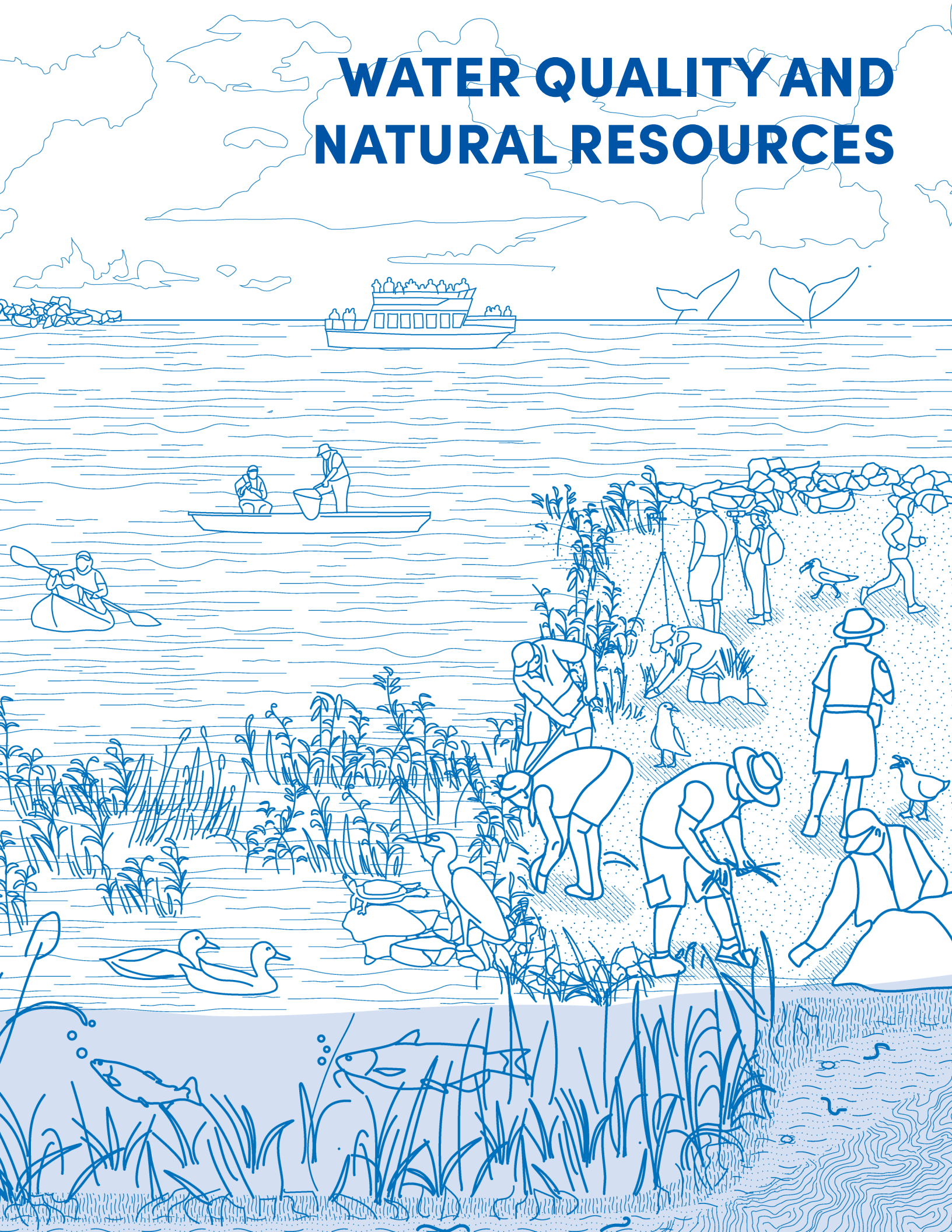# WATER QUALITY AND NATURAL RESOURCES

In the next 10 years, New Yorkers will have access to cleaner bodies of water, expanded water safety education and more interaction with nature. The City has opportunities to build on its multibillion-dollar investments to improve water quality through various programs and policies. These opportunities include investing in existing critical infrastructure for the transport and treatment of sanitary sewage, updating rules for stormwater management on new and redeveloped properties, and continuing to build out the nation's largest green infrastructure program.

Habitat restorations and improvements in water quality have encouraged wildlife to return to NYC. The City will continue to maintain and restore the waterfront's natural habitats and ecological diversity through robust planning and research, especially in the face of climate change. Collaborations among City agencies and community stewards will support the rewilding of treasured estuaries and wetland ecosystems. And, because climate change threatens wetlands, City agencies will need to continue to use the best available data to restore and protect these essential habitats.

Improvements in water quality have led to more New Yorkers now able to access and enjoy the waterfront. The COVID-19 pandemic highlighted the benefits of public access to waterfront open spaces and the mental and physical benefits of getting out to the natural waterfront. Making sure all New Yorkers benefit from water quality improvements and access to waterfront ecology is vital. Excellent nature centers currently exist throughout the five boroughs, with programming that could be extended to NYC schools. The City encourages community involvement in waterfront restoration efforts, from monitoring oyster reefs to planting seagrass and participating in cleanup activities.

Goal 1: Improve water quality throughout the five boroughs and build upon key agency and public partner collaborations

Goal 2: Protect ecosystems, support ecosystem services, and enhance biodiversity of the natural waterfront, including in-water strategies

Goal 3: Help connect New Yorkers with waterfront ecology and raise awareness of water quality and habitat protection
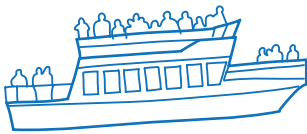
Goal 4: Utilize existing and new data sources to assess natural resources and inform decision making for restoration and protection

Overview

With more than 520 miles of shoreline and an interconnected network of islands, NYC is a city of water and diverse marine habitats. Clean waterways allow residents and visitors to engage in safe and healthy recreational activities, such as swimming at one of NYC's many public beaches, fishing and boating. NYC's coastal ecosystems provide many benefits for people and the environments by promoting biodiversity and mitigating the effects of climate change.

The quality and ecology of NYC's waterways are strongly shaped by the city's wastewater management infrastructure. NYC is served by two types of sewer systems — separate and combined — that are defined by how they handle wastewater and stormwater. In Municipal Separate Storm Sewer System (MS4) areas, stormwater and sanitary sewer systems operate independently: Pipes carrying wastewater connect directly to the wastewater resource recovery facility (WRRF) for processing, while pipes carrying stormwater connect directly to local waterways. Unfortunately, stormwater may pick up pollutants (such as oil, trash, and fertilizers) from the street and carry them into the water.

In combined systems, a single pipe carries sanitary sewage and stormwater flow to the local WRRF. NYC's sewer system is approximately 60% combined. During heavy rain or snowstorms, the combined sewer system discharges a diluted mixture of stormwater and sewage into local waterways, which is called a combined sewer overflow (CSO). This release is necessary to protect the wastewater infrastructure and treatment systems. CSOs become a concern, however, when they occur too frequently or in large amounts. The result is harmful to water quality.

At the start of NYC's industrial age, local waterways supported manufacturing and maritime industries. In the early 1800s, as NYC's population grew, open trenches and early sewers sent waste directly to the nearest waterbody. Physical changes to historic marshes and creeks and widespread industrial pollution further degraded water quality and harmed local ecosystems. Since the start of the Harbor Survey Monitoring Program and the construction of NYC's first wastewater treatment facility in 1886, water quality has improved steadily. Today these improvements can be seen by the diversity of marine life that has returned to NYC, such as whales, sharks, seals, sea turtles and various fish populations.

Since the 1970s, the City has invested more than $40 billion to upgrade and expand wastewater treatment services, an essential move to improve water quality near NYC's shoreline. More recently, the City has invested $1.2 billion to upgrade six WRRFs to reduce nitrogen

In 2011, only 3 whales were spotted near NYC, in 2020, there were more than 300. Whale watching tours are now a part of the NYC tourism industry!

discharges. Too much nitrogen in water creates an environment where algae grow too fast, overwhelming the ecosystem and making the water less healthy. Less nitrogen in the water provides more oxygen to help fish, other aquatic animals and plants survive. Work on two additional WRRFs is expected to be complete by the end of 2022. To reduce CSOs that affect water quality during heavy rainfall, the City has spent nearly $2.7 billion on grey infrastructure projects since 2010 and has committed almost $6 billion for investment toward future CSO reduction.

Over the last decade, the City has actively engaged local stakeholders in developing 11 Long Term Control Plans (LTCPs), a multibillion-dollar effort to reduce the frequency and volume of CSOs. The City also oversees a $1.6 billion green infrastructure program — the nation's largest — which will reduce CSO discharges by 507 million gallons per year by the end of 2021. The overall stormwater management and water quality in NYC's waterways also will benefit from new stormwater regulations expected to be in place in 2022. Together, these efforts have made NYC's water quality the best it has been in more than a century.
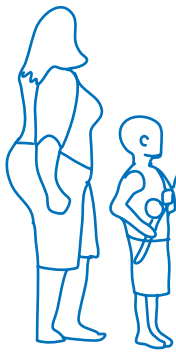
Brandt Preserve, Queens.

Enforced regulations are another effective tool to protect waterways. When Congress passed the Clean Water Act (CWA) in 1972, wetlands frequently were drained and filled to create new building developments. Section 404 of the CWA was written to reverse that trend by preventing fill material in wetlands. Its enforcement has helped to protect many areas; however, the challenges presented by climate change and rising sea levels require new solutions. For example, clean fill and eroded salt marsh can help build up low-lying coastal wetlands that cannot expand inland or acquire new sediment naturally. Flexible regulations will be critical in allowing practitioners to support wetland restoration and protection under today's conditions.

Since the City released the first **Comprehensive Waterfront Plan** in 1992, NYC Parks has overseen more than 30 salt marsh restorations across all five boroughs, encompassing more than 75 acres. More than 355 acres of wetlands were restored citywide. These restoration efforts strengthen coastal habitats, improve water quality and offer a degree of protection against storm surges by reducing the effect of waves. However, these spaces need additional support to provide these essential services. Improving water quality and protecting and enhancing natural areas also can create co-benefits for public enjoyment.

Restoration and remediation efforts help connect New Yorkers to the natural waterfront by allowing for safe in-water recreation such as boating, fishing and swimming, where appropriate. NYC has more than 50 launches for human-powered boats, proving opportunities for on-water recreation from Long Island City to the North Shore of Staten Island to Jamaica Bay and beyond. Increased access to on-water recreation has been made possible through strategic collaborations among City agencies, State and federal partners, and community stewards of waterfront spaces. These activities provide opportunities for New Yorkers to stay healthy, connect with fellow New Yorkers, and enjoy a reprieve from living in a dense urban environment.

"The waterfront needs to respect existing plant and animal habitats; polluted bodies of water need to be carefully remediated and access to water transportation services needs to be improved."

A 10-Year Vision

Building on a focus on environmental remediation that goes back to the 1992 Plan, the City remains committed to cleaning its waterways by addressing environmental contamination, loss of natural resources and crumbling infrastructure. The City has earmarked $1.6 billion for green infrastructure. More than 11,000 rain gardens have already been built to collect and absorb stormwater before it enters our sewer system. Rain gardens reduce the pollution that enters and harms NYC's waterways, and more rain gardens are being planned.

Key partnerships among the City, State and community organizations also have helped advance in-water restorations, expand habitats and promote biodiversity. Over the past few years, millions of oysters, which function as natural filters for cleaning waterbodies, have been restored to NYC's waters. In 2019, the State announced $1.5 million in capital funding to help create approximately four acres of enhanced habitat for between 5 million and 10 million oysters in the Hudson River Park's Estuarine Sanctuary. Oyster monitoring stations and community oyster reefs — maintained by the Billion Oyster Project in collaboration with community scientists — are located throughout the five boroughs. Future habitat improvements may include the installation of reef balls, gabion baskets and mounds of recycled shells to create habitat corridors between piers.

Oysters at field visit to Richmond County Yacht Club (RCYC) in Staten Island

Credit: SCAPE

Goals and Strategies

Goal 1: Improve water quality throughout the five boroughs and build upon key agency and public partner collaborations

The New York City Department of Environment Protection (NYC DEP) manages the largest municipal wastewater treatment program in the United States. The City continually improves the ways it manages pollution during heavy rain events. Every day, the City treats 1.3 billion gallons of wastewater. The system can treat 3.7 billion gallons of stormwater and wastewater on a rainy day, nearly three times as much as it does on a dry day. In response to CSOs, the City has invested billions of dollars to upgrade wastewater treatment infrastructure and increase its resilience to the effects of climate change.

In CSO areas, DEP implements LTCPs, which use both grey infrastructure (CSO tanks and tunnels, curbs, gutters, drains, piping) and green infrastructure to capture rain water where it falls and to move urban stormwater away from the built environment. This hybrid approach maintains the specific conditions of each waterway.

In MS4 areas, the City continues to implement the NYC Stormwater Management Program. This program includes several initiatives, ranging from enforcement around illegal discharges to rules about managing stormwater runoff during and after construction. Under the City's NYS SPDES MS4 permit, the City coordinates a construction permitting program with the NYS DEC. As part of the most recent update, NYC is simplifying and aligning its stormwater rules. The new unified rule will, in part, require a larger share of construction projects to control their stormwater runoff.

DEP has significantly scaled up its green infrastructure work through the **NYC Green Infrastructure Plan**. The initiative includes construction of rain gardens, rooftop water catchment basins and green streets. In March 2012, the Green Infrastructure Plan was incorporated into a consent order with the State to eliminate or defer $3.4 billion in traditional investments and achieve annual CSO reductions of approximately 1.5 billion gallons by 2030. More than $1 billion has been committed to the initiative since 2012, and more than 11,000 green infrastructure assets have been constructed or are under construction.

Public rights of way (sidewalks, parking lanes, medians and the roadway) offer a tremendous opportunity for siting green infrastructure and, as such, have been the largest implementation area of the Green Infrastructure Plan. These surfaces make up
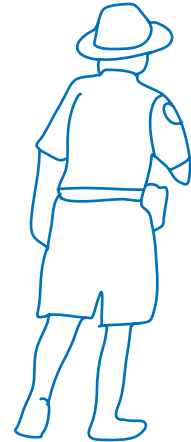
Opposite:
$10M Drainage Upgrade for Bay Terrace, Staten Island.

Credit: NYCDEP

approximately 30% of the impervious cover in NYC that does not absorb rainfall. Through the Green Infrastructure Plan, the City has added more than 660,000 square feet of pervious surfaces to NYC streets and sidewalks, which reduces stormwater runoff.

"NYCs waterfront, despite being mostly armored, still has capacity to provide habitat for diverse aquatic organisms, making the water edges important areas for urban conservation and ecological rehabilitation."

Another area in which DEP has made positive strides is the launch of an updated advisory system that makes it easier for waterfront enthusiasts to see if daily water conditions are safe for recreational activity. While basic water-quality alerts are issued through the Notify NYC system, the updated DEP system offers a more interactive platform based on State water quality standards. Users now have access to data for 45 waterbodies (up from 28). The dashboard displays rainfall data from rain gauges at all 14 WRRFs and provides more detailed advisory durations based on measured rainfall.
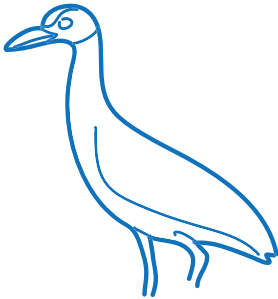
Strategy 1.1
Enact the new Unified Stormwater Rule to align on-site stormwater management requirements across NYC and expand best practices for retaining stormwater on-site with green infrastructure.

Strategy 1.2
Continue to implement the NYC Stormwater Management Program to reduce pollution generated in MS4 areas. Ensure that cleanup plans, permits, and other key decisions are grounded in local solutions developed with community engagement and support.

Strategy 1.3
Further reduce CSOs by improving and expanding green and grey infrastructure, as described in the NYC Green Infrastructure Program and LTCPs.

Prioritize expansion and equitable implementation of green infrastructure and nature-based solutions.

Strategy 1.4
Increase interagency coordination to identify barriers to and opportunities for expanding green infrastructure implementation, maintenance and stewardship.

Strategy 1.5
Support innovative bio-extraction pilot programs to improve water quality (including oysters, ribbed mussels and eelgrass) to support cleaner water across New York Harbor and all five boroughs.

Strategy 1.6
Continue expanding the Bluebelt program with associated aquatic ecosystem protection strategies.

Unified Stormwater Rule

The Unified Stormwater Rule (USWR) will change how new and redeveloped properties in NYC manage stormwater. The USWR updates and aligns water quantity requirements in NYC's combined sewer drainage areas with water quality requirements in separate sewer drainage areas, providing a comprehensive, citywide stormwater management policy for public and private development.

As part of the USWR, the NYC Stormwater manual offers clear technical guidance and incentives for meeting multiple stormwater requirements with a holistic, retention-based green infrastructure approach to stormwater management. The rule requires more on-site stormwater management, which will lead to improved water quality, reduced urban flooding, lower burden on public infrastructure and reduced energy demands. The rule will provide CSO reductions of 362 million gallons per year by 2030 in combined sewer areas.

Above:
Jack's Pond, Staten Island.

Credit: NYC DEP

Next page credits:
Top and middle: Rebecca Swadek, NYC Parks
Bottom: Billion Oyster Project

Innovative, Nature-Based Methods for Treating and Transporting Water

Managing billions of gallons of wastewater and stormwater per day is a massive challenge that requires a complex wastewater treatment system and a broad range of policies and strategies to protect residents and marine life from polluted water. The City is working to improve wastewater infrastructure equitably across the five boroughs, particularly by addressing environmental justice communities near the Bronx River, Hutchinson River, Flushing Bay, Flushing Creek and Newtown Creek. These waterbodies have historically borne a disproportionate share of the negative effects associated with water pollution.

Tibbetts Brook Daylighting

At the southern end of Van Cortlandt Lake in the Bronx, Tibbetts Brook enters the Broadway sewer at a rate of 4 million to 5 million gallons of water per day, on a dry day. This water is treated at the Wards Island WRRF. When it rains, the combination of sewage, street runoff and water from the brook enters the combined sewer—bypassing the treatment plant and flowing directly into the Harlem River. This single CSO outfall—known as WI-056—generates more than half of the CSO discharge entering the Harlem River. DEP will construct a bypass to remove this streamflow from the sewer and direct it along a new path to the Harlem River, "daylighting" it in an open channel—a development that will significantly reduce CSO occurrences on the Harlem River.
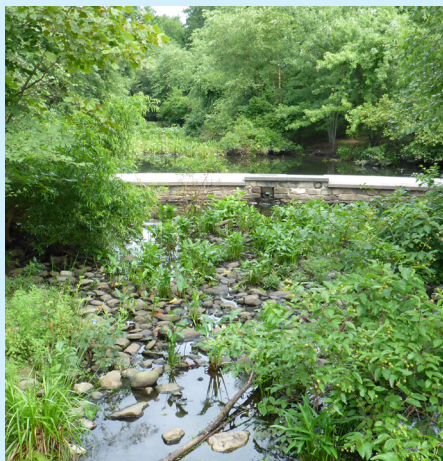
Bluebelt

Bluebelts are nature-based, cost-effective drainage systems that preserve and enhance existing natural drainage corridors, such as streams, ponds and other wetland areas. Their role is to assist in transporting, treating and detaining stormwater in place — instead of relying on traditional grey infrastructure. Bluebelts receive stormwater from the developed landscape, slow the flow of stormwater using vegetation, and detain the stormwater in ponds and wetlands. DEP's Bluebelt program started in Staten Island and currently features almost 10,000 acres. Efforts continue to expand in Staten Island and other areas, including Southeast Queens WRRF.

Bioremediation Techniques

Narrow waterways (such as Coney Island Creek, Flushing Creek, Newtown Creek, Westchester Creek and Gowanus Canal) are a key challenge to improving water quality, particularly in industrial areas. Local bioremediation techniques (such as wetlands) can help to reduce pollution. Water quality improvements can be made by restoring natural ecosystems. Wetlands, oysters and ribbed mussels all act as natural filters to clean waterbodies and waterways. A partnership involving City and State agencies and nonprofit organizations has successfully restored oyster habitats.

Goal 2: Protect ecosystems, support ecosystem services, and enhance biodiversity of the natural waterfront, including in-water strategies

Although it is primarily viewed as a concrete jungle, NYC actually contains thousands of acres of salt marshes, freshwater wetlands, rivers, streams and about 286 miles of natural shoreline (out of 520 miles of total shoreline). NYC Parks manages approximately half of NYC's 5,650 acres of wetlands, including 1,540 acres of salt marsh, 850 acres of freshwater wetlands and 60 miles of streams. This habitat supports a diverse range of organisms and provides recreational and educational opportunities for residents and visitors. NYC has worked hard to protect and conserve the remaining wetlands since Congress passed the Clean Water Act more than 50 years ago. Although this effort has slowed the destruction of this critical habitat and helped to preserve many acres for future enjoyment, it is no longer sufficient simply to conserve existing habitat. Degraded natural resources must be restored as well.

The City is committed to maintaining and restoring the waterfront's natural habitats and ecological diversity through robust planning and research, especially as it confronts the potential effects of climate change. From 2013 through 2017, NYC Parks and the Natural Areas Conservancy (NAC) assessed the condition of more than 1,300 acres of tidal and freshwater wetlands and 26 miles of streams. The _Wetland Management Framework_ (WMF) summarizes these indicators of ecological health and threat and proposes a path forward for wetland management in NYC.

Wetlands help slow storm surges and mitigate flooding by trapping and slowly releasing precipitation and by helping to slow erosion. Quantifying the true benefits that coastal marshes bring to mitigating the impact of erosion due to waves is difficult. Current models suggest that incredibly large areas of wetlands are needed to provide adequate protection from coastal flooding, but they still provide benefits and need protection. Healthy wetlands can sequester carbon and help mitigate the effects of climate change for coastal communities. NYC wetlands are vulnerable to the effect of rising sea levels, and NYC's dense urban environment makes it less likely that wetlands are able to migrate naturally to higher ground.

Salt marshes managed by NYC Parks will lose several acres per year as vegetated marsh erodes and potentially face the threat of drowning

"The habitats that support us must be cared for as integral elements of the urban ecosystem where biodiversity flourishes and ecological resilience is maintained"
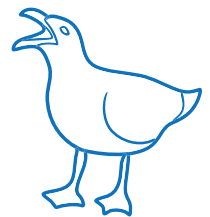
Opposite:
Soundview Park Ecological Restoration, The Bronx.

Credit: NYC Parks

as the climate changes. Stormwater flows and a loss of adjacent protective vegetation degrade streams. Freshwater wetlands face degradation from a range of factors including adjacent development, invasive species, stormwater pollution and the gradual losing of their connection to robust water sources.

> *"[We should...] Prioritize the health and maintenance of existing wetlands, and push for legislation to preserve them from development; where feasible, reconstruct them."*

Wetlands and marshes require increased protection and maintenance to survive for decades to come. Degraded marshes can be restored by removing debris and invasive species and by planting native species. Placing a thin layer of clean soil on existing salt marshes also can help adapt wetlands to rising sea levels. Ecologically sensitive design features, such as roads constructed with eco-culverts and wildlife passages, can help minimize the negative effects of development on wetland habitat quality and biodiversity.

NYC's waterfront is characterized by a wide range of conditions — sandy beaches, living shorelines, bulkheads and esplanades — that are generally classified as either soft, hard or hybrid infrastructure. The City has made substantial progress in restoring coastal habitats and promoting ecologically healthy shorelines. The U.S. Army Corps of Engineers' Nationwide Permit # 54 (**USACE NWP #54**), designed specifically for living shorelines, has been a particularly helpful tool.

These efforts are an important first step, but must be accompanied by additional in-water restoration activities that directly restore the ecology of the harbor and promote biodiversity. Oyster reefs, eelgrass meadows, reef balls and other in-water interventions can create marine habitat that also clean the water. A single oyster alone can filter up to 50 gallons of water per day. Opportunities exist to expand intertidal experiences for all New Yorkers, especially as restoration efforts extend into the water. A few years ago, oyster reef pilot programs were being designed and implemented, but creation of large-scale oyster reefs had not yet been attempted in NYC. Today, NYC's oyster reefs are an important natural infrastructure tool to improve water quality and reduce storm surge effects.
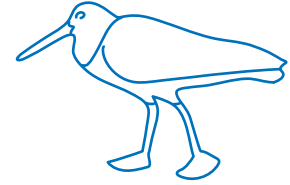
Strategy 2.1
Increase City, State and federal investment in wetland protection, restoration, acquisition, management and monitoring.

Continue to prevent habitat loss, create new habitat and secure space for tidal wetlands migration, while recognizing the constraints presented by the dense, surrounding urban environment.

Explore options to protect smaller wetlands.

Ensure that wetlands and streams have adjacent natural land, where feasible, to mitigate the effects of storm-related flooding and to facilitate the migration of wetlands when sea levels rise.

Strategy 2.2
Implement priority projects from the NYC Parks and NAC WMF and explore new strategies to restore and enhance the natural waterfront.

Strategy 2.3
Develop a reserve supply of clean sediment that can be used to elevate marshes that are vulnerable to sea level rise.

Strategy 2.4
Continue to advance Mitigation and Restoration Strategies for Habitat and Ecological Sustainability (MARSHES), such as the Saw Mill Creek Pilot Wetland Mitigation Bank. Make wetland impact offset credits steadily available for the permitting process associated with implementing critical public and private waterfront infrastructure projects.

Strategy 2.5
Increase coordination between capital infrastructure planning and habitat restoration planning.

Strategy 2.6
Work with State and federal partners to modify permit requirements to promote nature-based solutions, building upon the success of designated USACE Nationwide Permits for Living Shorelines and Aquatic Habitat Restoration.

Strategy 2.7
Support innovative in-water strategies to promote biodiversity and ecosystem restorations, including the propagation of oysters, ribbed mussels and eelgrass.

Restoring Ecosystems and Promoting Biodiversity

Marine wildlife is returning to NYC through the dedicated efforts of community scientists, nonprofit organizations and government agencies. The preservation and expansion of coastal habitat in NYC and the presence of cleaner waters have led to incredible sightings of marine wildlife throughout the City.

In Jamaica Bay during 2021, a resident seal gave birth to a pup in what was considered the first instance of seal nativity in NYC in 100 years. Jamaica Bay, an 18,000-acre wetland estuary and an unit of the National Park's Gateway National Recreation Area, provides a unique environment for both wildlife preservation and urban recreation. Jamaica Bay currently hosts over 325 species of birds, 50 species of butterflies, and 100 species of finfish.

During 2020, ecologists at CUNY Queens College spotted a bobcat roaming along the Bronx River, likely foraging for food. The Bronx River is NYC's only freshwater river. In the last three years, local ecologists have noted 20 different animal species spotted in and along the Bronx River, including muskrats, flying squirrels, and white-tailed deer. The presence of these species is a sign of the river's health, demonstrating the value of preserving city habitats and the biodiversity that they can support.

Wallabout Basin Nursery

Artificial Reef Program

Artificial reefs are human-made structures created to provide habitat for fish and other organisms. They feature a variety of hard, durable materials including rock, concrete and steel. In 2020, NYS DEC launched the third year of the largest artificial reef expansion in history. This initiative includes publication of an interactive map online, where visitors can view images of the artificial reefs. Volunteer scuba divers are invited to dive on the artificial reefs, record their observations, and submit the data to the NYS DEC.

Randall's Island Living Shoreline

The Randall's Island Living Shoreline features terraces and tide pools that create new ecological habitats and encourage biodiversity. Markers at different shoreline elevations allow the public to observe the effects of changing tides and rising sea levels. The shoreline uses poplar plants for environmental remediation, acting as a "living cap" on contaminated sediment. These site improvements address environmental justice concerns by eliminating the need to dredge contaminated soils and export them to another community.

Randall's Island Living Shoreline.

Saw Mill Creek Wetland Mitigation Bank

The Saw Mill Creek Wetland Mitigation Bank, NYC's first mitigation bank, protects and preserves NYC's valuable wetlands. Developers of waterfront infrastructure projects near wetlands can purchase tidal wetland mitigation credits to improve and protect critical coastal resources. This process is a predictable, efficient and environmentally responsible way to serve a coastal area's wetland mitigation requirements. More than 50 acres of tidal wetlands have been restored through the Saw Mill Creek wetland mitigation bank program.

Saw Mill Creek amphipod traps, Staten Island.
Credit: Tara Stewart, WSP

New York Restoration Project (NYRP): Revitalization of Sherman Creek

A former illegal dumping ground, Swindler Cove at Sherman Creek Park is a vibrant, versatile green space in Northern Manhattan. The five-acre site is home to the Riley-Levin Children's Garden, which is considered the crown jewel of New York Restoration Project's public park projects. Opened to the public in August 2003, Swindler Cove exemplifies the full spectrum of NYRP's mission to restore open space as a catalyst for community revitalization and environmental conservation. This cove features native natural habitats with a lush array of restored woodlands, wetlands, native plantings and a freshwater pond, accented by a gracious pathway.

Sherman Creek, Manhattan.   Credit: NYC Parks

Goal 3: Help connect New Yorkers with waterfront ecology and raise awareness of water quality and habitat protection

From whales in New York Harbor to bobcats along the Bronx River and dolphins in the East River, wildlife has made an incredible return to NYC. NYC is not typically considered an eco-tourism destination, but this image is starting to change. The expansion of ferry service has made it easier to travel to waterfront destinations in all five boroughs.

Increases in wildlife throughout NYC have sparked renewed interest in birding, fishing and other outdoor activities. Popular activities include free fishing clinics in Hudson River Park and Brooklyn Bridge Park, pier fishing from Coney Island and fishing charters in the Rockaways. Many waterfront parks feature fish cleaning stations and other innovative designs to promote fishing. While there are dozens of opportunities to fish throughout NYC, deciding whether to eat the fresh-caught fish is a more complicated matter. The NYS Department of Health issues clear and specific guidance (updated regularly) on the safest fish to eat.

Field trips and site visits are important activities that engage students in environmental science and other science/technology/engineering/ math (STEM) fields. Waterfront stewards regularly organize beach cleanups and special projects to remove plastics and other marine debris. Participation in these hands-on stewardship activities fosters participants' connection to specific waterfront locations and often lead to people's greater interest in advocating for the site's protection and enhancement.
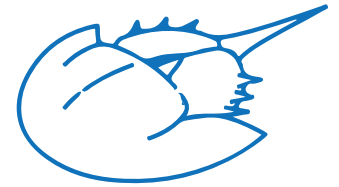
"The last few years witnessing climate change and the pandemic here in New York were a personal wake up call. As the more-than-human beings called me to be in conversation with them, the teaching from this conversation is: we are not separate from nature. In fact, the opposite is true: we are nature. In ways simple and complex we are truly and deeply entangled with the more-than-human beings."

Opposite:
Randall's Island walking tour,
NYC 520, 2019.

Strategy 3.1
Support stewardship opportunities that elevate New Yorkers' awareness of the health of our waterways.

Strategy 3.2
Increase educational signage and improve trails to ensure that the public's access does not disrupt sensitive habitats.

Strategy 3.3
Support community science efforts to monitor and restore the natural waterfront.
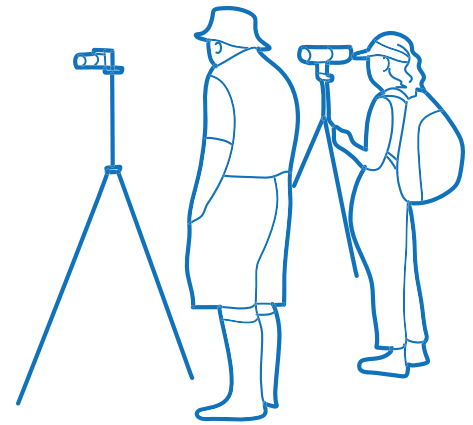
Strategy 3.4
Organize community bio-blitzes to engage New Yorkers and track biodiversity.

Strategy 3.5
Increase public awareness of green infrastructure programs through public education and wayfinding.

Strategy 3.6
Collaborate with NYC Parks' Urban Park Rangers, local stewardship and nonprofit groups to conduct boat tours, bird-watching hikes and fishing clinics, and highlight the return of wildlife to the city.

Opposite:
Living Shoreline Installation at
Alley Creek, Bayside, Queens.

Credit: NYC Parks

Connecting New Yorkers to Nature

NYC contains thousands of acres of salt marshes, freshwater wetlands, streams and forests. New Yorkers and visitors can experience these types of environments in hundreds of waterfront parks. Many opportunities exist for the public to get involved in the stewardship of these spaces and to foster a deeper connection to nature through first-hand experience learning at wildlife education centers.

Alley Creek Restoration

Alley Pond Park in Bayside, Queens, is home to the nonprofit Alley Pond Environmental Center (APEC) for children and adults. APEC was established in 1972 through grassroots organizing and a partnership with NYC Parks. In 2015, NYC Parks developed the Alley Creek Watershed Management and Habitat Restoration Plan to guide restoration and green infrastructure efforts throughout the watershed. The Plan was developed alongside NYC DEP's 2015 LTCP to improve water quality in Alley Creek and Little Neck Bay. Currently, DEP and NYC Parks are restoring tidal salt marshes along Alley Creek to improve water quality and enhance marsh resiliency. In Spring 2021, construction began on a living shoreline along the western shore of Alley Creek at Little Neck Bay.

Hunts Point Riverside Park

This former illegal dumping ground at Hunts Point situated at a predominantly industrial waterfront along the Bronx River, has been transformed into a waterfront oasis, featuring a fishing pier, a kayak and canoe launch and a spray park for children. NYC Parks currently is designing a reconstructed dock in the park (scheduled for completion by October 2021) to enhance public opportunities for kayaking and rowing.

Photo Credit:
NYC Parks
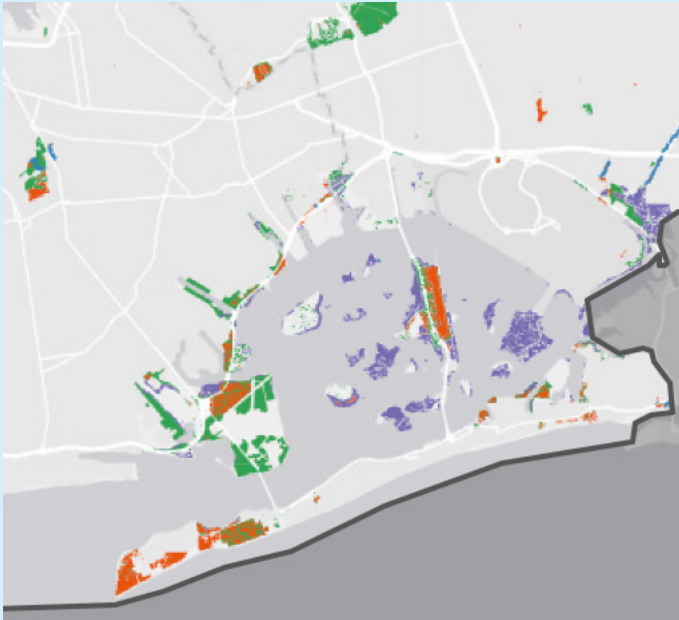
Natural Areas Map

The "**NYC Nature Map**" created by the Natural Areas Conservancy with NYC Parks, is an online tool to provide New Yorkers with information about the location, size and condition of natural resources on local public lands. The map also includes information about previous improvement projects and the potential for future restoration and management of these important spaces.

Jamaica Bay – Rockaway Parks Conservancy (JBRPC): Shoreline Cleanups

JBRPC's cleanups remove floatable trash, plastics and marine debris from the shorelines of Jamaica Bay and Rockaway. Jamaica Bay and Rockaway parks offer the public a unique, exciting way to connect with nature, since they collective host more than 325 species of birds, 50 species of butterflies and 100 species of fish. These attractions offer participants a thrilling day of park stewardship at some of NYC's most diverse, beautiful shorelines.

Photo Credit:
NAC/NYC Parks

Photo Credit:
Daniel Avila, NYC Parks

Goal 4: Utilize existing and new data sources to assess natural resources and inform decision making for restoration and protection

Light Detection and Ranging (LiDAR) provides precise elevation data to identify topographic and other changes to the land, and has become an important tool to evaluate the extent of wetlands. Updating local maps using LiDAR provides more precise location data on the scope of NYC's wetland resources to ensure they can be better protected. In 2016, NYC Parks partnered with the University of Vermont Spatial Analysis Lab to update NYC wetland and stream hydrography maps using 2010 LiDAR and other field and remote sensing data. This geographic information system (GIS) methodology was used to accurately estimate the extent of freshwater wetlands, particularly under forest canopy. This work generated a reliable preliminary map for tidal wetlands but required additional field verification to be used for quality control of freshwater wetlands. NYC Parks is providing this new map information to the U.S. Fish and Wildlife Service (USFWS) for use in their next, as-yet unscheduled NWI map update. NYC Parks will also share this data with NYS DEC for future updates to State regulatory maps. The data is publicly available on NYC OpenData.
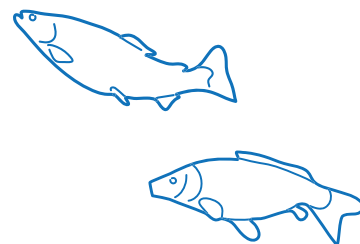
"A healthy waterfront would be flourishing with wildlife. These are very important ecosytems. We must also protect them from numerous pollutants such as solid waste, heavy metals, and plastic."

Strategy 4.1
Continue local efforts to use LiDAR to provide precise elevation data to detect land use and topographic changes and provide better information on the current extent of wetlands.

Strategy 4.2
Align locally generated wetland map updates with any future State or federal mapping updates to accurately depict the extent of wetland resources to help better protect and manage them.

Opposite:
Waterfront monitoring.

Credit: NYC Parks

Goal 1: Improve water quality throughout the five boroughs and build upon key agency and public partner collaborations

Strategy 1.1: Enact the new Unified Stormwater Rule to align on-site stormwater management requirements across NYC and expand best practices for retaining stormwater on-site with green infrastructure.

Strategy 1.2: Continue to implement the NYC Stormwater Management Program to reduce pollution generated in MS4 areas. Ensure that cleanup plans, permits, and other key decisions are grounded in local solutions developed with community engagement and support.

Strategy 1.3: Further reduce CSOs by improving and expanding green and grey infrastructure, as described in the NYC Green Infrastructure Program and LTCPs.

Strategy 1.4: Increase interagency coordination to identify barriers to and opportunities for expanding green infrastructure implementation, maintenance and stewardship.

Strategy 1.5: Support innovative bio-extraction pilot programs to improve water quality (including oysters, ribbed mussels and eelgrass) to support cleaner water across New York Harbor and all five boroughs.

Strategy 1.6: Continue expanding the Bluebelt program with associated aquatic ecosystem protection strategies.

Goal 2: Protect ecosystems, support ecosystem services, and enhance biodiversity of the natural waterfront, including in-water strategies

Strategy 2.1: Increase City, State and federal investment in wetland protection, restoration, acquisition, management and monitoring.

Strategy 2.2: Implement priority projects from the NYC Parks and NAC WMF and explore new strategies to restore and enhance the natural waterfront.

Strategy 2.3: Develop a reserve supply of clean sediment that can be used to elevate marshes that are vulnerable to sea level rise.

Strategy 2.4: Continue to advance Mitigation and Restoration Strategies for Habitat and Ecological Sustainability (MARSHES), such as the Saw Mill Creek Pilot Wetland Mitigation Bank. Make wetland impact offset credits steadily available for the permitting process associated with implementing critical public and private waterfront infrastructure projects.

Strategy 2.5: Increase coordination between capital infrastructure planning and habitat restoration planning.

Strategy 2.6: Work with State and federal partners to modify permit requirements to promote nature-based solutions, building upon the success of designated USACE Nationwide Permits for Living Shorelines and Aquatic Habitat Restoration.

Strategy 2.7: Support innovative in-water strategies to promote biodiversity and ecosystem restorations, including the propagation of oysters, ribbed mussels and eelgrass.

Goal 3: Help connect New Yorkers with waterfront ecology and raise awareness of water quality and habitat protection

Strategy 3.1: Support stewardship opportunities that elevate New Yorkers' awareness of the health of our waterways.

Strategy 3.2: Increase educational signage and improve trails to ensure that the public's access does not disrupt sensitive habitats.

Strategy 3.3: Support community science efforts to monitor and restore the natural waterfront.

Strategy 3.4: Organize community bio-blitzes to engage New Yorkers and track biodiversity.

Strategy 3.5: Increase public awareness of green infrastructure programs through public education and wayfinding.

Strategy 3.6: Collaborate with NYC Parks' Urban Park Rangers, local stewardship and nonprofit groups to conduct boat tours, bird-watching hikes and fishing clinics, and highlight the return of wildlife to the city.

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