NJHDG and other partners to compile data on water quality and show trends throughout the Harbor. This information should describe what impairments mean and how the EPA, the states and the public can use this information. The report will focus on data interpretation and identifying gaps in information. Parameters will include those of importance to stakeholders with long-term datasets such as pathogens and dissolved oxygen. It may include information on contaminants. Maps and graphics will reflect ongoing challenges in addressing recreational water quality and help address desire for consistent messaging across agencies on criteria, standards, and monitoring. Reports will be available on HEP's new website as well as in hardcopy. In addition, an interactive web-based map will identify all existing sampling locations in the Harbor Estuary with pertinent information associated with each. Creation of the map will require new grant funding.

KEY PARTNERS: NYCDEP, NJHDG

RESOURCES: Staff and Leveraging; Grant Funded Project <$200,000

TIMELINE: 2017-2019. HEP will work with partners beginning in 2017 on both the joint report and the web-based map.

OUTCOMES

Short-term:

- Clear, easily-accessible information on water quality trends and impairments in the Harbor.

Long-term:

- Better informed stakeholders that are aware of what "safe uses" means and how to incorporate that information into their decisions on where and when to recreate.
- Collaboration between sampling programs in NY and NJ.

Citizen science groups performing pathogens analyses on water quality samples. Photo: NY/NJ Baykeeper

OBJECTIVE D

Share clear and easy-to-understand water quality information with the public, focusing on uses and potential public health risks

WQ-D-2

WATERWAY STORIES

Develop briefs and stories about water quality conditions of individual waterways and watersheds.

NEED

Waterbody and watershed-specific information focused on potential public health risks related to uses and ways that agencies and organizations are working to eliminate or minimize these risks is currently lacking. Breaking down overall Harbor water quality trends into easily digestible, locally relevant, information is another key communication tool that is needed for the region's stakeholders.

DESCRIPTION

This material can be distributed through the HEP website and newsletter to effectively communicate activities and progress. The effort will help support NYSDEC fact sheets and NJDEP watershed planning efforts as well as information prepared by local stewardship organizations. Waterbody specific story maps can also be used to share information on fish and shellfish consumption advisories.

KEY PARTNERS: NYSDEC, NJDEP, NGOs

RESOURCES: Staff and Leveraging

TIMELINE: HEP will work with partners to develop two waterbody and/or watershed-specific briefs in 2018 to start. This effort will continue with additional waterbodies.

OUTCOMES

Short-term:

- Accurate, current and clear information on waterbody-specific conditions as well as ongoing initiatives and projects within the watershed.

Long-term:

- Better informed stakeholders that are aware of local waterbody conditions and efforts to improve them.

Collecting floatable debris on the Passaic River. Photo: PVSC

OBJECTIVE E

Assess the potential impacts of climate change on water quality

WQ-E-1

CLIMATE IMPACTS

Support and share research to assess climate change impacts on water quality and hydrology.

NEED

It is certain that climate change will affect water quality in the Harbor Estuary but specific impacts and the magnitude, duration and frequency of these impacts are not well understood. Modeling future possibilities through a range of climate change scenarios is crucial to help advance policy options.

DESCRIPTION

HEP and HRF will support research projects seeking to explore climate impacts, model anticipated changes, and communicate this information to stakeholders to discuss possible policy responses. Research projects will require new grant funding. Of particular concern are the effects of changing precipitation patterns and temperature on pathogens, nutrient input, eutrophication, availability of dissolved oxygen, exposure to toxic contamination, changes in watershed dynamics, streamflow and residence time in the Estuary, ocean acidification, and harmful algal blooms (HABs).

KEY PARTNERS: HRF, EPA, NYSDEC, NJDEP, NYCDEP, NJHDG, Hudson River Estuary Program, Academia
RESOURCES: Grant Funded Project >$200,000
TIMELINE: 2017 - 2022.

OUTCOMES

Short-term:

- Additional information on the potential impacts of climate change on water quality in the Harbor Estuary.
- Accurate models demonstrating water quality impacts for a variety of climate change projections.

Long-term:

- Adaptive policies that take into account water quality impacts
- Projects specifically intended to mitigate effects on water quality.

WQ-E-2

CLIMATE MONITORING

Identify parameters and potential for establishing a long-term monitoring program to assess climate change impacts on temperatures and other water quality variables.

NEED

There are many uncertainties in the ways that climate change will impact water quality. Collecting observable data to track changes will assist in future planning and mitigation efforts.

DESCRIPTION

HEP will convene partners to identify specific parameters, including dissolved oxygen, algal blooms, and nutrients as well as how best to support this long term monitoring need and reporting over time. This effort may focus on especially susceptible waterways, such as the Hackensack, where dams and drinking water reservoirs may exacerbate future temperature increases. Monitoring could involve citizen scientists to help collect data on algal blooms and other parameters. Creation of the monitoring system will require grant funding and on-going operating support.

KEY PARTNERS: IEC, EPA, NYSDEC, NJDEP, Hudson River Estuary Program, Academia
RESOURCES: Grant Funded Project >$200,000; On-Going Operating
TIMELINE: HEP will convene partners in 2019. Monitoring will be established in at least one watershed by 2022.

OUTCOMES

Short-term:

- A monitoring plan that lays out appropriate locations and parameters for long-term data collection with the specific goal of assessing climate change impacts.
- Pilot data for at least one susceptible waterbody/watershed.

Long-term:

- Data throughout the Harbor Estuary that will supplement other monitoring programs.
- Clear information on how climate change is impacting water quality.

OBJECTIVE E

Assess the potential impacts of climate change on water quality

WQ-E-3

CLIMATE ADAPTATION

Advance understanding and consideration of water quality in the analysis of hazard mitigation and coastal resilience projects.

NEED

Water quality is infrequently taken into account when the focus of a project is long-term resiliency. Primary concerns are human health and safety as well as habitat protection, however understanding potential impacts on water quality will facilitate the design and selection of appropriate projects. This will help ensure that projects are not working against water quality goals for the broader Harbor Estuary.

DESCRIPTION

HEP staff will participate in advisory committees, organize workshops, and work through the Water Quality Work Group, Citizens Advisory Committee, and Hudson River Estuary Program to help ensure that hazard mitigation projects, such as the tidal barriers being considered under the USACE Harbor and Tributaries Study, fully assess implications of their construction on water quality issues.

KEY PARTNERS: USACE, EPA, Hudson River Estuary Program
RESOURCES: Staff and Leveraging
TIMELINE: Participation in advisory committees will occur as needed with the project schedule, beginning in 2017 onwards.

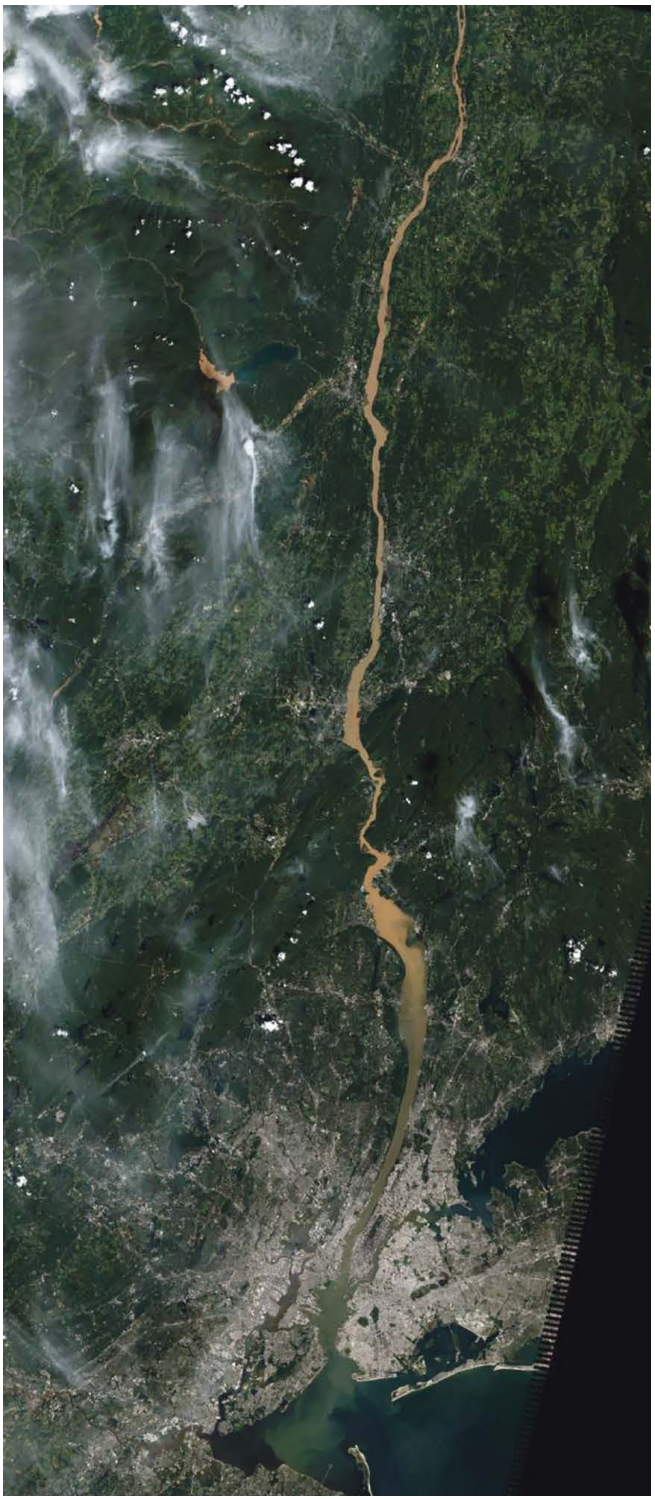
OUTCOMES

Short-term:

- Input from water quality experts on potential impacts of climate adaptation projects in the Harbor Estuary.
- Approved projects take into account these potential impacts and ways to address them.

Long-term:

- Projects are able to properly mitigate hazards without negatively impacting water quality.



Sediment plume following Hurricane Irene, 2011. Photo: David Ralston

Habitat and Ecological Health

GOALS, OBJECTIVES, *and* PRIORITY ACTIONS

RESTORATION WORK GROUP

Lisa Baron, U.S. Army Corps of Engineers (chair)
Marit Larson, NYC Department of Parks and Recreation (chair)
Carl Alderson, National Oceanic and Atmospheric Administration
Susan Elbin, NYC Audubon
Ross Feltes, NJ Sports and Exposition Authority
John King, NJ Department of Environmental Protection
Kristen King, NYC Department of Parks and Recreation
Jim Lodge, Hudson River Foundation
Meredith Comi, New York-New Jersey Baykeeper
Isabelle Stinnette, NYNJHEP
Susan Maresca, NYS Department of Environmental Conservation
Steve Mars, US Fish and Wildlife Service
Emily Maxwell, The Nature Conservancy (New York City)
John McLaughlin, NYC Department of Environmental Protection
Dana Mecomber, Port Authority of New York and New Jersey
Daniel Montella, US Environmental Protection Agency
Lisa Oberreiter, Passaic Valley Sewerage Commission
Andrew Peck, The Nature Conservancy
James MacDonald, NYS Department of Environmental Conservation
Ken Scarlatelli, NYS Department of Environmental Conservation
Eric Schrading, US Fish and Wildlife Service
Clay Sherman, NJ Department of Environmental Protection
Carter Strickland, The Trust for Public Land
Nellie Tsipoura, New Jersey Audubon
Judith Weis, Rutgers University
Rick Winfield, US Environmental Protection Agency

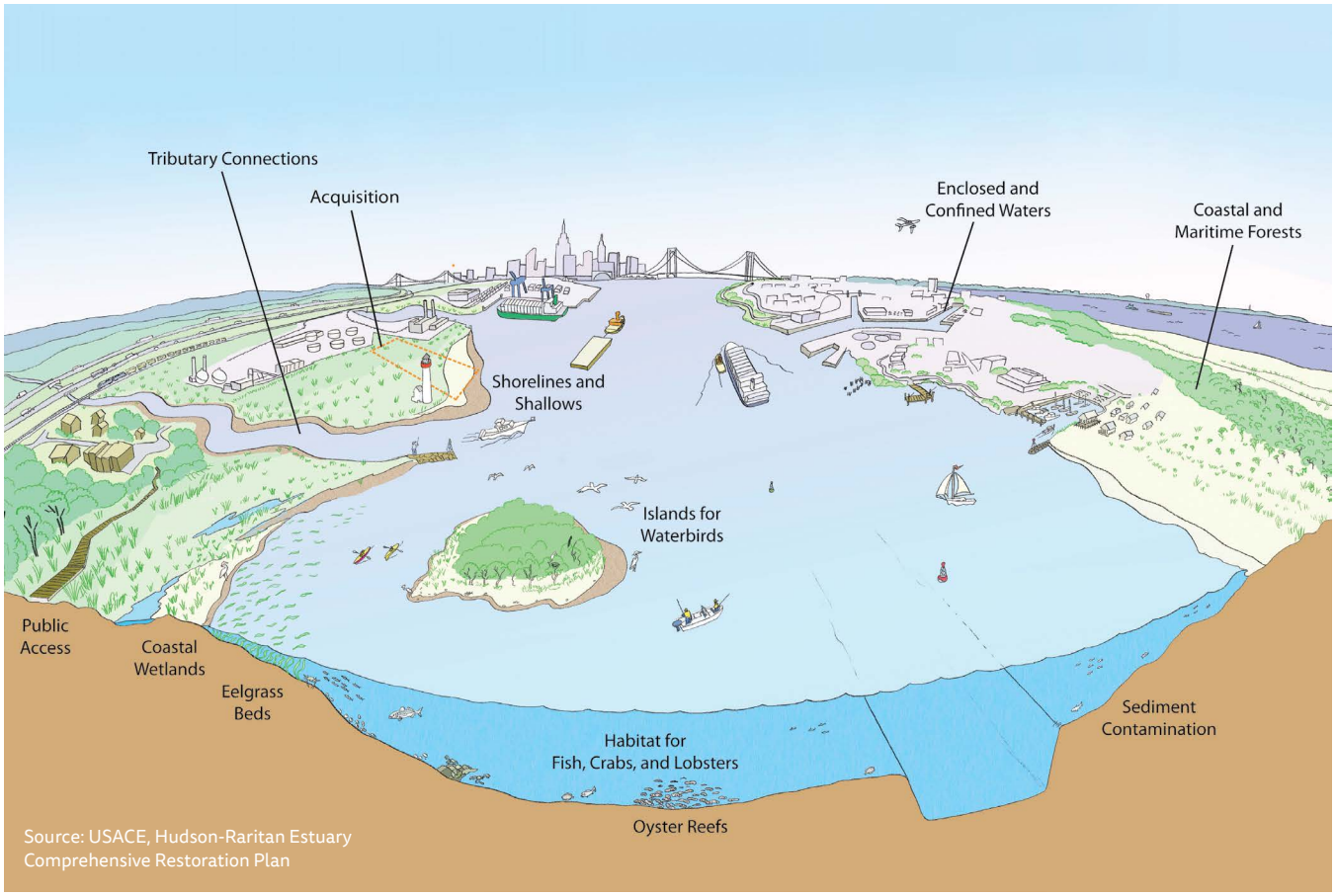
Oyster Catchers. Photo: Don Riepe

Protect and restore the vital habitat, ecological function, and biodiversity that provide society with renewed and increased benefits.

The Harbor Estuary is an incredibly vital and important landscape. While the natural resources remaining today do not compare with the rich habitats our estuary supported before European colonization, the open waters, tributaries, and wetlands continue to support important population of fish, migratory birds, and other species. Through the creation of the Hudson-Raritan Estuary Comprehensive Restoration Plan, HEP and its partners have set goals for the conservation and restoration of 12 Target Ecosystem Characteristics (TECs) including wetlands, habitat for waterbirds, oysters, tributary connections, and maritime forest. These goals provide a path towards a healthy urban ecosystem.

Over the next five years, HEP will undertake 13 actions that will help implement the Comprehensive Restoration Plan. These include actions intended to reduce the costs and secure required funding for the individual restoration projects. HEP will also continue to support the community of practice for urban restoration, notably seeking to address challenging issues related to the recontamination of restoration sites, understanding the value of urban shallows and shorelines, documenting the value of ecosystem services, supporting the sharing of monitoring results, and advancing the understanding of how impending sea level rise and other climate change impacts will affect restoration work.

THE 12 TARGET ECOSYSTEM CHARACTERISTICS OF THE HUDSON-RARITAN ESTUARY



Source: USACE, Hudson-Raritan Estuary Comprehensive Restoration Plan

The Harbor Estuary is an ecologically significant resource, despite its location at the heart of the North America's largest metropolitan area. More than 250 square miles of open water and countless tidal tributaries are home to more than 200 fish species for some or all of their lifecycles, including 16 for which the Estuary provides essential habitat. Lining the 1,600 miles of shoreline are shallow mudflats and about 7,600 acres of wetlands that shelter shellfish, fiddler crabs, juvenile fish, and resident and migratory birds. There are 68 small islands critical to nesting shorebirds and hundreds of acres of rare coastal and maritime forests and grasslands.

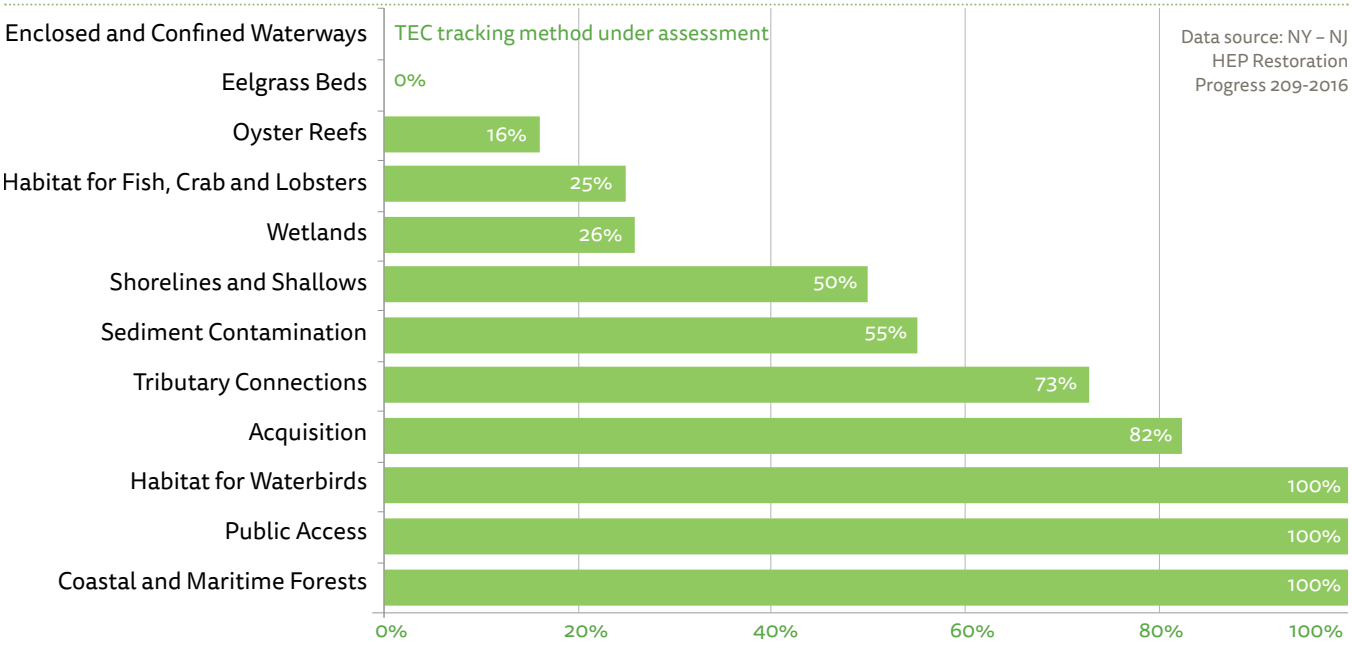
Managing these existing resources, and restoring the ecological characteristics of the historic estuary, involves many challenges. There is intense pressure to develop and fragment much of the remaining unprotected habitat area for transportation, commercial, residential and recreational uses, and other purposes. Even for areas protected as public parkland, toxic contamination of soil and sediments, historical and illegal filling of wetlands, interference with natural hydrological functions, and overuse can stress and degrade habitat in the Harbor. The impacts of climate change will pose new challenges associated with increasing air and water temperatures, rising sea levels, and larger coastal storms.

Published in 2016, Version 1.0 of the Hudson-Raritan Estuary Comprehensive Restoration Plan (HRE CRP) provides a blueprint for guiding ecosystem restoration and conservation efforts. This science-based plan was developed by the US Army Corps of Engineers and the Port Authority of New York & New Jersey, and involved many partners, notably HEP's Restoration Work Group (RWG). The plan, available at **www.harborestuary.org/watersweshare** provides goals for each of 12 TECs for the years 2020 and 2050.

Progress towards these goals since the 2009 publication of the initial draft plan has been varied. Some 2020 goals have already been met or exceeded, including targets for habitat for waterbirds, coastal and maritime forests, and improving tributary connections critical to migratory fish. However, progress toward other goals such as restoring wetlands, oyster reefs, shorelines and shallows, 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. 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.

HEP is also working with New York State's Hudson River Estuary Program and Partners Restoring the Hudson to help ensure coordinated progress towards the Targets identified in the Hudson River Estuary Action Agenda as well as the TECs identified in the Hudson River Comprehensive Restoration Plan that covers the River and watershed north of the Tappan Zee Bridge. This plan has identified 12 TECs including shallow water habitat, shorelines and riparian areas, and tributary barriers and connectivity.

Target Ecosystem Characteristics Towards 2020 Restoration Goals




PASSAIC
WESTCHESTER
HABITAT AND ECOLOGICAL HEALTH CONTEXT
Habitat Restoration Sites Identified in HRE-CRP Feasibility Study
Wetlands
Waterfront Parks
BERGEN
MORRIS
BRONX
ESSEX
NEW YORK
HUDSON
QUEENS
NASSAU
KINGS
UNION
RICHMOND
SOMERSET
MIDDLESEX
MONMOUTH
0
5 miles
Data sources: Restoration Sites: USACE, Hudson River Estuary CRP Feasibility Study. Wetlands: U.S. Fish and Wildlife Service NWI, Bathymetry: NJ: USGS CoNED Topobathy DEM, NJ & DE, USGS; LI: NOAA NCEI Topobathy DEM Hurricane Sandy Area, NOAA; Ocean: USGS Geologic Framework Data, Long Island Sound.

Habitat and Ecological Health

Protect and restore vital habitat, ecological function, and biodiversity that provide society with renewed and increased benefits.

OBJECTIVE A *Make progress towards restoring the Estuary's target ecosystem characteristics*

H-A-1 **INVESTMENT**
Increase investment in conservation and restoration projects.

H-A-2 **COST REDUCTION**
Evaluate ways to reduce costs of restoration.

H-A-3 **ECOSYSTEM SERVICES**
Document value of ecosystem services delivered through restoration for decision makers.

H-A-4 **PRIORITIZATION**
Create a decision making tool for prioritization of restoration opportunities.

OBJECTIVE B *Improve the quality and likely success of habitat restoration*

H-B-1 **RESTORATION BEST PRACTICES**
Share research and best practices among partners.

H-B-2 **SHORELINE ASSESSMENT**
Assess and interpret shoreline and shallow-water habitat condition and value.

H-B-3 **RECONTAMINATION**
Understand the risks of recontamination of restored sites.

OBJECTIVE C *Support habitat and restoration monitoring and the utility of monitoring data*

H-C-1 **HABITAT MONITORING**
Increase support for monitoring and consistency among metrics.

H-C-2 **DATA SYNTHESIS**
Synthesize existing monitoring data to better understand and communicate trends.

OBJECTIVE D *Advance understanding and incorporation of climate change impacts in habitat management and restoration*

H-D-1 **SEA LEVEL RISE**
Ensure incorporation of sea level rise into restoration and management practices.

H-D-2 **BUYOUT RESTORATION**
Advance conservation and restoration planning for properties eligible or already acquired through flood plain/ buyout programs.

CHALLENGES	INDICATOR
● **NOT ENOUGH HABITAT** *Objective A* *Objective D*	**NOT ENOUGH HABITAT** • *Established Oyster Beds* • *Area of Coastal Forest and Grassland* • *Area of Wetlands* • *Percent and Distribution of Natural Shorelines* • *Tributary Habitat Connectivity*
● **HABITAT IS DEGRADED** *Objective B* *Objective C* *Objective D*	**HABITAT IS DEGRADED** • *Benthic Index of Biotic Integrity* • *Estuarine and Diadromous Fish Abundance* • *Whale and Dolphin Abundance* • *Riparian Area Integrity* • *Stream Health Bioassessment* • *Horseshoe Crab Abundance* • *Submerged Aquatic Vegetation* • *Nesting Pairs of Harbor Herons* • *Acreage of Habitat Exposed to Low DO* • *Upland Quality/Functionality*

OBJECTIVE A

Make progress towards restoring the Estuary's target ecosystem characteristics

H-A-1

INVESTMENT

Increase investment in conservation and restoration projects.

NEED

There is limited funding for restoration efforts in the NY – NJ Harbor Estuary.

DESCRIPTION

HEP will work with the members of the Restoration Work Group and the Citizens Advisory Committee (CAC) to identify and assess measures to increase funding such as finding new ways to justify and incentivize investment, broadening the scope of potential investors, and integrating HRE CRP priorities in other, related efforts such as the creation of NYSDEC's Regional Action Plan and hazard mitigation/coastal resiliency projects. A primary focus for this action will be the 33 sites recommended for near-term construction as part of the USACE's Hudson-Raritan Estuary Ecosystem Restoration Feasibility Study. HEP will work with the CAC and other partners to advance campaigns required to secure new capital funding identified in its Options for Funding Priorities Report. This could include funding available under the USACE's restoration and other authorities, greater use of environmental benefit agreements, and other sources.

KEY PARTNERS: Restoration Work Group, CAC, USACE, NYSDEC, NJDEP
RESOURCES: Staff and Leveraging, Major Capital Projects
TIMELINE: 2017-2022
OUTCOMES

Short term:

- Identification and support for additional resources for restoration.
- Restoration projects will secure funding in a timelier manner.

Long-term:

- Implementation of additional restoration projects and progress toward the Estuary's goals for target ecosystem characteristics.

H-A-2

COST REDUCTION

Evaluate ways to reduce costs of restoration.

NEED

Restoration projects in the Estuary are costly. Identifying ways to be economical with existing funding will enable additional and/or enhanced projects to move forward in a timely way.

DESCRIPTION

HEP will work with the Restoration Work Group to identify and assess what cost-reduction measures have the potential to help advance individual restoration projects across the Estuary. Potential avenues include better communication of guidance on permitting standards and practices, consideration of bioremediation of sediments, on permitting standards for living shorelines and other restoration work, and encouraging cost-sharing across projects as was done for the Jamaica Bay Marsh Islands and NYC's clean soil bank. Employing community and volunteer stewardship and monitoring is one important approach. HEP-led efforts may include the creation of an estuary-wide hub, engaging corporate involvement, and/or partnering with existing volunteer organizations to assist managers with recruiting participants.

KEY PARTNERS: Restoration Work Group
RESOURCES: Staff and Leveraging
TIMELINE: 2017-2022
OUTCOMES

Short-term:

- Creation of a more streamlined approach towards cost-sharing with partners and access to volunteers.

Long-term:

- A greater number or larger restorations will occur, making progress towards the restoration goals outlined in the HRE CRP and eventually leading to enhanced habitat and ecological health.

Resident and migratory birds in Jamaica Bay, NY. Photo: Don Riepe

OBJECTIVE A

Make progress towards restoring the Estuary's target ecosystem characteristics

H-A-3

ECOSYSTEM SERVICES

Document value of ecosystem services delivered through restoration for decision makers.

NEED

Better documentation of the value (monetary and otherwise) ecosystems provide to humans will help urban restoration projects compete for funding on regional and national levels.

DESCRIPTION

Valuation of ecosystem services has become an important tool for understanding and communicating the benefits of the Harbor Estuary, especially for people outside of the restoration and conservation communities. In partnership with other staff at the Hudson River Foundation, HEP will work with Resources for the Future and an advisory committee to refine ecosystem services valuation for our urban environment. A policy white paper will illustrate how valuation of ecosystem services for restoration projects would be beneficial to managers and funders. It will identify the analytical methods and possible protocols that could be used to incorporate a range of the most important ecosystem services in those decisions. These will include consideration of the value of providing habitat and nature-based experiences in a densely developed urban environment as well as processes such as improved water quality. The protocol can be adapted for use in future restoration prioritization efforts (see Action H-A-4). Undertaking such a case study analysis for a particular site or TEC project is a possibility for the future. Presentations and other outreach will share this information with communities, local governments, state and federal agencies, and other decision makers.

KEY PARTNERS: HRF, RFF, USACE, EPA, RWG, Academia

RESOURCES: Staff and Leveraging; Grant Projects <$200,000. Undertaking the case study demonstration project will require additional commitments of time and funding.

TIMELINE: 2017-2019. The initial policy paper expected by 2018.

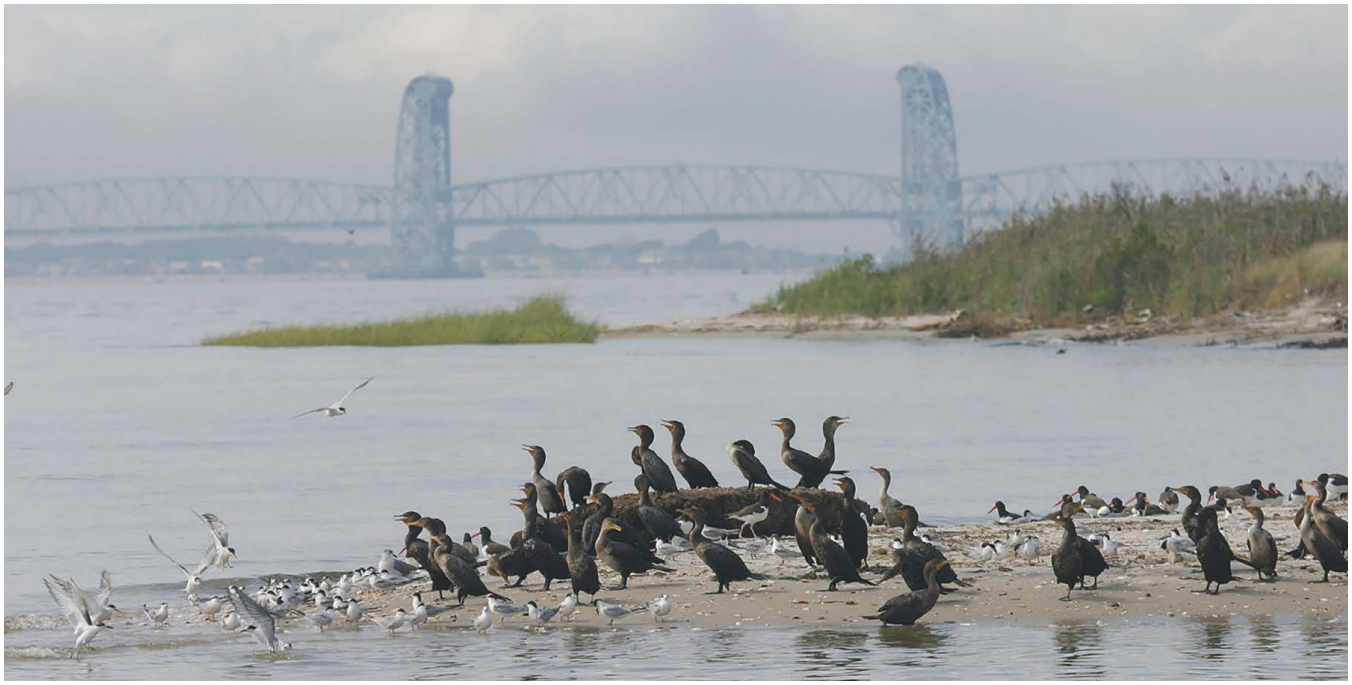
OUTCOMES

Short-term:

- An assessment of how ecosystem services valuation could be used to analyze restoration projects in the estuary.

Long-term:

- Greater understanding of the ecosystem services provided by restoration projects in the estuary.
- Incorporation of ecosystems service valuation as a factor by decision makers.



OBJECTIVE A

Make progress towards restoring the Estuary's target ecosystem characteristics

H-A-4

PRIORITIZATION

Create a decision making tool for prioritization of restoration opportunities.

NEED

The NY – NJ Harbor Estuary Program has compiled a list of over 300 restoration opportunities within the Hudson-Raritan Estuary study area as part of the HRE CRP. HEP's Restoration Work Group also regularly adds to this list of opportunities after vetting new projects. Identifying the most appropriate restoration projects for different funding opportunities is a challenge for public agencies and conservation groups.

DESCRIPTION

A decision-making tool will help HEP and its partners identify and assess the important or appropriate restoration projects by geography, TEC, or potential funding sources. This effort will build on the existing HRE CRP database, the OASIS GIS mapping platforms, as well as previous efforts by NYC DPR and others. Understanding of specific restrictions on existing grant programs or other available funding sources would increase the utility of the tool. An initial step for determining possible search criteria and the level of detail required for data will be to survey members of the Restoration Work Group for their take on how their agencies could use the tool, as well as other current users of the HRE CRP database. The creation and utility of this tool may also depend on the development of a method for evaluating ecosystem services (see Action H-A-3).

The tool should be comprehensive and user-friendly, as well as adaptable to different scales, TECs, and the changing needs of its users. For shoreline restorations, the tool may consider shoreline typology and include consideration of the shoreline materials being replaced and their relative toxicity. The efficacy of this tool is limited to the completeness and quality of the data used as inputs. Through this process, HEP staff or contractors will assess the availability of the data required and desired, and work towards filling data gaps. HEP staff will assume responsibility of managing the user interface and updating the tool as needed.

KEY PARTNERS: RWG, USACE, NYSDEC, NJDEP, NYC DPR, Academia

RESOURCES: Staff and Leveraging; Grant Projects <$200,000. Funding will likely be required to develop the decision-making tool.

TIMELINE: 2019-2020

OUTCOMES

Short-term:

- Understanding of user need and availability of the data required for a decision making tool.
- Creation of the decision making tool and integration into an online platform.

Long-term:

- More efficient and appropriate selection of a restoration project when funding is available or restoration is required.
- Additional restoration as tool helps justify projects for funding.

Scientists from Columbia University monitoring the habitat value of our urban shorelines. Photo: HEP

OBJECTIVE B

Improve the quality and likely success of habitat restoration

H-B-1

RESTORATION BEST PRACTICES

Share research and best practices among partners.

NEED

Restoration in the NY-NJ Harbor can be quite complex, involving a large number of projects and stakeholders. Projects are often designed to meet multiple goals in addition to restoration, such as resiliency and public access. The size of the restoration community necessitates and offers opportunities to learn from successes and mistakes of past restoration projects and to build collective understanding in design, implementation or monitoring of restoration projects.

DESCRIPTION

HEP will continue to promote the exchange of research and best practices through many avenues, notably through meetings of the Restoration Work Group, which provides a regular means of elevating common concerns and facilitating conversation within the restoration community.

Members reach consensus on common goals and objectives, share the lessons learned from their own restorations, and hear presentations from others outside the group that have new research or techniques or data to share. Likewise, HEP will also continue to support the Oyster Restoration and Harbor Herons committees. Their planning and outreach efforts and may launch additional Restoration Work Group committees focused of specific TECs such as shorelines and shallows (see Action B-2). Key deliverables include the bi-annual restoration conference and restoration progress reports.

KEY PARTNERS: Restoration Work Group, Harbor Herons and Oyster Restoration Committees
RESOURCES: Staff and Leveraging
TIMELINE: 2017-2022. This action is ongoing; the Restoration Work Group meets quarterly.

OUTCOMES

Short-term:

- Improved restoration practice and projects.
- Greater learning and collaboration among the restoration partners

Long-term:

- Ensure continuity of community knowledge and experience and help pave the way for the next generation of restoration projects and professionals.

H-B-2

SHORELINE ASSESSMENT

Assess and interpret shoreline and shallow-water habitat condition and value

NEED

The restoration of urban shorelines and shallow water habitat is poorly understood, in large part because there is a limited history of such projects, in comparison to more common wetland restoration projects. Clarification is needed to better define restoration goals, how restoration can improve habitat and biodiversity, and the viability of specific techniques.

DESCRIPTION

HEP will support and undertake research to improve understanding of the ecology of shoreline and shallow water areas, including their projected future conditions. Research topics may include: the value of cleaner waters delivered by stormwater improvements, the importance of shoreline habitat connectivity and how to achieve it, how to assess habitat condition and the benefits of restoration along urban shorelines, biological use by shoreline type or sediment substrate, an assessment of shoreline typology and suitability, the benefits of replacing shoreline materials containing PAHs and heavy metals, upstream/downstream habitat connectivity, and how to assess the relative impact to shorelines from development or the relative value of different habitat types.

This work will continue past efforts by HEP and other partners to assess the value of urban shorelines and shallow water habitat. Additional grant funding will enable new research efforts and pilot restoration projects. Any pilot restoration efforts are likely to be conducted in cooperation with public landowners along the waterfront including park agencies, PANYNJ, and/or EDC. A key consideration will be the shoreline targets established by the Hudson River Estuary Program.

KEY PARTNERS: HRF, Academia, TNC, NYCDPR, NJDEP, NYSDEC, Hudson River Estuary Program, HREP, HRPT, EDC, PANYNJ
RESOURCES: Staff and Leveraging; Grant Projects>$200,000
TIMELINE: 2017-2022

OUTCOMES

Short-term:

- Identification of important questions and creation of consensus research agenda.
- Undertake and publish research or pilot restoration projects.

Long-term:

- Improved understanding and practice of restoration of shorelines and shallow water habitat.

OBJECTIVE B

Improve the quality and likely success of habitat restoration

H-A-B-3

RECONTAMINATION

Understand the risks of recontamination of restored sites.

NEED

The polluted nature of our waterways, in terms of both water quality and sediment contamination, has raised concerns that restored estuarine ecosystems could become recontaminated over time. This recontamination may be more harmful than leaving the project area in its current state because, in some cases, it may lead to greater bioaccumulation of toxins in marine animals.

DESCRIPTION

HEP will gather and summarize available information and organize one or more meetings of interested parties to identify the current state of knowledge and regulatory and management concerns. The goal will be to develop a shared understanding and possible agreement among HEP's partners, including but not limited to USACE, NOAA, EPA and USFWS, regarding how to approach restoration projects given this concern, and what further research efforts are needed. Improved understanding of the current and future levels of sediment contamination resulting from the Contaminant Assessment and Reduction Project referenced under Maritime Objective A may be particularly useful.

HEP staff will produce a report detailing the result of the meetings and any further steps required. Based on this initial assessment, HEP and the Hudson River Foundation may support such research and/or seek funding to undertake further steps which may include conducting an ecological risk assessment or developing a protocol for analyzing risk on a project basis.

KEY PARTNERS: Restoration Work Group, USACE, NOAA, EPA, USFWS, HRF

RESOURCES: Staff and Leveraging; All efforts beyond initial meetings will require grant projects ><$200,000

TIMELINE: 2018-2019

OUTCOMES

Short-term:

- Greater understanding on scope of the issue and state of knowledge, available remedies and data needs.
- Common agreement on how to address concerns through the establishment of a protocol, method of site selection or other agreement.

Long-term:

- Improved restoration projects and practices.

Recently restored salt marsh, Woodbridge NJ. Photo: Great Ecology

OBJECTIVE C

Support habitat and restoration monitoring and the utility of monitoring data

H-C-1

HABITAT MONITORING

Increase support for monitoring and consistency among metrics.

NEED

Insufficient monitoring is taking place for restoration projects and habitat quality in the NY – NJ Harbor Estuary. The monitoring that is taking place is not consistent, and offers limited opportunities for practitioners to compare projects, assess long terms trends for wildlife and biodiversity and improve practice.

DESCRIPTION

HEP will identify opportunities (e.g. permitting, project funding, dedicated funding) for increasing the extent and duration of project and site monitoring, including evaluating overlapping purposes, needs, and metrics to determine whether there are ways to leverage efforts and encourage (or require) consistent data collection and possible entrance into a shared database. Creation of a shared database will require grant funding, while new support for monitoring will require sources of on-going operational funding.

HEP will specifically work with partners to determine common monitoring metrics for Natural and Nature Based Features (NNBF), and engage with other regional groups to build off of previous research. This work is currently managed by SRIJB and has been funded through grants from NYSERDA and NYSDOS. A focus will be greater consistency with Hudson River Estuary Program and NYS RECAP. Other key aspects of this action will be expanding and improving Citizen Science efforts, supporting long-term monitoring of natural shorelines, and assessing the role of monitoring for addressing climate change risks posed by increased number of invasive species and range shifts for native species.

KEY PARTNERS: USACE, NOAA, NYSDEC, NYSDOS, NYCDPR, NYCDEP NJDEP, SRIJB, IEC, TNC, Hudson River Estuary Program, Academia, Consultants

RESOURCES: Staff and Leveraging, Grant Projects <$200,000; On-going operating needs

TIMELINE: 2017—2020

OUTCOMES

Short-term:

- Identification of core list of metrics and protocols for monitoring NNBF projects.
- Evaluation and actions to improve the collection and sharing of monitoring data, possibly including creation of a shared database.

Long-term:

- Advancement in the design, implementation, and management of restoration projects.
- Greater understanding of habitat condition.

H-C-2

DATA SYNTHESIS

Synthesize existing monitoring data to better understand and communicate trends.

NEED

In the past, many restoration projects in the NY – NJ Harbor have included monitoring, either because it was required by regulators or just done as a best practice. Unfortunately, there has been no formal or informal collection of the restoration monitoring data. This monitoring data is a key element to improving our understanding of what makes a restoration successful and sustainable.

DESCRIPTION

HEP will work with the Restoration Work Group, Water Quality Work Group, and STAC to synthesize monitoring data for water quality, fisheries, and other data sets to support analysis of and communication about ecological health. Compilation of past monitoring data will provide a more complete picture of lessons learned from previous restorations. This data can be collected through outreach to the agencies conducting the restorations, regulators or consultants. HEP will also assess and potentially create a shared monitoring database (see Action H-C-1).

Information and metadata for long term monitoring programs for some key environmental indicators is being compiled in the Environmental Monitoring Plan and will be shared through a web-based application and State of the Estuary report.

KEY PARTNERS: Restoration Work Group

RESOURCES: Staff and Leveraging

TIMELINE: 2018-2020

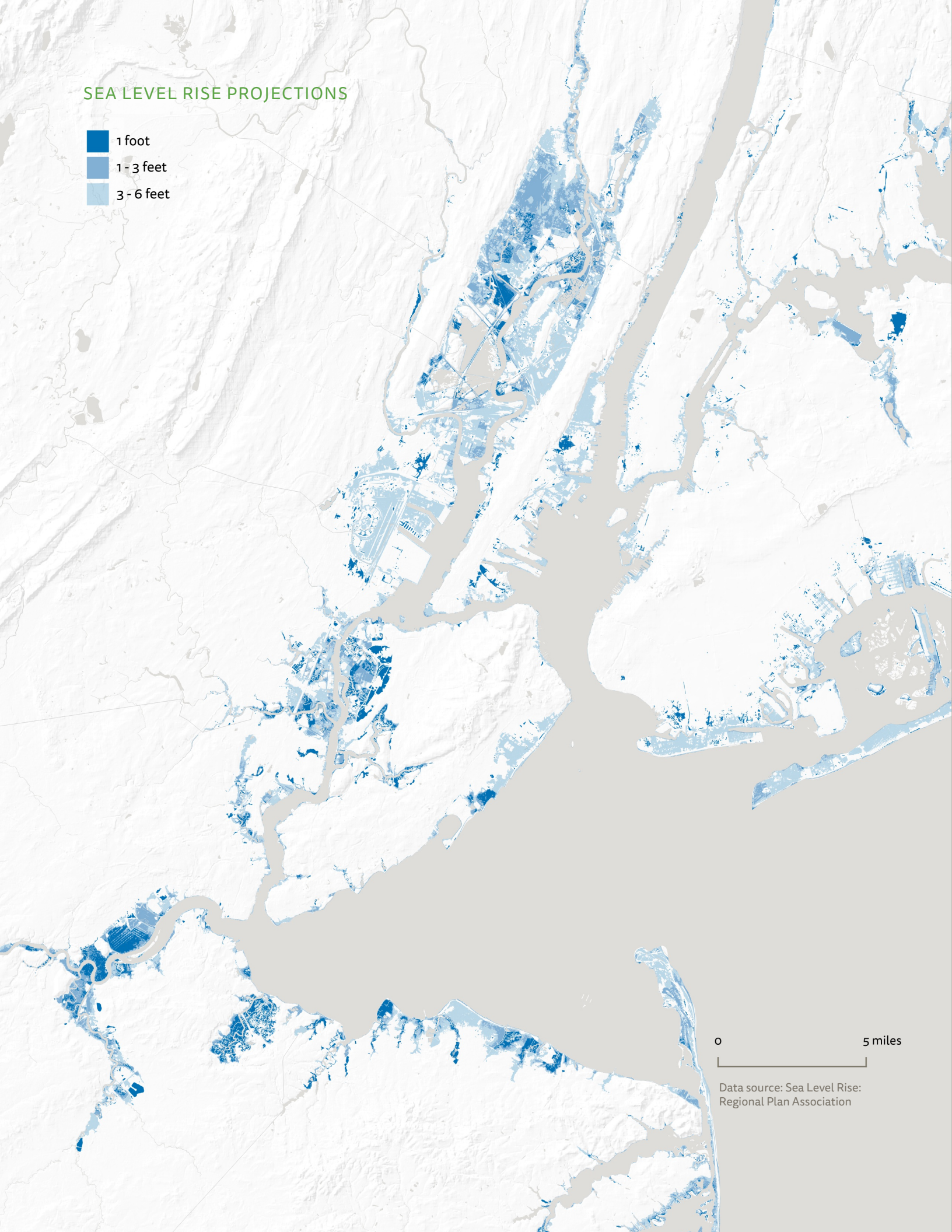
OUTCOMES

Short-term:

- Understanding of monitoring trends among the restoration/science community.
- Data will be ready for the shared monitoring database when it is designed.

Long-term:

- Advancement in the design, implementation, and management of restoration projects.


SEA LEVEL RISE PROJECTIONS
1 foot
1 - 3 feet
3 - 6 feet
0
5 miles
Data source: Sea Level Rise:
Regional Plan Association

OBJECTIVE D

Advance understanding and incorporation of climate change impacts in habitat management and restoration

H-A-D-1

SEA LEVEL RISE

Ensure incorporation of sea level rise into restoration and management practices.

NEED

Historic sea level rise is expected to accelerate in the next 50 years. Restoration projects that do not incorporate sea level rise in their design may not be sustainable in the future.

DESCRIPTION

HEP will support integrating climate change considerations into restoration practices (e.g. encouraging partners to follow NOAA, New York State, and New York City guidance) and pursue opportunities to expand or adapt guidance for conditions here in the Harbor Estuary.

HEP will work with its partners to assess and analyze the restoration opportunities in the HRE CRP for their adaptability to sea level rise, including conservation projects that provide an upland buffer and pathways for migration of existing wetlands, and seek to prioritize such efforts. HEP and HRF will support research analyzing the impacts of climate change on restoration efforts, including comparing adaptive responses of *Spartina* and *Phragmites* marshes; assessing the pros and cons of restoration that includes rock structures and other means of stabilizing shorelines; and advancing techniques for addressing barriers to marsh migration, elevation, and sediment budgets.

KEY PARTNERS: RWG, USACE, NJDEP, NYSDEC, SRIJB, NYCDPR, NOAA, HRF, Hudson River Estuary Program, NGOs

RESOURCES**:** Staff and Leveraging; grant projects >< $200,000

TIMELINE: 2018-2022. Some parts of this action are ongoing; however, priority projects should be identified by the RWG by Fall 2018.

OUTCOMES

Short-term:

- Incorporation of sea level rise as a factor in restoration design and implementation.

Long-term:

- Reduce loss of habitat due to sea level rise.

H-A-D-2

BUYOUT RESTORATION

Advance conservation and restoration planning for properties eligible or already acquired through flood plain/ buyout programs.

NEED

In order to reduce risk to people and property, the states of NY and NJ as well as the City of New York have purchased houses and other property in flood prone areas. Only a few of these sites have had long-term planning undertaken with respect to identifying a long-term owner and manager, and determining management objectives. Many more buyout properties represent unique opportunities to pursue larger-scale restoration projects.

DESCRIPTION

HEP will work with the Restoration Work Group and other partners to determine status of these buyout properties, landowner needs, and to identify restoration opportunities. This includes assessing opportunities to allow for marsh migration and for improving habitat connectivity between in-water to upland areas. An initial exploration and meeting with relevant state and city agencies may lead to identification of planning projects requiring grant funding. The Oakwood Beach area of Staten Island may be a good pilot project.

KEY PARTNERS: USACE, NJDEP, NYSGOSR, NYSDEC, NYCDPR, NOAA, Hudson River Estuary Program, NGOs

RESOURCES**:** Grant projects < $200,000

TIMELINE: 2018-2020

OUTCOMES

Short-term:

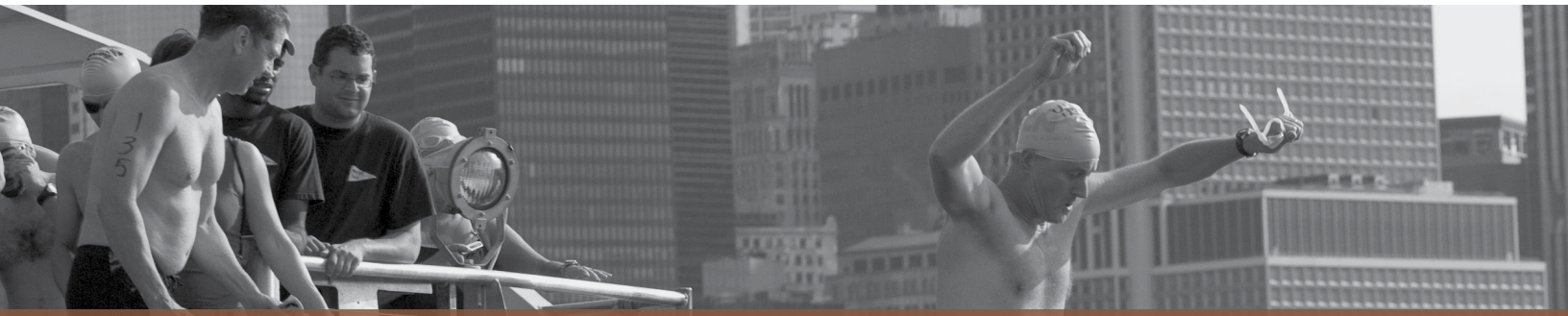
- Properties purchased to reduce risk will be evaluated for restoration opportunities and suitable ones will be added to the HRE CRP list.

Long-term:

- Appropriate properties will be restored, leading to progress towards the TEC goals from the HRE CRP and greater habitat for wildlife.

Public Access and Stewardship

GOALS, OBJECTIVES, *and* PRIORITY ACTIONS



PUBLIC ACCESS WORK GROUP

Margaret Flanagan (Chair), Waterfront Alliance
Helena Andreyko, Hudson River Foundation
Lisa Baron, US ACE
Rob Buchanan, NYC Water Trail Association
Hugh Carola, Hackensack Riverkeeper
Mike Danko, NJ Sea Grant
Ted Enoch, City Parks Foundation
Rebecca Foster, NJ DEP
Meghan Gosselink, NJ DEP
Michelle Johnson, US Forest Service
Andrea Leshak, NY NJ Baykeeper
Debbie Mans, NY-NJ Baykeeper
Kerry Miller, ANJEC
Nicholas Molinari, NYC Parks
Michael Mullaley, City Parks Foundation
Jamie Ong, NYC Parks
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Robert Pirani, NY NJ HEP
Lucy Robson, NY4P
Bill Shultz, Raritan Riverkeeper
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Erika Svendson, US Forest Service
Shino Tanikawa, NY Soil and Water Conservation District
Ahmed Tigani, Manhattan Borough President's Office
Nellie Tsipoura, NJ Audubon
Ben Weiland, The Trust for Public Land
Allan Zaretsky, NYC DCP

NYC SWIM. Photo: Amy Bolger

Improve public access to the waters of the Estuary and the quality of experience at public spaces along the waterfront.

Access to the waters of the NY – NJ Harbor Estuary, whether for swimming, boating, fishing, or just enjoying the spectacular views, is an amenity that improves quality of life and drives spending and investments by residents, visitors, and businesses. Park use has been positively correlated with physical activity levels and improved public health. Most critically for HEP, access is a vital strategy for fostering improved stewardship of the Estuary. For all these reasons, ensuring and improving access is an important goal shared by HEP's government, utility, and civic partners. Over the next five years, HEP will focus on nine actions designed to increase public access and stewardship and programming of public sites. To increase stakeholder and public understanding of waterfront safety issues, HEP will assess water quality for primary and secondary contact recreation and work with partners to develop effective ways of communicating that information to the public, including examining where it is feasible to create new bathing beaches. HEP will continue to improve and expand our small grants program, providing a needed source of support for local stewardship efforts and leveraging their volunteers. HEP will support direct public access to the water through public awareness efforts like updating our estuary paddling guide.

HEP's target (which it shares with the Hudson-Raritan Estuary Comprehensive Restoration Plan) is that all residents of the Harbor Estuary should be within a short walk or public transit trip from an accessible waterfront by 2050. To establish a baseline of current public access and to be able to document progress toward this goal, HEP worked with the USDA Forest Service and our Public Access Work Group, comprised of key public agencies and civic organizations, to characterize public access and its distribution around the Harbor Estuary, the relationship of these parks and public spaces to socioeconomic need, and where and how civic organizations are providing stewardship and programming at the waterfront. The 2016 report, "Connecting with Our Waterways: Public Access and its Stewardship in the New York—New Jersey Harbor Estuary" identifies 539 parks and public spaces totaling roughly 41,000 acres that are accessible to the public. The shorelines of these public spaces—ranging from the small urban street-ends and esplanades to sandy beaches and marshes—stretch for about 600 miles or 37% of the 1,600-mile waterfront. The full report is available at **www.harborestuary.org/NYNJHEP-PublicAccess.pdf.**

While comprehensive visitation data for the Estuary does not exist, just four major regional parks (Liberty State Park, Hudson River Park, Brooklyn Bridge Park, and Governors Island) attract more than 26 million visitors a year to what was a railroad yard, warehouses, and a military base just a generation ago. Across the Estuary, the growing number of boathouses and other providers now bring more than 100,000 people a year on kayak and other human powered boats—more than double the number of just seven years ago. Accelerated by the recent creation of NYC Ferry, more than 38 million trips happen every day on the region's growing fleet of ferry and excursion boats.

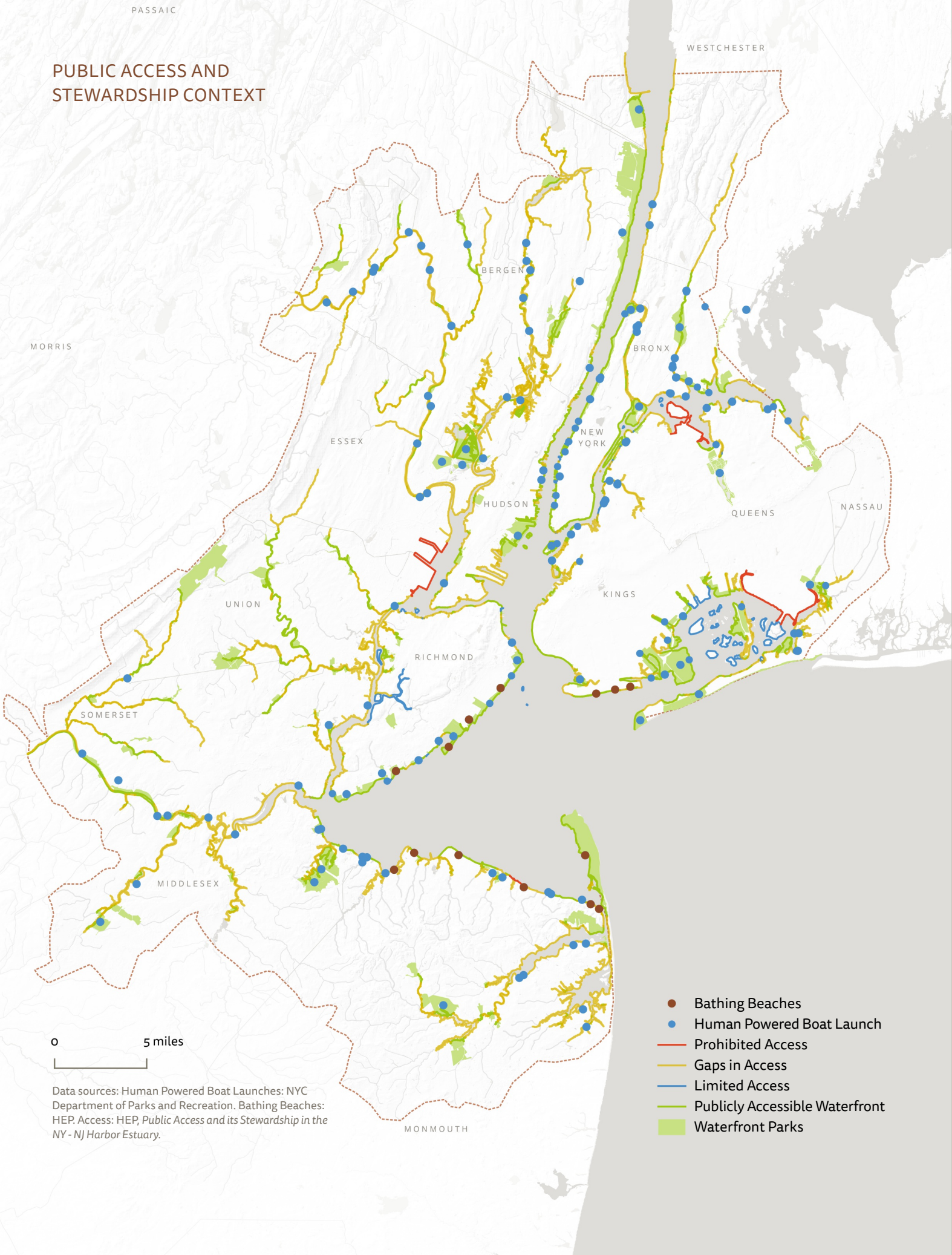
Places where the public can enjoy swimming, boating and other programs touching the water are more limited; there are only 14 swimming beaches scattered throughout the Estuary and another six beaches on the ocean side of Sandy Hook and the Rockaways. Based on survey results, there are another 139 sites where the public can "safely touch the water" at a human powered boat launch. Creation of additional direct access areas is limited due to water quality impairments, timely knowledge of water quality conditions, and other safety and management constraints.

These parks, public spaces and access sites are not evenly distributed across the Estuary, especially when considered in the context of differing socioeconomic characteristics of the Estuary's waterfront populations. Only about nine percent of the waterfront is accessible for the more than 500,000 residents in 12 higher need areas around the bi-state estuary. These 12 waterfront areas are defined by HEP as being those waterfront reaches having a limited number of parks, densely developed housing, and/or an otherwise disadvantaged population. In the Passaic River between Newark and Paterson, for example, over 96% of the waterfront is inaccessible. As detailed in HEP's Public Access Report, the 12 areas include sections of the Bronx; Passaic River; Jamaica Bay; Brooklyn; Elizabeth River; Green Brook; Staten Island's North Shore; Raritan River/Arthur Kill; Hackensack River; Yonkers; North Manhattan/Harlem River; and Flushing Bay.

Meeting public access goals does not mean providing access to one hundred percent of the waterfront. In particular, vital maritime and other water-dependent uses require that some portions of the waterfront not be accessible to the public for national security, safety and practical business considerations. Respect for these concerns makes providing access to other waterfront areas even more important. This is particularly true in those communities impacted by essential water dependent uses.

Improving access is not only about creating public spaces, but also about improving the quality of the visitor experience at those parks. This is particularly important for residents living in and around some of the higher need areas.

PUBLIC ACCESS AND STEWARDSHIP CONTEXT



Data sources: Human Powered Boat Launches: NYC Department of Parks and Recreation. Bathing Beaches: HEP. Access: HEP, *Public Access and its Stewardship in the NY - NJ Harbor Estuary.*

Public Access and Stewardship

Improve public access to the waters of the Estuary and the quality of experience at public spaces along the waterfront.

OBJECTIVE A *Increase public access and new possibilities for contact recreation, particularly in areas of higher need.*

PA-A-1 **INCREASE ACCESS**
Advance opportunities for increasing public access.

PA-A-2 **CONTACT RECREATION**
Assess prospects and refine goals for increasing direct access for boating, swimming, and wading, incorporating associated water quality considerations.

OBJECTIVE B *Improve stewardship and programming at existing public access sites, particularly in areas of highest need.*

PA-B-1 **STEWARDSHIP**
Identify and support strategies for increasing public stewardship in higher need areas.

PA-B-2 **SMALL GRANTS**
Support stewardship activities and public programming through small grants.

OBJECTIVE C Promote and expand awareness of public access opportunities and issues.

PA-C-1 **SAFETY**
Increase public understanding of the safety and risks associated with direct contact with the water.

PA-C-2 **PUBLIC PARTICIPATION**
Encourage and support public participation in water-based activities.

CHALLENGES	INDICATORS
● **NOT ENOUGH PUBLIC ACCESS** *OBJECTIVES A, C*	**NOT ENOUGH PUBLIC ACCESS** • *Publically Accessible Waterfront (including in higher need communities)* • *On-water access (bathing beaches, boat launches, marinas, and ferry landings).* • *On-water programs (number of human-powered boaters on the water over time)* • *Visitors to Waterfront Parks*
● **LIMITED STEWARDSHIP CAPACITY** *OBJECTIVE B*	**LIMITED STEWARDSHIP CAPACITY** • *Capacity of stewardship organizations (number of organizations/staff/members/volunteers)* • *Participation in Stewardship Events* • *Participation in Citizen Science*

PUBLIC ACCESS AND STEWARDSHIP

OBJECTIVE A

Increase public access and new possibilities for contact recreation, particularly in areas of higher need.

PA-A-1

INCREASE ACCESS

Advance opportunities for increasing public access, particularly in areas of higher need.

NEED

Access to the public waters of the Harbor Estuary is limited, especially for waterfront communities with few public parks, dense residential development, and a disadvantaged population.

DESCRIPTION

HEP will identify access opportunities, pursue creation of community supported plans and implementation of capital projects and other improvements. This work will focus on the 12 waterfront communities of higher need identified in HEP's 2016 Public Access Report and addressed by HEP's staffing of Partnership Ambassadors at the Urban Waters Federal Partnerships in the Passaic and Bronx & Harlem Rivers. On the Bronx & Harlem Rivers, the Partnership will initially focus on advancing improvements along the Harlem River waterfront and its watershed in the Bronx through a community planning effort being led by the New York City Department of Parks and Recreation. On the Passaic River, the Partnership will identify public access and stewardship opportunities.

HEP will also work with the Hudson River Estuary Program and with coastal zone management programs in both states on advancing their public access goals in all of these higher need areas. This includes helping integrate access requirements with coastal adaptation projects, meeting principles of universal access and/or storm resiliency identified by the Hudson River Estuary Program, working with NJDEP and local municipalities in creating municipal public access plans or otherwise complying with state requirements and working with the New York City Department of City Planning as they revise their Local Waterfront Revitalization Plan.

KEY PARTNERS: Lower Passaic and Bronx & Harlem River Urban Water Partnerships, NJDEP, NYCDCP, NYCDPR, Partnerships for Parks, local municipalities and community-based organizations
RESOURCES: Staff and Leveraging; Grant Projects ><$200,000; Capital Funding
TIMELINE: 2017-2022
OUTCOMES
Short term:

- Additional public access opportunities and other improvements will be identified for higher need waterways.

Long-term:

- Improved access to waterways in higher need area, in particular the Lower Passaic and Bronx & Harlem Rivers.

PA-A-2

ACCESS GOALS

Assess prospects and refine goals for increasing direct access for boating, swimming, and wading, incorporating associated water quality considerations.

NEED

Direct access to and from the public waters of the Harbor Estuary is limited due to water quality impairments, timely knowledge of water quality conditions, and other safety and management constraints.

DESCRIPTION

HEP will inventory opportunities for primary and secondary contact with the water; places where one can touch the water whether by swimming, wading or boating. HEP will work with the Public Access Work Group and other partners to assess how best to incorporate this information and associated water quality considerations into its goals for public access and the tracking of success. The information will also be used to create an updated version of HEP's Paddling Guide (see Action PA-C-2).

HEP will also examine the water quality, management, and regulatory issues of enabling the public to access the water for swimming and/or wading at select pilot sites in both New York and New Jersey. One or more feasibility studies, conducted through a workshop, university studio or contractor will serve to identify possibilities and challenges. A latter phase could include efforts to work with partners to secure specific capital investments and operating funding.

KEY PARTNERS: Public Access Work Group; NYCDPR; NJDEP; Waterfront Alliance; NYC Water Trails Association; and other state and local park agencies in both states
RESOURCES: Staff and Leveraging; Grant Projects ><$200,000. Assessing the possibilities for increasing access at pilot sites will require new grant funding and/or a university partnership.
TIMELINE: 2018-2019. The initial investigation of enabling the public to access the water for swimming and/or wading at pilot areas will commence in 2018.
OUTCOMES
Short term

- Inventory of existing direct access sites.
- Improved understanding of the feasibility of additional direct access opportunities given water quality and management.

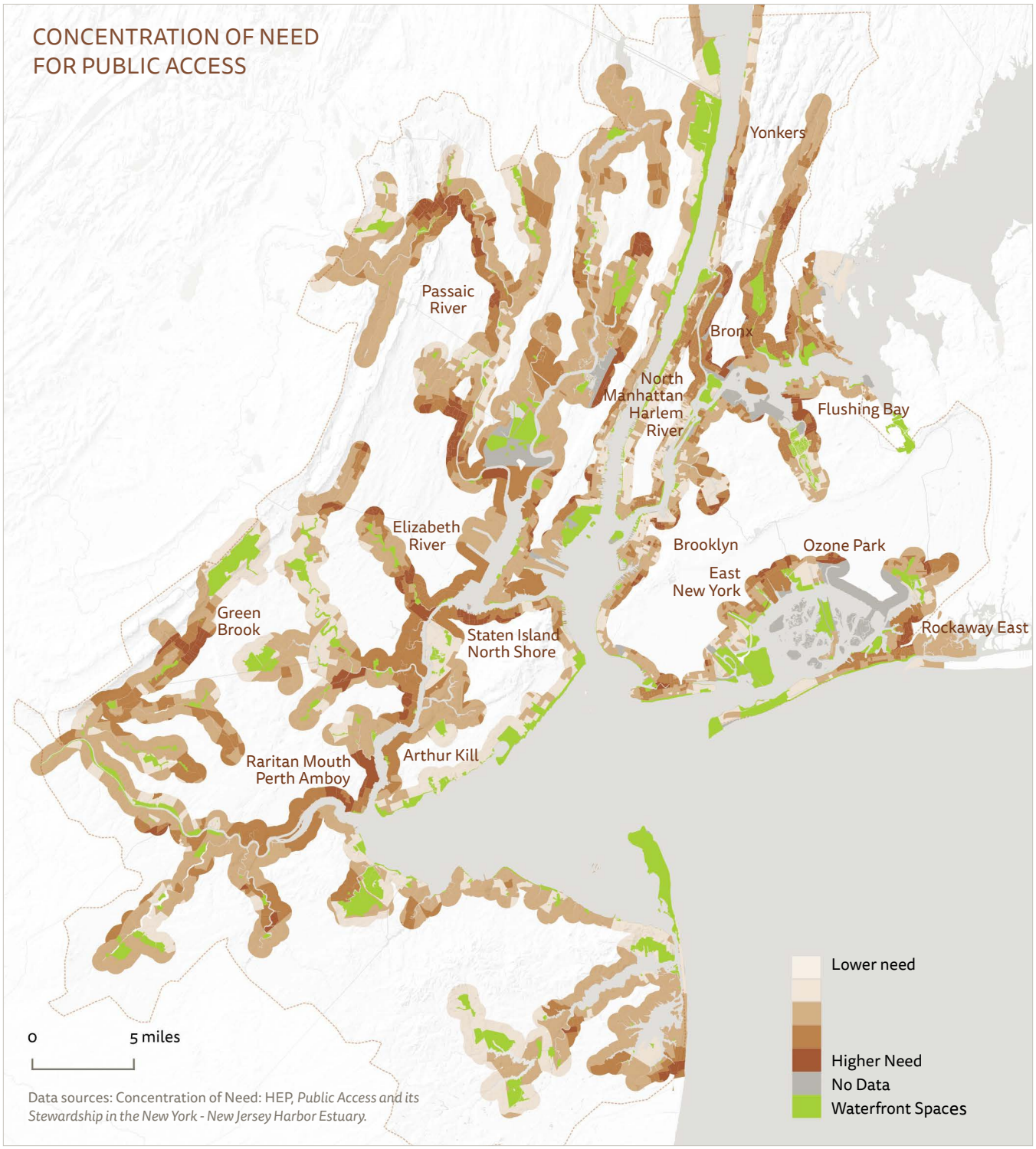
Long-term:

- Creation of additional opportunities for the public to enjoy the Estuary through swimming, wading, paddling, and boating.

PUBLIC ACCESS AND STEWARDSHIP

OBJECTIVE A

Increase public access and new possibilities for contact recreation, particularly in areas of higher need.



OBJECTIVE B

Improve stewardship and programming at existing public access sites, particularly in areas of highest need.

PA- B-1

STEWARDSHIP

Identify and support strategies for increasing public stewardship in higher need areas.

NEED

Engaging and strengthening connections to local residents is the key to the success of local stewardship organizations.

DESCRIPTION

HEP and the Public Access Work Group and the Citizens Advisory Committee will conduct a survey and possibly convene a workshop to identify and pursue strategies for increasing public engagement and stewardship activities in higher need areas.

Participants will include civic and community-based organizations; funders like City Parks Foundation, Urban Waters Federal Partnership and others; and local and state park agencies. This work will build on the HEP's on-going collaboration with the US Forest Service NYC Urban Field Station Stewardship Mapping and Assessment Project (STEW-MAP).

The results of the survey and possible workshop will assist the more than 146 civic organizations that help engage people with the Harbor Estuary through a broad array of public programs and stewardship activities. Possible directions will include identifying how waterfront programming could help address broader issues/interests within the community including recreation/public health, employment and job training, and youth programs; creation of a peer exchange or other learning opportunities; and/or other ongoing networking opportunities.

KEY PARTNERS: Public Access Work Group, Citizens Advisory Committee, USDA Forest Service NYC Urban Field Station, NGO Partners, NYC Parks, Partnerships for Parks, Urban Federal Waters Partnership, Philanthropy

RESOURCES: Staff and Leveraging

TIMELINE: 2018-2021. This project will start following collection and analysis of the 2017 STEW-MAP survey anticipated in 2018.

OUTCOMES

Short term:

- Greater understanding of the needs and potential of local stewardship organizations.

Long-term:

- Increased capacity of stewardship organizations, in particular in high need areas.

PA-B-2

SMALL GRANTS

Support stewardship activities and public programming in higher need areas through small grants.

NEED

Improving access requires improving the quality of the visitor experience at existing parks through enhanced programming and management.

DESCRIPTION

HEP and the Hudson River Foundation will continue their public access and stewardship grants programs. They will seek support and/or leverage additional sources of funding to grow the grant program in order to ensure a grant cycle every year. The RFP and applications will be reviewed by a special committee of the Public Access Work Group. HEP will also continue to provide funding for the *In Your Neighborhood Program* at the Waterfront Alliance's City of Water Day each July. HEP will coordinate with and otherwise support the Hudson River Estuary Program on their stewardship and education grant programs in the lower Hudson Estuary. This will include helping identify and support applications from civic groups in New York City.

This funding provides an important source of support for small civic organizations that have direct knowledge of the interest of local communities and the opportunities afforded by existing parks and estuarine resources. Supporting civic stewardship complements and extends governments' ability to manage these public spaces. Funds at the Hudson River Foundation that have supported similar activities include the Hudson River Improvement Fund and the New York City Environmental Fund. Growing the grants program will require working with other sources of philanthropy: state and local actors involved in environmental benefit agreements; state or city funding programs; and the advocates on the CAC to leverage or secure on-going funding.

KEY PARTNERS: Hudson River Foundation, Public Access Work Group, Hudson River Estuary Program

RESOURCES: Staff and Leveraging; Grant Projects > <$200,000

TIMELINE: 2017-2022

OUTCOMES

Short term:

- Direct support for local civic stewardship and programs, especially in high need areas.
- Securing sustainable non-federal sources of funding.

Long-term:

- Increased capacity of stewardship organizations, in particular in high need areas.

OBJECTIVE C

Promote and expand awareness of public access opportunities and issues.

PA-C-1

SAFETY

Increase understanding of the safety and risks associated with direct contact with the water.

NEED

There is limited awareness and common understanding of the risks associated with poor water quality among the public and civic organizations that help support and manage the public's contact with the water. While bathing beach standards are well known and understood by managers and communicated to the public, standards for secondary contact are not as well defined and/or understood by stakeholders.

DESCRIPTION

HEP will undertake an analysis of the actual and the perceived safety of water quality for primary and secondary contact recreation, including car top boating and wading. The analysis will include the public health risk associated with pathogens associated with CSO events and stormwater runoff, and anticipated results from efforts to manage them via Long Term Control Plans and MS4 permits as well as the risks associated with exposure to contaminated floodwaters from storm events.

Based on analysis of perceived and actual risks, HEP will work with the Public Access Work Group and in particular the two states and EPA to develop consistent messaging for the public. This information will be displayed on the HEP website and other venues.

KEY PARTNERS: EPA, NYSDEC, NJDEP, Health Departments, Public Access Work Group, CAC

RESOURCES: Staff and Leveraging; Grant Projects <$200,000

TIMELINE: 2019-2021. This action will require new grant funding.

OUTCOMES

Short term:

- Greater understanding and a unified message from managers, regulators, and key stakeholders as to the safety of the Estuary's waters.

Long-term:

- Improved management of direct access to the water.

PA-C-2

PUBLIC PARTICIPATION

Encourage and support public participation in water-based activities.

NEED

Public materials describing paddling opportunities for the entire Harbor Estuary are limited.

DESCRIPTION

Getting out on the water in a human powered boat is an important means for the public to enjoy the Harbor Estuary and better understand management issues. HEP will work with partners to revise and update the 2011 harbor-wide paddling guide. The new version will incorporate the inventory of opportunities for direct contact with the water created under Action A-2 as well as safety information and common messaging developed under C-1.

As with the 2011 edition, this update will feature public access sites, associated facilities, safety considerations, and launch site conditions. This will be a general brochure aimed to inform the general public and novice paddler about estuary resources and paddling opportunities. It will complement the more detailed and up-to-date information about the launch sites available online by park managers and paddling organizations.

KEY PARTNERS: Public Access Work Group; NYC Parks; NJDEP; Waterfront Alliance; NYC Water Trail Association; Other paddling organizations.

RESOURCES: Staff and Leveraging; Grant Projects <$200,000. HEP will seek a sponsor and partners for creation and distribution of the harbor- wide water trail map.

TIMELINE:

2017-2019

OUTCOMES

Short term:

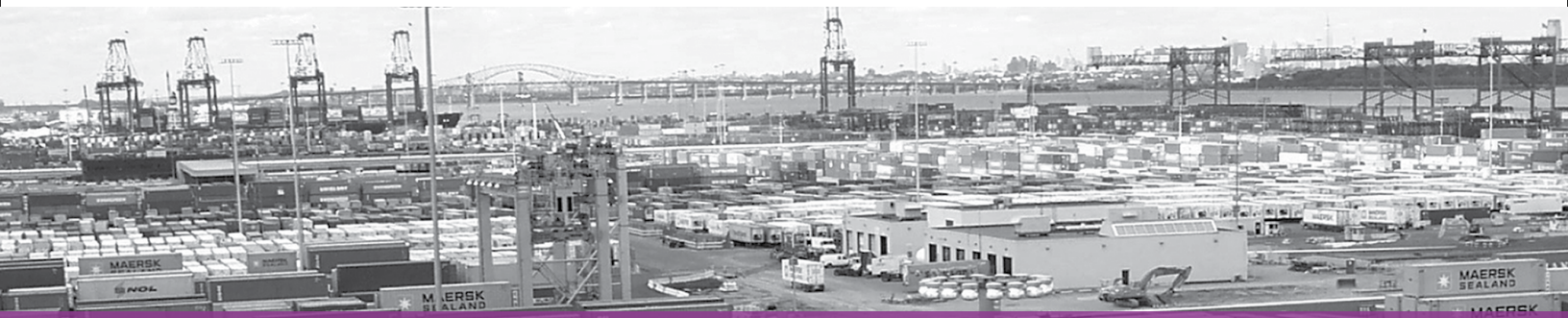
- Greater awareness of paddling opportunities.

Long-term:

- Improved public access and enjoyment of the Estuary for paddling activities.

Port and Maritime

GOALS, OBJECTIVES, *and* PRIORITY ACTIONS

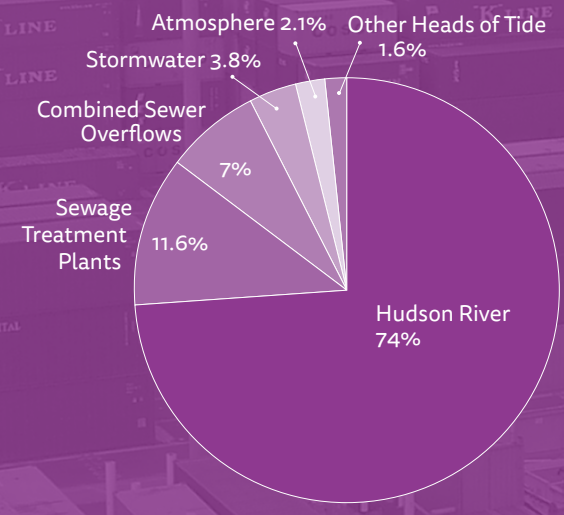


PORT AND MARITIME WORK GROUP

Scott Douglas (Co-Chair), NJDOT
Dennis Suszkowski (Co-Chair), HRF
Jodi McDonald, USACE
Mark Reiss, USEPA
Dan Millemann, NJDEP
Katie Axt, NYSDEC
Omar Choukeir, PANYNJ

Photo: Port Elizabeth, NJ. Captain Albert E. Theberge, NOAA (ret.)

Loading of PCBs to the NY/NJ Harbor Estuary



Data source: Hudson River Foundation, *Contaminant Assessment and Reduction Project Summary Report*

Support port and associated maritime operations so that they are both economically and ecologically viable.

The Port of New York and New Jersey and associated maritime activities are an integral and complementary part of the New York – New Jersey Harbor Estuary. The economic importance of moving cargo and people must be balanced with addressing historic and on-going impacts of port facilities and operations on estuarine ecology and host waterfront communities. HEP's role is to provide important information on the sources and fate of contaminated sediment.

The presence of toxic contaminants in sediments is a major factor in the economic and ecological health of the Port. The second phase of the Contaminant Assessment and Reduction Project (CARP 2) will provide important information on the movement of sediment, and in particular the sources and fate of contaminated sediment. Over the next five years as the project's scope is delineated and data is collected and analyzed by a team led by the Hudson River Foundation, HEP will provide a vehicle for informing and engaging public and private stakeholders in this work. HEP will also convene a workshop on the appropriate development and use of seasonal no-dredging windows.

The Port of New York and New Jersey is the largest port on the Atlantic seaboard, with about 3.7 million containers, 500,000 automobiles, and other goods coming in and out each year. This cargo is valued at $200 billion and supports about 190,000 direct jobs at the port and associated shipping and maritime trades.

Successfully managing this critical industrial activity requires careful attention to the Estuary and surrounding waterfront communities. In particular, the management of the quantity and quality of sediment that flows into navigation channels and berthing areas, both for large container ships as well as smaller tugboats and barges, can substantially reduce the costs of dredging while reducing the exposure of people and wildlife to toxic materials.

The Estuary is a machine for transporting sediment down the Hudson and other rivers into the harbor. Between 400,000 to 1.4 million metric tons each year move through the system. Conversion of agricultural and forested land to impervious surface creates surges of stormwater runoff that erodes streambeds and banks. These high sediment loads can damage aquatic systems and fill channels in the port. Sediment runoff rates from construction sites can be 1,000 to 2,000 times greater than those of forested lands.

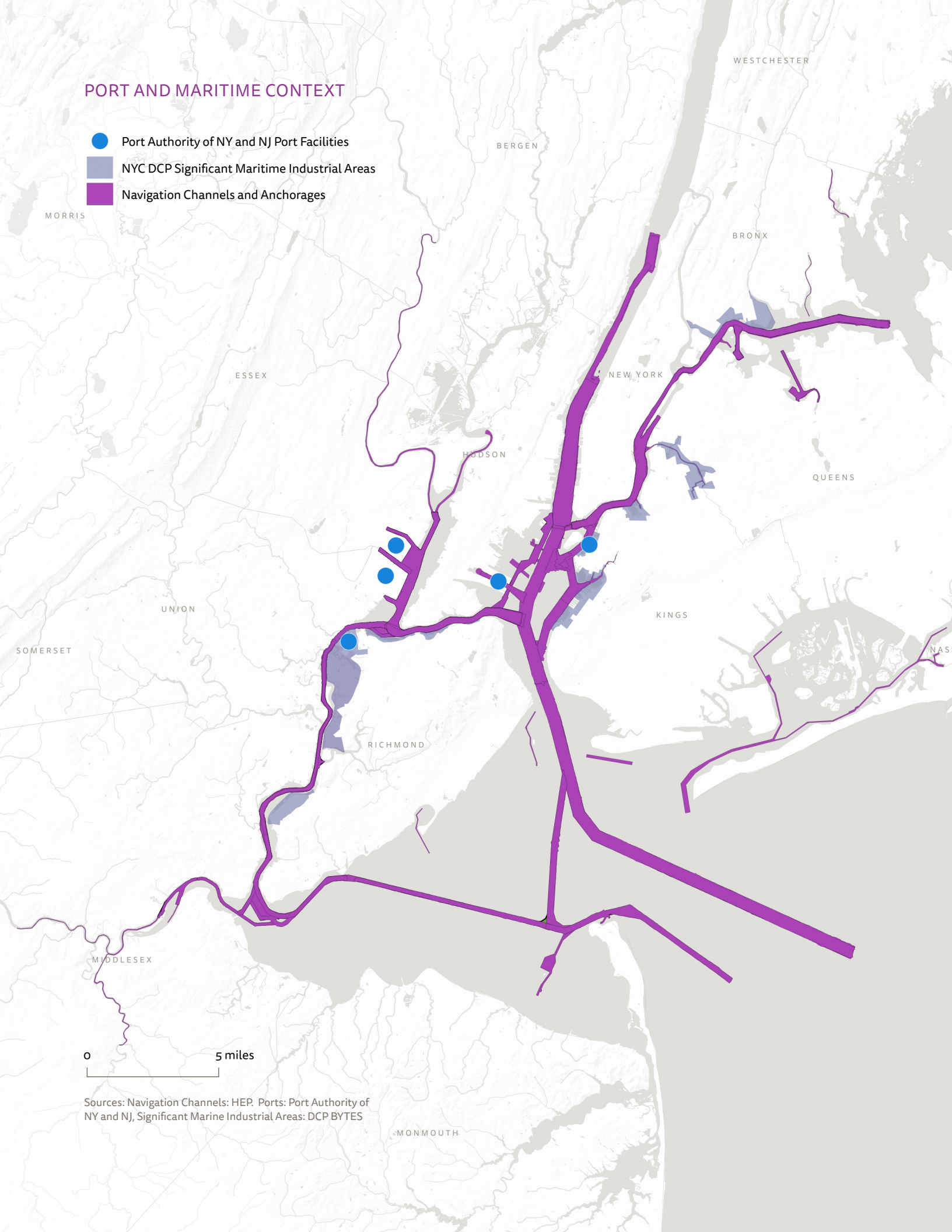
In a short period, construction activity can contribute more sediment to streams than would be discharged over several decades. Understanding the movement of material in the system can help guide efforts to foster best management practices throughout the Estuary to reduce this load while protecting habitat. It can help refine and target actions to address the sediment management and erosion goals articulated by the Hudson River Estuary Program and the Hudson River Comprehensive Restoration Plan.

Unfortunately, a history of industrial activities along our waterways has left behind pollutants in the sediment that are toxic to people and wildlife, such as heavy metals, dioxin, and PCBs. Bioavailable contamination has resulted in reduced recreation opportunities, water quality, habitat quality, and fisheries. Contamination of navigational dredged materials has resulted in multi-fold increases in dredging costs over the past decade. Cleaning up this material, concentrated at Superfund sites in the Passaic, Newtown Creek, Gowanus Canal and especially in the upper Hudson River, will help eliminate sources of these contaminants from the system. The original Contaminant Assessment and Reduction Project (CARP), completed in 2007, identified the relative contribution of these and other sources of toxic contamination across the Estuary. A more detailed and updated mapping will further illuminate our understanding of the sources and fate of toxic material, and can be used to help guide decisions on dredging as well as restoration and public access projects.

The recent completion of the Harbor Deepening Project makes this improved understanding ever more important. By lowering the depth of eight navigation channels, this 12 year, $2.1 billion initiative reduced the need for annual appropriations for maintenance dredging. With its completion, the importance of understanding when and how dredged material might become clean enough for beneficial uses or disposal at Historic Area Remediation Site (HARS) is more critical than ever.

Dredging and dredged material management is the aspect of sediment management with the greatest visibility and economic impact to the Harbor Estuary. Proper construction practices must be used to mitigate direct dredging impacts. Dredging can alter or destroy aquatic habitat, remove benthic invertebrates that fish and wildlife feed upon, and interrupt spawning and other activities critical to fish life-cycles. Seasonal no-dredging windows have been developed to protect fish and wildlife resources but rely on incomplete scientific information. This uncertainty is compounded by the possible impact of climate change on these resources. Moreover, there are inconsistencies between the relevant federal agencies and the States of New York and New Jersey in their implementation of these windows. Dredging can also result in unintended secondary effects such as the release of contaminants during transit to the processing site. Protective Best Management Practices (BMPs) to reduce turbidity—the dispersal of sediment-bound contaminants—have proven effective over the years in addressing these issues.

PORT AND MARITIME CONTEXT



Sources: Navigation Channels: HEP. Ports: Port Authority of NY and NJ, Significant Marine Industrial Areas: DCP BYTES

Summary Table ~ GOALS AND OBJECTIVES

Port and Maritime

Support port and associated maritime operations so that they are both economically and ecologically viable.

OBJECTIVE A *Improve understanding and management implications of changing sediment contamination in the Estuary, including the timeline for achieving HARS suitable sediments in the navigation channels*

M-A-1 **SEDIMENT QUALITY**
Map current sediment quality conditions in the Estuary and identify changes over the last 15 years.

M-A-2 **FUTURE CONTAMINATION**
Evaluate, update and refine the CARP I Sub-models to predict levels of contamination in the future.

OBJECTIVE B *Help design and implement port and maritime improvement projects that are more environmentally friendly*

M-B-1 **DREDGING WINDOWS**
Convene Technical Workshop on the development of seasonal windows for dredging projects.

CHALLENGES	INDICATORS
● **CONTAMINATION MAKES DREDGING EXPENSIVE** *OBJECTIVES A & B*	**CONTAMINATION MAKES DREDGING EXPENSIVE** • *Contaminants in Sediments (PCBs, dioxin, PAHs)* • *Metals in Sediments (Hg, Cr, Cd, Pb)* • *PCBs (in fish)*
● **INCOMPLETE UNDERSTANDING OF DREDGING IMPACTS** *OBJECTIVES A & B*	**INCOMPLETE UNDERSTANDING OF DREDGING IMPACTS** • *Estuarine and Diadromous Fish Abundance*

PORT AND MARITIME

OBJECTIVE A

Improve understanding and management implications of changing sediment contamination in the Estuary, including the timeline for achieving HARS suitable sediments in the navigation channels

MA-A-1

SEDIMENT QUALITY

Map current sediment quality conditions in the Estuary and identify changes over the last 15 years.

NEED

The changes in Harbor sediment quality over the last 15 years are not well documented.

DESCRIPTION

As part of the second iteration of the Contaminant Assessment and Reduction Project (CARP II), a team led by the Hudson River Foundation will create a current conditions map of levels of PCBs and dioxins in navigation channels and off-channel areas in the Estuary. The mapping and data analysis will be used to assess the adequacy and accuracy of previous CARP model projections of future contaminant levels in Harbor sediments and determine where improvements to the model are needed.

The initial map will be based on existing information from regional assessments and dredged material testing data. Subsequent maps will be updated with new data collected under CARP II.

HEP will convene one or more meetings to provide a means of communicating this information to key stakeholders and managers, including the HEP Management Committee and Policy Committees, and will follow up with key stakeholders to help identify possible additional applications of the data. HEP will help communicate findings to HREMAC.

KEY PARTNERS: NJDOT, HRF, Monmouth University, USACE, EPA, NJDEP, NYDEC, PANY/NJ, NYCEDC, Rutgers University, HREMAC
RESOURCES: Staff and Leveraging. HRF is managing the CARP II technical team with $ 4.1 million of funding provided by NJ DOT.
TIMELINE: 2017-2020

OUTCOMES

Short term:

- Data on level of PCBs and Dioxins and associated maps of current Harbor contamination and changes in contamination over the last 15 years.
- Identification of additional management applications and research needs.

Long-term:

- Improved forecast of dredged material placement costs.

MA-A-2

FUTURE CONTAMINATION

Evaluate, Update and Refine the CARP I Sub-models to predict levels of contamination in the future.

NEED

The CARP I model forecasted that over the 30 year period from 2010-2040, many of the current contaminants of concern in dredged material were expected to decrease to levels that would allow ocean placement. Since the 2002 CARP I model projections of time to HARS (ocean placement) suitability, the bathymetry of the Harbor has changed significantly and the Harbor has experienced a number of extreme events that were not simulated in the CARP I model projections. Therefore, it is necessary to refine the CARP models and to assess the impacts of extreme flow events on contaminant responses in Harbor sediments.

DESCRIPTION

The refined CARP II model will be applied to reevaluate the CARP I forecasts to predict future (15 and 25 years from now) levels of contamination in the sediments within navigation channels of the New York and New Jersey Harbor.

HEP will convene one or more meetings to provide a means of communicating key information to Harbor and Hudson River stakeholders and managers, including the HEP Management Committee and Policy Committees and the Restoration Work Group, and will follow up with key stakeholders to help identify possible additional applications of the data.

KEY PARTNERS: NJDOT, HRF, Monmouth University, USACE, EPA, NJDEP, NYDEC, PANY/NJ, Rutgers University
RESOURCES: Staff and Leveraging. HRF is managing the CARP II team with $4.1 million of funding provided by NJ DOT.
TIMELINE: 2017-2020

OUTCOMES

Short term:

- Report on the evaluations of the CARP II Models (hydrodynamic, sediment transport and organic carbon cycling, and contaminant fate and transport sub-models).
- Forecast of the time for dredged material to meet HARS suitability.

Long-term:

- Improved forecast of future sediment quality including contaminant responses to extreme events to support improved dredged material planning.

PORT AND MARITIME

OBJECTIVE B

Help design and implement port and maritime improvement projects that are more environmentally friendly.

MA-B-1

DREDGING WINDOWS

Convene Technical Workshop on the development of seasonal windows for dredging projects.

NEED

Building shared understanding and a scientifically valid and consistent approach to the use of seasonal no-dredge windows will aid decision-makers.

DESCRIPTION

HEP will convene a workshop to review the science behind time-of-year restrictions on dredging (i.e. seasonal windows). Building on the information compiled by NY Sea Grant and data collected by the USACE through the Harbor Deepening Program, this effort will incorporate recent biological and operational data, assess potential impacts of dredging operations to natural resources, and discuss the policy approach to implement consistent, environmentally sound, economically feasible seasonal windows. The anticipated deliverables coming out of this effort will be: 1. A map identifying the locations and times-of-year dredging is restricted to protect natural resources; and 2. An updated decision matrix that incorporates biological data, operational considerations, and project information that will assist resource agencies with refining the application of seasonal windows to waterfront infrastructure projects.

KEY PARTNERS: USACE, EPA, PANY/NJ, NOAA, NYDEC, NJDEP, NJDOT, NYCEDC

RESOURCES: Staff and Leveraging. Grant Projects <$200,000.

TIMELINE: 2019-2020

OUTCOMES

Short term:

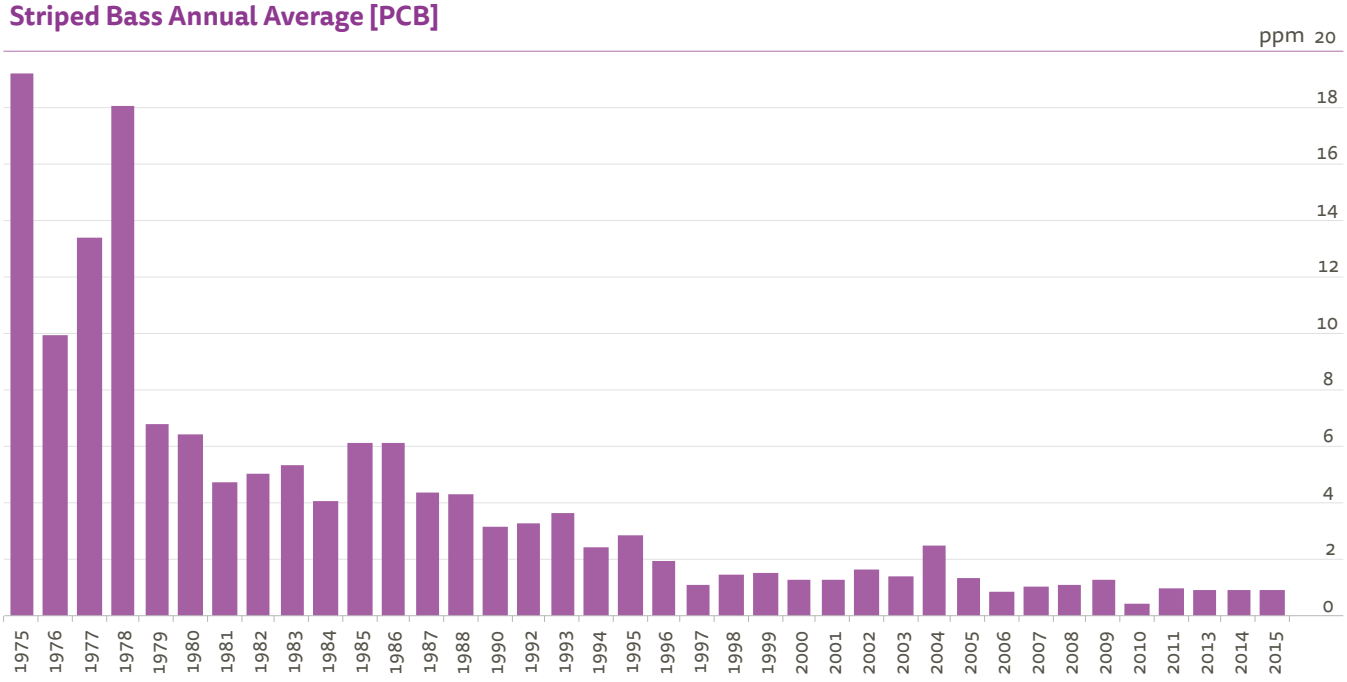
- A framework and shared understanding of the issues and available information affecting application of seasonal dredging windows.

Long-term:

- More efficient and effective regulation of waterfront infrastructure projects.

Data source: NYSDEC, Contaminant Monitoring Program

Striped Bass Annual Average [PCB]



Community Engagement

GOALS, OBJECTIVES, *and* PRIORITY ACTIONS

CITIZENS ADVISORY COMMUNITY

Meredith Comi, NYNJ Baykeeper (Co-Chair NJ)
Joe Reynolds, Bayshore Watershed Council (Co-Chair NJ)
Lisa Bloodgood, Newton Creek Alliance (Co-Chair NY)
Carrie Roble, HRPT (Co-Chair NY)
Shino Tanikawa, New York City Soil and Water Conservation District
Michelle Luebke, Bronx River Alliance
Harvey Morginstin, Passaic River Boat Club
Pamela Pettyjohn, Coney Island Beautification Project
Manuel Russ, Concerned Citizens of Bensonhurst
Robert Alpern, Clearwater
Maggie Flanagan, Waterfront Alliance
Michelle Doran McBean, Future City, Inc.
Nina Hitchins, The River Project
Ted Enoch, Partnerships for Parks
Nicholas Tufaro, Middlesex County Office of Planning
Dan Mundy, Jamaica Bay Ecowatchers
Nancy Brous, NYC Water Trail Association
Sally Yabra, Edison Township Boat Basin
Althea Mullarkey, Scenic Hudson
Bart Chezr, Gowanus Dredgers
Louis Kleinman, Waterfront Alliance
Julie Welch, SWIM Coalition
Noah Chesnin, WCS/NY Aquarium
Rebecca Kusa, WCS/NY Aquarium
Susan Elbin, NYC Audubon
Kathryn Heintz, NYC Audubon
Bill Schultz, Raritan Riverkeeper
Bill Surena, Future City, Inc.
Dan Recklies, Protectors of Pine Oak Woods
Ana Mendez, Future City, Inc.
Jenna Bonasmusa, Interstate Environmental Commission
Chrissy Remein, Riverkeeper
Michael Dulong, Riverkeeper

Earth Day Volunteers on Plum Beach. Photo: Don Riepe

Foster community understanding and involvement in decisions about the Harbor.

The waters of the Harbor and Estuary belong to the people of New York and New Jersey. Decisions about the future of this quintessential public resource, whether for water quality improvements, habitat restoration, public access, or maritime uses, are better when they incorporate public input and the place-based expertise of local residents. The key to effective public participation is an informed and active constituency: citizens and civic and community-based organizations that understand and are deeply committed to the wonderful complexity of this unique urban ecosystem, appreciate the role of science in making decisions about its future, and are savvy to the ways and means of government.

This ideal is challenged by the many other demands on the time and attention of citizens, managers, and decision makers in this busy region. Over the next five years, HEP will work to raise the profile of the Harbor Estuary and the importance of science in its management through a variety of communications tools, from an expanded web and social media presence to continued production of seminars, conferences, and waterfront festivals. HEP will support the growing number of interpretive centers and programs around the Estuary, including bringing together Harbor educators so they can share expertise and materials. HEP's participation in the Lower Passaic and Bronx/Harlem Rivers Urban Waters Federal Partnerships and direct sponsorship of Urban Waters Ambassadors in each watershed will better connect federal agencies, local government, and community in these two critical and higher need waterways. A special focus will be working with the CAC to expand and improve Citizen Science across the Estuary.

Thanks to billions of dollars invested in clean water, public parks and the revitalization of former industrial sites for residences and commerce, the Estuary has moved closer to the lives of the people of New York and New Jersey. While the water has always been central to the distinct waterfront communities and maritime economy of the region, the waters of the Harbor and Estuary are more of a presence for more people today than it has for many generations.

Hurricanes Sandy, Irene, and Lee and rising sea levels have also brought the water closer to people's homes and businesses —sometimes literally and unfortunately with tragic results. Helping move individuals and civic organizations from increased awareness to greater scientific literacy, broader civic discourse, and more productive interactions with managers and decision makers is at the heart of HEP's community engagement goal.

Environmental educators and social scientists understand that this ladder of engagement often starts with improving public understanding about the current condition and potential future of the Estuary. In partnership with HRF, HEP is developing a communications strategy that will assess key audiences, current and prospective outlets, potential partners, and capacity needs; identify how HEP can improve storytelling techniques and communications on all platforms; and specifically evaluate and recommend appropriate goals, roles, and needed human resources to address public awareness and raise scientific literacy about the Estuary and its management, in keeping with its mission and staff capacity.

This strategy will help HEP better utilize its newsletter and website, seminars and workshops, conferences and festivals and other communication tools to engage its key audiences of environmental managers and stewardship organizations; public and private scientists; elected and appointed officials and their staff; and professional environmental educators; media and the public, specifically the active members of community and civic organizations and students.

Key partners in improving understanding and scientific literacy are the education professionals that operate from public parks, nature centers and other place-based learning opportunities across the Estuary. An assessment of 146 civic organizations indicates that they offer a broad array of programs that help engage people with the Harbor Estuary through public outreach and stewardship activities. While small in size, with an average budget of less than $50,000, these organizations in aggregate represent more than 900 paid staff, 237,000 members, and more than 116,000 volunteers contributing about 5,000 hours per organization. Almost all conduct educational programs about the local environment; about 20% conduct boating, fishing, or swimming programs. These public and private organizations can help bring information and understanding to individuals.

The key to effective public participation is an informed and active constituency: citizens and civic and community-based organizations that understand and are deeply committed to the wonderful complexity of this unique urban ecosystem, appreciate the role of science in making decisions about its future, and are savvy to the ways and means of government.

Expanding and improving the quality of Citizen Science is a particular point of emphasis. Citizen Science, also known as participatory or community-led science programs directly raise awareness about the need to protect and restore shared waterways. They advance scientific literacy, especially with young people, and can fill critical data gaps for managers, professional scientists and policy makers. A recent survey by the CAC found about 50 organizations that collect water samples to determine whether it's safe to kayak, monitor artificial oyster reefs to test different restoration techniques, or analyze the kinds of trash that washes up onshore to help stop trash at its source. Building the capacity of these organizations, and identifying how their efforts can meet agency needs are important opportunities identified through the assessment.

Collaborative participation in resource management decisions can help address many of the thorny issues present in the Estuary. Establishing opportunities for dialogue and creating sustainable collaborations can build trust between community-based organizations and public agencies and between agencies with differing sets of responsibilities. This is particularly important for environmental justice communities with significant barriers towards meaningful public participation with agency decision making. The Urban Waters Federal Partnerships in the Bronx/Harlem and the Lower Passaic Rivers seek to forge connections between and among federal agencies, local government, the community members and advance the collaboration needed to enhance social and ecological outcomes.

Action Agenda Public Engagement

HEP is committed to engaging the public in the preparation and implementation of this Action Agenda, working in partnership with the members of its CAC.

1. **Gathering Information 2016**
   Identified key opportunities and challenges related to each of HEP's goals at public workshops hosted by civic organizations

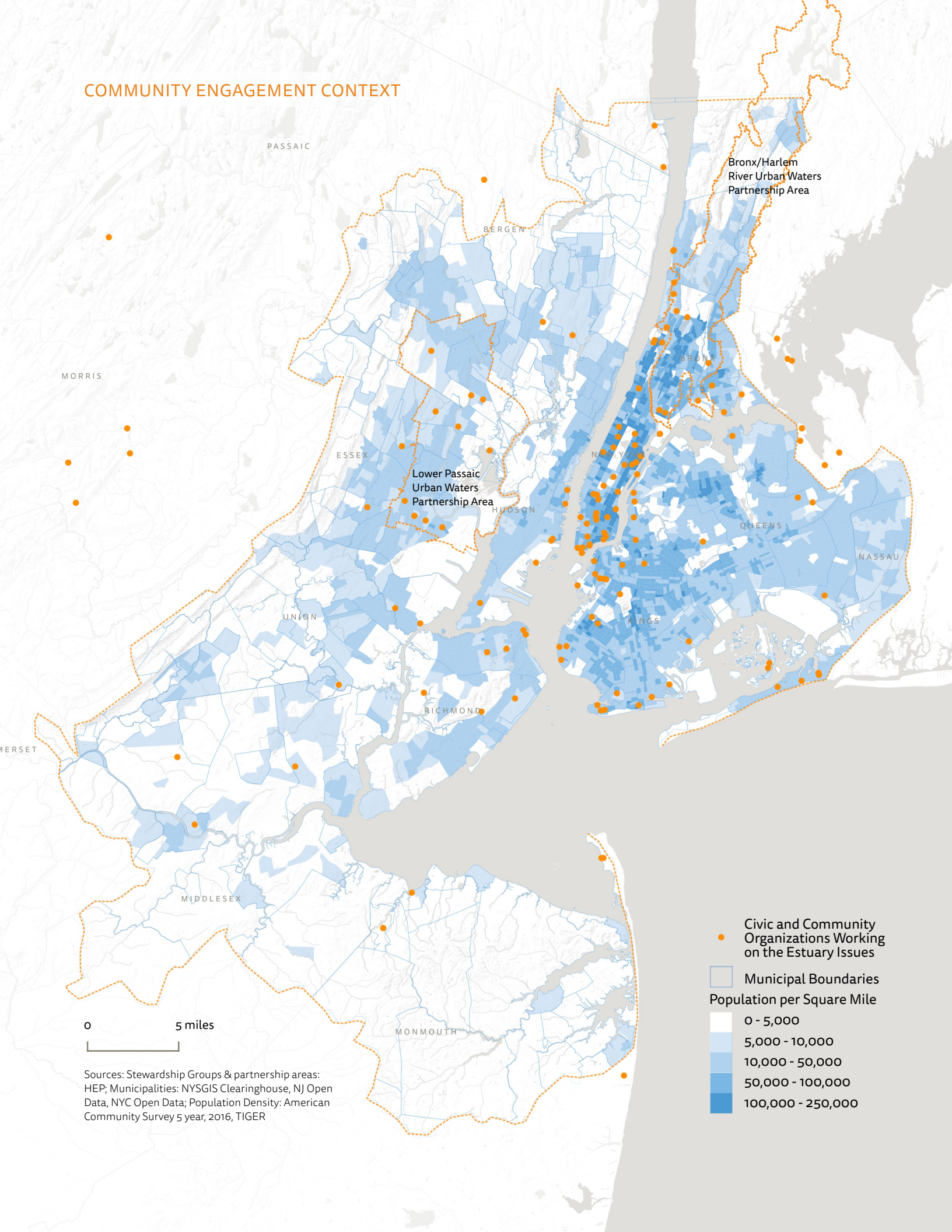
2. **Present Results to Civic Partners**
   Targeted outreach to workshop participants for 2016 CAC meeting. Presentation and prioritization of challenges and opportunities by HEP goal, including estuary-wide and region-specific themes

3. **Review and Prioritize Draft Actions 2017-2018**
   Program staff presented draft Actions for review, CAC offered revisions and prioritized the actions, final draft approved by CAC.

4. **Identify Key Avenues for Public Participation in Implementation 2018**
   Program staff supported the CAC in identifying avenues where public participation could support implementation of shared goals

5. **CAC Approval and Annual Work Plans; Ongoing**
   Each September, the CAC will develop an annual work plan identifying actions where their participation is key for successful implementation

COMMUNITY ENGAGEMENT CONTEXT



Sources: Stewardship Groups & partnership areas: HEP; Municipalities: NYSGIS Clearinghouse, NJ Open Data, NYC Open Data; Population Density: American Community Survey 5 year, 2016, TIGER

Summary Table ~ GOALS AND OBJECTIVES

Community Engagement

Foster community understanding and involvement in decisions about the Estuary.

OBJECTIVE A *Increase and improve the quality of citizen science efforts*

CE-A-1 **SHARED PROTOCOLS**

Identify, create and/or publicize shared protocols for habitat and water quality monitoring by civic organizations.

CE-A-2 **CONNECT VOLUNTEERS**

Publicize and otherwise support means of connecting volunteers with opportunities to participate in Citizen Science efforts.

OBJECTIVE B *Support Federal Urban Waters Federal Partnerships in target waterways*

CE-B-1 **URBAN WATER AMBASSADORS**

Underwrite Ambassador positions and advance Partnership priorities.

OBJECTIVE C *Enhance public understanding of the Harbor Estuary*

CE-C-1 **COMMUNICATIONS**

Sustain website, monthly newsletter, social media, contact database, and other communication tools.

CE-C-2 **EDUCATION PROGRAMS**

Support educational programs, including the sharing of best practices among providers.

CHALLENGES	INDICATORS
● **LIMITED PUBLIC UNDERSTANDING OF ECOSYSTEM** *OBJECTIVES A, B, C*	**LIMITED PUBLIC UNDERSTANDING OF ECOSYSTEM** • *Participation in Stewardship Events* • *Participation in Civic Science*
● **NOT ENOUGH PEOPLE INVOLVED IN CIVIC ORGANIZATIONS** *OBJECTIVES A, B, C*	**NOT ENOUGH PEOPLE INVOLVED IN CIVIC ORGANIZATIONS** • *Capacity of Stewardship Organizations (Number of staff/members/volunteers reported by civic stewardship groups)*

OBJECTIVE A

Increase and improve the quality of citizen science efforts

CE-A-1

SHARED PROTOCOLS

Identify, create and/or publicize shared protocols for habitat and water quality monitoring by civic organizations

NEED

Over 50 organizations conducting Citizen Science in the Harbor Estuary completed the CAC's survey identifying the goals, needs, degree of standardization, and geographic scopes of their programs. Analysis of this data reveals a cohort of groups that hope to use their data to inform management decisions, but do not have QAPPs or rigorous protocols in place. Furthermore, as the survey data includes geographic information, there is an opportunity for HEP to connect groups monitoring specific waterbodies to discuss data standardization.

DESCRIPTION

HEP will develop workshops for protocol sharing based on the needs identified in the survey. These workshops will focus on aspects of habitat restoration and/or water quality monitoring where the intended program goal is either establishing baseline conditions, or informing a management decision. The workshops may focus geographically on specific waterbodies.

KEY PARTNERS: CAC, RWG, WQWG, IEC, EPA, NGOs
RESOURCES: Staff and leveraging; grant projects <$200,000
TIMELINE: 2017-2022

OUTCOMES

Short term:

- Participants in the protocol workshops will adopt protocols suited to their program goals.

Long-term:

- Resource managers are equipped with additional quality data that can be used to advance habitat restoration and water quality goals.

CE-A-2

CONNECT VOLUNTEERS

Publicize and otherwise support means of connecting volunteers with opportunities to participate in Citizen Science efforts.

NEED

Citizen Science projects depend on consistent, trained volunteers for data collection and processing. For many groups, volunteer recruitment for data collection is the biggest barrier to expanding their programs. Groups need assistance with reaching new memberships that may have pre-existing interests in Citizen Science, as well as interesting their existing members and networks in citizen science efforts.

DESCRIPTION

In order to assist Citizen Science groups in tapping into existing volunteer networks, HEP will identify and partner with hub organizations that match residents across the New York – New Jersey metropolitan area with volunteer opportunities. HEP will also support community-based organizations with their communication needs, helping them develop strategies for visualizing Citizen Science data and helping community-based organizations tell compelling stories about their local waterways and ecosystems.

KEY PARTNERS: CAC, RWG, WQWG, IEC, EPA, NGOs
RESOURCES: Staff and leveraging; grant projects <$200,000
TIMELINE: 2018-2022

OUTCOMES

Short term:

- Partnership with a volunteer hub organization drives new volunteers to Citizen Science and raises the visibility of Citizen Science among the general public.
- Local community based organizations use their existing data to create data-driven stories that interest new volunteers.

Long-term:

- New leadership and greater percentage of the general public in the Harbor Estuary is consistently engaged in meaningful Citizen Science activities.

OBJECTIVE B

Support Urban Waters Federal Partnerships in target waterways

CE-B-1

URBAN WATER AMBASSADORS

Underwrite Ambassador positions and advance Partnership priorities.

NEED

The Passaic, Bronx, and Harlem Rivers and their watersheds were identified by HEP's assessment of public access and stewardship as having higher needs. These areas had fewer public access opportunities per person, higher population growth, and/or more economically disadvantaged populations. Fifty percent of the people living within one half mile of the Passaic River waterfront lack access to its shoreline. Along the shores of the Harlem River in the Bronx are some of the lowest income populations among all waterfront areas in the Estuary.

DESCRIPTION

The Bronx/Harlem Rivers and the Passaic Rivers are two of the 19 Urban Waters Federal Partnerships. These partnerships serve to reconnect urban communities, particularly those that are overburdened or economically distressed, with their waterways by improving coordination among federal agencies and collaborating with community-led revitalization efforts to improve our nation's water systems and promote their economic, environmental and social benefits. HEP will provide funding and administrative support for the Ambassadors for the Bronx/Harlem and Passaic River Urban Waters Federal Partnerships. HEP will work with other with Partnership members to identify priorities and seek resources and collaboration to build local capacity; align federal government programs and investments; and find innovative ways to communicate the environmental and economic potential of safe and clean urban waters.

KEY PARTNERS: EPA and USGS serve as the federal leads for the Bronx/Harlem Rivers Urban Waters Federal Partnership. NYC Parks and the Bronx Council for Environmental Quality are other key partners. EPA and the USACE are the federal leads for the Passaic River Urban Waters Federal Partnership. The NY/NJ Baykeeper, The Trust for Public Land, and Ironbound Community Corporation serve on the Partnership steering committee.

RESOURCES: Staff and leveraging; grant projects >$200,000

TIMELINE: 2017-2022

OUTCOMES

Short term:

- Build local capacity, expand partnerships, and align Federal government programs and investment in the Bronx/Harlem River and Passaic River communities.
- Advance specific urban water projects including public access and flood resiliency on the Passaic River and the Harlem River Watershed Plan.

Long-term:

- Create new access opportunities, cleaner waters, and sustainable stewardship capacity in these higher need waterfront communities.

Engaging students in the life of the Estuary through restoration activities.
Photo: New York Harbor School

OBJECTIVE C

Enhance public understanding of the Harbor Estuary

CE-C-1

COMMUNICATIONS

Sustain website, monthly newsletter, social media, contact database, and other communication tools.

NEED

Building an informed and engaged constituency for the Estuary starts with effectively communicating scientific understanding and best practices among professionals and the public. Enhancing HEP's visibility with the Harbor Estuary community can showcase the importance of improved ecosystem management and the benefit it contributes to people while advancing progress on specific Action Plan elements.

DESCRIPTION

HEP and HRF are developing a communications strategy that will identify specific audiences and develop key messages and communication tactics. This effort will build on current efforts to reach the core of HEP Committees and Work Groups as well as other audiences. HEP hosts an annual conference that attracts 200-plus people, with every other year focused specifically on habitat restoration. HEP sponsors other events including the Waterfront Alliance's City of Water Day and the annual meeting of the Harbor Herons Working Group. The HEP websites, including **hudsonriver.org**, **harborestaury.org**, **waterweshare.org**, and our participation in **oasis.net** are vital portal of communications for estuary stakeholders and partners, and a key gateway to citizen groups and educational professionals for estuary related science and information. The upcoming improvements to **hudsonriver.org** and **harborestuary.org** will offer additional opportunities to engage new audiences and advance scientific literacy and the data and insights of the State of the Estuary report and Environmental Monitoring Plan.

KEY PARTNERS: HRF, CAC, Waterfront Alliance, Hudson River Estuary Program
RESOURCES: Staff and leveraging; grant projects <$200,000
TIMELINE: 2017-2022

OUTCOMES

Short term:

- More effective communication to HEP's core and new audiences.

Long-term:

- Improved understanding and increased public awareness of HEP and its goals.

CE-C-2

EDUCATION

Support educational programs, including the sharing of best practices among providers.

NEED

Enhancing the ability of the growing number of education and public outreach programs with an organized structure will facilitate networking, resource sharing, and professional development.

DESCRIPTION

Education programs are a fundamental part of building public understanding and awareness of the Harbor Estuary. HEP will support and bring together a group of local and regional environmental education organizations to help facilitate and share best educational practices and higher quality resources based on the individual specialties and areas of expertise surrounding the Harbor Estuary. This regional network presents an opportunity for collective impact, stemming from a shared vision and values focused on the Harbor Estuary. The mechanisms which will make this group successful include creating a system amongst group members to both communicate and share resources, including quarterly meetings. Additionally, by inviting groups to share areas of expertise will help build fundamental skills amongst all Harbor educators. Impact of education programs can be best assessed when aligned measurement systems are used, creating a consistency in how successful programs are shared and discussed. HEP will also work with the Hudson River Park Trust and the Hudson River Estuary Program to advance construction of the proposed Estuarium in Hudson River Park.

KEY PARTNERS: Hudson River Park Trust, New York Harbor School and Billion Oyster Project, Hudson River Estuary Program, HRECOS, NGOs
RESOURCES: Staff and leveraging; grant projects <$200,000
TIMELINE: 2018-2022

OUTCOMES

Short term:

- Promote networking, and information and resource sharing among participating organizations.

Long-term:

- Facilitate ongoing communication and resource sharing amongst participating organizations through developing online tools such as group list serves and an online resource portal.

Bayshore Regional Watershed Council

United States Environmental Protection Agency

Hudson River Park

Interstate Environmental Commission
NY · NJ · CT

National Oceanic and Atmospheric Administration
NOAA
U.S. Department of Commerce

National Park Service

New Jersey Department of Environmental Protection

New Jersey Harbor Dischargers Group

NY/NJ Baykeeper
Protect Preserve Restore

NYC Environmental Protection

NYC Parks

New York State of Opportunity
Department of Environmental Conservation

The Urban Assembly New York Harbor School

NCA
Newtown Creek Alliance

The Port Authority of NY & NJ

Riverkeeper
NY's clean water advocate

SAVE Coastal Wildlife
Education • Restoration • Research

US Army Corps of Engineers.

Waterfront Alliance

Agencies and organizations represented on NY – NJ Harbor & Estuary Program's Policy and Management Committees.

Hudson River Foundation

NY/NJ Harbor & Estuary Program