NEW YORK STATE | Department of Environmental Conservation

Hudson River Estuary Action Agenda 2021-2025

OPPORTUNITIES FOR ACTION

DRAFT FOR PUBLIC COMMENT

Andrew M. Cuomo, Governor | Basil Seggos, Commissioner

About the Hudson River Estuary Program and the *Action Agenda*

The Estuary Program helps people enjoy, protect, and revitalize the Hudson River estuary and its valley. The *Draft Action Agenda* proposes strategies and actions to be taken by the Program and collaborating partners through 2025.

Additional information is available from:

Frances F. Dunwell
Hudson River Estuary Coordinator
NYSDEC – Hudson River Estuary Program
21 South Putt Corners Road
New Paltz, New York 12561
phone: 845-256-3016
e-mail: hrep@dec.ny.gov
www.dec.ny.gov/lands/4920.html

Letter from the Commissioner

New York is blessed with abundant natural resources that helped shape our state and nation. The Hudson River was a key resource and influence in our state's development, and today it continues to be an important waterway that supports local communities, key industries, and millions of people. It is vital that we continue to protect and restore the river and its watershed to ensure they remain vibrant and beneficial for residents, visitors, and businesses.

This *Action Agenda* outlines New York's goals for the conservation of the Hudson River estuary and its watershed. It sets a course to address the challenges we face in improving water quality, protecting fish, wildlife, and habitats and providing river access for recreation. It identifies two cross-cutting issues that will affect every aspect of our work: climate change and environmental justice.

New York has become a global leader in building climate resilience and addressing the causes of climate change. He has also recommitted to our work in creating a more fair and just society.

Within New York, the Hudson Valley has emerged as a region that fully embraces these two complimentary priorities. With this Action Agenda, DEC will more fully address longstanding, systemic inequities and build a more climate-resilient environment, building on the Estuary Program's foundation of science-based collaborative partnerships.

With the strong support of government partners and civic and environmental groups, and local residents, DEC has developed an effective team working toward mutual goals and achieving results for the Hudson estuary and its watershed.

The following pages feature opportunities for action that will protect, restore, and improve this vital state and regional resource. I encourage you to read this *Action Agenda* to learn about the successes we have achieved, the challenges facing the estuary, and the strategies and goals we will work toward in the next five years.

We look forward to your support as we work to implement a shared, targeted and inclusive vision for the future of this historic, national treasure.

Sincerely,

Basil Seggos, Commissioner

Table of Contents

DEC's Hudson River Estuary Program Mission

DEC's Hudson River Estuary Program helps people enjoy, protect, and revitalize the Hudson River estuary. Created in 1987 through the Hudson River Estuary Management Act (ECL 11-0306), the program focuses on the tidal Hudson and its adjacent watershed, from the federal dam at Troy to the Verrazano Narrows in New York City, including upper New York-New Jersey Harbor. The program works with many groups to develop knowledgeable and effective stewards of the estuary, using an understanding of the river's ecology as a foundation for its work.

The *Action Agenda*, which is periodically updated, forms a conservation and restoration blueprint to guide the program. It expresses a shared vision for the region, as defined by diverse groups of people who live and work along the river and in its watershed. Implementation of the *Action Agenda* relies on partnerships. Federal and state agencies, as well as local municipalities, non-profits, academic and scientific institutions, businesses, landowners, and dedicated volunteers all play a role.

The Estuary Program's role is to develop the essential actions necessary to achieve that vision and to organize, support, and guide our many partners to realize the goals of the vision. By engaging, informing, and empowering these communities, organizations, and individuals, the Estuary Program produces positive impacts on the Hudson River estuary and its watershed to ensure a healthy and thriving ecosystem for the benefit of the people.

The Estuary Program offers a variety of programs to support our partners, including:

- Education and training;
- Technical assistance and grants; and
- Research, monitoring and mapping.

The program is funded through the NYS Environmental Protection Fund in partnership with Cornell University and New England Interstate Water Pollution Control Commission (NEIWPCC).

With this Action Agenda, DEC is focusing the program mission on more fully addressing longstanding, systemic social and economic inequities and building a more climate-resilient environment, using the Estuary Program's successful model of science-based collaborative partnerships.

The Hudson River Estuary Management Advisory Committee

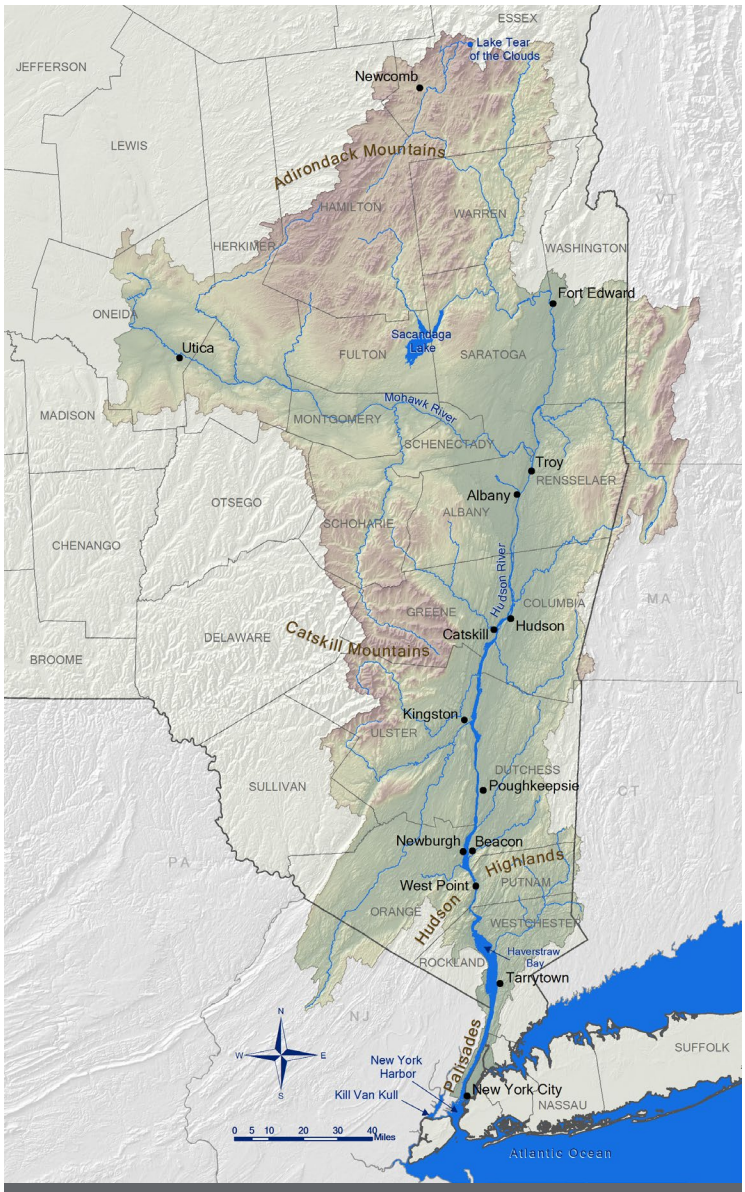
The Hudson River Estuary Management Advisory Committee (HREMAC) provides guidance to the program. It helps New York State define goals and evaluate progress. Committee members also provide a communication bridge to a wider group of partners, communities, and stakeholders. Numerous government agencies participate as *ex-officio* members of the committee to provide coordination and to help deliver our *Action Agenda* results. At the time of publication of the *Action Agenda*, the members are:

HREMAC Members		
Stuart Findlay, Committee Chairman Cary Institute of Ecosystem Studies	**Scott Croft** Hudson River Boat and Yacht Club Assoc.	**Suzette Lopane** Westchester County Dept. of Planning
Allan Beers Rockland County Dept. of Environmental Resources	**Todd Erling** Hudson Valley Agri-Business Development Corp.	**John Mylod** Commercial Fisherman
Andy Bicking Scenic Hudson	**Paul Gallay** Riverkeeper, Inc.	**George Schuler** The Nature Conservancy
Janet Burnet Ramapo River Watershed Council	**Lucille Johnson** Vassar College and Environmental Consortium of Colleges & Universities	**Shino Tanikawa** NYC Soil & Water Conservation District

HREMAC Ex-Officios		
Peter Brandt U.S. Environmental Protection Agency	**Jamie Ethier** NYS Department of State	**Audrey VanGenechten** NYS Department of Health
Diana Carter NYS Office of Parks, Recreation and Historic Preservation	**Scott Keller** Hudson River Valley Greenway	**Peter Weppler** U.S. Army Corps of Engineers
Chris DeRoberts New York Power Authority	**Jessica Kuonen** NY Sea Grant	
Noreen Doyle Hudson River Park Trust	**Rob Pirani** NY-NJ Harbor & Estuary Program	

About the Estuary and its Watershed

The Hudson River estuary stretches 153 miles, from Troy to New York Harbor - nearly half the river's 315-mile course between Lake Tear of the Clouds in the Adirondacks and the tip of Manhattan Island. Twice daily, the ocean's tides are felt all the way to the Troy dam. With this rise and fall comes changes in the direction of flow. Salty sea water pushes up the estuary from the ocean, diluted by freshwater from the upper Hudson and tributaries. In the northern reaches, the estuary is a freshwater tidal environment. More than 200 species of fish are found in the Hudson ecosystem. Coastal migratory fish, like striped bass, sturgeon, and shad, depend on spawning and nursery habitat here. Bald eagles, herons, waterfowl, and other birds feed from the river's bounty. Tidal marshes, mudflats, and other habitats in and along the estuary support a great diversity of life. People also flourish here thanks to the river's rich natural resources. The Hudson provides drinking water for cities, supports the region's tourism and business economy, and offers a destination for swimming, fishing, and boating. It inspires people with its natural beauty.



The Hudson River Watershed is 13,400 square miles. The Estuary Program focuses on the 5,200 square miles from the Verrazano Narrows below Manhattan Island to the head of tide at the federal dam in Troy.

The land area of the Hudson's watershed covers nearly 13,400 square miles, roughly the size of Massachusetts and Connecticut combined. Rain that falls in the watershed eventually ends up in a stream that flows to the Hudson. More than 14 million people live in the counties adjoining the estuary, an area that roughly corresponds to its watershed.

The Mohawk River is the Hudson's largest and best-known tributary stream. The Estuary Program focuses on the lower half of the Hudson, south of its confluence with the Mohawk – the stretch of tidal river from the Troy dam to the Verrazzano Narrows, including Upper New York-New Jersey Harbor, as well as the East River and the Harlem River, which flow around Manhattan Island into the harbor. We also include the surrounding Hudson River Valley, which encompasses 5,200 square miles of the river's overall watershed. Appendix 2 more fully describes the geographic setting for our work.

Climate Change and Environmental Justice

Two cross-cutting issues affect every aspect of the program mission, presenting both challenges and opportunities: climate change and environmental justice. These issues are interconnected.

Climate change: Here in New York State, we are experiencing climate change faster than the national and global averages. Since the Hudson River is tidal, our waterfront communities face increasing flooding from strong storms and inundation risks from sea-level rise, which has risen a foot on the Hudson over the last one hundred years. This rise is predicted to accelerate.

The 2019 Climate Leadership and Community Protection Act (CLCPA)sets groundbreaking goals of 100% carbon-free power by 2040 and reducing greenhouse gas emissions to 85% below 1990 levels by 2050. The CLCPA also ensures landmark investments in environmental justice (EJ) communities, or low-income, tribal, or indigenous populations disproportionately impacted by environmental hazards, lack of opportunity for public participation, and health risk.

Communities in the Hudson Valley are also climate leaders: 112 of the 261 communities in our watershed are registered Climate Smart Communities (CSCs). The Estuary Program is actively encouraging this participation in the CSC program. In addition, the program is empowering our communities by piloting new, innovative programs like Climate-adaptive Design, planning for sea-level rise in municipal comprehensive plans, and advancing nature-based Sustainable Shorelines. Climate leadership is becoming an element of the region's identity. More than 194 climate adaptation actions have been completed in 120 watershed municipalities since 2015. Overall, our technical assistance to communities has leveraged $20 million in funding, mostly from the state, for climate resilience projects.

Diversity, equity, inclusion and justice (DEIJ): People with different capabilities, resources, and interests experience the river in different ways and can be affected by decisions made without their input. All areas of the Hudson River Estuary Program's mission will be carried out in a more inclusive way to assure diversity, equity, inclusion and justice. Populations disproportionately impacted by environmental hazards must be included at all stages of the decision-making process. We will seek input from our EJ communities, as well as people of all abilities. A DEIJ road map will guide every aspect of the program.

Challenges and Opportunities for the Decade Ahead

The Hudson Valley and the estuary are poised to provide models for new approaches to the management of ecosystems. Over the last 30 years, DEC has continuously invested in building the knowledge and skills of municipalities, non-governmental organizations, elected officials, schoolchildren, and others so they can become good stewards of our unique ecosystem for the benefit of the people who live, work, and recreate here. DEC has informed and empowered many partners through science, training, technical assistance, and grants. We have a strong track record of success, and several programs we piloted are now being adopted statewide.

Today, the challenges we face create opportunities for action. They include:

- Wastewater infrastructure: Water and sewer systems are aging. Repairs and upgrades to ensure adequate capacity for current and future growth, and climate conditions in the watershed, are expensive. The opportunity to modernize our systems is greatly enhanced by the sustained funding for the Clean Water Infrastructure Act in New York State.
- Land use and sprawling development patterns: Changes in land use and impacts of sprawl affect the region's water resources, tourism economy, wildlife habitats, and scenery. In a recent opinion poll conducted by the Estuary Program, when asked what they value most about this region, residents cited its natural beauty as number one. Land use choices within the watershed can impact the quality of water downstream, the availability of drinking water, the ecosystem of the river, and our ability to adapt to the changing climate.
- Fish & Wildlife: Actions up and down the Atlantic coast affect the Hudson's signature fisheries. The way other states manage coastal fisheries has a direct impact on what we can achieve here. Fortunately, governance structures exist for interstate decision-making, and DEC actively participates in this process. Invasive plant and animal species continue to arrive and affect the productivity of the ecosystem, including habitat for fish and wildlife. Working with DEC's invasive species programs and partners continues to be a priority. The growth of wildlife-related recreation is a positive factor for this region.
- Legacy contaminants: Polychlorinated biphenyls (PCBs) and other industrial contaminants are a continuing cause for concern. Gradually, these contaminants are being cleaned up and New York is demanding the complete removal of PCBs from the river, to address this threat to human health and the environment.
- Recreation: Increasing numbers of residents and tourists are using the Hudson for swimming and other activities, raising concerns over water quality and the public's knowledge about river conditions.

The solutions to these issues must include diverse management actions and involve everyone. The Hudson River Estuary Program, with its model of leadership through partnership, is prepared to take on this challenge and take advantage of new opportunities to restore our environment.

About the Draft Action Agenda 2021-2025

The New York State Department of Environmental Conservation (DEC) developed this *Draft Action Agenda* update for 2021-2025 with the input of many community groups and citizens throughout the region. The outcomes included here are measurable and achievable by 2030. They build on a strong record of success in achieving progress in each of our core areas of expertise, as expressed in previous *Action Agendas*. Copies of our progress reports are available online at www.dec.ny.gov/lands/4920.html.

The *Draft Action Agenda* sets objectives that can be achieved through collective action and collaboration among government and non-governmental partners. No one organization or agency can fund all the science, education, and conservation initiatives needed to protect and restore the Hudson and its watershed. This document is a collective vision with opportunities and a need for action by many partners. The implementation of the *Action Agenda* is an ongoing process subject to modifications as we progress. It embraces the actions needed to conserve the Hudson River estuary and its larger ecosystem, including, where relevant, the connected ocean and estuarine waters surrounding the estuary -- Lower New York Bay, the Bight, and Long Island Sound -- as well as the Mohawk River and the Upper Hudson. A companion *Action Agenda* has been developed and is being implemented for the Mohawk River Basin to guide stewardship of this major tributary. Similarly, a New York State Ocean Action Plan guides the actions the State and its partners will take to conserve ocean waters and ocean life.

As you read this *Action Agenda*, DEC encourages partners to consider how their vision for the Hudson can be woven into this shared strategy for the future of the river and for the benefits it provides the people who live in, work in, and enjoy this remarkable place.

This document establishes measurable long-range targets for 2030. It proposes Strategies and Actions to be taken from 2021-2025 by New York State and collaborating partners. After five years, our collective progress will be assessed, and the *Action Agenda* will be refreshed and updated, as needed, to adjust for changing circumstances. New or updated actions will be defined for 2026-2030 to meet the 2030 Targets and their associated Measures of Success.

The chapters of this document are built around the key benefits people receive from a strong and vibrant ecosystem:

A Vital River Ecosystem:

- Sustainable Estuarine Fisheries
- Robust River Habitats
- Clean Hudson River Water

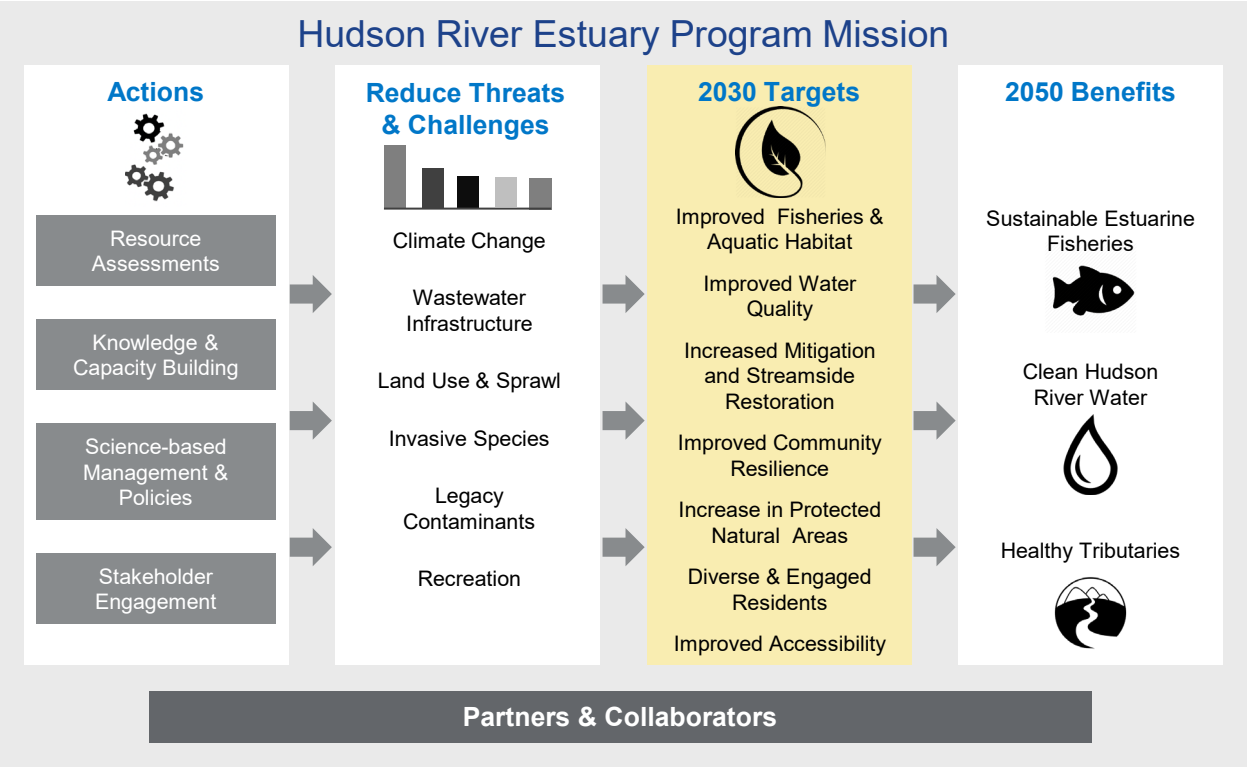
A Thriving Watershed:

- Healthy & Resilient Tributaries
- Climate-Adaptive Communities
- Conserved Natural Areas for Wildlife, Source Water, Climate Resilience, and Scenery

People Living Well with Nature: Recreation, Education, and Inspiration:

- An Informed and Engaged Public
- An Accessible Hudson River for People of All Ages and Abilities

The *Action Agenda* has been developed over the years based on our successful model of engaging, informing, and empowering communities, organizations, and individuals to produce positive impacts on the Hudson River estuary and its watershed to ensure a healthy and thriving ecosystem for the benefit of the people. An understanding of ecology is the foundation of our work, which begins with resource assessments.



Each chapter is structured to include:

- **A Goal:** The goals are aspirational and long-term.
- **2030 Targets:** These also build from previous *Action Agendas* and the *Comprehensive Restoration Plan.* They identify specific, measurable outcomes to be achieved over the next decade to achieve the goal. The 2030 targets are the primary focus of the strategies and next steps that will guide our work under this *2021-2025 Action Agenda*.
- **Strategies and Actions:** Strategies are the collective actions that define how we will achieve our short-term measures of success and, ultimately, our 2030 Targets and Goals. The actions DEC plans to take over the next five years to achieve the 2030 targets will be used to set our priorities and guide our spending. After five years, the *Action Agenda* will be refreshed and updated to adjust for changing circumstances, and a new or updated set of actions will be defined through 2030.
- **Measures of Success:** To track progress in achieving long-term changes that ensure a healthy and thriving estuary ecosystem, each of our 2030 Targets includes specific success measures for 2025 and 2030. Progress on programmatic achievements are reported annually in a Program Coordinator's Report. Environmental indicators will be reported every five years in State of the Hudson reports. Such indicators are chosen to reflect the condition of the ecosystem and to show change over time. After five years, our collective progress will be assessed and the *Action Agenda* will be updated, as needed, to adjust for changing circumstances. New or updated actions will be defined for 2026-2030 to meet the Targets and their associated measures of success.

A Vital River Ecosystem

The estuary is the focus of our program, along with the uses it supports and the benefits it provides to people. This section of the *Action Agenda* addresses the interdependent components of the tidal ecosystem—the fish, the habitats, and water quality.

Benefit: Sustainable Estuarine Fisheries

Background

Wildlife-related recreation in New York generates about $5 billion annually, and a well-managed estuary ecosystem supports important economic opportunities for employment, recreation, and tourism. However, today, blue crabs and river herring support the only remaining active in-river commercial fisheries, and the status of the Hudson's more popular recreational fisheries—shad, striped bass, and black bass -- is mixed.

To manage and restore signature species, the program and its partners have established long-term tracking and monitoring programs that provide necessary data on spawning and recruitment, habitat, food sources, river movement, and stock status. Programs to identify and remove dams and barriers that limit the movement of migratory fish, such as herring and eel, are also underway. Ensuring that river fishes are safe to eat depends on the continuation of remediation programs for contaminants, including PCBs, cadmium, and dioxins.

As the climate changes and the sea-level rises, the habitat for migratory fishes will also change, since it is affected by rising temperatures, shifts in salinity and in water depths, and potential loss of tidal wetland and aquatic vegetation acreage. Climate change has already affected the distribution and migratory movement of marine fish along the coast and will continue to do so into the future. Research will help inform management of a changing ecosystem.

Goal

Populations of signature Hudson River fisheries are robust and balanced with the larger ecological community, and contaminant levels are declining in all targeted species. These conditions will support both ecological and economic vitality, while restoring fishing traditions for our signature fish: American shad, striped bass, Atlantic sturgeon, river herring, blue crab, American eel, and black bass.

Key trends, challenges, and opportunities

- Human impacts on fish populations include the introduction of invasive species, climate change, sturgeon-vessel interactions, water quality impairment, and fishing harvest in Hudson River and ocean fisheries.
- Impacts of in-water construction on fish habitat include energy pipelines, shoreline hardening, and shallow-water habitat loss.
- Hard structural responses to increasing flood risk, like surge gates, dams, and floodwalls, threaten aquatic and shoreline habitat, and could impact critical migration pathways.

2030 Target and Measures of Success

***By 2030**, fish populations and contaminants in fish are effectively monitored and managed; Atlantic sturgeon and American shad are making measurable progress toward recovery goals; striped bass show a reverse in the apparent decline in size and number of spawning adult females; and river herring populations are at sustainable levels. Key habitats needed to support signature fish populations during critical life stages and seasons are identified, protected, or restored.*

2025 Measures of Success

- Our understanding of Atlantic sturgeon spawning habitat locations and seasonal habitat use has been refined.
- A population estimate for shortnose sturgeon and assessment of trends since the 1990s has been completed.
- The prevalence and strain of mycobacteria in Hudson River striped bass has been determined. The importance of mycobacteria on the Hudson River striped bass population and fishery has been assessed.
- River herring have been sustained at current levels.
- Tributary habitat for herring and eel has been increased by at least 1 mile, in collaboration with the healthy tributary conservation efforts (see that chapter of the Action Agenda)
- Factors contributing to the failure of American shad populations to recover have been determined, and a shad management plan with identified benchmarks has been adopted
- The Best Technology Available standard has been met for affected facilities.
- A robust sampling design has been developed to measure the index of abundance for Hudson River striped bass spawning stock.
- A black bass management plan has been developed and implemented.
- Research and outreach have been implemented for American eel conservation.
- Contaminants (PCBs, dioxins, cadmium) in blue crab have been reduced to levels at or approaching safety for human consumption, as established by the NYS Health Department

2030 Measures of Success

- Signature species have been monitored annually using the best available science, with data archived, documented, and used to identify trends and to inform management options.
- Atlantic sturgeon, American shad, striped bass, and herring are on track to meet 2050 management goals developed by the Atlantic States Marine Fisheries Commission.
- Contaminants in commonly eaten fish have been monitored annually to inform the NYS Fish Consumption Advisory.
- Potential invasions of invasive/exotic fauna have been minimized through preventive measures.
- A “Best Technology Available” standard has been implemented or scheduled in order to minimize or avoid fish kills at industrial and municipal facilities that use water withdrawals for non-contact cooling, and for the four remaining steam electric power plants.
- Contaminants (PCBs, dioxins, heavy metals, etc.) in commonly eaten fish (striped bass, carp, black bass, sunfish) have been reduced to levels at or approaching safety for human consumption, as established by the NYS Health Department.

- Migratory Hudson River fish populations have shown improvement, as measured by the index of abundance, with an increase in the percent of target species (American shad, striped bass, Atlantic river herring) approaching management thresholds.
- Black bass and shad management plans have been implemented.
- Contaminant source investigations have begun at major contributing upland/shoreline sites, and in-river assessment of contaminant source areas have begun.

Strategies and Actions to Implement the *Action Agenda*

Strategy 1: Continue cutting-edge fisheries science and research to inform adaptive management decisions and test new data collection techniques to reduce uncertainty.

- Conduct research to improve our understanding of management, life history, ecology, and biology; prioritize threats to migratory species, including climate change, and mitigate those threats.
- Annually monitor and report levels of contaminants in fish.
- Evaluate sampling protocols and modifications that will produce better fish indices of abundance and reduce uncertainty around the index.
- Use current sampling and the index modifications above to produce a revised sampling method to improve the accuracy of the fish abundance indices.

Strategy 2: Engage stakeholders through outreach

- Develop a plan - in consultation with key stakeholders - to prevent the movement of invasive aquatic species into the Hudson River watershed and canal system.
- Increase awareness of anglers about signature fisheries' issues and health risks from eating contaminated fish.
- Engage responsible parties in the development of plans for investigating and remediating in-river sediments and major upland source areas.

Strategy 3: Participate in interstate fisheries management decision-making councils and commissions to adopt management actions to sustain fisheries

- Participate in the adaptive coastwide fisheries management process with the Atlantic States Marine Fisheries Commission.
- Update regulations as needed to sustain fisheries.
- Improve data collection to inform and improve the efficiency and effectiveness of the permitting process for activities that affect Hudson River fish and their habitats; for example, by creating uniform work windows for dredging. Ensure enforcement of existing regulations protective of Hudson River fish and their habitats.
- Require that future Hudson River power-generating, municipal, and industrial facilities have closed-cycle cooling systems to avoid fish kills and meet the "Best Technology Available" standard pursuant to 6 NYCRR §704.5 and §316(b) of the Clean Water Act. This standard requires minimizing adverse environmental impacts by preventing fish from being impinged on intake screens and from being entrapped in the water withdrawal system. Have schedules to achieve the Best Technology Available standard at existing power plants that have not yet met the standard.

Benefit: Robust River Habitats

Background

The Hudson River estuary supports extraordinary biological diversity and provides important benefits to people. Its complexity of habitats includes shoreline wetlands, aquatic vegetation beds, and the bottom of the river itself. These natural systems are vital for the estuary ecosystem. They also serve our communities by reducing flooding, purifying drinking water, providing wildlife-dependent recreational opportunities for people of all abilities, and supporting all the social, economic, and ecological benefits associated with these activities.

Over the past several years, the Estuary Program, in close collaboration with the Hudson River National Estuarine Research Reserve (HRNERR) and other partners, has established a baseline for analysis of ecosystem change in the watershed over time. Now we need to better understand estuary-watershed connections. Multiple consequences of climate change will manifest on practically all Hudson Valley habitats. Wetland elevations may not keep pace with sea-level rise, and habitats and species will migrate. River habitats, if properly managed, can provide significant human benefits, including storm protection, water quality improvement, and carbon sequestration.

HRNERR is one of 29 reserves established by the National Oceanic and Atmospheric Administration (NOAA) to promote informed management of the nation's estuaries and coastal habitats. It improves the health and vitality of the Hudson River estuary by protecting estuarine habitats through education, estuary training, research and monitoring, and stewardship and restoration programs. As such, it is a key partner with the Estuary Program in delivering multiple goals of the *Action Agenda*.

Goal(s)

Vital shallow-water and intertidal habitats measure at least 12,000 acres, including 7,500 acres of tidal wetlands, and 4,500 acres of native submerged aquatic vegetation, providing essential habitats for fish, shellfish, birds, and other estuary wildlife. Five miles of shoreline have been designed with best management practices for increased habitat value, and 700 acres of riparian area are protected to enhance floodplain connectivity or facilitate the migration of tidal wetlands. Fifty acres of oyster habitat have been created. Ecologically significant natural plant and animal communities in the Hudson River and associated tidal portions of tributaries are more resilient to a variety of stressors, including climate change and invasion by non-native species. Such natural communities support ecosystem function and provide significant benefits, including maintaining species diversity, increasing stable shorelines, flood capacity, and storm buffering.

Key trends, challenges and opportunities

- New invasive species will continue to arrive.
- Climate change is likely to increase precipitation, storm intensity, storm surge, water temperatures, and the potential for harmful algal blooms.
- Wetlands migration pathways are not sufficiently protected.
- More hardening of shorelines is predicted.
- Shoreline development trends will impact habitats and the ecosystem.

2030 Target and Measures of Success

***By 2030**, 10 conservation or restoration projects that improve oyster habitat, shallow/intertidal habitats, and/or shorelines to enhance floodplain connectivity, and/or facilitate the migration and formation of tidal wetlands have been completed. Existing occurrences and known pathways for invasive species are mapped and prioritized, with treatments proposed or implemented and monitored for success, while critical habitats whose loss could perpetuate cascading effects are identified and prioritized for protection and restoration.*

2025 Measures of Success

- A tool has been developed to assist in the development of containment and/or remediation strategies for habitats.
- A map has been created showing existing occurrences and known pathways for invasive species, including invasive aquatic plants (e.g., hydrilla, water chestnut).
- A new assessment of shoreline character has been conducted to compare to the 2005 shoreline assessment.
- A Hudson River shore-friendly program has been developed.
- Procedures have been implemented to inform a database of restoration sites used to coordinate potential projects with funding sources.
- Five projects have been completed that improve shallow/intertidal habitats and/or shorelines to enhance floodplain connectivity and wetland migration in response to sea-level rise.
- A map of submerged aquatic vegetation and tidal wetland habitat has been created and an assessment of change over time was completed.
- 10 acres of oyster habitat have been restored in Hudson River Park.
- Collaboration on mapping distribution of Chinese mitten crab has been continued, in coordination with DEC invasive species programs.
- Procedures to maintain and inform a database of restoration sites has been developed and implemented to coordinate potential projects with funding sources.

2030 Measures of Success

- At least 10 projects have been completed that are demonstrated to improve shallow/intertidal habitats and/or shorelines to enhance floodplain connectivity and wetland migration in response to sea-level rise.
- 50 acres of oyster habitat have been restored.
- 750 acres of wetland migration pathway have been conserved through acquisition, and 300 acres through administrative measures.
- Habitat value has been increased for at least two miles of currently-hardened shoreline.
- 50 acres of shallow-water habitat have been restored in the estuary.
- Pathways for invasive species have been mapped and prioritized, with treatments proposed or implemented and monitored for success.
- Newly discovered invasive species have been treated to prevent establishment.
- Critical habitats whose loss could perpetuate cascading effects have been identified and prioritized for protection and restoration.

Strategies and Actions to Implement the *Action Agenda*

Strategy 1: Assess and prioritize management options and restoration opportunities.

Shallow/intertidal habitats/wetland migration

- Use Surface Elevation Tables to assess whether Hudson River marshes are keeping pace with sea-level rise, and use the Turkey Point tide station to assess long-term changes in water level.
- Identify Hudson River bathymetry change using Hudson River Sediment Environment coverage.
- Evaluate the use of restored oyster reefs in the Hudson River by finfish and other nekton as a conservation benefit.
- Prioritize critical habitat for protection and restoration, including pathways for marsh migration in light of predicted climate change.
- Study the feasibility of, and develop a methodology for, restoring Submerged Aquatic Vegetation through transplanting local native vegetation.

Shoreline

- Evaluate restored wetlands and shorelines using the Hudson River Sustainable Shorelines Project Rapid Assessment Protocol Manual to inform development and design of future projects.

Invasive species/contaminants

- Map habitat use by species using Hudson River benthic and species distribution data. Assess relative habitat values of tributary mouths.
- Assess Hudson River habitats to determine species use and identify habitat needed to support Species of Greatest Conservation Need.
- Enhance harmful algal bloom monitoring throughout the Hudson River estuary with trial deployment of nutrient probes and online notification and reporting of harmful algal blooms through 'NYHABS'.

Strategy 2: Build capacity in the resource management community

- Enhance the scientific knowledge, technical capacity, and skills and certifications of professionals involved in making decisions that affect the habitats, shore zones, water quality, and other natural resources of the Hudson River estuary.
- Build support for conservation actions by providing training and technical assistance on tidal wetland vulnerability to climate change and on factors influencing their resiliency, including migration and sediment accretion.
- Foster communities of practice for restoration practitioners, shoreline designers, and resource managers by providing certified training, technical assistance, and facilitation.
- Identify sustainable shorelines best management practices and promote their use in the regulatory process and in the shoreline design community, especially for areas proposed for shoreline hardening in developed areas.
- Support research projects and publications that inform the management of shallow water and shoreline habitats through grants management and oversight of funding opportunities, including the fellowships, and the National Estuarine Research Reserve Science Collaborative.
- Maintain continuous water quality and meteorological stations at Norrie Point and Tivoli Bays, and deliver data through the National Estuarine Research Reserve Centralized Data Management Office website and the Hudson River Environmental Conditions Observing System (HRECOS).
- Collaborate with partners to evaluate potential stewardship and restoration opportunities, and develop conceptual plans for priority projects.
- Connect and integrate with other federal and state programs to maximize available resources and synchronize funding opportunities.

Strategy 3: Plan and implement projects to improve, restore, and build resiliency

Shallow/intertidal habitats/wetland migration

- Work with partners to acquire lands adjacent to the Hudson River based on identified sea-level rise migration pathways.
- Work with State partners to establish protections using administrative means, such as reinvigorating and creating Memorandum of Understandings (MOUs).

Shoreline

- Support and manage community restoration projects proposed and implemented by local governments, not-for-profits, and/or private property owners.

Invasive species/contaminants

- Work with partners such as DEC's Invasive Species Program and PRISMs to manage existing invasive species with available and effective control methods.
- Identify and pursue the implementation of actions that will reduce the introduction of new invasive species and manage the spread prevention of aquatic invasive species.

Benefit: Clean Hudson River Water

Background

Over the last 50 years, water quality in the Hudson River estuary dramatically improved, with benefits for drinking water supplies, recreation, and habitat. Today, remaining challenges include aging infrastructure and sewer overflows. Climate change and related weather patterns also affect many aspects of water management, including availability of water supplies, the timing and volume of sewer overflows, and the impact of rising sea levels on wastewater infrastructure in shoreline communities. To account for this, we need to update our understanding of water quality impacts on the tidal Hudson River to inform management decisions.

DEC is working with local communities to identify steps to address chronic Sanitary Sewer Overflows, Combined Sewer Overflows, and aging municipal water and wastewater treatment infrastructure. DEC continues to characterize wastewater infrastructure needs. Collaborations among concerned residents, interested businesses, dedicated non-profit organizations, and government agencies at all levels are needed to continue progress toward our long-range goal of ensuring that Hudson River water quality supports drinking water, swimming, fishing, navigation, and ecosystem needs.

Goal

Water quality in the Hudson River estuary will be suitable for swimming and recreation, will support fish and aquatic life, and will provide clean water to communities relying on the Hudson for drinking water.

Key trends, challenges, and opportunities

- New funding sources enable the significant investments needed for aging wastewater and stormwater infrastructure improvement.
- Estuary water quality and ecosystem function is impacted by the downstream movement of a wide range of inputs and stressors originating from tributaries and the watershed.
- Where tributaries meet the Hudson River main stem, habitat, recreation, and water supplies often converge, so water quality needs to support these uses.

2030 Target and Measures of Success

***By 2030**, an updated characterization of Hudson River estuary water quality is complete. Priority wastewater infrastructure or stormwater management projects contributing to improved water quality conditions within tidal tributary mouths and in the Hudson riverfront communities have been identified and implementation has begun.*

2025 Measures of Success

- Lower Hudson River mainstem ambient water quality data has been collected within each Priority Waterbody List segment.
- Significant non-compliance with State Pollutant Discharge Elimination System permits, the Long Term Control Plan for Combined Sewer Overflows and Sanitary Sewer Overflows, and/or Orders of Consent has been annually tracked and assessed.

2030 Measures of Success

- Updated monitoring and characterization of water quality has been completed using accepted DEC methods.
- 25 wastewater infrastructure improvement and stormwater management projects have been implemented that address water quality and resilience within tidal tributary mouths, the Hudson mainstem, and river cities.
- Chronic Sanitary Sewer Overflows have been reduced, and all communities will have addressed significant non-compliance with State Pollutant Discharge Elimination System permits, the Long Term Control Plan for Combined Sewer Overflows and Sanitary Sewer Overflows, and/or Orders of Consent through timely and appropriate action, including schedule items when required.

Strategies and Actions to Implement the *Action Agenda*:

Strategy 1: Measure and monitor pollutants of concern

- Using approved DEC methods, identify pollutants of concern or resource conditions (e.g., emerging contaminants, bacteria, dissolved oxygen, etc.) in need of attention.
- Using approved DEC methods, implement monitoring programs to better understand conditions. Continue the Hudson River Environmental Conditions Observing System, including stations in the Mohawk Valley.

Strategy 2: Update Priority Waterbodies List

- Using approved DEC methods, update the Priority Waterbodies List, as needed, to reflect conditions based on monitoring.

Strategy 3: Assess and prioritize water quality project and wastewater needs

- Identify areas of importance for protection and restoration of Hudson River source water intakes.
- Complete Hudson River water quality monitoring to better characterize baseline conditions, inform finer-scale investigations, and update the Priority Waterbodies List/Waterbody Inventory.
- Identify projects on tributaries and mainstem to maximize water quality improvement.
- Incorporate climate change considerations into water quality improvement project needs and opportunities.
- Engage with affected communities to provide outreach and gather feedback
- Share monitoring and Combined Sewer Overflow data with partners, such as marine fisheries managers, to enhance coordination.

Strategy 4: Implement water quality improvements

- Assist communities and watershed groups in implementing best management practices.
- Implement water quality improvement projects that align with agency priorities.
- Coordinate with the NYS *Ocean Action Plan* and the *Mohawk River Basin Action Agenda* for ecosystem benefits.

Photo: Laura Heady

A Thriving & Resilient Watershed

The estuary watershed is a living system that carries water from mountain slopes across land and into the streams that join the Hudson along its shorelines. Beginning at the water's edge and extending up to the high peaks that surround the Hudson and form its renowned valley, the watershed is also where people live. Land-use decisions and conservation actions in the watershed impact the estuary. Through management of land and water uses in the Hudson Valley, residents and visitors will benefit from a healthy, resilient ecosystem that supports their well-being. Helping watershed communities and nature to thrive is the focus of this section of the *Action Agenda*.

Benefit: Healthy Tributaries

Background

Clean water is vital to all aspects of life in the Hudson Valley, including drinking water for communities, infrastructure for economic growth, and clean headwater streams and estuary waters supporting robust fisheries and recreation. A healthy estuary requires a healthy watershed containing intact riparian corridors, floodplains, wetland complexes, and forests. The Hudson's tributaries contribute essential freshwater and nutrients to the estuary. However, many stressors still affect watersheds and tributaries -- impervious surfaces, loss of vegetative cover, farm and lawn runoff, failing wastewater systems, barriers to fish movement, water withdrawals, pollutant discharges, and air pollution. Climate change, with more intense rainfall and drought, will impact stream health, aquifer recharge, the availability of water supplies, flooding, and stormwater discharges.

The Estuary Program has provided essential support for watershed planning to address these issues. The program has assessed more than half of the stream road crossings, revegetated over 24 miles of tributary stream buffers, supported stream barrier removals, and funded flooding assessments. With state support, watershed groups and other partners have been identifying key stressors, developing plans, and supporting implementation projects in the tributaries. Supporting good watershed protection and restoration principles sustains the tributaries and the estuary, and protects wildlife habitat, human health, and the well-being of people who live here.

Goal

Impaired tributaries will be identified and improved, and healthy rivers and streams will be maintained, delivering high quality freshwater and habitat connections to the estuary and to drinking water sources. Hudson River tributaries will support aquatic life, as well as human uses.

Key trends, challenges and opportunities

- Climate change and changing weather patterns are affecting all aspects of water management in ways that can be hard to predict.
- Local municipalities have limited capacity to address many of the water resource challenges, and they need help to ensure long-term availability of clean water.
- The presence of active watershed groups has been associated with improved water quality in many places, and supporting them is an opportunity for improved stewardship.
- Culverts and dams act as a barrier to fish and wildlife movement, and exacerbate flooding. Many are in poor condition, creating opportunities to improve flows and habitat, and address climate impacts.

- Streamside buffers face pressure from development and vegetation removal. Conserving and restoring these buffers offers the opportunity to mitigate climate change, conserve fish and wildlife habitat, and facilitate wildlife movement.

2030 Target and Measures of Success

***By 2030**, communities, landowners, and watershed groups will act to mitigate flooding, sustain stream ecology, restore habitat, and protect and restore water quality in at least half of the tributaries where active community-based efforts are underway, including 5 that are sources of drinking water.*

2025 Measures of Success

- Water quality has been assessed using DEC-approved protocols to update the Priority Waterbody List and identify potential water quality impairments in 3 new or unverified tributary segments in addition to routine sampling as part of the Rotating Intensive Basin Survey.
- 5 or more new miles of streamside vegetation have been planted, and revegetation goals have been established that indicate effectiveness of streamside plantings.
- The assessment of culverts in 75% of the watershed has been completed; sites have been prioritized for restoring connectivity and resiliency, and implementation has started to restore 5 miles in priority locations.
- 4 watersheds have one or more of the following: a watershed-based assessment, characterization, intermunicipal cooperative agreement, management plan, stream habitat or flood risk and mitigation studies.

2030 Measures of Success

- 50% of watershed groups have developed one or more of the following: a watershed-based characterization, intermunicipal cooperative agreement, management plan, stream habitat, or flood risk and mitigation study.
- 5 tributary watersheds with impaired stream segments have initiated a 9-element plan or Total Maximum Daily Load, or plan to develop Best Management Practices that address impaired waters.
- 30 or more new best management practices have been implemented for water quality, stream resilience, flood mitigation, and habitat restoration, including dam removals, right-sized culverts replacements, and stormwater improvements.
- 10 or more new miles of streamside vegetation have been planted, with a cumulative total of 35 miles since the Trees for Tribs program began in 2007, with at least 5 miles demonstrating effectiveness.
- The number of chronic sanitary sewer overflows in tributaries has been measurably reduced.
- 500 acres of riparian buffers have been conserved for source water protection

Strategies and Actions to Implement the Action Agenda

Strategy 1: Monitor and assess water quality

- Monitor water quality in tributaries to help prioritize needed actions.
- Assess the condition of streams for habitat and flood resiliency.

- Create monitoring efficiencies and new scientific knowledge through collaboration and partnership with DEC/Division of Water, Interstate Environmental Commission, US Geological Survey, watershed groups, and research and educational institutions.

Strategy 2: Inform and engage stakeholders through outreach

- Raise watershed awareness and capacity, and build support for improvements through learning networks and working groups, including outreach to watershed groups and to traditionally underserved communities that are impacted.
- Facilitate local participation in DEC source water protection plans and grant programs, including land acquisition in source watersheds.

Strategy 3: Build capacity of partners to implement best management practices

- Provide technical assistance and scientific information to watershed groups, municipalities, and county and regional partners, enabling them to work within and across municipal boundaries to conduct watershed management planning and to implement best management practices for water quality improvement, flood resiliency, wastewater management, habitat restoration and barrier mitigation, fish passage, and sustaining water resources.
- Conduct flood mitigation and stream road crossing assessments to identify and prioritize flood-prone areas and mitigation strategies (e.g., culvert replacements) under existing and projected climate and land-use change scenarios.

Strategy 4: Implement priority projects

- Implement priority projects in watershed plans or community plans to restore and protect tributary resilience and water quality, including streamside buffer and floodplain restoration, stormwater green infrastructure projects, wastewater improvements, habitat restoration, culvert replacement, dam removal, land acquisition, and land conservation practices.

Benefit: Climate-Adaptive Communities

Background

Changing development patterns, types of industry, modes of transportation, and sources of energy have shaped the communities and estuary ecosystems we see today, and will shape those we live in tomorrow. How resilient our waterfront communities are to changing conditions and how our communities manage their environment will be central to their health and the health of the Hudson River estuary. Our high-risk waterfront communities are those that have dense populations and high-value infrastructure in the floodplain, and where the climate crisis is introducing new and uniquely compounding challenges.

The Estuary Program, in partnership with the DEC Office of Climate Change, NYS Department of State, and other agencies and regional partners, has supported the revitalization of many river shoreline communities and the piloting of innovative flood adaptation strategies. We are supporting the US Army Corps of Engineers evaluation of coastal risk management strategies for the NY-NJ Harbor and Estuary. With rapid climate change, the potential for counterproductive choices is great. Sustained programming is needed to help communities adapt or relocate existing structures in the floodplain. Continued strengthening of partnerships and collaboration is needed to address this challenge.

Goal

Our highest risk waterfront communities have become thriving, beautiful, resilient global models for adapting to flooding and sea-level rise using strategies that also increase resilience to heat and drought.

Key trends, challenges and opportunities

- Given the high value of waterfront property, full build-out is occurring on the waterfront, including areas that may be inundated by the end of the century.
- Homes and businesses may be abandoned due to nuisance flooding if communities do not adapt.
- Significant infrastructure is in the flood zone: roads, bridges, railroad tracks, water, and sewer plants.
- Municipalities have limited capacity and resources to do the necessary adaptation planning on their own.
- Social vulnerability may increase rapidly over time in high flood-risk areas, and green gentrification may displace vulnerable populations.
- Natural and nature-based approaches can have numerous benefits, including reducing risk of erosion and flooding, as well as reducing or sequestering greenhouse gases that cause climate change.

2030 Targets and Measures of Success

*By **2030**, all high-risk waterfront communities have a climate adaptation plan and are implementing innovative strategies to adapt their waterfront to flooding, heat, and drought associated with rapid (medium high or high) climate change through the end of the century.*

2025 Measures of Success

In Hudson River Estuary watershed communities (257 total):

- 141 (55%) are *registered* Climate Smart Communities (CSCs), 17 (7%) are *certified* CSCs, and 50 new CSC Adaptation Actions have been completed

In Hudson River waterfront communities (78 total):

- 12 have developed a climate adaptation plan, eight have updated zoning, building codes or plans, and five have designs, engineering, and/or implementation of natural and nature-based approaches
- 100% of new adaptation plans and projects are developed using an inclusive process and consider social vulnerability factors like green gentrification

2030 Measures of Success

In Hudson River Estuary watershed communities:

- 178 (70%) are *registered* Climate Smart Communities (CSCs), 25 (10%) are *certified* CSCs, and 100 new CSC Adaptation Actions have been completed

In Hudson River waterfront communities:

- 25 have developed a climate adaptation plan, 15 have updated zoning, building codes or plans, and 10 have designs, engineering, and/or implementation of natural and nature-based approaches
- 100% of new climate adaptation plans and projects are developed using an inclusive process and consider social vulnerability factors like green gentrification

Strategies and Actions to Implement the *Action Agenda*

Strategy 1: Distill, streamline, and disseminate adaptation practices for ease of adoption

- Explore innovative efforts around the country to advance adaptation practices.
- Collaborate with regional partners on innovative adaptation strategies, pilot new approaches with communities, and evaluate their success.

Strategy 2: Increase partner capacity to support implementation of municipal resilience actions

- Support county-level efforts to help communities complete Climate Smart Communities adaptation actions.
- Work with partners to provide seed funding or creative financing opportunities that help communities overcome key municipal barriers to adaptation action, and foster intermunicipal efforts.
- Build the Learning Network, comprised of leading waterfront communities learning and working together on their resilience strategies.
- Explore partnerships with the environmental justice community to increase awareness and understanding of the implications of adaptation approaches on socially vulnerable populations.

Strategy 3: Help advance federal, state, and local policy to promote resilient communities and nature-based approaches

- Support development and implementation of state and federal policy initiatives, such as Climate Smart Communities, the Climate Leadership and Community Protection Act, and assessments of region-wide coastal risk management approaches.
- Connect and integrate with other federal and state programs to maximize available resources and synchronize funding opportunities.

Benefit: Conserved Natural Areas for wildlife, source water, climate resilience, and scenery

Background

The communities of the estuary watershed are as diverse as its natural areas and habitats, but they all share three key characteristics. First, they all connect to the estuary, either directly on its shorelines or tributaries, or through the living landscape of forests, fields, wetlands, and streams that comprise its watershed. Second, all communities benefit from these ecosystems, which help to keep drinking water and air clean, moderate temperature, store carbon, absorb floodwaters, and provide wildlife and fish habitat, scenery, and opportunities for outdoor recreation. Finally, all communities rely on local decision-makers — town boards, planning and zoning boards, conservation advisory councils, and open space commissions — to play a significant role in determining the fate of natural areas and biodiversity.

While New York State, land trusts, municipalities, and conservation non-governmental organizations have successfully conserved approximately 20% of the watershed, significant areas that support nature and human needs remain vulnerable to land-use change. The Estuary Program and its partners have helped local land-use planners balance future growth with protection of priority lands and waters, providing current scientific data and added capacity for conservation planning. Further assistance and capacity building are needed to reach new communities, strengthen

partnerships, and increase plan implementation to achieve conservation of the region's irreplaceable natural assets.

Goal

Lands and waters that are recognized as regional priorities for wildlife and fish habitat, clean water, climate resilience, and scenery are incorporated into conservation and land-use plans and policies in the watershed. Through acquisition, key sites are permanently protected, and connectivity of conserved habitats and natural areas in the estuary watershed is achieved.

Key trends, challenges, and opportunities

- Natural areas like forests and wetlands contribute to the well-being of watershed residents by supporting water quality, climate resilience, habitat, and scenery.
- Many natural areas are unprotected and vulnerable to incompatible land-use change, climate change, and invasive species. Emerging land-use trends like renewable energy siting present new challenges and opportunities to address the causes of climate change, and implement solutions.
- Natural carbon sequestration in forests is anticipated to play a significant role in meeting the carbon capture goals of the Climate Leadership and Community Protection Act.
- Municipal capacity and budgets are often insufficient to adequately address conservation of natural areas.
- Multiple jurisdictions often result in conservation planning that lacks coordination.

2030 Target and Measures of Success

***By 2030,** at least 50 new practices, plans, and policies are created and adopted by government agencies, non-governmental organizations, and land-use decision-makers in the estuary watershed to conserve areas recognized as regional conservation priorities for habitat, connectivity, clean water, climate resilience, and scenery, and priority natural areas in the watershed are protected through land acquisition.*

2025 Measures of Success

- 12,000 acres of natural area in the watershed, including 2,000 acres along the estuary, have been newly conserved by New York State and partners.
- 5 planning projects have been completed to support landscape conservation and habitat connections (e.g., core forests, stream corridors, wetland complexes, source watersheds).
- 2 municipalities in the watershed have successfully established local land acquisition programs (e.g., Community Preservation Act, open space bond, land trust partnership) for the protection of conservation priorities.
- New or updated conservation practices, plans, and policies have been completed in 25 municipalities, including 10 in Significant Biodiversity Areas, on the estuary shoreline, or in other areas identified as conservation priorities.
- 30% of municipalities with Natural Resource Inventories have used their inventories for conservation planning (e.g., open space index, plan, policy).

2030 Measures of Success

- 20,000 acres of natural area in the watershed, including 3,000 acres along the estuary, have been newly conserved by New York State and partners.
- Local land acquisition programs have been established in 5 new municipalities.
- New or updated conservation practices, plans, and policies have been completed in 50 municipalities, including 30 in Significant Biodiversity Areas, on the estuary shoreline, or in other areas identified as conservation priorities.
- 10 planning projects have been completed to support landscape conservation and habitat connections (e.g., core forests, stream corridors, wetland complexes, source watersheds).
- Natural Resources Inventories have been completed in 50 municipalities since 2014, with 25 (50%) actively using them in planning processes.

Strategies and Actions to Implement the *Action Agenda*

Strategy 1: Scientific study and research

- Use current science and data to update our understanding and ability to identify priority lands and waters for stewardship, conservation, and protection.
- Increase our ability to disseminate current data and recommendations on conservation priorities to decision-makers.

Strategy 2: Increase decision-maker capacity

- Deliver science-based training, technical assistance, and tools to increase the capacity of government agencies, non-governmental organizations, and land-use decision-makers for stewardship, conservation, and protection of priority lands and waters.
- Raise awareness, increase knowledge, and build support for improvements through learning networks, working groups, and community of practice.

Strategy 3: Increase and diversify resources for conservation action

- Increase opportunities for municipalities and land trusts to secure resources for implementation of local conservation plans and acquisition of priority lands and waters.
- Connect and integrate with other federal and state agencies and programs to maximize available resources and synchronize funding opportunities.

People Living Well with Nature: Recreation, Education, and Inspiration

The estuary provides outstanding opportunities for recreation and tourism for people of all ages and abilities. It also inspires us with its natural beauty and its majesty. This section of the *Action Agenda* focuses on helping people use the river, understand how it can best be managed, and become informed stewards.

Benefit: An Informed and Engaged Public

Background

Access to environmental education is essential to inform, inspire, and engage residents and visitors so they become good stewards of the estuary and its watershed. The Estuary Program, in close partnership with the Hudson River National Estuarine Research Reserve, ensures people have the knowledge and tools to go from exploring their river to making good decisions.

The Estuary Program implements a wide range of programs that introduce participants to the fundamentals of river ecology and current research. Citizen science programs, in-school programs, and online resources bring the river alive, while shoreside programs give students hands-on experiences in river science. Programs are supported with trainings, lesson plans, grants, and professional development for teachers and educators to build an informed community. We are committed to keeping our programs accessible and inclusive. At all levels, education is a crucial step in helping people keep the Hudson River estuary and watershed a thriving and vibrant place to live.

Goal

Effective curricula and programs have empowered a diverse audience of students, educators, communities, and decision-makers to engage in environmental stewardship actions, enabling them to demonstrate greater knowledge of their river and its benefits. Barriers to inclusion have been addressed to ensure access to all our programs.

Key trends, challenges and opportunities

- Time with technology is supplanting time outdoors.
- Teachers have to meet an increased number of new requirements, and they have limited time for adding new curriculum. However, new science standards correlate well with environmental education practices.
- Not all communities have adequate river access for educational programming.
- Environmental program staff and program participants sometimes do not represent the full diversity of valley demographics and perspectives.
- There is general, renewed interest in the Hudson River after decades of environmental abuse.

2030 Target and Measures of Success

By 2030, *effective curricula and programs engage students, educators, communities, and decision-makers in Hudson River environmental education, and include a diverse audience reflective of the valley's local communities and visitors. Barriers to inclusion have been identified and steps to improve accessibility are in place.*

2025 Measures of Success

- Annually, at least 500 educators have participated in professional development opportunities that are focused on the Hudson River and aligned to NYS learning standards, an increase from a 2020 baseline of 350 educators annually.
- 75% of partner organizations have regularly used and promoted shared messages and information about the river ecosystem.
- Each year, at least 15,000 K-College students have participated in our programs and those of our grant-funded partners, and an estuary-wide reporting system has been established to track collective metrics of river education providers.
- At least 10,000 people annually have participated in citizen science and public programs delivered by us and our grant-funded partners.
- By 2025, at least 30% of participants who have been engaged in education programs delivered by the Estuary Program or through grants and technical assistance to partners are from potential environmental justice areas—an increase over the 25% 2020 baseline. All Hudson River Estuary Program and Hudson River National Estuarine Research Reserve education staff are trained in culturally relevant teaching, and we support partners in similar efforts.
- Working groups have been established for both upriver and New York Harbor environmental education facilities, and annual grants provide support to improve programs, materials, and visitor experiences for at least four environmental centers annually.

2030 Measures of Success

- At least 20,000 people have participated in citizen science and public programs focused on the Hudson River and its watershed, contributing more than 60,000 volunteer hours over the ten-year period from 2021-2030.
- At least 150,000 students have participated in school-based and field programs over the ten-year period from 2021-2030.
- Up to 25% of school districts in the estuary watershed, and 50% of districts that border the shoreline, have participated in multiple Hudson River learning opportunities over the ten-year period from 2021-2030, including river studies at multiple grade levels or in-depth study within a grade.
- By 2030, at least 35% of participants engaged in education programs delivered by the Estuary Program or through grants and technical assistance to partners have been from potential environmental justice areas—an increase over our 25% 2020 baseline. Locally based facilities for learning about the river have been enhanced with state-of-the-art exhibits and a coordinated network of professional development.
- More than 500,000 Hudson Valley students and visitors have been exposed to the Hudson estuary through our education, stewardship, and grant programs for the period from 2000 to 2030.

Strategies and Actions to Implement the *Action Agenda*

Strategy 1: Engaging local communities and visitors

- Survey Hudson Valley residents to assess overall needs and changes in understanding, behavior, and attitudes over time.
- Expand online and multi-media resources to engage individuals and classrooms.
- Provide citizen science opportunities for community engagement with resources.
- Continue adult learning programs to meet specific needs of and opportunities for mature audiences.
- Coordinate with the NYS Department of Health to focus on fish advisories and the angling community.
- Implement public field programs to engage persons of all ages and abilities in festivals, open houses, and field work, including the Hudson River Almanac, Hudson River Environmental Conditions Observing System real-time monitoring, and community engagement in Norrie Point Environmental Center.

Strategy 2: Educating students and young people

- Continue to create stewardship, field and school programs, and K-12 experiences to engage and expose students to their local waterbody and next steps of engagement, including the annual Day in the Life of the Hudson & Harbor.
- Provide grants and assistance to local colleges and universities to provide opportunities for students to expand on their interests in science and public policy research about the Hudson River.
- Increase use of digital platforms to enhance learning.

Strategy 3: Empowering teachers and educators

- Support professional development opportunities for teachers to provide them with the tools and expertise to multiply their experiences within their classrooms.
- Provide curriculum development for classroom teachers and educators that engages students in multiple levels of Hudson River content.
- Align river education with NYS Learning Standards to make our materials as useful and inclusive as possible.
- Raise awareness and capacity, and build support for improvements through learning networks and working groups.

Strategy 4: Building education capacity and excellence

- Establish shared Hudson River key understandings and conservation actions, and use them to promote a natural history-based sense of place and a wider understanding and stewardship of the estuary.
- Maintain a network of environmental educators, partners, and river centers to improve and increase community engagement throughout the watershed.
- Address barriers to inclusion in the environmental education community and improve access to educational programming by persons of different abilities and ages.

Benefit: An Accessible Hudson River for People of All Ages and Abilities

Background

The Hudson River estuary and its shores offer exceptional opportunities for outdoor recreation. As water quality has improved over the last 40 years, the demand for river access has risen accordingly. Today, nearly every community along the estuary has some form of public access to the river despite site limitations due to steep slopes and the presence of railroad tracks. More than 100 sites now provide a variety of opportunities to experience the river for boating, fishing, hiking, swimming, river watching, wildlife-related recreation, and river cruising, as shown on the DEC website. https://www.dec.ny.gov/lands/112137.html. However, new challenges stemming from climate change require action to ensure there will continue to be access for everyone. River access sites will be on the front line of rising sea levels.

The Estuary Program's recent focus has been and will continue to be to encourage managers of access sites to maintain and improve these special places, making them more accessible to all users, including people with disabilities and environmental justice communities, as well as making them more resilient to flooding, sea-level rise, and storm surge. There are still some communities that have limited or no access to the river within a convenient traveling distance for their residents. Efforts will continue to identify these areas of need and improve access opportunities where these gaps exist.

Goal

Develop, maintain, and improve a regional system of access points for fishing, boating, swimming, hiking, education, river watching, tourism, and wildlife-related recreation, and build connections that enable residents and visitors of all ages and abilities to have rich and diverse river experiences. Vulnerable access sites are resilient to flooding and sea-level rise.

Key trends, challenges and opportunities

- The demand for new river access continues to increase, and with it the need to make inclusive, diverse, and positive experiences available to a broader spectrum of people, particular people of color.
- Protecting and maintaining existing access sites is costly and often exceeds the budget of many municipalities.
- Deep water docks/ports for educational vessels and river cruising are in need of maintenance and/or do not meet the needs of today's larger vessels.
- Flooding and sea-level rise is occurring now and will increase in scope and severity, affecting nearly all river access sites.
- Some communities continue to have limited access to the river, especially in the New York Metropolitan area and disadvantaged communities.
- Public beaches are very limited, and people are swimming at random locations in the estuary.
- Private marinas and boat clubs are having difficulty with dredging due to the cost, which cannot be covered with state grants.
- Limited public transportation to river sites makes it difficult for some communities to access the Hudson River.

2030 Target and Measures of Success

***By 2030**, at least twenty new and/or existing public Hudson River estuary and harbor access sites have improved accessibility to the river, addressing inclusivity, diversity, and the visitor experience for everyone, including people with*

disabilities, older adults, and families with small children. The impacts of flooding, storm surge, and sea-level rise, and related land-use changes on the amount and condition of river access sites has been evaluated, and at least 20 ecologically-sound flood-resiliency plans have been developed for sites in need.

2025 Measures of Success

- Accessibility has been improved at 10 new or existing Hudson River estuary and harbor access sites using universal design principles
- Ecologically sound flood-resiliency plans have been developed for 10 access sites in the anticipated 2050 flood plain; implementation has been demonstrated at three sites.

2030 Measures of Success

- Accessibility has been improved at a minimum of 20 new and/or existing public Hudson River estuary and harbor access sites for the time period from 2021 to 2030.
- Ecologically sound flood-resiliency plans have been developed for at least 20 vulnerable access sites in the anticipated 2050 500-year floodplain; implementation has been demonstrated at five sites for the time period from 2021 to 2030.

Strategies and Actions to Implement the *Action Agenda*

Strategy 1: Assess and prioritize

- Conduct a Gap Analysis/Needs Assessment to identify areas in need of additional public access, access types needed, and where improvements are needed to existing sites.
- Conduct a flood vulnerability assessment of access sites within the anticipated 2050 500-year floodplain and prioritize those most in need of flood resiliency planning.

Strategy 2: Best management practices, technical assistance, and capacity building

- Use the Flood Resiliency Handbook for Public Access Sites Along the Hudson River and the “Climate Adaptive Design Lookbook” as tools when assisting access site planners and site managers.
- Develop criteria and outline a structure for what an “ecologically sound flood-resiliency plan” would entail.
- Support working groups for site managers to address current and future flooding and storm surge resilience needs, including planning for future changes in land use, as well as accessibility improvements at access sites.
- Provide newly available information to improve accessibility through the implementation of the principles of universal design and access-site resiliency.
- Provide on-line information to the public about access opportunities, using easily accessible formats.
- Increase the use of technology, including for translations into other languages.
- Produce a handbook to help site managers and planners improve accessibility for paddle sports.
- Support the NYS Department of Health Hudson River Fish Advisory Outreach Program in educating the public about eating Hudson River fish.
- Work with local PRISMs and DEC’s Bureau of Invasive Species and Ecosystem Health on invasive species management at impacted river access sites.

Strategy 3: Implement Construction/Site Improvements

- Provide state grant support for both accessibility and resilience, including:
  - New site development,
  - Improved/upgraded sites and site maintenance
  - Improved wayfinding, signage, and communications to and at sites in multiple and appropriate languages
  - Ecologically sound flood resiliency plans for access sites within the anticipated 2050 500-year floodplain.
- Strengthen grant requirements for projects to be climate resilient by 2050 and beyond, and for compliance with the Americans with Disabilities Act and the principles of universal design.
- Support development of access in disadvantaged communities, urban areas, to underserved populations, and in identified areas of need. Support communities in providing public transportation to access sites.
- Connect and integrate with other federal and state programs to maximize available resources and synchronize funding opportunities.

Department of
Environmental
Conservation

www.dec.ny.gov